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Comprehension and generation of metaphors by children with autism spectrum disorder

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ABSTRACT

Background: Autism spectrum disorders (ASD) are often associated with reduced figurative language processing. However, recent findings suggest that individuals with ASD are not necessarily impaired in comprehension and generation of novel metaphors relative to typically developing (TD) individuals. The current study expands previous research (Kasirer & Mashal, 2014) findings by examining the comprehension and the generation of metaphors in children with ASD.

Method: The sample included 34 children with ASD and 39 TD age – matched peers (aged 9–16). A multiple-choice questionnaire consisting of conventional and novel metaphors was used to assess metaphoric comprehension; a concept explanation task was used to test conventional and novel metaphor generation.

Results: The results indicate that the ASD group understood fewer conventional metaphors than their TD peers. However, no group differences were observed in novel metaphor comprehension task. Furthermore, whereas participants with ASD generated less conventional metaphors they generated more creative and novel metaphors.

Conclusion: These findings suggest a unique style of thinking with regard to verbal creativity in ASD which occurs already in childhood.

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1. Introduction

Figurative language is one of the most significant areas of linguistic innovation, and the generation of novel metaphors is a prime example of verbal creativity. People with Autism Spectrum Disorders (ASD) have been found to experience difficulties in comprehending figurative language, demonstrating a tendency to interpret figurative phrases literally (Adachi et al., 2004; Happé, 1993, 1995; Kerbel & Grunwell, 1998; Mashal & Kasirer, 2011; Rapin & Dunn, 2003; Rundblad & Annaz, 2010). However, recent findings suggest that individuals with ASD are not necessarily impaired in the comprehension and generation of novel metaphors as compared to typically developing (TD) individuals (Giora, Gazal, Goldstein, Fein, & Stringaris, 2012; Hermann et al., 2013; Kasirer & Mashal, 2014; Mashal & Kasirer, 2011; Melogno, D'Ardia, Pinto, & Levi, 2012a; Olofson et al., 2014). The current study aims to examine whether the unique verbal creativity that was observed among ASD adults in previous study (Kasirer & Mashal, 2014) will be extended to children and adolescents.

A recent study reported that 20 adults with Asperger syndrome (aged 22–68) processed novel metaphors similarly to age-matched TD individuals (Hermann et al., 2013). The study included a semantic judgment task in which participants were

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asked to make rapid decisions about the literal truth of a given sentence. The responses to metaphors were significantly slower than the responses to the other types of expressions, but this pattern of results held for both groups, with no impairment in performance in participants with AS Kasirer and Mashal (2014) compared 17 adults with ASD (aged 18–27) to 17 age-matched TD individuals and found similar comprehension of novel metaphors in both groups. Furthermore, the comprehension of conventional metaphors did not differ across the groups once vocabulary was entered into the analysis as a covariate. In another study, Mashal and Kasirer (2011) found that adolescents aged 12–15 with ASD and age-matched TD adolescents performed similarly in the comprehension of novel metaphors. However, the groups differed in the comprehension of lexicalized expressions that included familiar idioms and conventional metaphors (Mashal & Kasirer, 2011). Thus, individuals with ASD demonstrate difficulties in comprehending figurative language that are more noticeable with familiar expressions that rely on pre-stored knowledge or pragmatic skills that are known to be impaired in ASD (Tager-Flusberg, 2003). In contrast, recent studies suggest that the ability to identify novel semantic connections between apparently unrelated concepts is not impaired in ASD. However, assessing metaphor comprehension by multiple choice tasks (as was used in Kasirer & Mashal, 2014) present the risk of under- or overestimating the participants' performance.

Some studies indicate that the type of metaphor affects the degree of understanding in ASD (D. Melogno, Pinto, & Levi, 2012b), with better comprehension of novel metaphors than of conventional metaphors (Kasirer & Mashal, 2014). Melogno et al. (2012a) asked children with ASD (mean age 8.5) to explain sensory metaphors and found that the participants understood these metaphors adequately. Thus, studies show that there is variability in metaphor processing in ASD, and that this variability depends not only on the particular subgroup but also on the type of task and stimuli (Mashal & Kasirer, 2011; Melogno et al., 2012b; Winner, 1988).

Levorato and Cacciari (1995) presented a psycholinguistic model for the development of figurative language comprehension and generation, called the Global Elaboration Model. According to this model, the metalinguistic awareness necessary for the creative use of figurative language is acquired fairly late, after the ability to comprehend and generate figurative expressions. Only in adolescence, around the age of 15, can young people generate figurative language at an adult level, and further development occurs even in adulthood. Other views suggest two disparate lines of development, one for metaphor production and another for metaphor comprehension. Thus, the normal development of metaphor production might follow a U-shaped curve (Winner, 1988; Winner, McCarthy, & Gardner, 1980), such that TD children first generate metaphors on intuitive grounds, as observed at the age of 2–5. At this stage children seem prolific in their metaphor production (Billow, 1981; Fourment, Emmenecker, & Pantz, 1987). Chukovsky (1968) described young children who produce such metaphors as “linguistic geniuses”. This production decreases gradually when children enter school, leading to a literal stage. According to Pollio and Pollio (1974), young TD children were less likely than adolescents to use unconventional metaphors. During adolescence young people begin to generate creative metaphors once again, completing the U-shaped curve. In contrast to metaphor generation, comprehension develops more linearly (Pollio & Pickens, 1980; Reynolds & Ortony, 1980; Vosniadou, Ortony, Reynolds, & Wilson, 1984), along with cognitive development and semantic knowledge (Melogno et al., 2012b).

Levorato and Cacciari (2002) investigated the generation of novel expressions in 324 Italian speakers aged 9, 11, and 18, as well as adults. They used a list of nine common actions (e.g., *telling a lie*) and nine common emotions (e.g., *being surprised*), and asked participants to generate either simple nominal sentences (e.g., *Telling a lie is _____*) or comparative ones (e.g., *Telling a lie is like _____*). The linguistic constraint ‘is like’ aimed at increasing the production of figurative expressions. Although the participants were not explicitly asked to use figurative language, more than half of the productions were figurative. Even school-age children produced an impressively high percentage of figurative expressions, where 37% of the expressions produced by 9-year-olds and 42% of the expressions produced by 11-year-olds were figurative. The percentage of figurative expressions was highest in adolescents (67.5%), with a small decrease in adults (61.3%). Children and adolescents produced the most figurative expressions in the comparative structure, whereas adults generated some figurative expressions in nominal sentences as well.

The current study used Levorato and Cacciari's (2002) method for individuals with ASD. It is not yet known how children with ASD develop the ability to generate metaphors. The finding that children and adults with ASD understand novel metaphors quite well makes this question particularly intriguing.

Metaphorical language depends on verbal skills as well as cognitive abilities (Dietrich, 2004) and is considered to be the most complex aspect of language function (Martin & McDonald, 2003). Ample research highlights the importance of semantic and conceptual knowledge in metaphor comprehension (e.g., Baldwin, Luce, & Readence, 1982; Evans & Gamble, 1988; Gardner, 1974; Nippold, 1998; Norbury, 2005). Nippold (1998) discusses the semantic feature hypothesis, which states that children's knowledge of the relevant semantic features of the topic and the vehicle of a metaphor or a simile plays a key role in their comprehension of such phrases. In the present study we focus on the contribution of executive function to metaphor processing. Executive dysfunction may affect people's ability to generate novel linguistic constructs and shift from one meaning of a word to another, especially in the case of metaphorical language (Landa & Goldberg, 2005). Executive functions are important not only for the production but also for the comprehension of metaphors (Beaty & Silvia, 2013; Chiappe & Chiappe, 2007; Dietrich, 2004; Iskandar, 2014; Silvia & Beaty, 2012). For example, Chiappe and Chiappe (2007) demonstrated that working memory and inhibition, as measured through verbal fluency tasks as well as the Stroop task, were associated with the time it took to comprehend metaphors, predicted the quality of metaphor interpretations, and also accounted for the quality of the metaphors produced. Indeed, research has suggested that individuals with ASD do not

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