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Text-Processing Differences in Adolescent Adequate and Poor Comprehenders Reading Accessible and Challenging Narrative and Informational Text

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ABSTRACT

Based on the analysis of 620 think-aloud verbal protocols from students in grades 7, 9, and 11, we examined students' conscious engagement in inference generation, paraphrasing, verbatim text repetition, and monitoring while reading narrative or informational texts that were either at or above the students' current reading levels. Students were randomly assigned to read informational or narrative text, and each student read two texts in their assigned genre—one accessible and one challenging. The research question addressed the combinations of text processes that best differentiated four groups of readers: (1) adequate comprehenders who read narrative and (2) informational text and (3) poor comprehenders who read narrative and (4) informational text. Canonical discriminant analysis (CDA) revealed that the four groups were best differentiated by two latent, underlying functions related to (a) a combination of inference generation in accessible text and paraphrasing in both accessible and difficult text (On-Level Inference/Paraphrasing) and (b) monitoring in both accessible and difficult text (Monitoring). Poor comprehenders who read informational text were significantly lower than the other three groups on On-Level Inference/Paraphrasing. Poor comprehenders in both genres were significantly lower on Monitoring than adequate comprehenders who read informational text. A second CDA further examining the effects of text difficulty identified one latent function primarily explained by inference generation (Inference). Text difficulty had a significant impact on adequate comprehenders' Inference in narrative text. Implications for research and practice are discussed.

Many adolescents struggle to learn from the text they read in school (National Center for Education Statistics, 2013). To develop appropriate interventions that enhance the ability of adolescents to learn from the variety of texts they encounter, it is necessary to understand the resources they bring to text, including the patterns of cognitive processing in which they engage when they interact with different types of text. To address this topic, we investigated the online processing of text by students in grades 7, 9, and 11 as they read accessible and challenging narrative and informational text. Specifically, we investigated students' inference generation, monitoring, paraphrasing, and verbatim text repetition and sought to identify the combinations of these processes and text characteristics (i.e., text difficulty, genre) that best differentiated adequate and poor comprehenders.

Theoretical Bases

This study was guided by van Dijk and Kintsch's (1983) construction–integration model, as described by Kintsch (1994, 2004), and by van den

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Broek, Rapp, and Kendeou's (2005) landscape model. Van Dijk and Kintsch's theory proposes three levels of mental representations of text that imply different qualities of understanding. Understanding the surface component, the words and phrases in the text and the relations among them, is necessary but not sufficient for text comprehension. The textbase is the semantic basis of a text, including the meaning of individual propositions, meaning across propositions, and their organization into more global units, with little influence of the reader's prior knowledge. Development of a rich mental representation of the text, a coherent situation model, is dependent on the integration of information across the text and integration of the meaning of text with the reader's prior knowledge. According to Kintsch (1994), readers who construct a textbase have basic recall of text information and may be able to identify important ideas in the text but are unlikely to strategically access this information or apply it to novel situations, while development of a coherent, integrated situation model facilitates the capacity to learn from text.

The landscape model (van den Broek et al., 2005) assumes that the activation of propositions and the establishment of meaningful connections within the text and between the text and prior knowledge reflect the combination and interaction of memory-based and constructionist processes. Memory-based processes are thought to be activated with little or no conscious effort on the part of the reader, as information in the text triggers the activation of associated information from prior text and/or the reader's background knowledge. In contrast, constructionist processing implies the purposeful implementation of effortful processes in the reader's attempt to satisfy personal goals or standards for comprehension of a text. According to van den Broek et al., memory-based processes determine what information is available to the reader, whereas effortful constructionist processes determine how text information and prior knowledge will be used and integrated. Proficient readers intentionally reactivate prior text information when it contributes to the comprehension of current text information, and they activate information from their background knowledge to support comprehension. In addition, readers' goals for text comprehension determine their standards for the coherence of their mental models of the text, which influence the nature and extent of purposeful processing in which they engage.

Think-Aloud Methodology

One method that has been used to examine comprehension processes as they unfold and interact over time is the analysis of think-aloud verbal protocols. Readers' online verbal self-reports offer researchers a unique opportunity to observe the reading processes that readers can access and verbalize (Afflerbach, 2000; Graesser, Wiemer-Hastings, & Wiemer-Hastings, 2001; Pressley & Afflerbach, 1995). Although the method cannot capture automatic, unconscious processes (van den Broek et al., 2005), it is likely to capture the contents of readers' working memory (Hilden & Pressley, 2011), providing a window into the conscious processes associated with the construction of meaning from text. Early think-aloud studies of reading comprehension focused largely on proficient readers because developing and struggling readers were assumed to be less verbal and less able to simultaneously read and report their thinking (Afflerbach, 2000). Afflerbach noted, however, that think-aloud protocols generated by less competent readers may be a valuable resource for understanding the unique processing and interpretive challenges with which these readers contend.

Think-aloud methodology has not gone unchallenged because of concerns about validity and reactivity, including variation in readers' abilities to attend to simultaneous tasks, vocalize a normally silent activity, attend consciously to cognitive processes, replicate inferences generated during normal reading, and demonstrate authentic comprehension processing in general (Branch, 2001; Fletcher, 1986; Olson, Duffy, & Mack, 1984; Stratman & Hamp-Lyons, 1994). However, data from think-aloud protocols have been found to significantly predict processing time during silent reading (Magliano, Trabasso, & Graesser, 1999; Trabasso & Suh, 1993) and length of fixations in eye-tracking research (Kaakinen & Hyönä, 2005), providing evidence of its validity. Despite its limitations, think-aloud research has made significant contributions to existing theories of reading comprehension (Afflerbach, 2000).

Essential Text Processes

Processes and competencies that are critical to the construction of a coherent mental model of the text include inference generation (Cain, Oakhill, & Bryant, 2004; Graesser & Kreuz, 1993), integration of ideas across a text and with background knowledge (Cain et al., 2004; Coté, Goldman, & Saul, 1998; McNamara & Kintsch, 1996), monitoring understanding (Cain et al., 2004; Hacker, 1997), awareness of text structure (Cain et al., 2004; Perfetti, 1994), and foundational skills such as word reading (Cain et al., 2004; Cromley & Azevedo, 2007; Perfetti, Landi, & Oakhill, 2005). These processes are impacted by characteristics of text (Barth, Tolar, Fletcher, & Francis, 2014; Cain & Nash, 2011; McNamara, 2001) and by a range of reader characteristics, including verbal working memory (i.e., the concurrent processing

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and storing of verbal information; Cain et al., 2004; Laing & Kamhi, 2002; Linderholm & van den Broek, 2002; Yuill & Oakhill, 1991), vocabulary knowledge and verbal ability (Cain et al., 2004; Cromley & Azevedo, 2007; Karasinski & Weismer, 2010; Laing & Kamhi, 2002; Nation, Adams, Bowyer-Crane, & Snowling, 1999), readers' goals and purposes for reading (Linderholm & van den Broek, 2002; van den Broek, Lorch, Linderholm, & Gustafson, 2001), and the extent and quality of the reader's relevant world knowledge (Cook & Guéraud, 2005; Cromley & Azevedo, 2007; Kendeou & van den Broek, 2007).

Several researchers have used think-aloud methodology to examine the nature and functions of inferences generated by college students during reading and inferences' effects on a reader's ability to construct and retain coherent representations of text meaning (e.g., Magliano et al., 1999; Trabasso & Magliano, 1996; Trabasso & Suh, 1993; van den Broek et al., 2001; Zwaan & Brown, 1996). It has been observed that explanatory inferences that identify implicit causes of text events or actions lead to enhanced reading comprehension and improved memory for text, particularly in narratives (Graesser, Bertus, & Magliano, 1995; Magliano et al., 1999; van den Broek et al., 2001). Other types of inferences, such as associative inferences that fill in missing details or make generalizations based on a narrative, may be less likely to facilitate improved comprehension and retention (Magliano et al., 1999). Readers also generate inferences that predict causal consequences in narrative text; however, proficient readers typically make predictive inferences less frequently than explanatory or associative inferences (Gillam, Fargo, & Robertson, 2009; Laing & Kamhi, 2002; Trabasso & Magliano, 1996). In general, proficient readers prioritize those inferences that are necessary for establishing and maintaining a coherent interpretation of text (Perfetti et al., 2005; Yuill & Oakhill, 1991).

Processes related to monitoring have also been targets of study in think-aloud research, although to a lesser degree than inferencing. Monitoring is a metacognitive skill that entails knowing when and how to apply appropriate reading strategies, check one's understanding, and attempt repairs when understanding is compromised. Readers most frequently monitor processing problems, understanding of the text, and word forms (Kendeou & van den Broek, 2007; van den Broek et al., 2001). When proficient readers detect misunderstandings, they may reread, read more slowly and carefully, and/or read on in the text to seek clarification (Pressley & Afflerbach, 1995).

Readers also engage in processes that serve to restate or organize text ideas, including paraphrasing and verbatim repetition of parts of the text. Trabasso and Magliano (1996) suggested that paraphrasing and text repetition may extend processing time and facilitate inference generation, thus enhancing comprehension; however, van den Broek et al. (2001) speculated that paraphrasing and text repetition are frequently used in place of more effortful and time-consuming processes such as inference generation. Paraphrasing and text repetition have been interpreted as indicative of processing at the level of the textbase, signaling sentence-level processing that may lack the integration of larger semantic components and world knowledge necessary for the construction of a coherent situation model (Caldwell & Leslie, 2010; Linderholm & van den Broek, 2002).

Differences Related to Reading Proficiency and Text Characteristics

Reading Proficiency

Previous studies using various methodologies have shown that good and poor comprehenders differ in the type, frequency, and accuracy of their inference making (Cain & Oakhill, 1999; Cain, Oakhill, Barnes, & Bryant, 2001; Laing & Kamhi, 2002; Magliano et al., 1999) and in the extent and nature of monitoring during reading (Garner & Taylor, 1982; Yuill & Oakhill, 1991). Several researchers have reported that better comprehenders generate more inferences than weaker comprehenders (Janssen, Braaksma, & Rijlaarsdam, 2006; Laing & Kamhi, 2002; Schellings, Aarnoutse, & van Leeuwe, 2006) and that less skilled readers may engage in more paraphrasing than more skilled readers do (Caldwell & Leslie, 2010; Janssen et al., 2006; Laing & Kamhi, 2002; Moore & Scevak, 1997). There is evidence that weak comprehenders are less likely to recognize textual inconsistencies (Garner & Taylor, 1982; Hacker, 1997; Yuill & Oakhill, 1991), whereas better readers have a stronger tendency to evaluate text ideas (Janssen et al., 2006) and are more adept at correctly identifying incoherent sections of text (Coté & Goldman, 1999). What is not known is whether these generalizations regarding proficient and weak readers are applicable to adolescents when they read texts of different genres and levels of difficulty.

Genre

Awareness of genre structures and their characteristic coherence devices is developed through reading experiences and can profoundly affect comprehension (Cain, 1996; Perfetti et al., 2005). Informational text may be more challenging to adolescent readers than narratives due to a lack of familiarity with the specialized vocabulary and rhetorical purposes and structures of informational text, as well as deficits in accurate, relevant background knowledge (Coté et al., 1998; Graesser, McNamara, & Louwerse, 2003; Sáenz & Fuchs, 2002; Taylor & Beach, 1984).

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Comprehension of narrative text is hypothesized to be dependent on the establishment of causal coherence, an integrated understanding of relationships on a causal chain of events (Graesser & Kreuz, 1993); this coherence is supported by the generation of explanatory inferences (Graesser et al., 1995; Magliano et al., 1999; van den Broek et al., 2001). Consistent with this hypothesis, several think-aloud studies conducted with college students reading narrative text have indicated a high prevalence of explanatory inferences that identify causal antecedents of events (Narvaez, van den Broek, & Ruiz. 1999; Trabasso & Magliano, 1996; Trabasso & Suh, 1993). Less is known about the types and functions of inferences that are most supportive of comprehension of expository text. The nature of inference generation by college students while reading both narrative (Magliano et al., 1999) and expository (Linderholm & van den Broek, 2002; van den Broek et al., 2001) text is impacted by readers' goals.

Narvaez et al. (1999) found that metacognitive monitoring is also affected by readers' goals in a comparison of the processes verbalized by college students while reading narrative and expository texts for the purposes of entertainment or study. When reading expository text, readers had significantly more evaluations, repetitions, and identification of knowledge-based coherence breaks when reading to study than when reading for entertainment. Narvaez et al. concluded, "Expository texts seem to evoke study-type behaviors, specifically the generation of repetitions and evaluations, as well as the identification of knowledge-based coherence breaks. Processing of narrative texts appears to be much less affected by reading purpose" (p. 493). Trabasso and Magliano (1996) reported that college students who read narrative text made few metacognitive comments.

Text Difficulty

Whereas proficient readers can understand easy texts by reliance on strategies that are largely automatized, more difficult, less coherent texts tend to evoke more comprehensive and consciously controlled strategies (Pressley & Afflerbach, 1995; Trabasso & Suh, 1993; Trabasso, Suh, Payton, & Jain, 1995). Proficient readers vary their strategy use according to their reading goals and the demands of the text (Pressley & Afflerbach, 1995; Taraban, Kerr, & Rynearson, 2004). The assumption is that proficient readers devote more processing time and effort to sections of text that are less coherent or more challenging, whereas poorer comprehenders and those with lower standards for establishing text coherence fail to engage in this more effortful processing.

Readers find text difficult for a variety of reasons, including reader characteristics such as a lack of sufficient relevant word and world knowledge. Characteristics of the text also determine its difficulty, including factors related to language, discourse, and text complexity such as referential cohesion (i.e., explicit connections among content words in the text), narrativity (i.e., the extent to which the text has story-like qualities), and syntactic complexity (Graesser, McNamara, & Kulikowich, 2011; Graesser, McNamara, Louwerse, & Cai, 2004; McNamara, Graesser, & Louwerse, 2012). These text characteristics interact with reader characteristics to impact reading fluency in middle school students (Barth et al., 2014) and are likely to impact comprehension. There is a need for more information about the effects of text difficulty for both adequate and poor comprehenders, particularly for adolescents (Barth et al., 2014).

Think-Aloud Studies With Students in Grades 7–12

The majority of think-aloud studies investigating reading processes have been conducted with adults (Hilden & Pressley, 2011), university students (e.g., Kendeou & van den Broek, 2007; Linderholm & van den Broek, 2002; Magliano & Millis, 2003; Narvaez et al., 1999; Trabasso & Suh, 1993), or students in grades 6 and under (e.g., Coté et al., 1998; Schellings et al., 2006). Fewer have examined the online processing used by students in grades 7–12. Among 45 think-aloud studies examining reader characteristics and processing of informational text reviewed by Fox (2009), only seven were conducted with students in grades 7–12. Of these, only four had sample sizes greater than 10, and only three used quantitative methods.

Think-aloud studies conducted with secondary school students have found that, in general, less proficient readers and younger students use a smaller array of strategies and apply them with less flexibility than do more proficient and older readers (Janssen et al., 2006; Langer, 1993/2001; Moore & Scevak, 1997). Prior research has also indicated that less skilled adolescent readers tend to derive primarily textbase models when reading expository texts, frequently paraphrasing text ideas in lieu of integrating text ideas and background knowledge (Caldwell & Leslie, 2010; Moore & Scevak, 1997; Yuill & Oakhill, 1991). A tendency to rely on paraphrasing was also noted among weak high school literature students reading narrative text (Janssen et al., 2006). Relatively little has been learned from think-aloud studies regarding metacognitive monitoring among high school students, although there is preliminary evidence of a greater tendency to critically evaluate text by stronger students than weaker students (Janssen et al., 2006) and in expository text relative to narrative (Langer, 1990).

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Study Purpose and Research Question

The development of effective interventions for students with reading comprehension difficulties can be enhanced through an understanding of the text-processing patterns that differentiate adequate and weak comprehenders. For example, students with comprehension difficulties may benefit from instruction to support inference generation or monitoring in particular types of texts or in particular situations; alternately, they may not require instruction in paraphrasing strategies. However, the text processes used by middle and high school students and how these processes are related to reading comprehension are not well understood. Little is known about how text difficulty and genre affect processing in this population (Hilden & Pressley, 2011).

The purpose of this study was to identify differences in conscious text processes implemented by adequate and poor comprehenders and the impact of text difficulty and genre on these processes. We implemented think-aloud methodology, an approach that is well suited for the study of reading comprehension because of its potential to identify conscious processes applied during the act of reading rather than relying on products of comprehension assessed after reading. The approach in the current study differs from those taken in the past in that (a) we collected a large sample of verbal protocols from adequate and poor comprehenders in middle and high school, providing sufficient power to investigate the influence of both text and student characteristics; (b) we used a large corpus of narrative and informational texts, enabling us to assign text to readers according to their individual reading levels to examine the effects of text difficulty; and (c) we employed methodology that allowed us to identify the factors that most differentiated adequate and poor comprehenders. We addressed the following research question: Which variables related to intentional text processes (i.e., inference generation, monitoring, paraphrasing, verbatim text repetition) and text difficulty maximally differentiate adequate and poor comprehenders reading narrative and informational text?

Method

Participants and Design

The participants were 325 adolescents in grades 7, 9, and 11 between the ages of 12 and 18 years (mean = 14.6; standard deviation [*SD*] = 1.8). The students were attending eight different schools in four school districts located in proximity to a large city in the southern United States. Reflecting the demographics of this region, most students were Hispanic (50%), and the rest were African American (23%), white (23%), Asian (2%), or other ethnicities (2%). Eight percent were served by special education, and 70% were economically disadvantaged based on participation in the federal free or reduced-price lunch program. The sample for the current study was a subsample of the participants in a larger study of reading comprehension. Due to the amount of time involved in the think-aloud procedures, participants in the larger study were randomly sampled within grade for participation in the present study.

All students in grades 7–12 in participating schools were eligible for the larger study except those who were excluded because they were identified by their schools as having limited English proficiency or severe intellectual, emotional, or sensory disabilities. In the state in which the study was conducted, the English-language proficiency of students with a home language other than English is assessed annually. Students would have been designated as having limited English proficiency, and thus excluded from our study, if they performed below the advanced-fluent level on the state-developed test of English proficiency or at a similar level on an alternate assessment. After they reach benchmarks allowing them to exit the limited-English-proficiency status, some students continue to receive support through the schools' English as a Second Language programs, through content area support or in pull-out classes. Five percent of the participants in the think-aloud sample participated in English as a Second Language programs in their schools.

Because the intent of the larger study was to investigate processes related to reading comprehension in the absence of the influence of serious word-reading difficulties, students were also excluded from the larger study if they performed below the 20th percentile for their grade on the Woodcock–Johnson III Tests of Achievement letter-word identification subtest. Twenty-three percent of the original pool of potential participants in grades 7–12 was excluded from the larger study based on the word-reading criteria.

Participants in the current study were stratified by grade and estimated reading comprehension ability based on whether they met passing standards on the most recent administration of the state-mandated reading test, and then randomly assigned to one of two genre conditions: informational or narrative. Each participant read two texts in his or her assigned genre, one accessible and one challenging, generating a total of 650 verbal protocols. Three protocols were lost due to examiner error or recording equipment malfunction, so 647 protocols were coded.

Figure 1 illustrates the study design. Although comprehension proficiency was estimated using the state reading test to ensure the inclusion of students with higher and lower reading proficiency at each grade level, the time lag since the administration of this test

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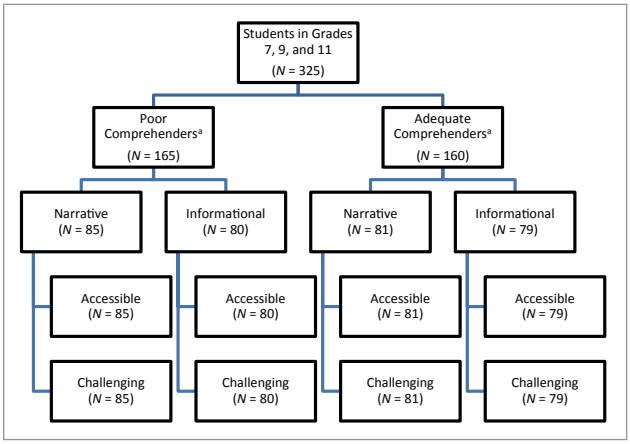
FIGURE 1
Research Design



[a]Estimated comprehender status based on state-mandated reading test.

varied across students. Therefore, we used scores on the Gates–MacGinitie reading comprehension (GMRC) subtest (MacGinitie, MacGinitie, Maria, Dreyer, & Hughes, 2000) to classify students as adequate or poor comprehenders for purposes of analysis.

Of the 325 participants, five were excluded from the analyses because they did not pass the screen or had missing screening data and had been included in the sample in error, and one was excluded because he was administered the incorrect text during the think-aloud procedure. Six students with missing GMRC scores were also excluded, leaving a sample of 313 students. Finally, the three students with missing protocols were excluded, leaving a sample of 310 students who had both accessible and challenging text protocols. Thus, although 647 protocols were coded, this study reflects data from 620.

Materials

Test of Reading Comprehension

The GMRC subtest is a group-administered test for kindergarten through adult populations. Students took either the grades 7–9 form or the grades 10–12 form based on their grade in school. In the GMRC, participants read passages selected to reflect materials that students are typically required to read for their schoolwork or choose to read for recreation, and respond to associated literal and inferential multiple-choice questions. Alternate-form reliability is adequate, with coefficients of .83 for grade 7, .80 for grade 9, and .74 for grade 11.

Text Passages

We assigned texts to students based on their individual Lexile ratings available from the most recent administration of the state-mandated reading test. Lexiles are scale scores that can be ascribed to text as measures of text difficulty and to readers as indicators of reading ability; thus, Lexiles can be used to match readers to texts (MetaMetrics, 2008). To match the probable Lexile range for middle and high school students, a corpus of 89 texts was compiled for think-aloud administration, selected at intervals of 40–60 Lexiles. Forty-five passages were narrative, and 44 were informational. Fifty-four were selected from the corpus of texts used by Barth et al. (2014), and 35 were excerpts of texts in the public domain (19 narrative, 16 informational). Public domain excerpts were modified to derive coherent, self-contained passages with the Lexile levels required to close Lexile intervals in excess of 50 in the set of texts from Barth et al.'s study and to extend the Lexile ceiling beyond 1460L, which was the most difficult passage used in that study. Nine narrative and six informational passages were not used in testing because their Lexiles did not correspond to appropriate levels for any participant.

The final corpus of 74 passages used in testing ranged from 450 to 1720 Lexiles. As a reflection of difficulty, passages varied in length and in the number of think-aloud prompts (i.e., preidentified opportunities for thinking aloud) they contained. Narrative texts consisted of an average of 585.67 words (*SD* = 111.74; range = 424–801) and contained an average of 16.6 think-aloud prompts (*SD* = 3.90; range = 9–25). Informational texts consisted of an average of 485.53 words (*SD* = 128.86; range = 154–696) and contained an average of 13.86 think-aloud prompts (*SD* = 2.97; range = 8–20).

Passages addressed a variety of topics. Lower Lexile narratives included folk tales and fables, as well as realistic fiction related to situations with which adolescents are likely to be familiar (e.g., conflicts arising from a group project assignment in school), whereas the most challenging narratives included excerpts from literary works by Miguel de Cervantes, Washington Irving, Nathaniel Hawthorne, Sir Walter Scott, and others. Lower Lexile informational texts focused on topics such as animals and skateboarding and included biographical accounts. More challenging informational texts addressed topics in science (e.g., meteors, cloud types, the mathematical foundations of Darwin's *The Origin of Species*) and history (e.g., a Civil War battle, beliefs of the ancient Greeks, the Neolithic Revolution, causes of the Great Plague, ancient Roman paintings). At the highest levels, informational texts included political essays on topics such as the intrinsic merits of peace and war and how human identity is defined, as well as an excerpt from a 17th-century philosophical text by René Descartes.

Text passages were typed in black, 14-point font and printed on 8.5″ × 11″ white paper, identified only by a code denoting the Lexile level and genre. Prompt lines (i.e., horizontal lines across the entire page) were inserted at intervals throughout each text to

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cue participants to think aloud. The first prompt line always followed the initial sentence; initial sentences ranged in length from five to 94 words across passages. After that, participants were not cued to think aloud after every sentence, following Caldwell and Leslie's (2010) suggestion that less frequent cues to think aloud might discourage sentence-by-sentence processing and encourage more integration of ideas. Given the size of the corpus, the variety of organizational structures, and the sentence and paragraph length and complexity, prompt lines were not inserted at standardized intervals apart from the initial sentence. Instead, texts were segmented at thematic or coherence junctures or into informational units that were anticipated not to overly tax readers' ability to process and respond.

Procedures

Accessible and challenging texts were selected for each individual student prior to the testing session. Accessible text was defined as text at the most proximate Lexile in the study corpus above a given participant's Lexile level. If this interval exceeded 20 points, the text with the most proximate Lexile below the student's Lexile was selected. To select the challenging text, 350 Lexiles were added to each participant's Lexile level and the same 20-point span criterion applied. The decision to add 350 Lexiles to identify a difficult text was based on expectations that this would identify a text with sufficient challenge, taking into account the error in both the calibration of the texts and the estimation of students' reading ability. A preliminary field test indicated that adding 200 Lexiles to the participants' Lexile levels was insufficient to elicit responses that indicated that students found the texts sufficiently challenging.

Think-aloud protocols were collected on-site in middle and high schools across two consecutive academic years. Protocols were collected in examiner–student dyads and digitally audiotaped. Examiners received approximately three hours of modeling and practice in the use of a scripted protocol manual and the operation of digital audio recorders. Examiners were then assessed for fidelity of administration in a role-play with the trainer or the first or second author of this article using a scaled rubric of criteria. Each examiner was observed and reassessed in the field on at least one occasion.

Students always read the accessible text first, followed by the challenging text. In each session, participants were told that they would read two passages in succession and answer comprehension questions after each, but text topic, genre, and difficulty were not disclosed. Participants were provided a practice passage to familiarize them with the think-aloud process. Each participant read one of four practice texts (i.e., narratives at 400 and 750 Lexiles, informational texts at 430 and 780 Lexiles). Practice texts, which were used exclusively for training, were selected according to a student's assigned genre (narrative or informational) and proximity in Lexile level to the participant's assigned on-level text. We provided easier practice texts to students who performed at lower Lexile levels so the practice texts would be accessible to them, allowing them to focus on understanding and practicing the think-aloud process; more proficient readers practiced with somewhat higher Lexile passages because these passages would be more similar to the ones they would read during think-aloud data collection.

Examiners read the first four sections of the practice passage, modeling a range of responses. Although these modeled responses were scripted to maintain consistency across participants, examiners executed them in a natural, spontaneous manner. Participants were then asked to practice responding to at least the next three text sections of the practice text and encouraged to continue until comfortable with the procedure. Once participants indicated their readiness to proceed, they were given the accessible passage that had been selected for them.

Participants were instructed to read orally, stopping at each prompt line to talk about whatever they were thinking. Although secondary school students typically read silently, we asked them to read aloud so we could more clearly monitor the parts of the text to which they were responding. Moreover, there is evidence that reading orally rather than silently does not have a differential effect on comprehension in students through grade 6 (McCallum, Sharp, Bell, & George, 2004) and may be associated with improved comprehension, even in high school students (Hale et al., 2007). Participants were given a blank cover card (8.5″ × 6.5″) to place just below the section of text in current focus, covering the remainder of the passage, and were instructed to move it down after they talked about each segment of the text. The card allowed readers to reread and/or refer back to sections of text that they had already read, but prevented them from scanning ahead. If a participant did not respond immediately to a prompt, examiners waited approximately 10 seconds before asking, "Is there anything you want to say about that section?" Students were reminded to think aloud if they did not respond for two consecutive prompts. Participants who commented that they had nothing to say or did not understand the text section were directed to continue reading and thinking aloud.

Following the reading and think-aloud procedure, students responded to five comprehension questions per passage. Data from the comprehension questions were not used in the current analyses.

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Protocol Transcription and Coding

Protocol responses were transcribed verbatim and in full into source text templates in CHAT format (MacWhinney, 2000, 2014) to enable coding and analysis using CLAN (MacWhinney, 2000, 2014). Transcribers were trained in the segmentation of speech into utterance breaks, the use of transcription software, and CHAT transcription formatting and then observed at the computer. Finally, they completed up to three transcriptions that were assessed for accuracy before beginning actual transcription of the research protocols. All transcripts were edited for accuracy and correct CHAT formatting by two coders, who listened to the recorded protocols and checked the transcripts prior to coding.

Unit of Analysis

To maximize reliability, structural rather than semantic guidelines were used to determine coding units, with exceptions made only for structural units indicated by intonation patterns and responses consisting of a single phrase. The basic coding unit was a clause containing a finite verb and a "unified predicate that expresses an event, activity or state" (Trabasso & Magliano, 1996, p. 264). Infinitives or participials expressing purpose or a logical relation were counted as separate coding units, as were utterances containing two or more verbs and one or more agents.

Coding Categories

Coding categories were both a priori (i.e., theory driven) and emergent (i.e., data driven). Theoretical considerations motivated the establishment of tentative general categories for the key phenomena of interest: inferences, monitoring strategies, and personal or general responses to text (adapted from Trabasso & Magliano, 1996; van den Broek et al., 2001). Subcodes were derived from observed patterns in the data. As described by Bakeman and Gottman (1997), the overall coding process was emic and recursive and entailed a succession of lumping and splitting across multiple rounds of preliminary coding of a random subset of 50 protocols to achieve a level of analysis that would both reliably represent the data and facilitate coding the 647 protocol texts. Relatively broad categories were derived to ensure acceptable inter-rater agreement. In addition, the weak expressive and receptive language skills characteristic of poor comprehenders (Carpenter, Miyake, & Just, 1994; Nation et al., 1999; Stothard & Hulme, 1992) meant that students' utterances were not always explicit and unambiguous and, therefore, were less amenable to fine-grained categorization.

The final code structure consisted of three categories: inference generation, monitoring, and other responses to text. The inference category included both constructive (i.e., explanatory and associative) inferences and predictions. The monitoring category included (a) monitoring the continuity or discontinuity of the focus text with the reader's interpretation of prior text information or background knowledge, (b) revision of interpretation or background knowledge, (c) noun reference monitoring, and (d) general monitoring (described in detail in the Appendix). Responses in most categories were also coded as either acceptable (i.e., reasonable, plausible, accurate, relevant, logical) or unacceptable (i.e., unreasonable, implausible, inaccurate, irrelevant, illogical, overly vague). The Appendix includes a table of the coding categories, with definitions and examples of each. In the current analyses, we used the codes for the major categories of inference generation and monitoring, and we used the subcodes paraphrasing and verbatim text repetition from the category of other responses to text.

Reliability

All coding was conducted by two individuals with direction and feedback from the first author. The 647 transcripts were randomized for coding order, and successive waves of 100 transcripts were coded at a time. Inter-coder agreement was assessed for each wave prior to coding; the two coders independently coded a randomly selected sample of 10 transcripts per 100, stratified on genre, for a total of seven assessments of reliability. If average overall agreement did not equal or exceed 80% for any set of 10 transcripts, the coders discussed their areas of disagreement in detail and then reassessed reliability with another set of 10 randomly selected transcripts from the same set of 100. Overall agreement was 81.2%, with a range of 79.8–82.4% across subsets. Coding discrepancies were resolved through discussion and modifications or clarifications made in the coding rubric, as needed. Modifications were made in the rubric only in cases in which there was a serious failure to consider a particular type of response or a persistent inability to achieve adequate reliability; if modifications were made in the coding scheme, all previously coded transcripts were recoded to ensure consistency across all 647 transcripts.

Data Analysis

Because of the complexity of the design and the number of correlated dependent variables, we adopted a multivariate approach based on computation of multivariate analysis of variance (MANOVA) and interpretation of the discriminant functions (Huberty & Olejnik, 2006). A MANOVA computes linear combinations of variables, or discriminant functions that maximally separate the groups in the design. The linear combinations can be examined to assess how individual variables are weighted in separating groups and to interpret the latent

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dimension along which the groups are differentiated. Because the response rates across the think-aloud categories were not normally distributed, we performed a nonparametric canonical discriminant analysis (CDA) using SAS 9.4 PROC DISCRIM to determine the linear combinations of think-aloud response variables that best revealed the differences among groups based on reader status and passage genre (i.e., linear discriminant functions; LDFs). This was possible in part because we had a large sample. According to Tatsouka (1970), for sufficient power, the sample size (n = 310) should be at least 2 or 3 times the number of outcome variables (16), and the smallest group (n = 73) should be greater than or equal to the number of outcome variables. The current study sample satisfied both guidelines.

Students were designated as adequate or poor comprehenders based on their GMRC scores; poor comprehenders were defined as those whose scores fell at or below the 25th percentile, whereas those who scored above the 25th percentile were designated as adequate comprehenders. The between-subject explanatory variable was a four-level variable (GROUP) that reflected students' reader status and assigned passage genre. The levels were (a) adequate comprehenders reading narrative text, (b) adequate comprehenders reading informational text, (c) poor comprehenders reading narrative text, and (d) poor comprehenders reading informational text. The think-aloud codes examined were inference generation, monitoring, verbatim text repetition, and paraphrasing. Each category was further subdivided into acceptable and unacceptable responses and denoted as occurring in accessible or challenging text, producing a total of 16 outcome variables (four response categories × 2 levels of acceptability × 2 levels of text difficulty). Because students read texts of various lengths that provided different numbers of opportunities to think aloud, a ratio of each outcome variable to the total number of prompts in the passage (i.e., prompt lines that signaled opportunities to think aloud) was calculated and used in the analyses.

To further investigate the effects of text difficulty, we performed a second CDA, using the difference scores between the response ratios for each student's on-level and challenging text to produce eight outcome variables (i.e., difference ratios for acceptable and unacceptable inference generation, paraphrasing, monitoring, and verbatim text repetition).

Results

Descriptive Statistics

Means and standard deviations are provided in Table 1. To illustrate the general direction of group differences on the outcome variables, group profiles are presented in Figures 2 and 3. To improve interpretability, the graphs contain only acceptable responses because there were relatively low rates of unacceptable responses in all groups. Table 1 indicates some prominent mean differences among the student groups; however, large standard deviations for several variables indicate substantial within-group variability, so group means must be interpreted with the understanding that there is considerable individual variation around the mean. There was substantial intercorrelation among the outcome variables, and significant correlations ranged from −.18 to .69 (see Table 2).

CDA

Response rates across the different categories were not normally distributed. Table 1 includes the skewness and kurtosis statistics for each variable. We attempted several transformations, but none achieved multivariate normality. Therefore, we applied nonparametric discriminant analysis, which does not rely on the multivariate normality assumption.

Nonparametric CDA was performed using the k-nearest-neighbor method with k = 2, 3, and 4 to determine the best fitting approach. To reduce bias in estimates of error counts, the cross-validation option was used. In cross-validation, the discriminant function is estimated based on $n - 1$ cases and used to classify the nth case. This entire process is repeated n times until all cases have been classified. This process is also known as the leave-one-out method, or the jackknife procedure of Lachenbruch and Mickey (1968). The k = 2 nearest-neighbor method had the lowest error rate (.22) and was used in the subsequent analysis.

Discriminant Function Significance Testing

The first step in performing a CDA is to determine the number of LDFs needed to explain differences among the groups. In general, the maximum number of possible LDFs is equal to the smaller of p (the number of variables in the analysis) and $k - 1$, where k is the number of groups. Thus, in this study, there were three possible LDFs, of which only the first two were statistically significant. The first test of the LDFs determined whether all three LDFs were equal to zero. This test was significant, $F(48, 866) = 2.30$, $p < .0001$. The second test determined whether the second and third LDFs were both equal to zero. This test was also significant, $F(30, 584) = 1.67$, $p = .015$. The third test determined whether the third LDF was equal to zero. This test was not significant, $F(14, 293) = 0.800$, $p = .67$. Together, the results show that there were significant group differences and that the first two LDFs were needed to explain them. The eigenvalues for the first two LDFs were 0.21 and 0.14, respectively.

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TABLE 1
Means (*M*s) and Standard Deviations (*SD*s) of Dependent Variables by Group

	Adequate comprehenders reading informational text (*n* = 78)		Adequate comprehenders reading narrative text (*n* = 77)		Poor comprehenders reading informational text (*n* = 73)		Poor comprehenders reading narrative text (*n* = 82)			
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	Skewness	Kurtosis
Inference										
Acceptable responses to accessible text	0.52	0.64	0.86	0.59	0.38	0.30	0.57	0.62	2.13	6.60
Acceptable responses to challenging text	0.55	0.92	0.55	0.47	0.26	0.30	0.39	0.33	3.55	18.27
Unacceptable responses to accessible text	0.11	0.18	0.12	0.20	0.12	0.17	0.13	0.15	2.61	8.84
Unacceptable responses to challenging text	0.13	0.18	0.18	0.22	0.13	0.25	0.12	0.17	2.69	9.23
Monitoring										
Acceptable responses to accessible text	0.56	0.79	0.50	0.85	0.29	0.46	0.21	0.27	5.11	39.94
Acceptable responses to challenging text	0.59	0.71	0.44	0.58	0.32	0.50	0.28	0.53	2.80	10.03
Unacceptable responses to accessible text	0.16	0.27	0.16	0.22	0.10	0.13	0.16	0.16	3.43	20.63
Unacceptable responses to challenging text	0.14	0.19	0.24	0.32	0.13	0.14	0.18	0.25	2.53	7.72
Repetition										
Acceptable responses to accessible text	0.09	0.15	0.09	0.18	0.20	0.39	0.19	0.39	4.07	21.19
Acceptable responses to challenging text	0.10	0.18	0.11	0.25	0.27	0.49	0.25	0.48	3.71	17.28
Unacceptable responses to accessible text	0.02	0.08	0.01	0.02	0.03	0.08	0.03	0.09	5.44	36.68
Unacceptable responses to challenging text	0.04	0.12	0.05	0.20	0.08	0.21	0.07	0.20	4.61	24.44
Paraphrasing										
Acceptable responses to accessible text	0.64	0.56	0.92	0.77	0.59	0.43	0.72	0.48	1.23	2.23
Acceptable responses to challenging text	0.58	0.57	0.93	0.58	0.48	0.42	0.75	0.54	0.91	0.48
Unacceptable responses to accessible text	0.11	0.20	0.10	0.13	0.10	0.12	0.11	0.12	2.89	14.11
Unacceptable responses to challenging text	0.17	0.21	0.22	0.22	0.16	0.19	0.19	0.23	2.04	6.58

Note. Accessible text = at students' Lexile levels; challenging text = 350 Lexiles above students' Lexile levels.

Another way of determining the number of LDFs needed is to examine the proportion of group-related variance explained by the three LDFs, which was 0.55, 0.35, and 0.10, respectively, indicating that the first two LDFs accounted for 90% of the between-group variance in the set of measures. The additional 10% that could be accounted for by the third LDF was not sufficient to retain the third dimension.

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FIGURE 2
Observed Group Means for Accurate Responses in Accessible Text

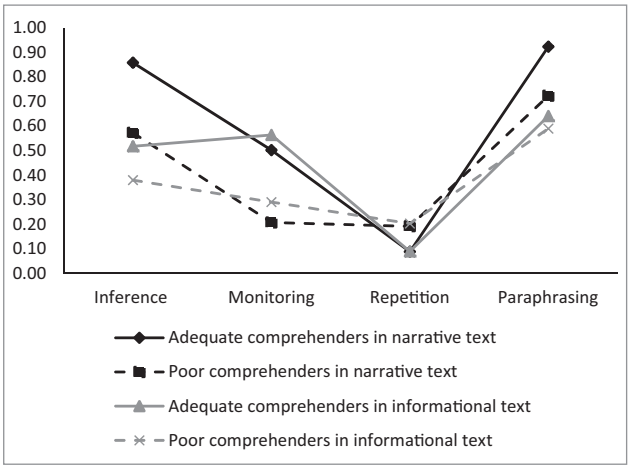
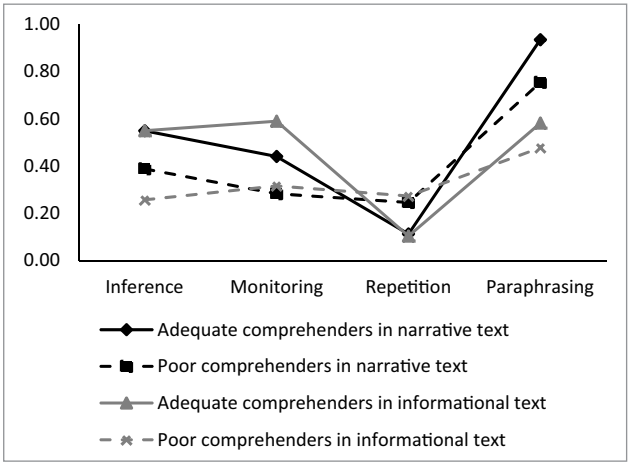


FIGURE 3
Observed Group Means for Accurate Responses in Challenging Text



Grade Level

To determine whether grade level (GRADE) should be included as an explanatory independent variable, we performed a 4 × 3 analysis of variance (ANOVA) with the LDF scores as outcome variables. We used an exponential distribution model using SAS PROC GLIMMIX to reflect the nonnormal, skewed distribution of the data. There was a significant main effect for GROUP: LDF1: $F(3, 123) = 5.96$, $p = .0008$; LDF2: $F(3, 130) = 5.91$, $p = .0008$. However, for both LDF1 and LDF2, the results showed that once GROUP was accounted for, there were no significant differences between grade levels: LDF1: $F(2, 123) = 1.67$, $p = .1922$; LDF2: $F(2, 130) = 2.14$, $p = .122$. There was also no indication that differences among the groups varied by grade; the GROUP × GRADE interaction was not statistically significant for either dimension: LDF1: $F(6, 123) = 0.49$, $p = .8139$; LDF2: $F(6, 130) = 1.92$, $p = .0826$.

Canonical Loadings

Next, we determined the contributions of the different think-aloud variables to each of the two dimensions along which the groups differed. To do this, we examined the canonical loadings representing the bivariate correlations of each dependent variable with the LDF (see Table 3)—the greater the correlation, the stronger the relation between the variable and the dimension along which the groups differ. Results indicated that acceptable inference generation in accessible text (0.67), acceptable paraphrasing in difficult text (0.67), and acceptable paraphrasing in accessible text (0.47) were most correlated with LDF1, which we interpreted as Inference in On-Level Text and Paraphrasing (On-Level Inference/Paraphrasing). Acceptable monitoring in difficult text (0.55) and acceptable monitoring in accessible text (0.54) were most correlated with LDF2, which we interpreted as Monitoring.

Group Differences in Canonical Variable Scores

The LDF group centroids (i.e., means of the canonical variable scores) are provided in Table 4 and illustrated in Figure 4. To examine more closely the group differences on the two LDFs, we performed a repeated-measures ANOVA using SAS PROC GLIMMIX with LDF1 and LDF2 as the repeated measures and GROUP as a between-subject factor. As expected based on the discriminant analysis, there was a significant interaction between GROUP and LDF, $F(3, 269) = 0.354$, $p = .015$. We followed up this significant interaction with pairwise comparisons using the Benjamini–Hochberg false discovery rate to control for multiple comparisons (Benjamini & Hochberg, 1995).

For the first LDF, On-Level Inference/Paraphrasing, the group of poor comprehenders who read informational text was significantly different from the other three groups, $t(269)_{\text{Poor-Inf,Adeq-Nar}} = 4.17$, $p < .0001$, $p' = .004$, $d = 1.37$; $t(269)_{\text{Poor-Inf,Poor-Nar}} = -3.11$, $p = .002$, $p' = .017$, $d = 0.48$; $t(269)_{\text{Poor-Inf,Adeq-Inf}} = 2.76$, $p = .006$, $p' = .020$, $d = 0.49$. The remaining three groups were not significantly different from one another. For the second LDF, Monitoring, the group of adequate comprehenders who read informational text was significantly different from poor comprehenders in both informational and narrative text, $t(269)_{\text{Adeq-Inf,Poor-Inf}} = 3.3$, $p = .001$, $p' = .013$, $d = 0.76$; $t(269)_{\text{Adeq-Inf,Poor-Nar}} = 3.61$, $p = .0004$, $p' = .008$, $d = 0.88$.

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TABLE 2
Correlations Among the Dependent Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Acceptable inference, accessible text	—															
2. Accessible inference, challenging text	.58***	—														
3. Unacceptable inference, accessible text	.37***	.36***	—													
4. Unacceptable inference, challenging text	.36***	.29***	.41***	—												
5. Acceptable monitoring, accessible text	.25***	.29***	.34***	.21***	—											
6. Acceptable monitoring, challenging text	.26***	.21***	.19***	.21***	.69***	—										
7. Unacceptable monitoring, accessible text	.30***	.28***	.40***	.32***	.37***	.21***	—									
8. Unacceptable monitoring, challenging text	.30***	.18**	.15**	.29***	.05	.07	.29***	—								
9. Acceptable repetition, accessible text	−.05	−.12*	.01	−.07	−.09	−.10	.13*	.06	—							
10. Acceptable repetition, challenging text	−.10	−.17**	−.03	−.15**	−.14*	−.18**	.10	.12*	.51***	—						
11. Unacceptable repetition, accessible text	−.10	−.05	−.02	−.06	−.12*	−.14*	.14**	.09	.56***	.51***	—					
12. Unacceptable repetition, challenging text	−.03	−.13*	.01	−.04	−.05	−.10	.14*	.17**	.40***	.64***	.39***	—				
13. Acceptable paraphrasing, accessible text	.39***	.26***	.14*	.21***	.05	.04	.35***	.29***	.07	0.18**	.22***	.19***	—			
14. Acceptable paraphrasing, challenging text	.40***	.35***	.13*	.09	−.02	−.11	.16**	.30***	.03	.03	−.02	.07	.60***	—		
15. Unacceptable paraphrasing, accessible text	−.01	.10	.26***	.19***	−.01	.08	.37***	.29***	.25***	.20***	.20***	.19***	.35***	.26***	—	
16. Unacceptable paraphrasing, challenging text	.24***	.09	.17**	.25***	−.11*	−.11	.28***	.39***	.14*	.13*	.25***	.11	.50***	.37***	.44***	—

Note. Accessible text = at students' Lexile levels; challenging text = 350 Lexiles above students' Lexile levels. *N* = 316 for correlations with accessible text and 319 otherwise.
*$p < .05$. **$p < .01$. ***$p < .001$.

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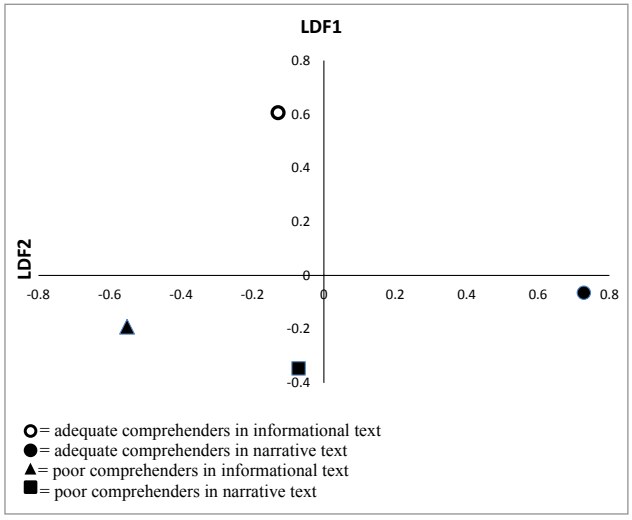
TABLE 3
Canonical Loadings for Linear Discriminant Functions (LDFs) in Primary Analysis

	Pooled Within Canonical Structure	
Variable	LDF1	LDF2
Inference generation		
Acceptable responses in accessible text	0.67	−0.06
Acceptable responses in challenging text	0.35	0.37
Unacceptable responses in accessible text	0.04	−0.11
Unacceptable responses in challenging text	0.22	0
Monitoring		
Acceptable responses in accessible text	0.23	0.54
Acceptable responses in challenging text	0.12	0.55
Unacceptable responses in accessible text	0.18	0.09
Unacceptable responses in challenging text	0.40	−0.15
Verbatim text repetition		
Acceptable responses in accessible text	−0.27	−0.36
Acceptable responses in challenging text	−0.29	−0.41
Unacceptable responses in accessible text	−0.23	0
Unacceptable responses in challenging text	−0.09	−0.18
Paraphrasing		
Acceptable responses in accessible text	0.47	−0.13
Acceptable responses in challenging text	0.67	−0.24
Unacceptable responses in accessible text	−0.03	0.05
Unacceptable responses in challenging text	0.22	−0.11

Note. Accessible text = at students' Lexile levels; challenging text = 350 Lexiles above students' Lexile levels. Loadings are the bivariate correlations of each dependent variable with the LDF.

FIGURE 4
Linear Discriminant Function (LDF) Group Means Plot



Thus, poor comprehenders reading informational text were significantly lower in On-Level Inference/Paraphrasing compared with poor comprehenders reading narratives and adequate comprehenders in both genres. Effect sizes ranging from 0.48 to 1.37 indicated that these differences were moderate to substantial. For Monitoring, adequate comprehenders reading informational text had significantly higher scores compared with poor comprehenders, regardless of genre, and this difference was large in both genres (d = 0.76–0.88).

Text Difficulty

A CDA to examine the differences among the groups on the effects of text difficulty found that only the first LDF was significant (F[24, 868] = 1.65, p = .026), with an eigenvalue of 0.096, explaining 72% of the group-related variance. Acceptable inference generation (0.74) was most highly correlated with this LDF. The next highest correlations were with unacceptable monitoring comments (−0.43) and unacceptable paraphrases (−0.42). Because of the considerably lower correlations of the latter two variables with the LDF compared with acceptable inference generation, we interpreted the LDF as primarily distinguishing the four reader groups based on the effects of text difficulty on inference generation

TABLE 4
Linear Discriminant Function (LDF) Means (*M*s) and Standard Deviations (*SD*s) by Group

	LDF 1: On-Level Inference/Paraphrasing		LDF 2: Monitoring	
Group	*M*	*SD*	*M*	*SD*
Adequate comprehenders reading informational text (n = 78)	−0.13	0.90	0.61	1.21
Adequate comprehenders reading narrative text (n = 77)	0.73	1.04	0.06	0.90
Poor comprehenders reading informational text (n = 73)	−0.55	0.82	−0.19	0.87
Poor comprehenders reading narrative text (n = 82)	−0.07	1.17	−0.35	0.97

Note. Score distribution M = 0, SD = 1.

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(Inference), although diminished unacceptable monitoring and unacceptable paraphrasing also played a role. See Table 5 for the canonical loadings and Table 6 for group centroids and standard deviations on this LDF.

The ANOVA to help clarify precisely how groups differed on this LDF resulted in a significant GROUP main effect ($F[3, 126] = 4.34$, $p = .0061$), as expected based on the discriminant analysis. Pairwise comparisons using the Benjamini–Hochberg false discovery rate identified a significant difference in the effect of text difficulty on Inference between adequate comprehenders reading narrative text and adequate comprehenders reading informational text ($t[126] = -2.56$, $p = .012$, $p' = 0.017$, $d = 0.81$) and between adequate comprehenders reading narrative text and poor comprehenders reading informational text ($t[126] = 3.11$, $p = .002$, $p' = .008$, $d = 0.68$). Thus, text difficulty had a stronger effect on adequate comprehenders' Inference in narrative text than it did on Inference by either adequate or poor comprehenders in informational text. Examination of the means in Table 1 shows that the effect is largely due to the much higher rate of inference generation and lower rates of unacceptable paraphrasing and monitoring in easy narrative texts by adequate comprehenders. Informational texts, both accessible and difficult, and difficult narrative texts tended to produce comparable rates of acceptable inferences and of unacceptable paraphrasing and monitoring by adequate comprehenders.

TABLE 5
Canonical Loadings for Linear Discriminant Function (LDF) Based On Text Difficulty Difference Scores

Variable	Pooled Within Canonical Structure: LDF
Inference	
Acceptable responses	0.74
Unacceptable responses	−0.22
Monitoring	
Acceptable responses	0.22
Unacceptable responses	−0.43
Repetition	
Acceptable responses	−0.14
Unacceptable responses	0.02
Paraphrasing	
Acceptable responses	−0.20
Unacceptable responses	−0.42

Note. The LDF is based on the difference between students' response rate ratios in accessible and challenging text.

TABLE 6
Means and Standard Deviations by Group for Linear Discriminant Function "Inference" Based on Text Difficulty Difference Scores

Group	Mean	Standard deviation
Adequate comprehenders reading informational text	−0.364	1.07
Adequate comprehenders reading narrative text	0.484	1.03
Poor comprehenders reading informational text	−0.123	0.73
Poor comprehenders reading narrative text	0.001	1.11

Note. The LDF is derived from analysis of the difference scores between students' response rate ratios in accessible and challenging text.

Discussion

The purpose of this study was to examine adolescent readers' conscious engagement in critical text processes when reading difficult and accessible narrative and informational text. Our goal was to identify differences in the text processing of adequate and poor comprehenders to advance the understanding of reading comprehension in adolescents and to guide the development of interventions for students with comprehension difficulties. We addressed this goal by examining students' online engagement in inference generation, metacognitive monitoring, paraphrasing, and verbatim text repetition as they read and thought aloud about text with different characteristics.

Our results reaffirmed the conclusion that the text processes that adolescent readers bring to bear, and thus their comprehension of text, are products of sometimes complex interactions among reader and text characteristics. To address this complexity, we conducted multivariate analyses to identify the latent factors (i.e., variables representing underlying constructs or conditions that cannot be directly observed) that best differentiated the text processes used by four groups of comprehenders: adequate comprehenders reading narrative text, adequate comprehenders reading informational text, poor comprehenders reading narrative text, and poor comprehenders reading informational text. Table 7 illustrates our major findings related to group differences.

Our results indicated that the four groups were best differentiated by two latent factors that were primarily explained by (a) a combination of the generation of acceptable inferences in accessible text (i.e., text at readers' Lexile levels) and acceptable paraphrasing in both challenging and accessible text, which we called On-Level Inference/Paraphrasing; and (b) acceptable monitoring responses in both accessible and challenging text, or Monitoring. Notably, variables that did not contribute

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TABLE 7
Summary of Group Differences

Adequate comprehenders	Poor comprehenders
Had higher Monitoring when reading informational text compared with narratives, but the difference was not statistically significant	Had significantly lower On-Level Inference/Paraphrasing in informational text than in narratives
The effect of text difficulty on Inference was significantly greater in narrative text than in informational text; adequate comprehenders had a lower rate of inference generation in challenging narratives compared with accessible narratives.	When reading informational text, had significantly lower On-Level Inference/ Paraphrasing than adequate comprehenders reading either genre
Text difficulty also had a stronger effect on Inference for adequate comprehenders reading narrative text than for poor comprehenders reading informational text.	Had significantly lower Monitoring, regardless of genre, compared with adequate comprehenders reading informational text

Note. Accessible text = text on a student's Lexile level; challenging text = text 350 Lexiles above a student's Lexile level; Inference = a latent factor best represented by the effects of text difficulty on the generation of acceptable inferences; Monitoring = a latent factor best represented by the rate of acceptable metacognitive monitoring responses; On-Level Inference/Paraphrasing = a latent factor best represented by a combination of acceptable inference generation (in accessible text only) and acceptable paraphrasing.

appreciably to group differences were inference generation in challenging text, verbatim text repetition, and unacceptable responses in any category. On average, rates of unacceptable responses were relatively low in all categories by all reader groups. It was not the generation of illogical or irrelevant inferences, inaccurate paraphrasing, or unacceptable monitoring statements that differentiated the groups; rather, poor comprehenders differed from better readers in the two genre conditions on the frequency with which they engaged in these essential processes in certain conditions. It should be noted, however, that we did not evaluate the functions of the student responses, only whether they were accurate, relevant, and logical or feasible. It is likely that the functions of key text processes are important. For example, it has been reported that better comprehenders generate more inferences that explain causal relations in narratives than weaker comprehenders generate (Janssen et al., 2006; Laing & Kamhi, 2002; Schellings et al., 2006). Similarly, paraphrasing may serve different functions for more and less proficient comprehenders.

Examination of the effects of text difficulty on student responses identified a third latent factor that differentiated the four reader groups. This factor, which we called Inference, was related primarily to the effects of text difficulty on students' rates of acceptable inference generation, with smaller contributions of unacceptable paraphrasing and unacceptable monitoring.

Inference Generation and Paraphrasing

Differences among adequate and poor comprehenders reading in different genres were strongly related to an underlying latent factor represented by a combination of inference generation (in accessible text) and paraphrasing. Thus, inference generation and paraphrasing appeared to be operating together in some way. Researchers have sometimes described readers' use of one of these processes in lieu of the other. For example, it has been reported that weak readers paraphrase rather than generate inferences (Caldwell & Leslie, 2010; Gillam et al., 2009; Janssen et al., 2006; Laing & Kamhi, 2002; Moore & Scevak, 1997), whereas college students, presumed to be at least adequate readers, may make many inferences but paraphrase less frequently when they read narrative text (Magliano et al., 1999; Trabasso & Magliano, 1996). As illustrated in Table 1 and Figure 2, participants in our study engaged in both processes at relatively high rates, especially when reading accessible narrative text.

Inference generation is necessary for the construction of an integrated situation model of the text, whereas paraphrasing has been associated with processing at the level of the textbase. The construction of an accurate textbase is a prerequisite for the integration of information across the text and with prior knowledge necessary to construct a coherent situation model. Prior research suggests that paraphrasing may facilitate comprehension of ensuing text by supporting memory for current text information, extending processing time, and facilitating access to prior knowledge (Todaro, Magliano, Millis, McNamara, & Kurby, 2008; Trabasso & Magliano, 1996). In addition, accurate paraphrasing requires context-specific understanding of words and phrases in the text; thus, it may have a key role in facilitating word-to-text integration, or the integration of current text information with words or phrases in previously read text (Perfetti & Adolf, 2012). The relation between paraphrasing and inference generation merits further study.

The results of this study show that when they read informational text, poor comprehenders are significantly less likely to engage in activities related to On-Level Inference/Paraphrasing than adequate comprehenders. This finding aligns with those of previous researchers

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who have shown that poor comprehenders generate fewer inferences than better comprehenders generate (Janssen et al., 2006; Laing & Kamhi, 2002; Schellings et al., 2006). The current study extends prior understandings by demonstrating that this is not necessarily the case in all circumstances and clarifying how text characteristics influence inference generation and paraphrasing in poor comprehenders. We discuss this finding in greater detail in the section on text characteristics.

Monitoring

The second underlying factor that strongly differentiated the reader groups was Monitoring. This factor was best explained by acceptable monitoring responses in both accessible and difficult text. Adequate comprehenders who read informational text were significantly higher on the Monitoring factor than poor comprehenders who read in either genre. Other researchers have similarly noted that weak comprehenders engage in metacognitive monitoring and evaluation of text ideas less frequently than better readers (Garner & Taylor, 1982; Hacker, 1997; Janssen et al., 2006; Yuill & Oakhill, 1991). The current study extends these findings by indicating that this is true for poor comprehenders in middle and high school, regardless of text difficulty or genre.

Low rates of monitoring by poor comprehenders may be related to several factors, including low word and world knowledge and limited working memory capacity. Monitoring requires complex cognitive activity. For example, detecting inconsistencies among items of text information and background knowledge requires that a reader retrieve relevant background knowledge from long-term memory, represent both the text information and background knowledge in working memory, and compare the representations to each other (Perfetti et al., 2005; Vosniadou, Pearson, & Rogers, 1987). Perfetti et al. observed that

> comprehension monitoring, like inference making, both contributes to and results from the reader's text representation…Any observed problem can result from an incomplete representation of sentence meaning, a failure to activate relevant knowledge at the critical moment, [or] a failure to monitor the coherence of the text with respect either to its internal consistency or the readers' knowledge of the world. (p. 235)

Poor comprehenders in our study, particularly those with more impaired working memory, may have had difficulties with any or all of these processes. The decreased tendency of poor comprehenders to monitor their understanding may also be related to low standards for maintaining coherent mental representations of the texts (van den Broek et al., 2005). These low standards of coherence may stem from low motivation to read challenging texts that are perceived as uninteresting.

It may be necessary to develop innovative approaches to teach adolescents to monitor meaning and implement repair strategies. By middle school, most poor comprehenders have been told that they should pay attention to whether text makes sense and reread if it does not, and merely providing this kind of reminder may not appreciably affect students' actual behaviors as they read. Poor comprehenders likely require more intensive and systematic instruction in how and when to monitor meaning and how to repair misunderstandings. Attention should be given to motivational factors when designing this instruction.

Effects of Text Characteristics

Text characteristics affected the text processing of both adequate and poor comprehenders. The processing of poor comprehenders was impacted primarily by genre, whereas text difficulty affected the processing of adequate comprehenders.

Genre

Previous research with university students has indicated that proficient comprehenders tend to engage in more monitoring in expository text than in narrative text, particularly when they read for the purpose of study (Linderholm & van den Broek, 2002; Narvaez et al., 1999). Our findings diverged somewhat. Although group means on the Monitoring factor were higher for adequate comprehenders in informational text than in narrative text, this difference was not statistically significant. Our differential findings are likely due to our multivariate approach that accounted for text difficulty, our decision not to specify reading purpose when students thought aloud, and by our younger sample. In addition, our adequate comprehender group included all students with comprehension scores above the 25th percentile, in contrast to other studies that have compared more proficient comprehenders with poor comprehenders.

Informational text presented particular challenges for poor comprehenders in our study. Poor comprehenders reading informational text scored significantly lower on the On-Level Inference/Paraphrasing factor than adequate comprehenders reading in either genre. The lower rates of inference generation and paraphrasing by poor comprehenders when reading informational text are probably related in large part to limitations in vocabulary and relevant background knowledge. McNamara et al. (2012) investigated several dimensions of text complexity in a large corpus of brief narrative, social studies, and science texts across several grade levels and concluded that in the secondary grades, science and social studies texts are likely to be particularly difficult for low-knowledge readers to comprehend due to high levels of word complexity and certain text

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characteristics. Social studies text demonstrated low referential cohesion, and science text lacked connectives signaling the nature of causal relations. When a text lacks referential or causal cohesion, key ideas and the relationships among them must be inferred, posing particular difficulties for readers who lack relevant background knowledge (McNamara et al., 2012).

Poor comprehenders' text-processing limitations in informational text may also be related to a lack of understanding of what it means to truly comprehend informational text. Middle and high school students may perceive that the object of reading content area text is to form an accurate textbase that will allow them to memorize key information for a test. Teachers can directly teach and model the integration of textbase-level information with background knowledge to form an ever-evolving mental model of a phenomenon, and their study guides and questioning strategies can emphasize not only the main ideas and details that comprise an accurate textbase but also the integration, explanation, elaboration, and comparison of text information with background knowledge that result both in and from the construction of a coherent situation model of text. It is important to note, however, that simply asking challenging questions is unlikely to appreciably improve poor comprehenders' understanding of text in the absence of instruction in strategies for inference generation, monitoring, and text integration required for the construction of coherent mental models of text.

Text Difficulty

We expected that text difficulty would have a stronger effect on the text processing of poor comprehenders than on the processing of adequate comprehenders. Our results did not support this hypothesis. Text difficulty, as we defined it, was not found to have significantly stronger effects for poor comprehenders relative to adequate comprehenders. It is important to note, however, that we measured text difficulty using Lexile ratings, which are primarily related to word and sentence length, properties assumed to be related to word and sentence complexity. A more specific description of text difficulty or complexity includes dimensions such as semantic complexity, syntactic complexity, and referential and causal cohesion. Poor comprehenders may be particularly affected by these dimensions of text complexity and cohesiveness because of the increased need for inference generation in complex and less cohesive text, as previously discussed. There is evidence that the reading fluency of middle school students is impacted by such factors (Barth et al., 2014).

Text difficulty had a strong influence on the generation of inferences by adequate comprehenders when they read narrative text. Specifically, adequate comprehenders reading narrative text demonstrated significantly higher effects of text difficulty on a latent factor closely related to inference generation than did either adequate or poor comprehenders reading informational text. Observed means illustrated a much higher rate of inference generation by adequate comprehenders when they read accessible narratives than when they read challenging narratives, whereas their inference rates were virtually identical in accessible and challenging informational text and challenging narratives. Thus, the generally accepted notion that readers generate more inferences in narrative text than in informational text (Graesser, 1981, as cited in Narvaez et al., 1999) may need to be revisited to incorporate the effects of text difficulty, at least for adolescent readers.

The decline in inferences generated by adequate comprehenders in challenging narrative text may have been related to the fact that adding 350 Lexiles to the current Lexile levels of better comprehenders meant that many students read selections from literary texts, often with historical settings. This text was characterized by vocabulary seldom encountered in other contexts, unfamiliar syntax, and long, complex sentences. In these texts, even normally competent middle and high school readers may have lacked adequate word and world knowledge to enable them to easily draw inferences to explain causal relations or fill in missing text information. High school students frequently encounter literary texts of this type, and this study illustrates the effects of these difficult texts on students' cognitive processing. Without supportive instruction, many middle and high school students could be expected to generate far fewer inferences when they read challenging literary narratives than in more accessible narratives with familiar settings and syntax. Literature teachers should recognize that even adequate comprehenders may need supplemental instruction to generate the inferences necessary to support coherent, integrated situation models in literary texts.

Implications of Findings Related to Text Characteristics

This study demonstrated that text selection matters for both adequate and poor comprehenders. Students in middle and high school may benefit from instruction in inference generation and paraphrasing that begins in accessible narratives and progresses systematically to more challenging narratives and informational text. Developers of reading interventions have understood for some time that students with word-reading difficulties benefit from instruction that is carefully sequenced, progressing from easier to more challenging skills and strategies in text that gradually increases in difficulty; however, this approach is rare in comprehension instruction, especially in the secondary grades. A review of research in a practice guide by Kamil et al. (2008) provides evidence that middle and

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high school students with reading difficulties benefit from systematic, direct instruction in reading strategies such as inference generation.

As previously discussed, poor comprehenders' challenges related to informational text are probably due in large part to a lack of relevant, accurate background knowledge. Students would likely benefit from increased attention to establishing requisite background knowledge, perhaps using audiovisual resources or photographs, prior to independent reading of informational text. This practice is implemented by teachers, but often inconsistently and with poor quality (Swanson et al., 2015), and might be more effective if done systematically with thoughtful consideration of what word and world knowledge is essential for the comprehension of a specific text and how best to teach it. In general, it is important that literacy instruction for secondary school students with reading difficulties includes a preponderance of informational text that can build background knowledge, along with systematic instruction in strategies for comprehending this text. By recognizing that both text complexity and lack of familiarity with the topic combine to make text more challenging to comprehend, teachers can select texts that are best suited to building students' background knowledge by controlling these two dimensions separately. Attention should also be given to motivation, including providing interesting text when possible and increasing interest by building background knowledge in ways that capture the attention of adolescents.

Study Limitations

The results of this study must be interpreted in light of its limitations. Primary among these is the use of think-aloud methodology, which has been criticized because the act of verbalizing thoughts during reading may itself affect readers' processing of text. In addition, coding think-aloud verbal protocols is challenging and involves inevitable error; however, our reliability exceeded 80% for each set of 100 protocols, and the lack of significant grade-level differences in the patterns of responses after accounting for comprehender group and text type indicates consistency in coding across the data set, further supporting reliability.

Our study is also limited because we did not account for reading purpose, which has been shown to affect how readers process text (Linderholm & van den Broek, 2002; Narvaez et al., 1999; van den Broek et al., 2001). If our participants had been reading to study or prepare for a test rather than engaging in what they knew was a research study, outcomes may have been somewhat different. We decided not to specify reading purpose to focus on genre differences without adding an additional dimension to the already complex analysis. Students' responses were also likely influenced by their motivation to engage in the think-aloud process and their interest in the texts that they were asked to read. These variables were not controlled in the study; however, we briefly surveyed students regarding their interest in and perceived difficulty of each passage, and responses indicated few differences among the four reader groups (e.g., adequate comprehenders in narrative text, poor comprehenders in informational text).

The generalizability of our findings is limited by the fact that our sample did not include students with very low word-reading ability because they had been excluded from the larger study of reading comprehension from which our sample was drawn. Conclusions based on our sample of poor comprehenders may not apply to students who have significant word-reading problems. Even so, it should not be assumed that students in the current study were free of word-reading difficulties. Only students with word-reading scores below the 20th percentile were excluded, and our sample included many students who met that criteria but had impaired word reading. Transcripts of the verbal protocols frequently indicated inaccurate word reading, often with observable negative effects on comprehension.

An additional consideration in comparing the results of this study with extant research is that it differed from others that have used think-aloud methodology in the variety and nature of the texts that were used. Typically, think-aloud researchers use two to four relatively brief texts. In this study, we used a corpus of 74 different texts, and even the texts that were considered accessible for most students were relatively long. Each student read two texts, with the easier text presented first. Factors related to task persistence and motivation likely affected students' standards for maintaining text coherence, which may have changed over the course of reading two extended texts. The reading task in this study may have been more similar to those in authentic school assignments than text more commonly used in think-aloud studies, but the nature of this task, along with the grade levels of the study participants, may help explain departures in our results from those previously reported.

Directions for Future Research

In light of our findings and those of other researchers (e.g., Perfetti & Adolf, 2012), more research is needed to illuminate the functions of paraphrasing in accessible and difficult text of different genres, and its relation with inference generation. Greater understanding of the functions of paraphrasing could facilitate the development of improved approaches to strategy instruction in which, for example, students might be taught to paraphrase complex text information and then generate inferences based on

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this concise representation of the textbase. Research is needed to examine the effects of such an approach.

In the current study, we evaluated the frequency of student responses in broad categories of text processes to understand how these processes operated in the context of text difficulty, reader proficiency, and genre. We evaluated whether responses were generally acceptable or unacceptable, but we did not take a fine-grained look at the types of inferences that were generated or the nature of the monitoring comments. Future studies with this age group should evaluate the quality and purposes of inferences generated and the specific nature of the monitoring comments made in various types of text. In addition, more information is needed about the effects of explicit instruction and practice in constructing specific types of inferences in both narrative and informational text.

The current study examined the effects of text difficulty on adolescents' text processing using Lexile ratings. Future investigations might examine the effects of more specific aspects of text complexity and cohesion on processing by adequate and poor comprehenders in this age group, including referential cohesion, syntactic complexity, and other dimensions of text cohesion related to the construction of a coherent situation model (Graesser et al., 2004, 2011). Some characteristics related to text cohesion may have stronger effects than others on text processing by better and weaker comprehenders in middle and high school.

Finally, future research should address the processing of subgroups of adequate and poor comprehenders under various text conditions. These might include students with identified disabilities, English learners, students with other oral language limitations, and students with very impaired word reading as well as poor comprehension. Think-aloud research by McMaster et al. (2012) has revealed subgroups of poor comprehenders with differing text-processing profiles that may indicate the need for different instructional emphases. Similar differences may exist that are specifically related to language proficiency or the presence of learning disabilities or attention disorders. To date, the latent subgroups approaches of McMaster et al. have not been integrated with subgroup methodologies focusing on observable subgroups, such as English learners and students with disabilities. Although the present study found substantial mean differences between adequate and poor comprehenders reading narrative and informational texts, these mean differences tell only part of the story, as evidenced by the substantial variability within each group of students reading each type of text. Using person-centered research methods offers considerable promise for elucidating the factors underlying this substantial and potentially important within-group heterogeneity.

Conclusion

This study provided a window into the text processing of adequate and poor comprehenders in middle and high school and the effects of text characteristics on their processing. The findings have implications for instruction and for the development of curricular materials to support adolescents' ability to learn from the text they read in school. The theoretical model that underpinned this investigation included the proposition that learning from text is possible only when readers develop cohesive, integrated mental models of text situations. The generation and maintenance of such integrated situation models depend on a constant process of inference generation, monitoring, integration of information across the text, and integration of text information with background knowledge. Even adequate comprehenders in our study did not consistently apply these critical text processes in all types of text, and poor comprehenders demonstrated significant deficits in inference generation and paraphrasing, especially in informational text, and in monitoring in both genres, compared with their more able peers.

Continuing research is needed to understand and address the reading comprehension problems that characterize a large percentage of students in middle and high school. Continuing and extending research that investigates text processing in adolescents with adequate and poor reading comprehension can potentially validate and extend current theories of comprehension. Understanding how text characteristics interact with student characteristics is essential for the development of effective instruction. Even with additional research, student outcomes will not be affected unless teachers frequently require students to read both literary and informational texts and implement evidence-based comprehension instruction to teach students how to learn from these texts. This instruction must include attention to text difficulty and genre.

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APPENDIX

Think-Aloud Protocol Codes, Definitions, and Examples

Codes and subcodes	Definitions	Examples from student protocols
Inference (A or N)	Attempt to construct meaningful interpretations from those portions of text where structures or content that support meaning are not present, explicit, or cohesive	
Constructive inference	Link between text propositions or between text propositions and prior knowledge for one of the following functions: • Provide a reason, cause, goal, motivation, outcome, or consequence for a text proposition. • Provide descriptive details that elaborate character traits or conditions, or spatial or temporal elements of text situation. • Identify a scenario in the text based on background knowledge.	Student: "It said he loved his dad, so I think maybe he doesn't like his stepfather because he doesn't want a replacement for his dad." Text: "Although he was sometimes described as a difficult person, he was a very successful scholar."[a] Student: "So, in my head, I think of someone very hard-headed, probably works very hard for what he does, and doesn't like people to get in his way." Text: "He shouted at the cook…."[b] Student: "So, he's disciplining her."
Predictive inference	Provide expectations, hypotheses, or projections about upcoming text content or outcomes of text propositions	Text: "Tufts and Tenen contacted the Kartchners, who were both surprised and excited when they learned about the cave."[a] Student: "The Kartchners probably told everybody about it after they found out."
Monitoring (A or N)	Conscious attention to enhancing or sustaining the comprehension process	
Monitoring of continuity	Confirmation or disconfirmation of the continuity of current text with prior text information, the reader's interpretation of prior text, or background knowledge	Student: "I thought Helen Keller wasn't real, like Betty Crocker or Aunt Jemima." Student: "So, I was right that her father *did* die." Student: "Wait, it said before that they were going to keep it a secret, but now they're telling everybody?"
Revision	Revision in interpretation or prior knowledge in response to (a) a perceived discrepancy between prior interpretation of the text and current text content or between text content and prior knowledge or (b) an erroneous on-line interpretation	Student: "Well, I thought it was talking about the language English, but I'm guessing it's talking about how to use correct English in all different subjects." (N) Student: "So, I had to learn to love and trust people in my first three years of life? I thought it was just about playing and having fun." Student: "That's why they're all dead—well, not dead but hidden away on reservations."
General monitoring[c]	Meta-awareness of processing problems or lack of understanding	Student: "This one is lots harder than the last one." Student: "I've got to think about this part some more."
	Perceptions about word familiarity, pronunciation, or form	Student: "There's a lot of words there that I don't know what they mean." Student: "I never heard of *fervid* before."
	Statement that text topic or information is familiar or unfamiliar	Student: "In social studies, we read an essay on this topic, on identity." Student: "I never knew that's how stalagmites formed."
	Awareness of literary features or author purpose	Student: "So, this is in a child's point of view." Student: "So, another metaphor—animals."
	Rhetorical queries or statements, or recognition that critical text information is insufficient or missing	Student: "How could they build something like that?" Student: "There really isn't enough information for me to know for sure."

(continued)

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Codes and subcodes	Definitions	Examples from student protocols
Noun reference monitoring	Failure to monitor (N) or self-correction or explicit recognition (A) of vague, inconsistent, ambiguous, or erroneous noun reference (i.e., mismatched in number or gender)	Student: "So he, someone, maybe she, because I don't know who the narrator is, is looking at a beautiful lake and admiring it." (A) Text: "…upon which my lady shut herself up in her own room, and my master said she might stay there, with an oath: and to make sure of her, he turned the key in the door…."[b] Student: "So, she locked his husband in her room." (N) Text: "The acropolis was the highest and most defensible location."[a] Student: "Who is the acropolis?" (N)
Other responses to text (A or N)	Attempts to organize ideas or otherwise enhance retention or engage with text content or style	
Paraphrase	Meaning-preserving restatement of the explicit meaning of a text proposition or section in the reader's own words	Text: "He continues to skate for show and his own pleasure."[a] Student: "He keeps doing it for fun." Text: "Nor can I remember, without laughing, the innocent admiration, not without a spice of envy, with which we poor girls, whose church-going clothes did not rise above dowlas shifts and stuff gowns, beheld Esther's scowered satin gowns, caps bordered with an inch of lace, tawdry ribbons, and shoes belaced with silver: all which we imagined grew in London, and entered for a great deal into my determination of trying to come in for my share of them."[d] Student: "So, that whole section is saying that she wants to go to London with her friend to have nice clothes."
Verbatim text repetition	Verbatim or near verbatim repetition of a text proposition	Text: "I am truly ashamed to say that I did nothing of value with the first twenty-nine years of my life."[a] Student: "He didn't do nothing of value with the first 29 years of his life."
Other response to text	Includes affective responses to the text or think-aloud situation,[c] unexplained or unsupported opinions or judgments, personal affiliations with text content or characters,[c] irrelevant associations with text content, and identification of text topic	Student: "I'm trying to take this seriously, but this is stupid." Student: "People are just selfish nowadays." Text: "In 1974 Randy Tufts and Gary Tenen discovered an amazing underground wonderland…."[a] Student: "My mom was born in 1975." (N) Student: "Talking about throwing boomerangs and sticks."

Note. A = responses that are acceptable, reasonable, plausible, accurate, relevant, and/or logical; N = responses that are unacceptable, unreasonable, implausible, inaccurate, irrelevant, illogical, or overly vague. N responses are so noted. For the current study, all inferences were combined into a single inference code, all monitoring was combined into a single monitoring code, and only Paraphrase and Repetition were analyzed in the category of other responses to text.

[a]From *Texas Middle School Fluency Assessment*, by D.J. Francis, A.E. Barth, D. Reed, and J.M. Fletcher, 2008, Houston, TX: University of Houston. [b]From *Castle Rackrent*, by Maria Edgeworth, 1749, retrieved from www.gutenberg.org/files/1424/1424-h/1424-h.htm#link2H_4_0005. [c]Not subcoded as A or N. [d]From *Memoirs of Fanny Hill*, by John Cleland, 1749, retrieved from www.gutenberg.org/files/25305/25305-h/25305-h.htm.

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