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The relationship between visual metaphor comprehension and recognition of similarities in children with learning disabilities

Nira Mashal *, Anat Kasirer

School of Education Bar-Ilan University, Ramat-Gan 52900, Israel

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ABSTRACT

Previous studies have shown metaphoric comprehension deficits in children with learning disabilities. To understand metaphoric language, children must have enough semantic knowledge about the metaphorical terms and the ability to recognize similarity between two different domains. In the current study visual and verbal metaphor understanding was assessed in 20 children with learning disabilities (LD) and 20 typically developed (TD) children. Results showed that LD children scored significantly lower than TD children in the comprehension of conventional metaphors, and idioms. However, visual and novel metaphor comprehension, which does not rely on prior knowledge, did not differ between the two groups. Furthermore, our results suggest that higher analogical thinking facilitates visual metaphor comprehension in the LD group. In the TD group, metaphor comprehension correlates with higher semantic knowledge.

1. Introduction

Metaphorical language is pervasive in everyday language and discourse and it is important for both communicating and reasoning about abstract concepts (e.g., Gibbs, 1994; Lakoff & Johnson, 1980). Understanding non-literal language forms, such as metaphors and idioms, requires the listener to go beyond what is said (i.e., the literal meaning) to infer what is meant. In a metaphor, properties of the vehicle term are attributed to the target term on the basis of some similarities. When we said "this seller is a leech", the leech (representing the vehicle term) properties of sticking and clinging are attributed to the seller (representing the target term), and the metaphoric interpretation – this seller sticks to customers as leech to its victim – is derived. Thus, metaphor understanding requires some necessary knowledge about the vehicle term (e.g., leech is a parasite that sticks and sucks blood) and in addition, the construction of similarity between the vehicle and the target term (Ortony, 1979). Winner and Gardner (1998) argued that metaphor comprehension is constrained by the availability of the semantic knowledge, and that children can perceive metaphoric language as long as they have sufficient knowledge of the domains involved. In the current study, metaphoric language comprehension is used to probe the relation between language and cognition in typically developing (TD) children and children with learning disabilities (LD). More specifically, the aim of the current study is to examine the relation between both semantic knowledge and the ability to recognize similarities and the understanding of verbal and visual (pictorial) metaphors.

Metaphor comprehension gradually evolves throughout childhood, adolescence, adulthood, and even into aging (Berman & Ravid, 2010; Gardner, Winner, Bechhofer, & Wolf, 1978; Mashal, Gavrieli, & Kave, 2011; Thomas et al., 2010). Gentner (1988) proposed that children aged around 6 or 7 years interpret metaphorical comparisons first in terms of perceptual

* Corresponding author.
E-mail address: nmashal2@gmail.com (N. Mashal).

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similarity and then in terms of relational similarity. In perceptual metaphors both objects share noticeable, physical properties (e.g., "her hair is spaghetti"). Here, the perceptual property of spaghetti's length is mapped onto one's hair. In relational metaphors, i.e., non-perceptual metaphors, the similarity between the objects cannot be perceived by our senses (e.g., "this lawyer is a shark"). Instead, the similarities are based on functions, properties, or internal structures that can be attributed to the target term. In the lawyer-shark example, cruelty and tenacious of the shark are mapped onto the lawyer. By the age of 11–12, children can interpret most types of metaphors, including those that require fairly precise conceptualization (Winner, Rosenstiel, & Gardner, 1976).

A considerable number of experimental studies and models have been made on the time-course of literal and nonliteral language comprehension. The two main models of non-literal processing are the serial model and the parallel (direct) model. According to the serial model, e.g., the standard pragmatic model (Grice, 1975), the metaphorical interpretation is computed through a sequence of processing stages that gives priority to literal meaning. First, the literal interpretation of the phrase is derived. Then, the literal interpretation is checked against the context of the phrase. Finally, if the literal interpretation is found incongruous then it is rejected and the metaphoric interpretation is computed. On the other hand, the parallel model argues that both the literal and the metaphoric interpretation are computed without rejecting the literal interpretation. According to this view, metaphorical and literal meanings are computed in parallel, with neither having unconditional priority, and in addition, both are processed automatically, i.e., neither meaning can be ignored (Glucksberg, 2008). Following these models, Giora and Fein (1999) proposes that the serial/parallel debate can be reconciled by the graded salience hypothesis in which regardless the type of meaning (either metaphorical or literal) more salient meaning is processed before less salient meaning. This view suggests that no priority is assumed with respect to literality. Although there is little consensus on the time course of metaphorical interpretation, all models view metaphors as cross-domain mappings between concepts from disparate domains of knowledge.

When verbal and pictorial information are contrasted in an explicit verbal recall task, visual information is recalled better. This effect is known as the picture-superiority effect. A recent study demonstrated a developmental trend in the picture superiority effect in recognition memory (Defeyter, Russo, & McPartlin, 2009). According to this study, whereas 7-year-old children did not show the picture superiority effect, it was significant among 9-year old, 11-year old, and adults. Several models have attempted to explain the picture superiority effect (e.g., McBride & Dosher, 2002). One influential account is Paivio's dual coding theory (Paivio, 1991). This theory proposes that pictures hold an advantage over words because semantic information is encoded through two separate routes. Whereas words are processed only through a verbal route, pictures are processed via both an image pathway and a verbal code. That is, when people process an image, they attend its visual features as well as spontaneously verbalize its label. Thus, according to the dual coding theory, pictorial information increases the strength of encoding by accessing semantic knowledge via two parallel pathways. Another explanation for the advantage of pictures over words is that pictures have more attention-inducing qualities than words. Given language and sometime attention deficits, children with learning disabilities may benefit from these advantages.

Visual metaphors are analogous to verbal metaphors in their ability to shape information and make sense of abstract concepts and relationships. Very little is known about visual metaphor processing in children with learning disabilities (Lee & Kamhi, 1990) studied verbal and visual metaphoric understanding in children with LD, children with LD with a history of spoken language impairments, and TD children ranging in age from 9 to 11 years. In the verbal metaphoric task in Lee and Kamhi's study, children read a sentence ("I went into the kitchen and ate up a storm") followed by four possible interpretations ("1. I ate a lot; 2. I drank some white lightning from the refrigerator; 3. I ate so much it rained; 4. I like to eat when it's raining"). The results indicated that the performance of both LD groups was poorer than the performance of the typically developed children on the verbal task. Possible explanations for the poor performances of LD children in the verbal metaphoric tasks may result from one (or more) of the following prerequisites needed for metaphoric comprehension: First, the child must have enough knowledge about the vehicle and the target terms (Keil, 1986). Second, the child must recognize some form of target–vehicle similarity (Gentner, 1988; Ortony, 1979). And third, a mental flexibility that switches between the two meanings (the intended metaphoric meaning and the literal interpretation) is required (Berman & Ravid, 2010; Mashal & Kasirer, 2011). Despite the lower scores of the LD children in Lee and Kamhi's study in the verbal task, understanding the visual metaphors did not differ between the LD and the TD group. In another study, visual and verbal metaphor comprehension was tested in 12 children with language disorders (mean age of 10.3 years) and 12 control subjects matched for age (Highnam, Wegmann, & Woods, 1999). TD children provided more metaphoric explanations than children with language disorders, regardless of modality (verbal or visual). These findings suggest that visual metaphors are not advantageous for children with language impairments. However, when no language impairments are present, children with LD perform as well as TD children in visual metaphor comprehension. Although the study of Lee and Kamhi provided valuable information regarding the ability of LD children to process visual metaphors compared to TD children, it was not clear from the study whether LD or TD children demonstrate the picture superiority effect.

Studies that tested the picture-superiority effect using metaphoric items are remarkably scarce. While there is a little evidence that the picture superiority effect is not found for metaphoric items (Kogan & Chadrow, 1986), this effect is well established in studies of typically developed participants using non-metaphoric items (e.g., Whitehouse, Maybery, & Durkin, 2006). For example, participants from middle childhood to adolescence showed better recall of pictorial relative to word