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Promoting gains in reading fluency: a comparison of three approaches

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Abstract On the ground that reading fluency entails appropriate phrasing or prosody as well as facile word recognition, we investigated the effectiveness of text-based and word-based repeated readings procedures for promoting fluency of reading aloud and comprehension in second-grade children. Repeated readings of text printed with spaces between phrases and ends of lines at clause boundaries (phrase-cued text), repeated readings of text printed with conventional layout (standard text), and repeated readings of lists of difficult words from text were compared. Computer-based, guided repeated reading training intervened between a pretest and post-test reading of text. Each training condition led to significant benefits on one or more of the experimental measures obtained from reading aloud. Repeated readings with text resulted in greater gains in fluency than repeated readings with word lists. Reading with natural prosody was most strongly facilitated by repeated readings of phrase-cued text, which provided visible support for sentence structure.

Keywords Cued text · Reading fluency · Repeated readings · Rereading · Training

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A common concern expressed by teachers is that children often have difficulty reading connected text fluently even though they have learned to decode individual words fairly well (Rasinski, 1994). An important goal of instruction, therefore, is to facilitate children's advancement from word reading to fluent text reading. Although it is clear that fluency can only be achieved through practice, there is lack of agreement as to the most effective form of practice and, hence, the most appropriate materials to use during practice. On one view, fluency is determined primarily by achieving adequate word recognition speed (Fries, 1962). However, fast reading is not necessarily fluent reading. Fluency also entails reading with appropriate phrasing or prosody. Prosody is an essential attribute of reading aloud and it may be implicit in silent reading as well (Fodor, 2002). But, unlike speech, printed material offers only partial and indirect cues to prosody. Acknowledging the importance of prosody, the National Reading Panel (NRP, 2000) defines reading fluency as the ability to ''read text with speed, accuracy, and proper expression (pp. 3–5).'' Thus, fluency is considered to have two essential characteristics: accuracy/speed of word recognition and appropriate phrasing or prosody. In our research, we have embraced both characteristics as goals of teaching for fluency.

Repeated readings (hereafter, RR) is a common form of supervised practice used routinely in elementary schools to help students increase their fluency (NRP, 2000). It involves rereading the same passage until a desired reading rate is achieved. RR training has been found to be more effective in promoting fluency than free, independent reading (Carver & Liebert, 1995; NRP, 2000). In particular, RR training has been shown to lead to higher reading rates, as measured in words correct per minute (WCPM).

RR training can take two general forms—unassisted practice in which the child silently rereads a passage without direct adult supervision, and assisted practice in which an experienced reader models reading of the passage as the child reads along (Meyer & Felton, 1999). In seminal studies by Dahl (1979) and Samuels (1979), second- and third-graders read passages unassisted until they reached a set reading rate. Following RR training, there were significant improvements in reading speed for the practiced text (see also Carver & Hoffman, 1981; O'Shea, Sindelar, & O'Shea, 1985, 1987). Similar findings have been reported for nonfluent readers (Faulkner & Levy, 1994; Herman, 1985) and children with reading disabilities (Rashotte & Torgesen, 1985; Stoddard, Valcante, Sindelar, O'Shea, & Algozzine, 1993).

Others have found success with assisted RR training. In an influential study, Chomsky (1976) asked poor readers in the third grade to read along in a book while listening to an audio-taped recording of the book. The audio support facilitates decoding and supplies appropriate prosody. Students continued with assisted RR until they could read the book easily without support. In a later study, Conte and Humphreys (1989) confirmed that RR training with audio-taped text enhanced reading accuracy in older poor readers (see also Morgan & Lyon, 1979; Young, Bowers, & MacKinnon, 1996).

Unassisted and assisted forms of RR training were explicitly compared by Dowhower (1987). She divided her second-grade participants into two groups. Children in the unassisted group reread passages independently and were given help with word recognition when requested. Children in the assisted group first listened

to each passage on audiotape. Once they could read aloud with the audiotape, they were asked to reread the passage without it. Dowhower found few differences between groups in accuracy or reading rates for the practiced text (see also Rasinski, 1990). However, the assisted group showed a somewhat greater benefit on prosodic indicators (e.g., pause intrusions), and needed less monitoring and encouragement than the unassisted group.

Although most RR training studies have used text, a few studies have presented lists of difficult words from the text for training purposes. For example, Fleisher, Jenkins, and Pany (1979) asked poor readers in fourth and fifth grade to read aloud lists of words on flashcards until they reached a criterion level of reading speed. Fleisher et al. (1979) found that RR training of word lists led to accuracy and speed advantages in reading text; however, they failed to replicate the findings in a second study. Subsequent studies have shown benefits of RR training of word lists (e.g., Levy, 2001; Levy, Abello, & Lysynchuk, 1997; Tan & Nicholson, 1997). For instance, Levy (2001) compared RR training of text with RR training of word lists in fourth-graders and found equivalent gains in reading for the two conditions.

An issue addressed in a number of studies is whether the benefits of RR training generalize to new, unpracticed texts. Most studies have reported that RR training contributes to accuracy and speed gains in reading new text (e.g., Carver & Hoffman, 1981; Faulkner & Levy, 1994; Herman, 1985; Morgan & Lyon, 1979; Rashotte & Torgesen, 1985). For instance, Rashotte and Torgesen (1985) found with non-fluent readers in grades two through five that reading speed advantages transferred across texts but only when at least half of the words were shared between texts. Faulkner and Levy (1994) obtained similar results, but only for more difficult texts; shared content was a more important prognosticator of transfer for easier texts.

A few studies assessing transfer effects have contrasted RR of text with RR of word lists. In an early study with second-graders Dahl (1979) found that, unlike RR training of text, RR training of word lists did not lead to gains in word accuracy or reading rate for unpracticed text. In contrast, Levy (2001) tested fourth-graders and found that RR training of text and RR training of word lists were equivalent in transfer of gains in accuracy and speed. Most recently, Martin-Chang and Levy (2005) compared RR training of text and word lists in second- and fourth-graders and found that while both forms of RR training resulted in transfer effects, overall benefits for both grades were greater for text training.

In the present study, we contrasted a version of assisted RR training of text with RR training of word lists. In addition, we compared the effectiveness of two forms of text layout. One form consisted of text in conventional (standard) layout whereas the second consisted of formatted text. The use of formatting was guided in part by results of our recent research (LeVasseur, Macaruso, Palumbo, & Shankweiler, 2006). In LeVasseur et al., we attempted to promote fluent reading by providing visible cues to prosody. We made clausal boundaries visibly distinct by using line breaks to mark boundaries. To assess the effects of this manipulation, we compared second- and third-graders' readings of formatted (cued) text with their readings of phrase-disrupted text (where ends of lines disrupted phrases). We found that cued text facilitated fluency in reading aloud compared with phrase-disrupted text.

Although we did not find speed advantages (but see Mason & Kendall, 1979; Wood, 1975), children were rated as showing better phrasal reading and made fewer errors in transitioning from one line to the next with cued text.

While the benefits of RR training and cued text have been examined separately, in the present study we investigated the benefits of combining the two approaches. Accordingly, we compared RR training of cued text, printed with spaces between phrases and ends of lines marking clause boundaries, with RR training of standard text. We also compared both text conditions with RR training of word lists. The effects of RR training were examined in second graders. Five measures of reading fluency were employed. Two measures, word errors and WCPM, assessed reading accuracy and speed, and three prosody-related measures assessed phrasal reading: beginning-of-line false starts, dysfluencies elsewhere in the text, and ratings of phrasal reading.

In addition to assessing fluency, we also considered whether RR training results in benefits to comprehension. Thus far, findings with regard to comprehension have been inconsistent. Some studies report that RR training with text improves comprehension (e.g., Bourassa, Levy, Dowin & Casey, 1998; Herman, 1985; O'Shea, Sindelar, & O'Shea, 1985, 1987) whereas others report no benefits (see Conte & Humphreys, 1989). Mixed results were reported by Dowhower (1987). She found comprehension benefits after assisted RR training but not after unassisted RR training. Similarly, results from RR training of word lists have been inconsistent. Some have found improved comprehension (Levy et al., 1997; Tan & Nicholson, 1997) while others have not (Dahl, 1979; Martin-Chang & Levy, 2005). In general, the effects of RR training on fluency have proved stronger than on comprehension (NRP, 2000). Finally, evidence is mixed regarding whether cued text benefits comprehension over standard text (for review, see LeVasseur et al., 2006). In the present study, we assessed comprehension using recall questions.

To summarize, for this study, we contrasted three forms of RR training: standard text, cued text, and word lists. We hypothesized that each form of training would produce measurable improvements in reading fluency and perhaps comprehension. Further, we predicted that RR training of cued text would lead to greater gains in phrasal reading than RR training of standard text, with RR training of word lists providing the least support for phrasal reading. Finally, we examined whether transfer effects would result from any of the three forms of RR training.

Method

Participants

The sample consisted of 49 children drawn from two elementary schools—one located in urban Rhode Island and the other in rural Connecticut. The children were second-graders tested in the middle of the school year. There were 21 boys and 28 girls, and all but three were native speakers of English. Four children were excluded

because their grade equivalencies on the Reading Fluency subtest of the *Woodcock-Johnson Psycho-Educational Battery, Third Edition, WJ III* (Woodcock, McGrew, & Mather, 2001) fell below kindergarten level. Nine were removed because they did not follow directions during the training procedure. Analyses were based on the remaining 36 participants (15 boys, 21 girls), all native speakers of English.

Materials

Tests that assess language- and reading-related skills were administered in order to develop profiles of the participants' abilities. These included the following subtests from the *WJ III*: Letter-Word Identification, Reading Fluency, Word Attack, Passage Comprehension, and Picture Vocabulary. In addition, two Rapid Serial Naming (RSN) tasks were administered—letter naming and object naming (S. Brady & H. Scarborough, personal communication, 2004). Finally, to assess working memory capacity, we administered a Word Span task (Hindson, Byrne, Fielding-Barnsley, Newman, Hine, & Shankweiler, 2005).

Three fictional passages were selected to assess the effects of RR training. These passages were excerpts from the following children's texts, rated as readable by beginning of third grade using the lexile procedure (Schnick & Knickelbine, 2000): *What a Day!* (Odgers, 1987) with a lexile value of 520, *The Midnight Pig* (Krueger, 1997) with a lexile value of 500, and *It's Just a Trick* (Dugan, 1988) with a lexile value of 500. Lexile scores are based on a readability formula that takes into account word difficulty and sentence complexity. The first half of each passage was used at pretest, during training and post-test, whereas the second half was used only at pretest and post-test to assess transfer to untrained material. The trained passages averaged 102 words, and the untrained passages averaged 128 words. (The trained and untrained passages are shown in Appendix A.)

The experiment was implemented on individual laptop computers. E-Prime, (Psychology Software Tools, Pittsburgh, Pennsylvania), the operating system used to present the passages, allowed the participants to progress through the training and testing phases via key presses, and kept track of reading times. It also provided feedback, informing the participants of their times on each rereading (of passage or word list).

Procedure

In an initial session, participants were seen individually for approximately 30 min. They were administered the background tests of language- and reading-related skills. For the *WJ III* Letter-Word Identification subtest, they were shown individual letters or words and asked to read each one aloud. On the *WJ III* Reading Fluency subtest, participants read a series of sentences and decided if the sentences were true or not. For a true sentence they circled YES (e.g., ''A bird can fly.'') and for a false sentence they circled NO (e.g., ''Cats have five legs.''). Scoring was based on the number of items answered correctly within a three-minute time limit. On the *WJ III* Passage Comprehension subtest, participants silently read sentences containing blanks and are asked to say aloud words that ''go in the blank.'' For the *WJ III*

Word Attack subtest, participants read aloud a set of nonwords (e.g., tiff). The *WJ III* Picture Vocabulary subtest assesses expressive vocabulary. The children named objects presented as line drawings (e.g., giraffe).

Each RSN task consisted of an array of 50 items (5 rows with 10 items per row). Items in the letter array were the letters m, t, o, s, and k. The object array contained line drawings of a chair, flower, umbrella, bed, and key. Participants were asked to name the letters (objects) ''as fast as you can'' starting at the top left corner and ending in the bottom right corner. Time to complete the array was recorded in seconds. Three sets of words were used on the Word Span task: six phonologically dissimilar one-syllable words (e.g., hand, clock), six phonologically similar one-syllable words (e.g., hat, cat), and six phonologically dissimilar three-syllable words (e.g., telephone, piano). Each set began with two lists of words, each two words long. If the participant repeated both lists correctly, the tester increased the length of the next two lists by one. If the participant failed to repeat both lists correctly, testing stopped. However, when a participant repeated only one list correctly, a third list at that length was given. If that list was repeated correctly, two lists at the next length were given. If the participant failed the third list, testing stopped. Scoring was based on the longest list length in which two lists were repeated correctly.

Following the initial session, each participant took part in three conditions of RR training: standard text, cued text, and word list. The three training conditions are described below. Participants read each one of the three test passages, each one on a different day in a different training condition. There were nine possible training condition-passage orderings. These were counterbalanced as shown in Appendix B. Five participants were allocated to each ordering. Scores on the *WJ III* Reading Fluency subtest were used to assign participants to these nine groups so that mean scores were roughly matched across orders.

The three training sessions were conducted partly individually and partly in small groups of participants. Each participant's three training sessions (one for each condition) took place on a different day distributed over a three-week period (see Appendix B for an example).

Each training session comprised three parts—pretest, training, and post-test. For the pretest, participants were seen individually and asked to read aloud the to-be-trained passage on the computer screen (in standard format). The participant was instructed to read the passage ''as best as you can'' and told that he or she would be asked to answer questions about the story afterwards. After reading the passage, the participant responded to four comprehension questions read by the tester. The participant then reread the passage with correction by the experimenter of any misreadings. Finally, the participant read aloud the untrained passage and answered four comprehension questions. (Comprehension questions are provided in Appendix A.) Responses during pretesting (and post-testing) were audiotaped and scored as described below.

After pretesting, participants, in groups of two or three, took part in a computer-based training session lasting 15 min. Each child was seated at a laptop computer. The content of the session varied according to condition:

Word list

Participants in the word list condition were trained on 10–20 individual words taken from the test passage. Low frequency and long words were targeted for training (see Appendix C).[1] The words appeared in a vertical column in the center of the screen. The tester pronounced each word and the participants repeated it after her. Next, each participant read the list aloud individually, with correction given by the tester as needed. Afterwards, the participants read the words aloud 12 times, without correction. They were told to ''whisper read'' to avoid disturbing the other children. When the participant reached the final word on the screen, he or she pressed the space bar. The time (in seconds) for that trial appeared on the screen. After trial two and subsequent trials, response-time feedback was given. If the current time was faster than the preceding trial, ''Faster than last time!'' appeared on the screen.

Cued text

Participants in the cued text condition saw the same passage they read at pretest, but with phrases and clauses presented in cued format. Clausal structure was kept intact at line breaks, and phrases were cued within a line by insertion of extra spaces. (See Appendix D for criteria for defining a syntactic phrase.) Below is an excerpt from the *What a Day!* passage:

I settled in my kitchen until the family got up.
Things were all right until after breakfast,
when the kids took me out into the garden.

The tester gave the following instructions: ''See how these words are grouped together (pointing)? That's because they belong together to mean something. So, we should read them together, like we say words when we are telling a story.'' (The tester gave an example from the passage.) The tester then played an audiotaped reading of the passage to the participants and said, ''Listen to how the lady is reading the story and what her voice is like while she's reading it.'' Afterwards, the tester reviewed what the reader did. She said, ''Did you notice that the lady was reading the words together in groups? She wasn't reading one ... word ... at ... a ... time ... like ... this. The lady reading the story paused at the ends of lines, too. That's because the words on one line go together to mean something and the words on the next line go together to mean something else. Also, the lady was changing the sound of her voice sometimes to stress something.'' The tester gave an example from the text. ''Now, it's your turn to read the story again. Read it the best you can.'' The participants practiced whisper reading the passage, pressing the space bar at the end. This brought up their reading time. Then they read the passage a second time. If they improved their reading time, ''Faster than last time!'' appeared on the screen. They read the passage two more times with response-time feedback.

[1] Approximately 15% of the words from each passage were selected for the word lists. Eighty-five percent of the words in each list were from the bottom third of all words in the passage in terms of word frequency (Francis & Kucera, 1982). All but one of the remaining words in the lists contained five or more letters. Overall, 72% of the words in the lists contained five or more letters.

Standard text

For this condition participants saw the same passage they read at pretest in standard format. Instructions were identical to the cued text condition except that the tester did not relate phrasing to visual cues in the passage. She began by playing the audiotaped reading of the passage to the participants and followed the procedure described above.

Post-testing took place immediately after training. Participants met individually with the tester and were asked to read aloud the same (trained and untrained) passages from pretest displayed in standard format. After reading each passage, participants responded to the comprehension questions given at pretest.

Scoring

Six experimental measures were obtained from audiotapes of participants reading the pretest and post-test passages. Two measures related to accuracy and speed:

(1) words correct per minute (WCPM);
(2) percentage of *word errors*, which included decoding errors and word omissions. Percentages were obtained by dividing the number of word errors by the number of words in the passage.

Three measures related to phrasing or prosody:

(3) *fluency ratings*. Ratings were based on a scale adapted from the National Association of Educational Progress (National Center for Education Statistics, 1995). The fluency rating scale gives the greatest weight to phrasing in reading aloud. A four-point scale was used in which 1 indicates that phrasing was mainly absent (reading in a list-wise, word by word manner) and 4 indicates appropriate phrasing (reading in prosodically-organized phrasal groups). The ratings 2 and 3 were assigned to intermediate cases. Two raters listened to the audiotapes and provided a rating for each passage. Both raters are teachers experienced with children's reading;
(4) percentage of *false starts*, which included hesitations or stumbles on the first word of a line, re-reading the beginning of a line after a stumble within the line, or re-reading the end of the previous line. For example, consider the following passage:

I thought I'd stay in there until they were tired of
looking for me and then sort of ease out as if I'd
never been gone.... (from Odgers, 1987).

If a participant read this as ''I thought I'd stay in there until they were tired of looking for….they were tired of looking for me,'' this was scored a false start. Reading it as, ''I thought I'd stay in there until they were tired of it…looking…looking for me ...'' was also a false start. Percentages were obtained by dividing the number of *false starts* by the number of lines in the passage;
(5) percentage of *other dysfluencies*, which included hesitations within a line, and stumbles on or re-reading any word other than the first word of a line.

Percentages were obtained by dividing the number of lines containing an *other dysfluency* by the number of lines in the passage;

The final measure assessed comprehension:

(6) percentage of correct responses on the *comprehension* questions.[2]

Results

The results are organized as follows: (1) descriptive statistics for the language- and reading-related skill measures, which include Letter-Word Identification, Passage Comprehension, Picture Vocabulary, Reading Fluency, and Word Attack subtests of the *WJ III*, two RSN tasks, and Word Span; (2) effects of training condition (standard text, phrase-cued text, word list) on the experimental measures obtained from reading the trained passages aloud (WCPM, word errors, false starts, other dysfluencies, fluency ratings, comprehension); (3) effects of training on the untrained passages; (4) bivariate correlations among the experimental and skill measures; and (5) an examination of individual differences in response to training. An alpha level of .05 was used for all statistical tests. Effect size was estimated using Cohen's *d* (Cohen, 1988).

Language- and reading-related skill measures

As shown in Table 1, on average, the participants were reading at a second grade level or above. Mean performance on *WJ III* Passage Comprehension and Picture Vocabulary was at second grade level, whereas performance was at third grade level for Letter-Word Identification, Word Attack, and Reading Fluency.[3]

Effects of training condition on the trained passage

To test for the effects of training on each experimental measure, a repeated measures 3×2 analysis of variance (ANOVA) was conducted with within-subjects factors *condition* (standard text, cued text, word list) and *training* (pretest, post-test). One-way ANOVAs revealed no differences among the nine orders of administration of the passages for any variable, Fs $(8, 27) < 1.91$, ps $> .10$ for WCPM, word errors, false starts, other dysfluencies, and comprehension, and F $(8, 14) = .58$, $p = .77$ for fluency ratings. Thus, order was not a factor in the ANOVAs. Pretest and post-test means (and standard deviations) for each experimental measure in each condition are shown in Table 2.

[2] The experimental measures were the same as those used in LeVasseur et al. (2006). In that study, a reliability index was obtained for dysfluencies (false starts and other dysfluencies combined) and word errors. The first and third authors scored the audiotapes independently. Percent agreement was 93% for dysfluencies and 85% for word errors. Due to this satisfactory degree of reliability, the first author's judgments were used in that study and the present study.

[3] Norms were not available for the RSN and Word Span tests.

Table 1 Children's performance on language- and reading-related skill measures

Measure	Raw scores		Grade equivalency	
	Mean	*SD*	Mean	Range
Woodcock-Johnson III subtests				
Letter-word Identification	41.6	6.3	3	2.0–5.3
Passage comprehension	22.2	3.6	2.4	1.9–4.0
Picture vocabulary	20.8	3.2	2.5	K.0–8.2
Reading fluency	28	7.8	3	2.0–5.4
Word attack	16.7	6.2	3.3	1.6–12.9
Rapid serial naming				
Letters	30.8	6		
Objects	53.7	8.4		
Word span	3	0.7		

Table 2 Effects of three types of training on experimental measures obtained from children's reading of the trained passages

Measure		Standard		Cued		List	
		Pretest	Post-test	Pretest	Post-test	Pretest	Post-test
WCPM	*M*	67.8	117.9	66.2	114.9	66.0	90.7
	SD	30.6	54.5	31.0	42.1	31.5	38.1
Word errors[a]	*M*	5.99	3.09	5.74	2.02	5.15	3.17
	SD	6.05	2.81	5.08	2.14	4.65	3.08
False starts[a]	*M*	7.68	4.94	10.61	1.11	8.86	11.21
	SD	7.43	8.64	11.91	2.80	9.04	10.3
Other dysfluencies[a]	*M*	27.3	18.5	22.6	14.9	32.1	25.6
	SD	14.9	12.9	13.6	12.6	16.8	17.8
Fluency ratings[b]	*M*	2.1	2.8	2.1	3.4	2.2	2.6
	SD	.74	.77	.65	.58	.68	.71
Comprehension	*M*	56.9	84.0	58.3	81.3	59.7	79
	SD	29.0	19.0	28.7	23.4	28.8	23

[a] Reported as percentages

[b] Includes data for 15 participants (see text)

The first analysis for WCPM revealed a significant main effect of condition, F (2, 34) = 11.11, $p < .0001$, and a significant effect of training, F (1, 35) = 160.46, $p < .0001$. These effects are qualified by a significant condition × training interaction, F (2, 34) = 20.12, $p < .0001$. Post-hoc dependent t-tests showed that, although significant gains from pretest to post-test were made in all three conditions (all ts (35) > 9.25, ps < .0001), gains in the text conditions were significantly greater than gains for the word list condition (see Table 3). Participants made larger gains in

Table 3 Dependent *t*-tests comparing three training conditions on gains made in experimental measures from pretest to post-test

Measure	Pair		*t*	*df*	*p*	*d*[a]
WCPM	Pair 1	Standard–Cued	.72	35	.48	.11
	Pair 2	Standard–List	5.57	35	.00	1.04
	Pair 3	Cued–List	5.65	35	.00	1.17
Word errors	Pair 1	Standard–Cued	.97	35	.34	.19
	Pair 2	Standard–List	1.31	35	.20	.24
	Pair 3	Cued–List	2.61	35	.01	.47
False starts	Pair 1	Standard–Cued	2.94	35	.00	.66
	Pair 2	Standard–List	2.08	35	.04	.49
	Pair 3	Cued–List	4.40	35	.00	.95
Other dysfluencies	Pair 1	Standard–Cued	.26	35	.80	.07
	Pair 2	Standard–List	.29	35	.77	.13
	Pair 3	Cued–List	.56	35	.58	.07
Fluency ratings	Pair 1	Standard–Cued	2.10	14	.05	.75
	Pair 2	Standard–List	.99	14	.34	.36
	Pair 3	Cued–List	5.78	14	.00	1.47
Comprehension	Pair 1	Standard–Cued	.76	35	.45	.17
	Pair 2	Standard–List	1.28	35	.21	.28
	Pair 3	Cued–List	.49	35	.63	.11

[a] *d* = Cohen's index of effect size (Cohen, 1988)

WCPM after RR training of text—standard or cued—than after RR training of word lists. No significant differences in gains were found between the standard and cued conditions. Effect sizes for the differences between each text condition and word list condition are large.

For word errors, there was no significant effect of condition, F (2, 34) = .77, p = .47, but there was a significant effect of training, F (1, 35) = 33.68, $p < .0001$. This is qualified by a significant condition × training interaction, F (2, 34) = 3.94, $p < .05$. Although there was a significant reduction in word errors in all three conditions (all ts (35) > 3.95, $p < .001$), the reduction in word errors in the cued text condition is significantly greater than in the word list condition (moderate effect size). No other differences between conditions were significant.

In the case of false starts, a significant main effect was found for condition, F (2, 34) = 6.62, $p < .01$, and for training, F (1, 35) = 8.07, $p < .01$. These effects were again qualified by a significant condition × training interaction, F (2, 34) = 9.66, $p < .0001$. Training with standard text and cued text each produced a significant reduction in false starts (t (35) = 2.12, $p < .05$ and t (35) = 4.67, $p < .001$, respectively), whereas training in the word list condition resulted in a non-significant gain in false starts, t (35) = 1.11, p = .27. The standard text and cued text conditions both led to a significantly greater reduction in false starts than the word list condition. Additionally, the cued text condition led to

significantly greater reduction in false starts than the standard text condition (moderate effect size).

For other dysfluencies, analyses revealed a significant main effect of training, F (1, 35) = 33.83, $p < .0001$. Fewer other dysfluencies were made in the post-test than the pretest. There were no significant effects of condition, F (2, 34) = .20, $p = .82$, or condition × training, F (2, 34) = .81, $p = .45$.

Fluency ratings were obtained for the 15 students who made less than 10% word errors at pretest on both the trained and untrained passages. Poorer decoders were eliminated so that the raters could assess phrasal reading unconfounded by frequent word errors. Ratings for the two raters correlated .70 ($p < .0001$). Their ratings were averaged for all analyses. ANOVA revealed a significant main effect of condition, F (2, 13) = 4.14, $p < .05$, and training, F (1, 14) = 40.19, $p < .0001$. The condition × training interaction was also significant, F (2, 13) = 16.21, $p < .0001$. Significant gains from pretest to post-test were obtained for all three conditions, ts (14) > 2.35, ps < .05. However, the increase in fluency ratings was significantly greater for the cued text condition than the standard text and word list conditions. In both cases the effect size was large.

Comprehension also showed a significant training effect, F (1, 35) = 84.31, $p < .0001$. The effects of condition and condition × training were not significant, F (2, 34) = .02, $p = .98$ and F (2, 34) = .82, $p = .45$, respectively. There was a significant increase in percent correct from pretest to post-test for all three conditions.

Effects of training on the untrained passage

As a means of assessing transfer effects, the passages were divided in half and the participants received RR training on the first half of each passage. The second, untrained half was read during pretest and post-test only. Below we examine the effects of training on the untrained passages. Means and standard deviations for each experimental measure in each condition are shown in Table 4.[4]

A significant effect of training was obtained for WCPM, F (1, 35) = 114.5, $p < .0001$ for the untrained passages. Participants read more WCPM in the post-test than in the pretest. There was no effect of condition, F (2, 34) = .33, $p = .72$, or condition × training interaction, F (2, 34) = 2.60, $p = .09$. There was also a significant effect of training on word errors, F (1, 35) = 16.77, $p < .0001$. Fewer word errors were made on the untrained passages at post-test than pretest. Again, there was no effect of condition, F (2, 34) = .66, $p = .52$, or condition × training interaction, F (2, 34) = 1.14, $p = .33$. The increase in WCPM and the reduction in word errors for untrained passages were similar across conditions.

There was no significant effect of condition or training on false starts for the untrained passages, F (2, 34) = 1.94, $p = .16$ and F (1, 35) = 1.13, $p = .30$, respectively. The condition × training interaction was also not significant, F (2, 34) = 1.57, $p = .22$. Similarly, for other dysfluencies, there was no significant

[4] One way ANOVAs revealed no order effects for any variable. Thus, order was not a factor.

Table 4 Transfer effects of three types of training on experimental measures obtained from children's reading of the untrained passages

Measure		Standard		Cued		List	
		Pretest	Post-test	Pretest	Post-test	Pretest	Post-test
WCPM	*M*	64.2	76.4	62.4	74.7	60.3	76.9
	SD	33.6	39.0	32.1	36.6	27.3	34.0
Word errors	*M*	8.08	6.57	7.05	6.36	7.30	6.37
	SD	5.96	4.87	5.56	4.60	5.38	4.66
False starts	*M*	7.49	8.02	8.72	5.44	9.71	9.76
	SD	7.20	7.17	7.99	6.91	8.99	8.93
Other dysfluencies	*M*	30.4	23.6	27.6	22.6	35.6	33.9
	SD	17.6	13.6	14.4	13.2	22.5	20.7
Fluency ratings	*M*	2.2	2.4	2.2	2.6	2.2	2.4
	SD	.59	.73	.59	.66	.70	.54
Comprehension	*M*	50.0	59.0	50.7	66.7	51.4	61.8
	SD	27.4	26.8	30.2	26.1	29.2	31.3

effect of condition (F (2, 34) = .15, p = .86) or training (F (1, 35) = 3.51 p = .07), and the interaction was not significant, F (2, 34) = .26, p = .77.

Although there was no significant effect of training on the untrained passage for false starts, a positive trend was found. Following training in the cued condition, false starts for untrained passages were reduced from 8.7% to 5.4%. The difference approached significance (t (36) = 1.85, p = .07). No reductions in false starts for untrained passages occurred after training in the standard text or word list conditions.

A significant effect of training was obtained on the untrained passages for fluency ratings, F (1, 14) = 9.72, $p < .01$. Participants received higher fluency ratings at post-test than pretest. There was no effect of condition, F (2, 13) = .30, p = .75, and no condition × training interaction, F (2, 13) = 1.23, p = .32. Hence, for fluency ratings, the benefits of training for the untrained passages were similar across conditions.

Lastly, there was a significant effect of training for comprehension, F (1, 35) = 77.2, $p < .0001$. Higher comprehension scores were obtained for untrained passages at post-test than pretest. The effect of condition and the condition × training interaction were not significant, F (2, 34) = .54, p = .59 and F (2, 34) = 1.38, p = .27, respectively.

Correlations of skill measures and experimental measures

Table 5 shows correlations among the skill measures (*WJ III* subtests, RSN, Word Span) and the experimental measures (WCPM, word errors, false starts, other dysfluencies, fluency ratings, comprehension). Since RSN for letters and objects showed similar patterns of correlations with the other measures, each RSN measure was transformed to a z-score and an average RSN z-score was used. Although three

Table 5 Correlations among language and reading-related skill measures and the experimental measures

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. WJ letter-word ID	–	.88**	.34*	.72**	.76**	−.21	.30	.78**	−.74**	−.27	−.65**	.59*	.32
2. WJ passage comprehension		–	.42*	.78**	.67**	−.17	.31	.80**	−.68**	−.22	−.60**	.72**	.45**
3. WJ picture vocabulary			–	.49**	.22	−.12	.24	.40*	−.34**	.04	−.08	.47	.48**
4. WJ reading fluency				–	.63**	−.45**	.40*	.94**	−.78**	−.31	−.64**	.86**	.48**
5. WJ word attack					–	−.27	.20	.67**	−.85**	−.34*	.58**	.35	.19
6. RSN						–	.02	−.41*	.39*	.33	.48**	−.56*	−.08
7. Word span							–	.46**	−.29	.08	−.13	.30	.12
8. WCPM								–	−.77**	−.37*	−.64**	.78**	.36*
9. Word errors									–	.37*	.58**	.45	−.34*
10. False starts										–	.57**	.22	.09
11. Other dysfluencies											–	−.41	−.19
12. Fluency ratings												–	.32
13. Comprehension													–

**$p < .01$; *$p < .05$

measures of Word Span were collected, only performance on multisyllabic phonologically dissimilar words was included. The remaining Word Span measures did not correlate with other measures. The experimental measures were based on pretest scores averaged across trained and untrained passages.

Most of the skill measures were highly intercorrelated. In particular, *WJ* Reading Fluency correlated significantly with all other skill measures. *WJ* Letter-Word Identification and Passage Comprehension showed significant correlations with the other *WJ* measures but not with RSN and Word Span. These latter measures did not correlate highly with most other skill measures.

Among the experimental measures, WCPM, word errors, false starts, other dysfluencies, and fluency ratings showed a number of high intercorrelations. Higher WCPM was associated with fewer word errors, false starts, and other dysfluencies, and higher fluency ratings; fewer word errors were associated with fewer false starts and other dysfluencies; and fewer false starts were associated with fewer other dysfluencies. In addition, WCPM and word errors correlated significantly with comprehension.

Predictably, skill measures correlated significantly with experimental measures of oral reading speed and accuracy: WCPM and word errors. Participants with higher scores on the *WJ* subtests showed higher WCPM and fewer word errors. In addition, faster RSN was related to higher WCPM and fewer word errors, and higher Word Span was related to higher WCPM. Other dysfluencies correlated significantly with five of the seven skill measures, and fluency ratings correlated significantly with four of the seven. However, false starts correlated significantly with only one skill measure (*WJ* Word Attack). Finally, three of the *WJ* subtests (including Passage Comprehension) correlated significantly with comprehension scores obtained from the experimental materials.

Correlations of *WJ* Reading Fluency with pre- to post-test gain scores

To examine whether post-training improvements were related to reading skill, we obtained correlations among *WJ* Reading Fluency and mean pre- to post-test gains[5] in the experimental measures (WCPM, false starts, word errors, other dysfluencies, fluency ratings, comprehension). *WJ* Reading Fluency was chosen as the skill correlate because it was the only skill measure to correlate significantly with all other skill measures and thus can be considered a good proxy for them. Given that each of the three training conditions had a significant effect on WCPM, word errors, other dysfluencies, and comprehension, we averaged pretest scores (and post-test scores) across conditions. For false starts, only the text conditions (standard, cued) produced a significant training effect, so pretest scores (and post-test scores) were averaged across these conditions only. This analysis yielded indications that the weaker readers benefited most from the training. For example, gains in WCPM and fluency ratings were significantly correlated with *WJ* Reading Fluency, $r = -.56$,

[5] Gain scores for each of the experimental measures were calculated as pretest scores subtracted from post-test scores. For example, if a child read 60 WCPM in the pretest and 110 in the posttest, their WCPM gain score would be 110–60, or 50 WCPM. If a child made 25% false starts in the pretest and 10% in the post-test, their false starts difference score would be 10–25%, or −15% false starts.

$p < .01$ and $r = -.57$, $p < .01$. Children with lower *WJ* Reading Fluency scores made greater increases in WCPM and/or fluency ratings after training. Reduction in word errors correlated significantly with *WJ* Reading Fluency as well, $r = .75$, $p < .01$. Participants with poorer *WJ* Reading Fluency scores showed greater post-test decreases in word errors. Not every dependent measure showed greater change in weaker readers, however. Correlations between the *WJ* Reading Fluency measure and improvements in false starts, other dysfluencies, and comprehension were not significant, $r = -.06$, $r = .25$, $r = -.32$, respectively.

General discussion

Printed text, unlike spoken discourse, conveys little direct information about phrasing or prosody. We and others have maintained that in order to show fluency in reading, young readers must learn to mentally group words into phrases that reflect normal prosody (LeVasseur, 2004; LeVasseur et al., 2006; Schreiber, 1991). Our earlier work showed the benefits for fluency of cued text in which line lengths were adjusted to correspond with clause boundaries (LeVasseur et al., 2006). The present study explored the possibility that the effectiveness of RR training to promote fluency might be enhanced by the use of cued text during training. To this end, children received RR training on text in which clauses coincided with line breaks and phrases were marked within lines by insertion of extra spaces. As a means of comparison, children also received RR training on standard text (without cues) and RR training of word lists from the text. A principal finding was that RR training of cued text facilitated phrasal reading (as indexed by fluency ratings) and resulted in dramatically fewer dysfluencies at line breaks (''false starts'') than RR training of standard text and word lists. This finding proved to be quite robust; gains in phrasal reading after training on cued text were twice and three times as large as after training on standard text and word lists, respectively.

Greater gains from text practice than word list practice

In addition to confirming benefits for phrasal reading with cued text, the present study found that RR training of text—standard or cued—led to significantly greater gains in WCPM than RR training of word lists. This finding was quite strong—participants gained about 50 WCPM after training on text versus 25 WCPM after training on word lists. The fact that RR training of text, in general, increases WCPM supports the findings of many others (e.g., Dowhower, 1987; Faulkner & Levy, 1994; Herman, 1985; O'Shea, Sindelar, & O'Shea, 1985; Rasinski, 1990). Further, the benefits of RR training of text over RR training of word lists are consistent with recent findings of Martin-Chang and Levy (2005). In line with the results for WCPM, we also found discrepancies between conditions on word errors. Reduction in word errors was significantly greater in the cued text condition than the word list condition. Though not statistically significant, the standard text condition also led to fewer word errors than the word list condition.

The general finding that RR training of text led to greater improvements in WCPM and word errors than RR training of word lists is inconsistent with results of Levy (2001) who showed equivalent gains in reading fluency (words per minute) with RR training of text and word lists. One possible explanation for these divergent findings is tied to the age of participants in the two studies. The second-graders in the present study may have depended more on context for word recognition than the fourth-graders in Levy (2001). Perhaps word recognition for second graders was facilitated more by RR training of text than word lists because these children were at a point in reading development in which they relied on context to support their developing decoding skills (see Tunmer & Chapman, 1998). In contrast, it is plausible that Levy (2001) found no difference between training conditions because her fourth-graders were already good decoders and thus relied less on context to facilitate word recognition.

One explanation for why RR training of text, in general, may be more beneficial than RR training of word lists was proposed by Martin-Chang and Levy (2005). They suggested that text training promotes development of rich semantic associations, which, in turn, benefit word recognition in subsequent readings (see Perfetti & Hart, 2002, for a similar argument). From another perspective, the greater benefit of RR training of text over word lists could stem from the fact that text training, but not list training, directs the learner's attention to sentence structure (i.e., helps the learner identify syntactic segments that correspond to the spoken form) (see Dowhower, 1987). Cued text would potentially facilitate this process further because the syntactic parser is offered visible support. As we showed, RR training of cued text led to higher fluency ratings and fewer false starts than RR training of standard text and word lists. That is, training with cued text facilitated parsing and line by line transitioning during reading.

The findings of this study are consistent with the claim that reading fluency consists of partially separable components—speed and accuracy of word recognition (indexed by WCPM), and phrasing (captured by fluency ratings and false starts) (LeVasseur et al., 2006). In the case of WCPM and false starts, these two variables clearly index different facets of fluency. First, we found that RR training of cued text affected the two variables differently. For false starts, RR training of cued text resulted in a substantially larger reduction than RR training of standard text. In contrast, for WCPM, RR training of cued text and standard text led to similar benefits. Second, WCPM correlated to a much greater extent with language and reading skill measures than false starts did. Of all the fluency measures, WCPM showed the strongest and most consistent relationships with skill measures, confirming findings of Fuchs, Fuchs, Hosp, and Jenkins (2001), Young and Bowers (1995), and our earlier work (LeVasseur et al., 2006). In contrast, false starts did not correlate well with skill measures. That is, over a fairly wide range of skill levels young readers are prone to make false starts.

Do practice effects generalize?

Looking beyond the direct effects of RR training, we also considered transfer effects to untrained (but related) passages. As reviewed earlier, there is evidence that both

RR training of text and RR training of word lists may show transfer effects to unpracticed material (Faulkner & Levy, 1994; Levy, 2001; Martin-Chang & Levy, 2005; Morgan & Lyon, 1979; Rashotte & Torgesen, 1985). We found some evidence of transfer effects in the present study. Regardless of type of training (standard text, cued text, word list), participants made significant gains from pretest to post-test on the untrained passages in WCPM, word errors, fluency ratings, other dysfluencies, and comprehension. However, these gains must be interpreted with caution. For each condition, post-testing occurred approximately 15 min after pretesting. Thus, a portion of the transfer effects may have resulted from previous reading of the same passage at pretest. A more unequivocal test of transfer effects would include a control condition in which participants read a passage at pretest, engaged in some unrelated activity for 15 min, and then reread the same passage at post-test.[6]

One way we might have distinguished genuine transfer effects from carry-over effects of pretesting would have been to find non-equivalent transfer effects across training conditions. That is, if one condition led to greater transfer effects than the other conditions, this would suggest that the condition itself, not pretesting, led to the transfer effects. There was, in fact, some evidence of non-equivalent transfer effects for false starts. The cued text condition resulted in a modest reduction of false starts for untrained passages (3.3%) compared to the standard text and word list conditions which showed no signs of transfer effects. However, given that the interaction between condition and training did not reach significance for untrained passages, our findings do not yield definitive evidence of transfer effects.

Effects of the training on comprehension

Although fluency was the chief focus of our study, we also considered possible effects of RR training on comprehension. As indicated earlier, there are inconsistent findings regarding whether RR training aids comprehension (NRP, 2000; Meyer & Felton, 1999). In the present study we found significant gains in comprehension following all three types of RR training. Although part of the comprehension gains may stem from the experience of having responded to the recall questions at pretest, gains for trained passages were greater than for untrained passages, indicating that RR training supports comprehension of trained passages. Our results fall in line with others who found comprehension gains after RR training with text (Dowhower, 1987; O'Shea, Sindelar, & O'Shea, 1985; Young, Bowers, & MacKinnon, 1996) and word lists (Levy et al., 1997; Tan & Nicholson, 1997).

Implications for assessment, instruction, and further research

The results of this study support the view that a balanced assessment of reading fluency should include not only accuracy and speed measures but also indices of

[6] Unfortunately, we were unable to include this control condition. The extra time required for this condition would have exceeded the amount of time we were allotted to test the children.

appropriate phrasing or prosody. So, for example, when assessing reading beyond the earliest stages, it may prove useful to obtain fluency ratings and to monitor false starts. The latter are straightforward to assess and reliably capture limitations in phrasal reading (LeVasseur et al., 2006).

Given that RR is commonly used as an instructional tool to boost reading fluency, our finding that its effectiveness can be enhanced by phrase-cued text suggests that this manipulation could serve as a useful alternative to standard text at the earlier stages of fluency training. We have shown that reading speed and accuracy along with phrasal reading generally benefit from such training. Further, given the possibility that experienced readers generate prosody internally even in silent reading situations and that readers no less than listeners rely on prosodic representations to derive meaning from connected material (Fodor, 2002; Slowiaczek & Clifton, 1980), the benefits we obtained may apply to these situations as well (see Marciarille-LeVasseur, Shankweiler, & Macaruso, 2001).

Considering who could best benefit from the experimental interventions, we wished to discover whether the effects of training varied with the children's level of reading skill. As one might expect, we found that training, while benefiting all readers, was most beneficial to the weaker readers. Children with lower scores on the *WJ* Reading Fluency subtest made larger gains in WCPM and rated fluency and had greater reductions in word errors than children with higher scores on the *WJ* Reading Fluency subtest. However, as we noted, for the false starts measure, readers at all levels benefited from training to the same extent. Regardless of their scores on the *WJ* Reading Fluency, children showed large improvements in false starts after RR training on text. It should be noted, however, that children who fell more than two years below grade level were not included in our study. Thus, although the present results suggest that RR training has wide applicability, inclusion of a more diverse sample of children (with materials appropriate to their skill levels) would be required to examine the benefits of training across the range of individual differences.

Finally, we note that this study demonstrated significant benefits of RR training with a minimal, and surely suboptimal, amount of training. It will be important in the future to conduct more extensive studies, with training sessions distributed such that more time elapses between training and evaluation phases and allowing for a fuller assessment of the effects of training on untrained passages.

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Appendix A

Trained and Untrained Passages with Corresponding Comprehension Questions

Following are the trained and untrained portions of the three texts used in the experiment. They are shown in their standard form. Trained and untrained passages were read at pretest and post-test. The corresponding comprehension questions follow.

The Midnight Pig—Trained Passage

> We called Fred the ''Midnight Pig'' because that's when he usually ate. We owned the local store, and by the time Mom had closed up and prepared for the next day, it was usually about midnight. The old clock would strike twelve, and Mom would throw out cabbage leaves, vegetable peels, and any other leftover food. Fred would wolf it down.
>
> I can still remember the day I got Fred. It was my first day at my new school. We had just moved from the city. Although Mom was hesitant at first, she finally agreed to me having a pet pig.

The Midnight Pig—Untrained Passage

> As time went by, things started to settle down, and I became quite happy in our new town.
> Fred, however, had a habit of making life difficult for me. I got a part in the school play, so I went to rehearsal after school. The play went really well—sort of. We performed at the Town Hall, in front of all the parents. The only thing that ruined it was Fred.
>
> He must have followed Mom to the Town Hall and stood, watching through the open doorway. In the final scene, I had to collapse to the floor. Fred was obviously concerned. He clip-clopped across the floor and onto the stage. He kept grunting and butting my face with his wet nose. Everyone laughed and applauded. Mark had to pull him off the stage. Boy, was I embarrassed!

What a Day!—Trained Passage

> I settled in my kitchen until the family got up. Things were all right until after breakfast, when The Kids took me out

into the garden. I thought we might be going to
play rabbits-in-the-bushes or something like that,
so I went along with them. Then, one of
those traitors held me by the collar while the other one
brought out a bucket of warm
water, a bar of flea soap, and a towel. No dog who
calls himself a dog can put up with
that, so I twisted away from the one that was
holding me and shot under my favorite
bush.

What a Day!—Untrained Passage

It was a bit prickly under there but nice and
safe, so I scraped myself a shallow hole to lie in.
I thought I'd stay in there until they were tired of
looking for me and then sort of ease out as if I'd
never been gone.

It didn't work. One of The Kids got hold of
my poor tail and the other one got my hind legs
and they hauled me backwards out of the bush. I
tried to use my front claws as brakes, but it didn't
help. Nothing helped.

They tied me up to the fence and tipped that
whole bucket of water over me. Then they lathered
me from my ears on back. Oh, the indignity! They
got another bucket of water and threw that over me,
too. Then they scrubbed me with that old towel.

It's Just a Trick—Trained Passage

The nearest of the farms was sold, and a new family came to live
there. The children of the family were a baby and two girls our own age.

It wasn't that Gary and I disliked girls, but...

They could swim in the dam just as well as we could. Maria
could run faster than I could, Anna could beat
Gary at arm wrestling, and they were just as good at
shooting with homemade bows and arrows as we were.
In fact there was nothing we could do that they couldn't.

It's Just a Trick—Untrained Passage

At school they were popular, snobby, and always in trouble.
Maria did imitations of the teachers that had the

whole class in fits of laughter. Anna brought five field mice to school in a cardboard box and let them out in the middle of first period. By the time they had been collected and put outside, the whole classroom was a shambles.

Gary and I were used to being leaders in our group at school, but suddenly we found Anna and Maria were taking over. At home it didn't matter as much, but we didn't like it at school. We didn't like it at all!

Comprehension Questions

What a Day!

First Half: I settled in…my favorite bush. (106 words)

1) Who is telling the story?
2) Where was he until the family got up?
3) What did he think was going to happen in the garden?
4) Where did he hide when he twisted away?

Second Half: It was a bit……with that old towel (137 words)

1) What did he lie in?
2) How long was he planning on staying there?
3) What did he use his front claws as?
4) What did he get scrubbed with?

The Midnight Pig

First Half: We called …..a pet pig. (104 words)

1) How did Fred get the name ''Midnight Pig''?
2) What did Mom throw out at midnight?
3) What day was it that they first got Fred?
4) Did Mom want the kid to get a pig at first?

Second Half: As time went by ….was I embarrassed! (138 words)

1) Where did the kid go after school?
2) Who ruined the play?
3) Why was Fred concerned?
4) What did everyone watching the play do?

It's Just a Trick

First Half: The nearest of the ……. .that they couldn't. (93 words)

1) Who were the children of the family?
2) Where did they live?

3) Did Gary dislike girls?
4) What were the girls good at?

Second Half: At school…..didn't like it at all! (98 words)
1) What did Maria do that had the whole class laughing?
2) What did Anna do with the mice?
3) What were Gary and his friend used to being?
4) What didn't they like about the girls?

Appendix B

Nine orderings of training condition and passage

	Condition-passage	Condition-passage	Condition-passage
Order 1	A-1	B-2	C-3
Order 2	B-1	C-2	A-3
Order 3	C-1	A-2	B-3
Order 4	A-3	B-1	C-2
Order 5	B-3	C-1	A-2
Order 6	C-3	A-1	B-2
Order 7	A-2	B-3	C-1
Order 8	B-2	C-3	A-1
Order 9	C-2	A-3	B-1
	A = standard text		1 = passage 1
	B = cued text		2 = passage 2
	C = word list		3 = passage 3

Progressing through the study: an example of a participant assigned to Order 1

Week 1	Background testing		
Week 2	Pretest Passage 1: Standard Text	Training Condition 1: Standard Text	Post-test: Standard Text
Week 3	Pretest Passage 2: Standard Text	Training Condition 2: Cued text	Post-test: Standard Text
Week 4	Pretest Passage 3: Standard Text	Training Condition 3: Word list	Post-test: Standard Text

Appendix C

Word list training: selected words from the passages

The Midnight Pig	What a Day!	It's Just a Trick
midnight	kitchen	nearest
Fred	family	farms
usually	breakfast	sold
owned	kids	family
Local	bushes	children
prepared	traitors	age
strike	collar	Gary
throw	bucket	disliked
cabbage	warm	Maria
vegetable	flea	beat
Wolf	soap	wrestling
remember	towel	homemade
school	dog	bows
although	twisted	arrows
hesitant	shot	
	favorite	

Appendix D

Procedure for Chunking Text into Syntactic Phrases (Phrase-cued Condition)

1. Definitions
   - 1.1 A simple noun phrase is a noun without any embedding (i.e. only pre-nominal adjectival modification).
     - a small cat
     - the very noisy dog
     - John's big green bucket
   - 1.2 A verb complex (matrix or embedded) is sequential verbal material starting with the first verb/modal/auxiliary/adverb after the subject up to but not including the main verb's complement. The verb complex includes verb particles and predicative adjectives.
     - John is a liar.
     - The cat could very well have been under the table.
     - The dog probably will not bark anymore tonight.
   - 1.3.1.1 Predicative adjective phrase is used in the conventional sense:
     - John is tall.
     - The balloon is lighter than air
     - The cat got very sick.

2. Chunking procedure:
   2.1 Mark all punctuation, commas, periods, etc., as chunk boundaries.
   2.2 Identify all simple noun phrases, verb groups, and predicative adjective phrases and mark their boundaries (where not already marked in step 1.)
   2.3 Adjust the boundaries to associate complementizers (that, for, whether, while, etc.), prepositions (for, in, over, under between, etc), and connective devices (and, but, however, that, since, therefore, because) with the first following chunk.

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