Intentions vs. resemblance: Understanding pictures in typical development and autism

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A B S T R A C T

Research has debated whether children reflect on artists' intentions when comprehending pictures, or instead derive meaning entirely from resemblance. We explore these hypotheses by comparing how typically developing toddlers and low-functioning children with autism (a population impaired in intentional reasoning) interpret abstract pictures. In Experiment 1, both groups mapped familiar object names onto abstract pictures, however, they related the same representations to different 3-D referents. Toddlers linked abstract pictures with intended referents they did not resemble, while children with autism mapped picture-referent relations based on resemblance. Experiment 2 showed that toddlers do not rely upon linguistic cues to determine intended referential relations. Experiment 3 confirmed that the responding of children with autism was not due to perseveration or associative word learning, and also provided independent evidence of their intention-reading difficulties. We argue that typically developing children derive meaning from the social-communicative intentions underlying pictures when resemblance is an inadequate cue to meaning. By contrast, children with autism do not reflect on artists' intentions and simply relate pictures to whatever they happen to resemble.

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1. Introduction

Symbolic understanding is at the core of human cognition (Deacon, 1997; Tomasello, 1999; Wittgenstein, 1953). Children must learn to master the symbol systems of their culture if they are to become functioning social beings (Callaghan, Moll, Rakoczy et al., 2011). In Western societies, pictorial symbols are universally used to teach children about the world, and, for many low-functioning children with autism (CWA), they provide an alternative means of communication (Frost & Bondy, 2002). In order to use pictures as symbols, children must understand that they are representations of independently existing objects. Typically-developing children (TDC) show awareness that pictures are symbols for real-world entities between 18 and 36 months (Callaghan, 2000, 2008; Callaghan et al., 2011; DeLoache & Burns, 1994; Ganea, Pickard, &

DeLoache, 2008; Preissler & Carey, 2004; Suddendorf, 2003). However, comparatively little is known about picture comprehension in autism, and the question of *how* TDC and CWA map pictures to objects remains unanswered.

Some theorists contend that *resemblance* (i.e. similarity of perceptual features) defines picture-referent relations (e.g. Hopkins, 1995, 1998; Hyman, 2006; Peacocke, 1987), while others claim that a picture's referent is determined by the *intentions* of the artist and that intention-monitoring skills are critical to picture comprehension (e.g. Bloom, 1996; Bloom & Markson, 1998; Preissler & Bloom, 2008; Taylor, 1998). The purpose of the present study was to establish which of these cues is most crucial to picture-object mapping in TDC and low-functioning CWA; do they always relate pictures to objects they resemble, or do they map pictures to objects they are intended to represent (irrespective of resemblance)? A novel way of teasing apart these hypotheses is to compare how these populations comprehend *abstract* pictures that relate to referents *only* by virtue of representational intent. Given that low-functioning CWA

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often have profound difficulty understanding the intentions of others (Baron-Cohen, 1995; D'Entremont & Yazbek, 2007; DSM-IV: American Psychiatric Association, 1994; Kanner, 1943), this comparison may yield the first evidence that TDC and CWA differ in their understanding of what fundamentally relates a picture to its referent. Mapping abstract pictures to objects based on resemblance, despite its inadequacy as a cue to intended referential meaning, would be consistent with naïve realism – a non-intentional theory of picture interpretation that privileges perceptual similarity and neglects external sources of meaning that are not immediately perceptible (e.g. the artist's intentions, whether the picture was created accidentally, expectations of the viewer; Freeman, 1991; Freeman & Sanger, 1995).

Several studies have examined young children's sensitivity to referential intentions when comprehending pictures. Bloom and Markson (1998) asked 3- and 4-year-olds to draw pairs of objects that closely resembled each other, such as a balloon and a lollipop. The pairs of pictures were virtually indistinguishable, and therefore could not be accurately matched to their original referents based on resemblance alone. When asked to name their drawings after a distractor task, both 3- and 4-year-olds correctly and consistently discriminated based on their original representational intentions. Even more remarkably, 2 and 3-year-old children have been shown to perform mentalistic reasoning when interpreting ambiguous pictures created by others. In one study, Gelman and Ebeling (1998) showed 2- and 3-year-olds a series of line drawings roughly shaped like familiar nameable objects (e.g. a kite). Some children were informed that the pictures had been created intentionally (e.g. someone painted a picture), while others were told that the pictures had been created accidentally (e.g. someone spilled some paint). Children were more likely to name the ambiguous pictures according to shape (thus regarding them as symbolic representations) when they believed the pictures were intentional creations. In another study, 2-year-olds watched an experimenter produce an ambiguous line drawing that looked equally like two unfamiliar objects (Preissler & Bloom, 2008). When asked to extend a novel label from the picture, the majority of children generalized the word to the object that the artist had been gazing at whilst drawing, suggesting that they perceived this object to be the picture's intended referent. Together these studies indicate that, by 2-years of age, TDC consider intentional information when comprehending pictures created by themselves and by others.

Although TDC are capable of using intentional information to decipher ambiguous visual representations, it is undeniable that resemblance plays a vital role in children's picture comprehension. Numerous studies have demonstrated that young children's ability to map picture-referent relations is facilitated by high levels of iconicity – the extent that a picture resembles its referent (Callaghan, 2000; Ganea et al., 2008; Simcock & DeLoache, 2006). However, there is some evidence that children's picture comprehension is governed *primarily* by resemblance, including when a picture's appearance is in conflict with its creator's intentions. When Browne and Woolley (2001) presented 4-year-olds, 7-year-olds, and adults with a puppet show in which the protagonist announced his

intention to draw a bear, but actually produced a picture resembling a rabbit, all groups named the picture according to its appearance (e.g. a rabbit) rather than the artist's stated intentions (e.g. a bear; also see Richert & Lillard, 2002).

The preceding results suggest that if a picture is sufficiently recognisable, resemblance rather than referential intent determines what it represents for both children and adults. However, as it is extremely irregular to encounter a drawing that is intended to represent X, but uniquely resembles Y, participants in these studies may have disregarded the artists' intentions in an attempt to reconcile the conflicting cues. While it is doubtful that an artist would draw one thing whilst intending to represent something else, it is culturally acceptable to assign meaning to pictures that do not have a clearly recognisable referent (e.g. abstract art, infantile scribbles). Studying how children interpret abstract pictures can provide an innovative and ecologically valid method of assessing the relative importance of resemblance and representational intent to picture comprehension. Intentional theorists, such as Bloom and Markson (1998), claim that resemblance is beneficial because it provides a window to an artist's intentions – "children might call a picture that looks like a bird "a bird" not merely because it looks like a bird, but because its appearance makes it likely that it was created with the intent to represent a bird" (Bloom & Markson, 1998, p. 203). Therefore, it may be that TDC derive meaning from resemblance only insofar as it provides an index of representation (Bloom & Markson, 1998; Gelman & Ebeling, 1998). If this theory holds, we would expect TDC to refrain from mapping shape-based picture-object relations when resemblance is a poor cue to a picture's intended meaning.

To date, very few studies have examined children's comprehension of abstract pictures, with Bloom and Markson (1998) being a notable exception. In their "Size Task", 3- and 4-year-olds were shown pairs of differently-sized scribbles that had been 'drawn' by a child with a broken arm. For each pair of scribbles, the experimenter explained that the artist had attempted to draw two objects, such as an elephant (large) and a mouse (small). Crucially, the pictures looked nothing like the named objects, and could only be matched to their intended referents based on relative size. At test, children mapped labels for large and small objects to the abstract pictures based on relative size, which the authors interpreted as evidence for TDC inferring the artist's representational intent. However, a more stringent test of intention reading in the domain of pictures would require children to map pictures to referent objects in the absence of resemblance.

Research investigating the development of pictorial understanding has shown that social-cognitive skills (e.g. intention reading and imitation) enable TDC to learn about pictures through interactions with symbolically-experienced adults (Callaghan & Rankin, 2002; Callaghan & Rochat, 2008; Callaghan, Rochat, MacGillivray, & MacLellan, 2004; Rochat & Callaghan, 2005). However, many low-functioning CWA show deficits in the social-cognitive skills that underlie pictorial development (Baron-Cohen, 1989, 1995; Charman et al., 1997; Griffin, 2002; Hobson, 2002; Mundy & Willoughby, 1996). If a nonverbal child with autism is