Components of Story Comprehension and Strategies to Support Them in Hearing and Deaf or Hard of Hearing Readers

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In this article, we review the skills that have been found to be related to good story comprehension in novice readers with normal hearing and describe the relative weight each plays. The relationship between effective story comprehension and lower level skills (such as syntactic awareness and vocabulary knowledge) is considered, and the casual relations between discourse-level skills (such as inference abilities and story-structure understanding) and good text comprehension are delineated. We then compare this information with what is known about the abilities of children who are deaf or hard of hearing (DHH) and review the current research findings concerned with text intervention strategies designed for this population. Drawing on research with both hearing and DHH readers, we make suggestions for future text intervention strategies and research for DHH readers, which emphasize the need for research on practices that are directed (at least in part) at training the discourse-level component skills involved in effective story comprehension. Key words: discourse-level comprehension skills, deaf or hard of hearing readers, story comprehension

If the means by which stories are comprehended is broken down into component processes, it serves to explicitly highlight some of the challenges facing novice readers (i.e., 7- to 11-year-olds). In order for a child or adolescent to understand a story, not only do individual words need to be recognized and their meanings appreciated, but also the sentences need to be understood and the meaning of individual sentences need to be integrated to form a coherent overall representation. These integration processes often require inferences. To effect this integration, good readers are guided by their experience of the world, their familiarity with the typical structure of narratives, and their general knowledge. Good comprehenders are also adept at monitoring their own understanding and taking corrective action if they detect a problem: for instance, rereading part of the text. The majority of these processes are executed simultaneously and are continuous as the reader proceeds through the text constructing meaning (that being the aim of successful reading).

Some of the component processes outlined previously are termed “lower level.” These include vocabulary knowledge, word decoding, and syntactic understanding, which are the basic building blocks of comprehension at the word and sentence levels. They provide an essential foundation. For instance, if
a child does not understand the majority of the words in a passage, then understanding the passage as a whole will be virtually impossible. Beyond understanding the words and structure of sentences, successful story comprehension also relies on integrating information from different parts of the passage to form a coherent representation, inference generation, and the monitoring of one’s own comprehension. These are examples of “higher level” processes. Successful comprehension involves a complex interplay between both lower level and higher level processes. However, although several component skills correlate with good comprehension, research suggests that some are a greater driving force behind narrative understanding than others (Oakhill, Berenhaus, & Cain, 2015).

In this article, each of the component processes of story comprehension is briefly considered and the relative contribution of each process to good comprehension in hearing readers is reviewed and contrasted with what is known about the performance of deaf or hard of hearing (DHH) children in that domain. Deaf or hard of hearing children are a heterogeneous group; yet, some researchers postulate that they use qualitatively similar strategies when reading to those used by hearing children (Paul & Lee, 2010; Paul & Wang, 2012) and that they learn to read following the same developmental sequence as hearing children (e.g., Ewoldt, 1978; King & Quigley, 1985; Leybaert, 1993; Luckner & Handley, 2008; Mayer, 2007; Paul, 1998, 2001; Schirmer & McGough, 2005; Williams, 2004). Although some disagree with this notion (e.g., Allen et al., 2009; Miller & Clark, 2011), it is possible that interventions designed to improve story understanding with young hearing readers could be adapted for use with DHH children (Williams, 2012). Initially, however, a better understanding of DHH readers’ strengths and weaknesses is needed so that interventions can be appropriately tailored for them.

A consideration of the component skills that drive good story comprehension, and the intervention strategies that have led to significant gains in reading comprehension in hearing readers, may serve to highlight possible avenues for future research with DHH children, including which interventions might be best tailored to their specific needs. This is important because, although the reading comprehension deficits of DHH readers are well documented, the factors underlying their problems are still strongly debated (e.g., Allen et al., 2009; Paul, Wang, Trezek, & Luckner, 2009), and there has been relatively little progress in improving narrative comprehension in DHH readers despite decades of research.

**WORD- AND SENTENCE-LEVEL SKILLS IN STORY COMPREHENSION**

First, we review research on the lower level component skills involved in good story comprehension. Because of the crucial role that these processes are considered to play, they have been the focus of a number of studies with DHH readers. Thus, there is a comprehensive body of research demonstrating DHH children’s difficulties at the word and sentence levels of text processing.

**Word recognition and phonological skills**

The ability to read written words accurately and fluently (word recognition/decoding skills) is a known correlate of reading comprehension in hearing readers, from childhood to adulthood (e.g., García & Cain, 2013). However, the strength of this relationship decreases with age (e.g., García & Cain, 2013; Gough, Hoover, & Peterson, 1996; Jenkins & Jewell, 1993) because as word reading becomes more fluent (at around the age of 9 years in English readers), other comprehension processes (e.g., inference making) start to become increasingly important.

The word- decoding skills of DHH readers have been the focus of a number of studies because their phonological skills (i.e., phonemic awareness, phonological decoding) are considerably worse than those of their hearing peers (e.g., Charlier & Leybaert, 2000; Dyer, MacSweeney, Szczersinski, & Campbell, 2003; Hanson & Fowler, 1987; Hanson & McGarr, 1989; Miller, 1997,
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Importantly, however, findings also suggest that even those DHH readers with severely impoverished phonological processing skills can still process written words efficiently and often on a par with their hearing peers (see Kargin et al., 2012; Koo, Crain, LaSasso, & Eden, 2008; Miller, 2001, 2002, 2004; Miller & Clark, 2011). Such findings cast doubt on whether a phonological deficit can fully account for the comprehension difficulties observed in DHH readers (Hanson & Fowler, 1987; Hanson & McGarr, 1989; Izzo, 2002; Kyle & Harris, 2006; Leybaert & Alegria, 1993; McQuarrie & Parrila, 2009; Miller, 1997, 2007).

Thus, although phonological awareness is clearly important for text comprehension (as it underpins word-reading ability), the weight of evidence suggests that a phonological deficit cannot solely account for the poor story comprehension skills of DHH children, even though efficient word-decoding skills are necessary for developing reading comprehension, especially in beginner hearing readers (see, e.g., the Simple View of Reading; Gough & Tunmer, 1986; Hoover & Gough, 1990).

Vocabulary

Studies with children with normal hearing indicate that vocabulary knowledge is a strong correlate of reading comprehension (Bast & Reitsma, 1998; de Jong & van der Leij, 2002; Roth, Speece, & Cooper, 2002; Torgesen, Wagner, Rashotte, Burgess, & Hecht, 1997). In fact, it has been claimed that vocabulary acquisition is the single most important determinant of a child’s educational attainments (Gathercole, 1999). However, findings also suggest that even when training interventions lead to improvements in vocabulary understanding, these improvements do not necessarily result in concomitant improvements in comprehension (e.g., Jenkins, Pany, & Schreck, 1978). Moreover, when good and poor comprehenders with normal hearing are matched for vocabulary knowledge, poor comprehenders still perform significantly worse on standardized measures of reading comprehension and inference making (Cain, Oakhill, & Lemmon, 2004). These findings suggest that good vocabulary knowledge is necessary, but not sufficient, for good story comprehension (e.g., Jenkins et al., 1978).

A number of studies indicate that vocabulary knowledge is related to reading ability in DHH readers (e.g., Connor & Zwolan, 2004; de Villiers & Pomerantz, 1992; Harris & Beech, 1998; LaSasso & Davey, 1987) and that DHH readers are significantly weaker in the area of vocabulary knowledge than their hearing peers (e.g., Holt, 1993; Karchmer & Mitchell, 2003; Marschark, 2007). Often they do not have the same depth or breadth of knowledge about topics as hearing children (Schirmer, 2000), which limits their ability to acquire new vocabulary from context and that, in turn, limits their reading comprehension skills (Paul, 1996; Wauters, Knoors, Vervloed, & Aaroutse, 2001). Hence, although the difficulties faced by DHH readers in this domain are well documented, the evidence from research with children with normal hearing suggests that interventions aimed solely at improving vocabulary knowledge are likely to have only a negligible direct impact on reading comprehension ability (see Oakhill et al., 2015).

Syntactic skills

Studies with children with normal hearing indicate that syntactic knowledge is causally implicated in successful text comprehension (Willows & Ryan, 1981), but that once vocabulary knowledge is controlled, there is no longer a direct relation between the two (Bowey & Patel, 1988). Indeed, intervention studies designed to improve syntactic awareness in hearing readers, although successful in increasing such knowledge, have not resulted in gains on reading comprehension tasks (Layton, Robinson, & Lawson, 1998).

Findings from longitudinal studies with children with normal hearing demonstrate that syntactic awareness is at best a weak predictor of reading comprehension once initial levels
of reading comprehension are controlled for (Demont & Gombert, 1996; Oakhill & Cain, 2012). Hence, proficiency in syntax appears to be relatively less important to successful reading than other skills.

A number of studies indicate that DHH children lack adequate structural (syntactic) knowledge, and fail to reach similar levels of syntactic awareness as their hearing peers, even with extensive training (Quigley, Power, & Steinkamp, 1977; Webster, 1986). Recent research postulates that poor syntactic understanding may be the main cause for the large variance observed in the reading skills of DHH readers (Miller et al., 2012).

Thus, word- and sentence-level skills are clearly crucial to story comprehension, as children need to have a certain level of word and sentence understanding in order for them to be able to acquire discourse-level skills (see Oakhill et al., 2015; Stanovitch, 1986). Yet, the research with children with normal hearing (reviewed previously) suggests that lower level skills (e.g., vocabulary knowledge) are necessary, but not sufficient, for effective story comprehension.

TEXT-LEVEL PROCESSES IN STORY COMPREHENSION

As noted previously, in addition to understanding the words and structure of sentences, successful story comprehension also relies on integrating information from different parts of the text to form a coherent representation of the passage. Research with hearing children indicates that higher level processes (such as those required for sentence integration) play a crucial role in good story comprehension.

Successful readers are guided by their understanding of story structure and background knowledge. They also use cohesive devices (e.g., connectives and anaphoric devices) to help them form a coherent mental representation of a passage in which, for example, events and relations are correctly ordered and causal relations are established. Such readers integrate information both that is explicitly stated and that is inferred, and they monitor their own comprehension. These processes have been the focus of a number of studies with novice readers with normal hearing.

Story-structure understanding

The understanding and production of stories are guided by knowledge of story structure (Trabasso & Nickels, 1992). It provides the reader with a framework for understanding stories and can provide signals to indicate when inferences are needed. Research with readers with normal hearing indicates that story-structure understanding is causally implicated in good text comprehension and predicts later reading comprehension skills over and above vocabulary and general verbal ability (Oakhill & Cain, 2012). Indeed, text comprehension problems may be caused in part by a poor understanding of text structure (Perfetti, 1994). A fairly large body of evidence suggests a link between poor story-structure understanding and poor text comprehension skills in novice readers (e.g., Cain & Oakhill, 1996; Cragg & Nation, 2006; Yuill & Oakhill, 1991), with some indications that the link is causal (Oakhill & Cain, 2012). Interventions with children with normal hearing that have focused on training story-structure understanding have resulted in improvements on comprehension measures (Stevens, van Meter, & Warcholak, 2010).

Findings with DHH readers attest to their difficulties with story-structure understanding (e.g., Banks, Gray, & Fyfe, 1990; Weiss & Johnson, 1993; Wilbur, 2000; Yoshinaga-Itano & Downey, 1992). Interventions that have focused on improving this understanding have been shown to lead to gains in the reading comprehension scores of DHH readers (e.g., Ingber & Eden, 2011; Luetke-Stahlman, Griffiths, & Montgomery, 1998; Schirmer & Bond, 1990). Thus, this skill appears to play a key, and likely causal, role in story comprehension.

Cohesive devices

Successful comprehension at both the local (sentence) and global (discourse) levels also relies on the reader placing events into
the correct temporal and causal sequence and understanding causal links between events. These processes are guided not only by knowledge of story structure but also by processing cohesive markers that signal these relations (e.g., before/after, because/so). Poor comprehenders with normal hearing have difficulties in both the use and comprehension of these connectives on a variety of tasks (Cain, 2003; Cain, Patson, & Andrews, 2005), and these problems are related to their broader difficulties with coherence and cohesion skills (Sanders & Maat, 2006). Research also suggests that training that includes a focus on the understanding of connectives can lead to improvements on standardized measures of text comprehension (Cofini, Di Giacomo, Di Mascio, Gennari, & Vittorini, 2013; Sullivan & Oakhill, 2014).

Although some research suggests that DHH readers can utilize temporal and causal information when producing stories (e.g., Arfé & Boscolo, 2006; Marschark, Mouradian, & Halas, 1994), other findings suggest that they have difficulty in this domain (e.g., Banks, Gray, & Fyfe, 1990; Eden, 2008). Some research indicates that DHH readers are significantly worse than their hearing peers at processing connectives even when matched on standardized measures of reading comprehension (Sullivan, Oakhill, Arfé, & Bourieux, 2014). These difficulties likely have an impact on these students’ ability to understand the global organization of meaning within a text (Yoshinaga-Itano & Downey, 1992, 1996).

Inference and integration skills

Inference-making skills are also causally implicated in reading comprehension for readers with normal hearing. Indeed, findings indicate that such skills contribute to later comprehension ability over and above the contributions of vocabulary, verbal IQ, and earlier comprehension skill (Cain & Oakhill, 1999; Oakhill & Cain, 2012). Hearing children with text comprehension problems have difficulties with inference-making skills at both the sentence and discourse levels (Oakhill, 1982, 1984), even when background knowledge (a critical component of inference making) is kept constant between good and poor comprehenders (Cain, Oakhill, Barnes, & Bryant, 2001). Longitudinal and comprehension-age-matched design studies also indicate a causal relation such that early inference skills predict subsequent reading comprehension (Cain & Oakhill, 1999; Oakhill & Cain, 2012). Furthermore, training that focuses on encouraging inference-making skills leads to improvements on standardized text comprehension measures (Yuill & Oakhill, 1988).

In comparison with the body of research examining inference skills in readers with normal hearing, only a few studies have examined the inference-making skills of DHH novice readers (see Kyle & Cain, in this issue, for a fuller account). Interestingly, Walker, Munro, and Rickards (1998) found that a 30-week intervention employing pictorial material during training resulted in significant gains in the inferential and comprehension abilities of DHH children during the period of the intervention, especially for younger children.

Metalinguistic awareness and comprehension monitoring

The ability to think about one’s own comprehension of a text, which is termed “comprehension monitoring,” is an aspect of metalinguistic awareness. This ability is intrinsically linked to good story comprehension. It may be that metalinguistic awareness drives the development of reading comprehension (e.g., Donaldson, 1978; Vygotsky, 1962) or that comprehension drives metalinguistic awareness in general and comprehension monitoring in particular (Perfetti, Marron, & Foltz, 1996). Either way, the two skills are closely interrelated. Longitudinal studies with novice readers indicate that comprehension monitoring at the age of 7–8 years significantly predicts reading comprehension 4 years later, over and above the contribution of earlier comprehension (Oakhill & Cain, 2012). This supports the view that there is a causal link between monitoring skill and comprehension.

In their review of the DHH literature, Luckner and Handley (2008) suggest that
explicit instruction in comprehension monitoring should be a required component of reading instruction with DHH novice readers. The research findings indicate that when used in directed reading activities, explicit instruction in comprehension monitoring leads to improvements on reading comprehension tasks (Schirmer, 2000).

CONCLUSIONS AND FUTURE DIRECTIONS

In summary, the aforementioned literature review of the driving forces behind good story comprehension highlights several abilities that correlate with reading skill, some very highly. However, few of these studies have investigated causal links between specific component skills and reading comprehension. The extant research that has addressed such questions in hearing readers indicates that, although word- and sentence-level skills are crucial to comprehension, some of the text-level comprehension skills (e.g., inference making, comprehension monitoring, story-structure understanding) play a causal role in developing reading comprehension. As the findings reviewed previously indicate, DHH readers typically have difficulties at the word and sentence levels. Thus, future text interventions need to focus on both word- and sentence-level skills and text-level skills to be effective. Currently, there are far fewer studies in the DHH literature that have examined text-level processes as opposed to word- and sentence-level processes. As such, there is an urgent need for studies to assess the efficacy of text comprehension strategies that train text-level component skills, especially considering the known importance of these skills to good story comprehension in readers with normal hearing.

This imbalance in the literature is surprising, given that a number of researchers have suggested that DHH children may rely less on syntactic and vocabulary knowledge and more on global understanding (albeit with impoverished background knowledge; Gormley & Franzen, 1978; Yurkowski & Ewoldt, 1986). For instance, even when DHH children are matched with hearing peers on standardized measures of text comprehension, they still perform significantly worse than their hearing counterparts on measures of connective understanding (Sullivan et al., 2014). Indeed, as noted by Banks et al. (1990), in some circumstances, DHH readers may use contextual information to bypass their difficulties with syntax to arrive at the overall meaning of the passage (see also Cumming, Grove, & Rodda, 1985; Ewoldt, 1981).

An interactive view of story comprehension, which emphasizes a constant interplay between lower level and higher level processes, could be applied to future intervention strategies with DHH children. That is, intervention strategies aimed at improving story comprehension in DHH children should focus not only on lower level skills (such as ensuring adequate knowledge of the vocabulary used in a specific story) but also on more complex skills (such as emphasizing the structure of the story, or training inference skills at a global level). As already noted, there is currently a scarcity of interventions for DHH children that attempt to train both low- and high-level processes in concert.

When considering possible formats for interventions aimed at DHH readers, a review of the literature highlights some promising avenues. First, interventions that use picture arrangement tasks to train storytelling and story-structure understanding have met with success (e.g., Ingber & Eden, 2011). These findings indicate that DHH children are readily able to understand and use pictorial representations of narrative events. For instance, in Ingber and Eden's (2011) intervention, DHH children were presented with random picture sequences, which they learned to rearrange into correct sequences and then to use as prompts to create and narrate a story. These authors found that training with picture sequences led to improvements on standardized measures of temporal perception (i.e., Kaufman Assessment Battery for Children, second edition [KABC-II]; Kaufman & Kaufman, 1996) and storytelling ability. Although DHH children's aptness in sequencing pictures (see
also Sullivan et al., 2014) should not be confused with an adequate understanding of story structure, it demonstrates the potential for use of this representational medium with DHH children.

Second, imagery-training procedures with DHH readers have been shown to improve text-level skills, such as inference making (Schirmer, 1993). When novice DHH readers are encouraged to engage in mental imagery, they exhibit four qualities of thinking both during and after reading that support comprehension: recollection, representation, inference, and evaluation (Schirmer, 1995). Findings with children with normal hearing also demonstrate that teaching them to construct mental images as they read enhances their skill in making inferences and remembering what has been read (e.g., Pressley, 1976; Sadoski, 1985). Instruction on constructing mental images is also associated with efficient reading comprehension (e.g., Sadoski, Goetx, & Kangiser, 1988) and improved story production ability (Center, Freeman, Robertson, & Outhred, 1999). Moreover, imagery training can be implemented quickly and gains in comprehension may be detected after a brief 20-min session (Pressley, 1976).

Third, in their review of research conducted with DHH readers, Luckner and Handley (2008) suggested that interventions with the most positive outcomes were those that focused on explicit teaching of comprehension strategies. Other qualities associated with a positive outcome were those concerned with training story grammar understanding using directed reading-thinking activities (e.g., discussion and enrichment activities, such as drawing pictures of the text).

To conclude, foremost, the findings with children with normal hearing indicate that, although a large number of skills correlate with good story comprehension, only some are causally related to it. Text-level skills such as inference making, story-structure understanding, and comprehension monitoring seem to play a crucial role in driving good text comprehension, but these skills have received only scarce attention in research with DHH readers. Findings with hearing children indicate that interventions that attempt to train a combination of component skills are effective (e.g., Carretti, Caldarola, Tencati, & Cornoldi, 2013; Clarke, Snowling, Truelove, & Hulme, 2010) and can lead to improvements on standardized reading comprehension measures. Considering the well-established difficulties at the word and sentence levels for DHH readers, future interventions need to train both low- and high-level component skills. As noted previously, there is an urgent need for more research with DHH students that focuses on training higher level component skills.

The review of the literature also highlights possible formats for future intervention research as it indicates that DHH readers are adept at working with pictorial representations of the events in narratives. Interventions using picture formats have been successful in training high-level component skills (e.g., the understanding of story structure), which are important to good comprehension. Thus, interventions that focus on DHH children’s strengths in using pictures (i.e., that include activities that involve drawing, or the use of visual imagery, or picture arrangements tasks) seem particularly suited to training component skills involved in story comprehension, with the stipulation that such visual supports should always be related back to comprehension of the written word and not used as a substitute for it by struggling readers.

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