



# Young children show representational flexibility when interpreting drawings



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## ABSTRACT

Drawings can be ambiguous and represent more than one entity. In three experiments, we examine whether young children show representational flexibility by allowing one picture to be called by a second name. We also evaluate the hypothesis that children who are representationally flexible see the artist's intention as binding, rather than changeable. In Experiment 1, an artist declared what she intended to draw (e.g. a balloon) but then produced an ambiguous drawing. Children were asked whether the drawings could be interpreted differently (e.g. 'could this be a lollipop?') in the presence of a perceptually similar or dissimilar distractor (e.g., lollipop or snake). Six-year-olds accepted two labels for drawings in both conditions, but four-year-olds only did so in the dissimilar condition. Experiment 2 probed each possible interpretation more deeply by asking property questions (e.g., 'does it float?', 'does it taste good?'). Preschoolers who understood that the ambiguous drawing could be given two interpretations nevertheless mostly endorsed only properties associated with the prior intent. Experiment 3 provided converging evidence that 4-year-olds were representationally flexible using a paradigm that did not rely upon modal questioning. Taken together, our results indicate that even 4-year-olds understand that pictures may denote more than one referent, they still think of the symbol as consistent with the artist's original intention.

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## 1. Introduction

The development of symbolic understanding is a crucial facet of human development (Deacon, 1997; DeLoache, 2004). Visual symbols such as drawings can be understood in terms of the artist's attempt to communicate, represent, or express something. Under this interpretation, the artist's intent determines the referential content of the depiction (see Bloom, 2000). However, the contents of drawings are often ambiguous, as its elements are plurifunctional: a circle can represent a ball (sphere), cookie (disk), ring (loop) or even a hole (emptiness). Pictorial realism relies on the readiness with which a picture or drawing triggers recognition of contents (see Hopkins, 1998; Lopes, 1997; Sartwell, 1994; Schier, 1986). A mature understanding of pictures respects the artist's intent in creating the picture, whilst appreciating that a given drawing might be ambiguous, and could plausibly symbolize multiple referents. Children's understanding of pictures can therefore

shed light on their emerging understanding of symbols and intention.

Children are sensitive to the artist's intent very early in development. Children as young as 30-months of age can spontaneously monitor an artist's gaze to infer referential intent. When taught a word for an ambiguous drawing ("this is a spoodle!"), children mapped the novel word to the object the artist had intended to draw rather than a similarly shaped distractor that the drawing could also plausibly represent (Preissler & Bloom, 2008). They only did so during an intentional act of drawing, and not merely when associative cues were provided. Young children are also sensitive to how a picture was created when they are deciding how to name it; Gelman and Ebeling (1998) told 2–4 year old children that ambiguous pictures were either created accidentally ("John spilled some paint on the floor") or intentionally ("John used some paint to make something for his teacher"). Children were more likely to name the intentionally produced creations (e.g. "man"), and showed a trend towards using material terms (e.g. "paint") to describe the accidentally produced ones, even though the pictures were identical.

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In addition, Bloom and Markson (1998) showed that 3- and 4-year-olds remembered which of their own drawings had been intended as a balloon and which a lollipop, even though the drawings themselves were compositionally identical (e.g. a simple circle and line). In their discussion, Bloom and Markson reported that children objected when the experimenter relabeled their picture, for instance calling the balloon a lollipop. It is possible that these children believed that pictures only refer to a single referent, but empirical investigation is required to confirm or deny this anecdotal report.

In contrast to findings prioritizing artist intention, Browne and Woolley (2001) found children instead sensitive to appearance when choosing a label for a drawing. In this study, the artist declared her intent (“I’m going to draw a bear”) before making a drawing that looked more like a rabbit. Instead of using the artist’s intent when naming the resultant picture, 4- and 7-year-olds relied on its appearance, calling the picture, for instance, a “rabbit”. In this experiment, 4-year-olds did not seem to consider as binding what the artist himself said he was drawing (see also Richert and Lillard (2002) for similar evidence).

The discrepant results of Bloom and Markson (1998) and Browne and Woolley (2001) open a field of new possibilities. Each pioneering experiment on its own is fine; it is in putting them together that explanatory puzzles arise, with important methodological differences. For instance, in one experiment the child draws, in the other the adult draws. A second difference is that in one experiment there are two drawings (balloon, lollipop) that are perceptually similar, whilst in the other there is only one. It is conceivable then that a difference in the social variable of ‘agency’ coincides with a difference in the graphic variable of ‘number of drawings’ or, more likely, the type of comparison drawing (perceptually similar or not).

In Samuelson, Perry, and Warrington (2007), children were unable to remember the name of their similarly shaped drawings when they were asked to produce 6 pictures in the same coloured crayon (e.g. balloon, lollipop, yoyo, spoon, and the numbers 6 and 9). A second study showed that when the number of drawings was reduced from 6 to 2 (as in Bloom and Markson’s (1998) original task), children were successful at naming even when the drawings were produced using a single colour crayon. The authors point out that some perceptual cues were still available, though, as adults could independently categorize the children’s purportedly indistinguishable drawings into balloons and lollipops at a rate greater than chance. It is possible children used these perceptual distinctions to guide their labelling. In the current study, we use drawings produced by the experimenter to avoid such perceptual cuing, and thus focus more specifically on the role of intentions. However, it should be noted that both perceptual and conceptual information play a role in terms of children’s categorization.

In order to explore how children view the relationship between intent and representation, we devised a new unified design to probe children’s commitment to intent when interpreting drawings. Experiments 1 and 3 specifically investigate whether 4- and 6-year-old children are willing to attach more than one label to a drawing. The first experiment uses two conditions to compare and equate the methodological differences in prior empirical work. Experiment 3 uses a game-like paradigm to confirm the results of Experiment 1, which was obtained using modal questioning.

If children are willing to accept more than one label for an ambiguous drawing, we term this *representational flexibility*. Flexibility has been studied in relation to the production of children’s drawings (Picard & Vinter, 1999), and the ability to create imaginative entities such as a man who does not exist has been taken as evidence of conceptual flexibility and representational change (Adi-Japha, Berberich-Artzi, & Libnawi, 2010; Berti & Freeman, 1997; Karmiloff-Smith, 1990, 1992). However, little is known

regarding how children perceive other people’s depictions with respect to flexible interpretations. This is especially important because it taps children’s broader understanding of pictures and intentionality (see Allen, 2009; DeLoache, 2004), rather than just those they construct.

If children show representational flexibility, this may change conceptually how they think about a picture. We probe this second question in Experiment 2, where we ask children properties about each potential referent. One hypothesis is that the symbolic status of the picture actually changes; if, for example, a drawing of a balloon *could be* a lollipop, it is possible that the viewer now thinks of the picture as a lollipop, and only a lollipop. We term this ‘changeable status’. An alternative possibility is that although the viewer acknowledges that the picture may represent something else (e.g. a drawing of a balloon could plausibly represent a lollipop), it is in fact bound to the original referent (e.g. it is still really a balloon). We refer to this possibility as ‘bound status’. In both cases, the referential content is linked to artist intention, but the viewer weights this intention differently.

As adults, we understand that declared intent might become effective, ineffectual, abandoned or altered. Our research investigates the degree to which preschoolers take an individual’s statement of intent as binding, so that the actual outcome has necessarily to be construed as what was intended, out of all competing possibilities, or less strongly as heuristically suggestive amongst possibilities. Overall, we investigate the degree to which children rely on artist intent, and whether respect for intent might hamper children’s grasp that an ambiguous picture has possibilities other than what the artist intended. These studies can inform theories of pictorial development and links to early understanding of intentionality.

## 2. Experiment 1: When does intent bind outcome?

Bloom and Markson (1998) found that 4-year-olds used the artist’s intent to name pictures. In this study, the child needed to distinguish between two competing drawings that looked nearly identical. Perhaps children relied heavily on artist intent in this case because of the need to distinguish between drawings that visually compete for each label: when in doubt, consult the artist. We tested this by adding a condition containing two *dissimilar* drawings, so no appeal to intent was needed in order to name each with a single label. Thus, in the Competing condition, the target drawing, for example a balloon, was paired with a lollipop, whilst in the new Noncompeting condition, the target drawing was paired with a visually distinct depiction, for example, a snake. The adult made the drawings, to (a) ensure experimenter control over the appearance of each drawing, and (b) give generality to the study by probing the child’s broader understanding of pictures, rather than just those she makes herself.

### 2.1. Method

#### 2.1.1. Participants

Forty-eight 4-year-olds (mean 4;5, range 3;9–4;11) and 46 6-year-olds (mean 6;4, range 6;0–6;10) were individually tested. Children were tested at the Bristol Cognitive Development Centre and local schools.

#### 2.1.2. Materials and procedure

Children were randomly assigned to the Competing Drawing condition ( $N = 24$  4-year-olds,  $N = 23$  6-year-olds), modelled after Bloom and Markson (1998) or to the Noncompeting Drawing condition ( $N = 24$  4-year-olds,  $N = 23$  6-year-olds). In each condition, two trials were presented.

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