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The role of illustrations in children's inferential comprehension

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ABSTRACT

Illustrations are a salient source of information in children's books, yet their effect on children's reading comprehension has been studied only through literal factual recall. The purpose of the current study was to determine the effect of illustrations on bridging inferences, an important aspect of meaning making in comprehension models. Identical short stories were presented under different illustration conditions with pictures that represented different parts of the story. Participants were 73 7- to 11-year-olds. Illustrations both facilitated and interfered with inferencing depending on the type of information depicted; however, this effect was reduced as grade increased. Additional findings were that the overall ability to make inferences increased with age and working memory was a significant predictor of this skill. Results are discussed in relation to cognitive and developmental models of comprehension.

Introduction

Children's books are often accompanied by illustrations that provide an additional source of information that must be processed in conjunction with the text. Illustrations play a prominent role in nearly all of the books that children use to learn to read. During the past few decades especially, illustrations have become increasingly salient and elaborate in children's books and often dominate each page of text (Brookshire, Scharff, & Moses, 2002; Willows, 1978). However, very little is known about how illustrations affect reading comprehension. Nearly all of the studies aimed at assessing the influence of illustrations on children's reading comprehension have studied children's literal

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comprehension of the text (Moore & Skinner, 1985). By presenting text with and without corresponding illustrations, dozens of studies have demonstrated that pictures facilitate the ability to remember specific and concrete information from the text (e.g., Brookshire et al., 2002; Haring & Fry, 1979; McDaniel & Waddill, 1994; O'Keefe and Solman, 1987; Peeck, 1994). These studies assessed only the effects of illustrations on children's literal text comprehension and, more specifically, the effect of illustrations on memory for story details.

Although recall of information in the text is an important component of comprehension (Cain, 2006), conclusions about the effects of illustrations on reading comprehension cannot be based solely on this ability. Rather, it is necessary to study how illustrations affect other aspects of comprehension, such as inference making and mental model building, which are components identified in cognitive models of comprehension as being important for constructing coherent representations of the text (Gernsbacher, 1990; Kintsch, 1991). It is also important to understand how illustrations interact with cognitive abilities associated with comprehension such as working memory.

Several different theories and cognitive models have been proposed to explain how meaning is constructed during the process of reading comprehension; however, the development of a mental representation of the situation described by the text is an element that is common to all of the major theories (Oakhill & Cain, 2007). Johnson-Laird (1983) called this mental representation a "mental model," explaining that it goes beyond the literal meaning of the text to embody spatial, temporal, causal, motivational, and person- and object-related information. As the reader progresses through the text, the mental model is continuously updated as new information is read and interpreted (Kintsch, 1998; Zwaan & Madden, 2004).

Gernsbacher's (1990) structure building framework hypothesizes that the mental model is constructed from memory nodes that contain all previously comprehended information and become activated by incoming information. If the activated information is relevant for structure building, its level of activation is enhanced. If the activated information is not relevant for ongoing comprehension, suppression of this information occurs (Gernsbacher & Faust, 1991). This frees up memory resources, which then become available for the information activated by subsequent sentences and paragraphs. Several studies have reported that poor comprehenders lack the ability to suppress irrelevant information (e.g., Barnes, Faulkner, Wilkinson, & Dennis, 2004; DeBeni & Palladino, 2000; Gernsbacher, 1993).

The process of activating relevant information, updating the model, and suppressing irrelevant information continues throughout the reading process, allowing the reader to make connections between the relevant information, both within and outside of the text, to develop a coherent understanding (Gernsbacher, 1990; van den Broek, Rapp, & Kendeou, 2005). The making of these connections is referred to as inferencing, which is one of the processes that contribute to the construction of the mental representation of the situation described by the text. The ability to make inferences has been a strong predictor of reading comprehension in a number of studies (Cain & Oakhill, 1999; Cain, Oakhill, & Elbro, 2003; Cain, Oakhill, & Lemmon, 2004). Skilled comprehenders make many different types of inferences as they proceed through text, but bridging inferences are one type considered as essential for developing and maintaining coherent understanding (Kintsch, 1994). Bridging inferences require the reader to integrate two pieces of explicitly stated information from within the text to maintain coherence.

Developmental studies of inference making have found that this skill increases with age (Casteel & Simpson, 1991). Although young children are able to make some of the same types of inferences as are older children and adults, young children are less likely to do so spontaneously and are more successful when prompted or cued (Barnes, Dennis, & Haefele-Kalvaitis, 1996; Paris & Carter, 1973; Paris & Lindauer, 1976). Consistent and spontaneous making of inferences appears to develop around Grade 3 (Paris & Lindauer, 1976; Paris, Lindauer, & Cox, 1977).

Inferencing ability is also affected by certain text-based factors, such as the distance in the text between the ideas that need to be integrated, as well as certain child-based factors, such as working memory ability. When the integration of information that is separated within the text is required, younger children and less skilled comprehenders are more affected by the separation than older children and more skilled comprehenders (Barnes et al., 2004; Cain et al., 2004; Schmidt & Paris, 1983; Schmidt, Paris, & Stober, 1979). Inference making also appears to involve a strong working memory component (Cain, Oakhill, & Bryant, 2004). Both children and adults with reading comprehension