



Making the right connections: Differential effects of reading intervention for subgroups of comprehenders

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ABSTRACT

The purpose of this study was to compare the effects of different types of questioning interventions on students' reading comprehension. Fourth-grade students ($n = 246$) were identified as struggling, average, or good readers and assigned randomly within school to one of three questioning interventions: two inferential conditions (Causal or General) or one literal condition ("Who, What, Where, When" or W-questioning). Teachers delivered the interventions for 20–30 min, 2–4 times per week, for 8–10 weeks. All readers made reliable pre- to posttest comprehension gains as measured by story recall ($ps < .001$ to $.04$). Differential effects for intervention were found between two subgroups of struggling comprehenders—elaborators and paraphrasers. Elaborators benefited more than paraphrasers from Causal questioning ($d = .86$) whereas paraphrasers benefited more than elaborators from General questioning ($d = 1.46$). These findings suggest that identifying subgroups is important in developing and evaluating the effectiveness of reading comprehension interventions.

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1. Introduction

The failure of many students to become proficient readers is a persistent problem. According to the 2009 Nation's Report Card (National Center for Education Statistics, 2010), 33% of U.S. fourth graders and 25% of eighth graders read below basic levels. Students who experience reading difficulties are likely to struggle throughout school and to experience difficulties with employment and other aspects of daily living as adults (Snow, 2002).

As students advance through school, they must be able to read and understand a wide range of content-related materials (Chall, 1996). Some students begin to struggle when academic requirements shift to include comprehension of increasingly complex texts. Thus, a substantial amount of research has focused on the development of reading comprehension interventions.

Recent research syntheses (e.g., Berkeley et al., 2010; Gersten et al., 2001; National Institute of Child Health and Human Development, 2000) point to a wide array of interventions that have improved comprehension outcomes for struggling readers. Yet, despite the extensive knowledge base on effective reading comprehension interventions, the gap between struggling readers and their peers becomes larger and

more difficult to close as they advance through school (Faggella-Luby & Deshler, 2008). Attempts to close this gap might be aided by understanding *under what instructional conditions* and *for whom* specific interventions are effective (Connor et al., 2004).

The purpose of the present study was to explore the effectiveness of specific interventions and determine whether intervention effectiveness varies with reader characteristics. To this end, we draw upon cognitive theories of reading comprehension, following recommendations to link cognitive theory and educational practice to develop more precise and focused interventions (e.g., McKeown et al., 2009; Pressley et al., 2006; Rapp, van den Broek, McMaster, Kendeou, & Espin, 2007).

1.1. Connecting cognitive science to reading intervention

Cognitive scientists emphasize that successful reading comprehension depends on the construction of a coherent representation of text in memory (Kintsch, 1998; van den Broek, 2010). A coherent text representation is formed when information in the text is integrated with the reader's background knowledge. This coherent representation is easily accessible and can be applied in a variety of situations (e.g., Goldman & Varnhagen, 1986; Graesser & Clark, 1985; Kintsch & van Dijk, 1978; Trabasso et al., 1984). Prompts designed to promote inference generation can be used to help readers construct a coherent text representation. Such prompts guide the reader to connect information within

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various parts of the text, and to connect information in the text to relevant background knowledge.

Considerable evidence indicates that explicit inference instruction, questioning approaches, or a combination of both can have positive effects on the reading comprehension of struggling readers (e.g., Hansen & Pearson, 1983; McGee & Johnson, 2003; Pressley et al., 1987; Yuill & Joscelyne, 1988; Yuill & Oakhill, 1988). Further, researchers have provided evidence that prompting inferences *during* reading might be more beneficial than after reading (Laing & Kamhi, 2002; van den Broek et al., 2001), presumably because it is during the moment-by-moment reading process that readers construct coherent representations of text (e.g., Goldman & Varma, 1995; Kintsch, 1998; van den Broek et al., 1998).

Cognitive scientists have also identified specific *types* of connections that are fundamental to the reader's construction of coherent representations of text. Specifically, identifying *causal relations* among events or facts within a text is critical to comprehension (Trabasso & van den Broek, 1985). To illustrate, in the following text: "The lady gave the waiter \$20. He returned to give her the change," the reader establishes causal coherence—and thus comprehends the text—by inferring that the waiter is returning change because the lady's lunch cost less than \$20. The causal relations that readers must infer are usually more complex than in this example, extending over long distances in the text and requiring coordination of multiple pieces of information (van den Broek et al., 2009).

Given that establishing causal relations is important for coherence, questions designed to prompt such causal connections should increase the impact of interventions focused on improving reading comprehension. In the example above, a question that prompts a causal connection, such as "Why did the waiter return to give the lady the change?" should lead the reader to infer that the lady's lunch cost less than \$20. This type of question should direct the reader to attend to specific causal information in the text. In a recent study (van den Broek, McMaster, Rapp, Kendeou, Espin, & Deno, 2006), we compared causal questioning approaches to general questions ("How does this sentence relate to something you previously learned in the text?") in brief, one-on-one experimental sessions. We found that, when asked causal questions, readers recalled more causally-connected events in narrative text than they recalled when asked general questions.

Evidence also suggests that direct prompting of inference generation might be more effective than explicitly teaching comprehension strategies to promote students' text comprehension. McKeown et al. (2009) compared the effects of two reading interventions designed to promote fifth graders' comprehension by prompting text-based connections. Fifth-grade classes were assigned randomly to a text-processing intervention or to strategies instruction. In the text-processing approach, the teacher read with the students, stopping at key points in the text to ask questions that prompted text connections. In the strategies approach, the teacher also stopped at key points in the text, but taught students to use strategies (e.g., summarizing, comprehension monitoring) to understand the text. McKeown et al. found that the text-processing approach had a stronger effect on students' comprehension than did the strategies approach. They noted that they did not examine how results varied by student reading level, and thus they encouraged future intervention-by-reader-type examinations.

1.2. Subgroups of struggling readers

As suggested by McKeown et al. (2009), in addition to establishing effective approaches to helping students make important text-based connections during reading, it is important to determine *for whom* different approaches are most effective (Connor et al., 2004; Faggella-Luby & Deshler, 2008). Researchers have found that children who struggle with reading comprehension do not fit one specific profile (e.g., Cain & Oakhill, 2006; Nation et al., 2002), but instead show varying patterns of weak verbal or cognitive skills that affect their reading development in different ways. If struggling readers have different types of

comprehension difficulties, they might also respond to interventions in different ways.

In a recent series of studies (see Rapp et al., 2007), we observed that struggling readers have different types of inferencing difficulties. We asked fourth-grade students to think aloud as they read narrative text, and coded their responses into 11 possible categories: (1) associations to background knowledge, (2) connecting inferences, (3) reinstatement inferences, (4) elaborative inferences, (5) predictive inferences, (6) comprehension monitoring, (7) paraphrases, (8) repetitions of the text, (9) affective statements (10) evaluations of the text, and (11) questions about the text. Using cluster analysis, we identified different sub-groups of struggling readers based on their think-aloud responses. The 11 types of responses were treated as distinct cases in this analysis. We used Ward's method (Ward & Hook, 1963), which attempts to minimize the sum of squares of observations within any two clusters that are formed at each step. Three different clustering solutions were considered (i.e., two-, three-, and four-cluster solutions). The two-cluster solution was adopted as the best description of the dataset because the three- and four-cluster solutions did not account for significant additional variability in the data. The identification of two subgroups of struggling readers was replicated in three separate samples over three years of research (Rapp et al., 2007; van den Broek et al., 2006).

The two subgroups of struggling readers differed in the types of inferences they made during reading. The first subgroup, which we call 'elaborators', made the same number of elaborative inferences as did average and good readers, but their inferences were more likely to be inaccurate or invalid. The second subgroup, which we call 'paraphrasers', made fewer inferences than did the average and good readers (in fact, made few inferences in general), and instead repeated or paraphrased the text. Support for the first subgroup is provided by research that suggests that some struggling comprehenders have difficulty constructing coherent representations of text due to inappropriate use of background knowledge or personal viewpoints (e.g., Williams, 1993). Support for the second subgroup is provided by research that demonstrates that some struggling comprehenders fail to generate many inferences and thus have difficulty establishing coherence (e.g., Cain & Oakhill, 2006).

Elaborators and paraphrasers did not differ on standardized measures of listening or reading comprehension, oral reading fluency, decoding and word recognition, vocabulary, general intelligence, motivation, or working memory (Rapp et al., 2007). These findings support the view that think-aloud tasks, designed to measure reading *processes*, may yield important, unique information about struggling readers that goes undetected by more traditional measures designed to assess the *products* of reading (e.g., Ericsson & Simon, 1993; Kendeou et al., 2010; Pressley & Afflerbach, 1995). An alternative explanation, however, might be that the subgroups are merely an artifact of the think-aloud procedure. An important question, then, is whether the subgroups are instructionally relevant; that is, does identification of subgroups have implications for how to provide instruction to struggling readers? A strong test of the instructional validity of these subgroups would be to examine whether elaborators and paraphrasers respond differently to different types of questioning interventions.

1.3. Study purpose and research questions

The literature reviewed above provides important directions for further research. First, asking questions to prompt readers to make inferences during reading appears to be a promising approach to improving comprehension of text (e.g., Hansen & Pearson, 1983; McGee & Johnson, 2003; McKeown et al., 2009; Pressley et al., 1987; van den Broek et al., 2001; Yuill & Joscelyne, 1988; Yuill & Oakhill, 1988). Second, given that establishing causal relations is critical to coherence (Trabasso & van den Broek, 1985), questions designed to prompt causal connections might increase the effect of interventions

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