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Do Young Children Know What Makes A Picture Useful To Other People?

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Abstract

Even babies have an implicit appreciation of the relationship between realistic pictures and the objects that they depict, but a mature understanding of pictures involves an explicit appreciation of how pictures work. Adults appreciate that pictures are public representations that can communicate information to other people, and that some pictures are better at doing this than others. We explore the foundations of this understanding in young children. In three experiments, using yes/no and forced-choice questions, we find that 3- and 4-year olds understand that other people benefit from pictures that contain greater perceptual detail and that the more realistic the picture, the better it is as a symbolic vehicle.

Keywords

Pictures, symbols, communication, knowledge

Do young children know what makes a picture useful to other people? In a classic article, Hochberg and Brooks (1962) described how they raised a child without any access to visual representations, and then, when he was 19 months old, showed him photographs and line-drawings of familiar objects and asked him to name them. He did so easily, suggesting that children do not need experience with pictures in order to appreciate which objects they correspond to. Since then, several studies have found that even younger children have some tacit appreciation of the relationship between realistic representations and the objects they depict (DeLoache and Burns, 1994; Preissler and Carey, 2004; DeLoache et al., 1996). Other studies find that preschool children can use the inferred intention of the artist to name pictures that do

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not resemble what they depict – they appreciate, for instance, that if someone stares intently at a spoon while producing a scribble, that this scribble is likely to represent the spoon (e.g., Bloom and Markson, 1998; Preissler and Bloom, 2008).

There is a critical distinction, however, between being able to recognize and name pictures versus actually understanding how pictures work. Domestic chickens will respond to a realistic two-dimensional picture of a chicken as if it were another chicken (Ryan, 1982), but surely chickens have no explicit grasp of the representational properties of pictures. Even 3-month-old human babies are able to perceive similarities between pictures and the real world, evidenced by the ability to recognize their mother's face in a colour photograph (Barrera and Maurer, 1981). However, this is far from showing an understanding the symbolic and communicative nature of pictures. In contrast, as experienced viewers and creators of pictures, adults know a lot about representations and how they work. We appreciate that pictures are public representations that can communicate information to other people, and that some pictures are better at doing this than others. In addition, adults recognize that one's own knowledge of what a picture represents might differ from the knowledge of other people. An artist who just completed an abstract painting of her lover, for instance, will be entirely confident about what her painting represents, but will also realize that, in the absence of other information, a stranger looking at it will have no idea.

We are interested here in the question of whether young children have any appreciation of what makes some pictures more useful than others. There are reasons to expect this to be difficult for children. DeLoache and her colleagues have discovered that preschool children have problems coping with the "dual nature" of representations – the fact that they are both symbolic entities and concrete material things. This makes it difficult for them to use representations in certain ways, such as finding the location of a hidden object (e.g., DeLoache and Burns, 1994; DeLoache et al., 1997; see also Preissler and Bloom, 2007). Other researchers find that preschool children often have problems reasoning about pictures independently of the objects that they represent; they sometimes say "yes" when shown a picture and asked, "Can you eat this picture of an apple", and they sometimes agree that if you get close enough to a picture of a rose, you can smell it (Beilin and Pearlman, 1991; Thomas et al., 1994). In addition, children of this age tend to have a broad conception of what constitutes a picture, and include letters and numbers as acceptable pictures, in addition to drawings (Thomas et al., 2001). Finally, there might be special difficulties in children's understanding that others might not recognize a picture that they themselves recognize, since, in

general, children tend toward egocentrism – they are highly vulnerable to the so-called 'curse of knowledge' (see Birch and Bloom, 2003).

Here we address these issues through use of simple yes/no and forced-choice questions. In Experiment 1, we explore whether children believe that a detailed picture makes a better symbol than a less detailed one, even if both could depict the same referent. Experiment 2 investigates whether a simple preference for detailed pictures by young children could be responsible for the results of Experiment 1. Finally, Experiment 3 investigates children's expectations of how other people interpret drawings.

Experiment 1

In Experiment 1 we provide children with two plausible depictions of a referent, and varied the level of perceptual detail, to examine whether children think that more detailed drawings are better for conveying information to other people than vague renderings.

Method

Participants

Sixteen children (mean age 4.0 years; range 3.2–4.6 years) recruited from the Unitots nursery at the University of Edinburgh were included in the study. There were 7 males and 9 females.

Materials

Eight pre-drawn pictures of familiar entities were used in the study. For each trial, two pictures depicted the same referent; however, one was detailed and one was vague (see Fig. 1). The stimuli included pairs depicting a house, dog, car and the experimenter.

Procedure

Children were seated at a table across from the experimenter. Each participant was presented with 4 pairs of pictures, 2 per trial. Both members of the pair could depict a particular referent (such as a house), however one was a simple, relatively vague drawing, and the other a more detailed artist's rendering. Children were presented with each member of the pair randomly, and asked for each: "If we showed this to Anna (the nursery coordinator), would she know what it is a picture of?" Then they were asked "which picture should we show your Mum so she knows what the X looks like?" During

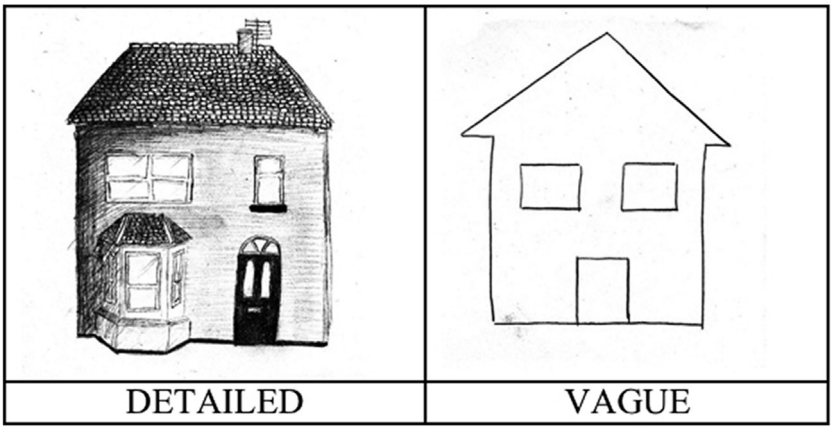


Figure 1. Example of stimuli for Experiment 1.

pilot testing, adult participants selected the more detailed picture when asked which picture should be shown to someone else so they know what the X looks like. We interpret this as understanding that the detailed picture is a better source of information to show to someone else, which guided our subsequent hypotheses for the child participants.

Results and Discussion

When asked if another person would know what the detailed drawing was a picture of, 95% indicated 'yes', whereas only 23% agreed that a person would know the identity of the less detailed depiction (McNemar's test, χ^2=31.1, P<0.01, df=1). When asked, "Which picture should we show your Mum so she knows what the X looks like?", children selected the more detailed depiction 78% overall – binomial P (two-tailed)<0.0001). Taken together, these results suggest that children understand that other people benefit from detailed information when linking a picture to its referent.

However, an alternative explanation is that children simply prefer more detailed pictures to simpler depictions, and are answering in accord with their own preferences instead of considering the actual information depicted in the pictures. Experiment 2 explores this possibility.

Experiment 2

In Experiment 2, we present a different sample of children with pictures varying both in detail and content (2 different superordinate levels within a

given kind category). This experiment will examine if children have a default preference for detailed drawings when asked to choose between the two types of pictures.

Method

Participants

Twenty native English-speaking children (mean age 4.2 years; range 3.0–4.9 years) recruited from the Unitots nursery at the University of Edinburgh and the Human Development Centre at Lancaster University were included in the study. Twelve males and 8 females participated.

Materials

The stimuli consisted of eight drawings (2 per trial). The drawings were simple figures, with one of each pair depicting a detailed, non-prototypical example of a category such as 'house' (e.g., Japanese style house) and the other showing a less detailed, but prototypical exemplar (a standard western style house). The stimuli set also included pairs of pictures representing a cat (lioness and tabby cat), bird (penguin and cardinal) and fish (stingray and goldfish). The first member of each pair was a detailed rendering and the second member of each pair was less detailed (but prototypical of the kind category). A pre-test was comprised of those 8 drawings and 16 additional drawings (see Fig. 2).

Procedure

Participants were seated at a small table across from the experimenter. In order to determine that children believed that both examples of the picture pairs to be used in the test trials were indeed members of the same category, a pre-test was administered. During this pre-test, children were shown all items from the test trials, presented in pairs (one prototypical example and one non-prototypical example of the same category), along with 2 additional distracter drawings per trial. Children were asked to show the experimenter, for instance, all the 'houses' from the array. Filler trials were added so that the correct response was sometimes one picture, sometimes 2 pictures and sometimes 3 pictures, hence the children could not discern a pattern of 2 correct pictures. Only pairs of pictures which 'passed' this pre-test were then used in the test phase; hence, children individually received from 1–4 test trials tailored to their pre-test responses. Thus, the only items to be used in the test trials were ones in which both members of the pair were considered to be members of the same kind category (56 trials overall).

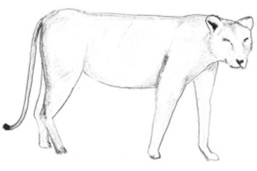
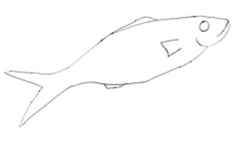
CATEGORY	DETAILED (Non-Prototypical)	VAGUE (Prototypical)
Bird		
House		
Cat		
Fish		

Figure 2. Stimuli for Experiment 2.

In the test trials, which followed immediately, children were presented with each pair of pictures and were told: "My friend Daxi has been living in a far-away land and he does not know what a lot of things here in England/Scotland look like. Can we help him? Let's help Daxi learn what things here look like." They were then asked, "Which picture should we show to Daxi so he knows what a (bird/house/cat/fish) looks like?"

Results and Discussion

Overall, children selected the less detailed (but more prototypical) picture on 48/56 (85.7%) of the test trials, a highly significant difference from a chance level of 50% as measured by an independent *t*-test ($P<0.001$, $t(19)=4.3$, $d=0.83$).

These results show that children do not simply have a bias for selecting more detailed pictures instead of less detailed ones. Rather, children are taking into account the kind of information the picture contains, and thus have a fairly sophisticated understanding that other people may benefit best from a less detailed picture if it contains more relevant information. Experiment 3 investigates whether this hypothesis holds when the picture which is the best source of information conflicts with a child's own knowledge of an artist's intentional state.

Experiment 3

Experiment 3 explores whether children understand that even though they themselves know what the picture is intended to represent, other viewers might not. Children of this age often behave egocentrically, showing a 'curse of knowledge' bias, which manifests itself by influencing how they interpret other people's behavior and expectations (Birch and Bloom, 2003). Here we examine whether children can override such a bias when reasoning about the communicative nature of pictures. More specifically, do children understand that, even though they know what a picture represents, other people may not share this knowledge?

Method

Participants

Twenty-five children (mean age 4.1 years; range 3.3–4.8 years) recruited from the Unitots nursery at the University of Edinburgh and the local Edinburgh community were included in the study. There were 12 males and 13 females.

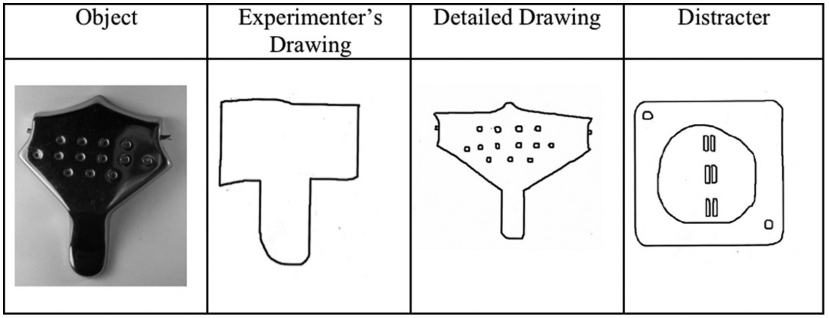


Figure 3. Example of stimuli for Experiment 3.

Materials

Twelve pre-drawn pictures and four novel objects were used in the study (see Fig. 3). The drawings included 4 pictures which represented each of the target novel objects in detail, 4 vague pictures 'drawn' by the experimenter to represent each of the target novel objects, and 4 detailed distractor pictures which did not resemble any of the target objects.

Procedure

Children were each shown an opaque bag, and told: "My friend Lucy found some toys and pictures, and she put them in this bag for us to look at. They are things we have never seen before!" There were four trials. In each trial, the experimenter selected one object from the bag, reminded the child she has never seen the item before, and named it with a novel word (e.g., "let's call this a *dax*!"). The experimenter then told the child that she was going to 'draw a picture of the *dax*!', and she picked up a clipboard and oriented a piece of paper on it. She pretended to draw a picture of the object (which was actually pre-drawn). This picture crudely resembled the object. Children were then asked if they wanted to see the experimenter's 'picture of the *dax*', and it was then placed on the table for inspection.

The experimenter then said to the child, "Let's look at some of the pictures Lucy left for me. Remember we have never seen them before!" The experimenter removed two pictures from the bag (one detailed drawing which resembled the *dax*, and one distracter drawing), and placed them on the table next to the experimenter's drawing of the *dax*.

Children were then asked: "My friend John has never seen a *dax* before! Which picture should we give him so he knows what it looks like?" They were also asked to indicate, out of the array of 3 pictures, which picture was drawn by the experimenter. Finally, children were asked to label the experimenter's picture.

Results and Discussion

When asked for a picture to give to John so that he might know what the object looks like, children selected the picture the experimenter drew 19% of the time, the picture which clearly resembled the object 79% and the distracter picture 2% (McNemar's test, χ^2=51.3, P<0.001, df=2).

When asked to indicate the picture that the experimenter drew, they selected the correct picture 85%, the picture which resembled the target object 15%, and never indicated the distracter object. The question of what the experimenter's picture represented was more difficult; some children did not answer (37%), and others said that they did not know (30%). When children did respond, however, it was usually by naming or pointing to the *dax* (70% of all responses).

We were surprised that so few children were able to identify the experimenter's picture, given that 2-year-olds succeed on a similar task (Preissler and Bloom, 2008). It might be that the referential cues in this current study were not salient enough for children to realize what the experimenter was intending to draw. Another possibility is that some children did not remember the label after the brief delay. Alternatively, children may have been hindered by the order of the questions. After having picked out another picture as the best referent of the object, they perhaps felt that they would be contradicting themselves if they said that the experimenter also drew a picture of that same object.

However, there were enough children who correctly stated that the experimenter's picture is of the *dax* to ask whether these children were biased by this knowledge when choosing a picture for someone else. More specifically, when children are themselves aware that a vague picture depicts an object, do they then believe that others would benefit from being shown that picture? As predicted, they do not; an analysis of just those trials in which the children correctly identified the experimenter's picture found that these children still tended to choose the detailed picture (81%; binomial P (two-tailed) <0.007 as compared to chance).

General Discussion

Pictures are an important source of conveying information, but to serve this purpose, they have to be understandable to other people. These three studies suggest that 3- and 4-year-olds have some understanding of what makes a picture useful as a symbolic tool. Experiment 1 found that children believe that the more realistic a picture, the better, however Experiment 2 showed that children aren't simply biased towards detailed pictures. Rather, they pay attention to the content of the picture and use that information to decide

what picture another person would best benefit from. Experiment 3 also found that when children see a relatively crude picture of an object being drawn (which they believe represents the object), they appreciate that a different more realistic picture is more useful to another person.

How do children come to know this about pictures? One proposal is that it might be an inference based on the child's own experience. It might be, for instance, that children notice that they themselves would find some of these drawings harder to recognize than others and infer that this would hold true for other people.

This leads to a proposal about younger children and their own drawings. One and 2-year-old children will create scribbles and name them – for instance, they might call a certain scribble "Mommy" or "airplane" (Cox, 1992; Bloom, 2000). Perhaps even these very early acts of naming are rooted in a sophisticated understanding of other people's grasp of pictures. In particular, children might be eager to name their pictures because they know that these pictures do not resemble their referents, and hence, without the name, other people would not be able to tell what they are.

In sum, we have explored here the developing understanding that pictures are public representations that can communicate information to other people, and that some pictures are better at doing this than others. There is a lot more to knowing how pictures work, of course, but this foundation at least appears to be in place in preschool children.

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References

Barrera, M. E. and Maurer, D. (1981). Recognition of mother's photographed face by the three-month-old infant. *Child Development* 52, 714-716.

Birch, S. A. J. and Bloom, P. (2003). Children are cursed: An asymmetric bias in mental state attribution. *Psychological Science* 14, 283-286.

Beilin, H. and Pearlman, G. E. (1991). Children's iconic realism: Object versus property realism. *Advances in Child Development and Behavior* 23, 73-111.

Bloom, P. (2000). *How children learn the meanings of words*. MIT Press, Cambridge, MA.

Bloom, P. and Markson, L. (1998). Intention and analogy in children's naming of pictorial representations. *Psychological Science* 9, 200-204.

Cox, M. (1992). *Children's Drawings*. Penguin, London.

DeLoache, J. S. (2004). Becoming symbol-minded. *Trends in Cognitive Sciences* 8, 66J-70J.

DeLoache, J. S. and Burns, N. M. (1994). Early understanding of the representational function of pictures. *Cognition* 52, 83-110.

DeLoache, J. S., Pierroutsakos, S. L. and Troseth, G. L. (1996). The three 'R's of pictoral competence. In Vasta, R. (Ed.), *Annals of child development, Vol. 12*, pp. 1-48. Jessica Kingsley, Bristol, PA.

DeLoache, J. S., Miller, K. F. and Rosengren, K. S. (1997). The credible shrinking room: Very young children's performance with symbolic and non-symbolic relations. Psychological Science 8, 308-313.

Preissler, M. A. and Carey, S. (2004). Do pictures and words function as symbols for 18- and 24-month-old children? *Journal of Cognitive Development* 5, 185-212.

Preissler, M. A. and Bloom, P. (2007). Two-year olds understand the dual nature of pictures. *Psychological Science* 18, 1-2.

Preissler, M. A. and Bloom, P. (2008). Two-year olds use artist intention to understand drawings. *Cognition* 106, 512-518.

Ryan, C. M. E. (1982). Concept formation and individual recognition in the domestic chicken (*Gallus gallus*). *Behaviour Analysis Letters* 2, 213-220.

Thomas, G. V., Nye, R. and Robinson, E. J. (1994). How children view pictures: Children's responses to pictures as things in themselves and as representations of something else. *Cognitive Development* 9, 141-164.

Thoman, G. V., Nye, R., Rowley, M. and Robinson, E. J. (2001). What is a picture? Children's conceptions of pictures. *British Journal of Developmental Psychology* 19, 475-491.