Preschoolers favor the creator’s label when reasoning about an artifact’s function

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Abstract

The creator of an artifact, by virtue of having made the object, has privileged knowledge about its intended function. Do children recognize that the label an artifact’s creator uses can convey this privileged information? 3- and 4-year-olds were presented with an object that looked like a member of one familiar artifact category, but which the speaker referred to with the label of a different familiar category (e.g. a key-like object was called a “spoon”). Children who heard the speaker refer to the object as something she made were more likely to assign its function on the basis of the anomalous label she used than those who heard it referred to as something the speaker found. Thus, even very young children expect a unique connection between the label the creator of an artifact uses and the function she intends it to have.

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Adults assume that artifacts are intentionally created by a designer in order to fulfill a particular function (Bloom, 1996; Dennett, 1987; Kelemen, 2004). An artifact’s function can often be inferred from its appearance. If something looks like a key, then chances are, it was intended to be a key and to have the function of a key. Another cue to an object’s intended function is its name. If something is called a “key”, it is probably meant to have the function of a key.

In a recent study, Jaswal (2004) asked 4-year-old children to judge the function of an artifact that looked like a member of one familiar category, but which was referred to with
the label of a different familiar category. For example, a speaker referred to a key-like object as a “spoon”, and children had to decide whether it was used to eat cereal or to start a car. When these two normally reliable cues to an artifact’s intended function (i.e. appearance and label), were put into conflict, children were ambivalent. They were as likely to indicate that the key-like object was used to start the car as to eat cereal. However, when the speaker introduced the anomalous label by saying, “You are not going to believe this, but this is actually a spoon”, implying that he had some special knowledge about the object, most children decided that the function of the key-like object was, in fact, to eat cereal.

In the case of an artifact, one person in particular would be expected to have special knowledge about its name and function: the person who made it. The study reported here asks whether children would be more likely to reason about an artifact’s function on the basis of its label rather than its appearance if the label were provided by the artifact’s creator.

A number of studies have shown that children recognize that artifacts are intentionally created, and that they are designed to be members of particular kinds (Bloom & Markson, 1998; Diesendruck, Markson, & Bloom, 2003; Gelman & Bloom, 2000; Gelman & Ebeling, 1998). For example, preschoolers in Gelman and Bloom (2000) saw a knife-shaped piece of Plexiglas, and heard it described either as the product of someone’s intentional act (involving sawing and sanding) or as the product of an accidental act (involving a large piece of plastic breaking into several pieces). When asked to say what the object was, those in the intentional condition tended to call it a “knife”, whereas those in the accidental condition tended to refer to it as “plastic”.

In a related study, Bloom and Markson (1998) asked 3- and 4-year-olds to draw a picture of a balloon and a picture of a lollipop. Even though these two pictures were often indistinguishable, children later indicated that the picture they drew to be a balloon was a balloon, and the one they drew to be a lollipop was a lollipop. Moreover, Bloom and Markson reported anecdotally that children were often adamant about their names for these pictures, even correcting the experimenter if she called them by the “wrong” names.

In fact, Matan and Carey (2001) and German and Johnson (2002) have suggested that children may expect that the person who makes an artifact gets to decide its name. For example, German and Johnson (Study 2) showed 5-year-olds a picture of a novel artifact and explained that the person who made it called it a “tog”, but that its current owner called it a “fep”. When asked what it really was, children tended to say that it was a “tog”, the name its inventor had given, rather than a “fep”.

Interestingly, however, results are mixed when preschoolers judge whether an artifact’s function is the one its creator intended. Kelemen (1999, Study 3) told 4- and 5-year-olds a story about a novel object designed to stretch clothing, but that someone had used to exercise her back. When asked what the object was really for, children (and adults) tended to say that it was to stretch clothes—the function for which it was originally designed. German and Johnson (2002) were concerned that the alternative uses in Kelemen’s vignettes may not have seemed legitimate. They happened only once or were described with language that may have implied they were accidental rather than intentional. When German and Johnson used vignettes that emphasized that the alternative uses occurred in a frequent, goal-directed manner, they found that 5-year-olds were as likely to give
the alternative use for an object as its original one. Adults, in contrast, continued to privilege the function intended by the object’s creator (see also Matan & Carey, 2001). German and Johnson argued that preschoolers expect that “objects are made intentionally to be of a specific kind” (p. 259)—hence, their success on the naming task described earlier—before recognizing that they are intentionally created to fulfill a particular function.

Of course, an artifact’s kind and function can be closely related. If someone who creates an object calls it a “spoon”, this indicates that it was intended to be a spoon and that its intended function is that of a spoon. The present study asked whether 3- and 4-year-olds would use the label that the creator of an artifact provided to determine the artifact’s function even if the label conflicted with the object’s appearance. Children were shown a picture of an artifact that had features of both a key and a spoon, for example, but which looked more like a key. As this key-like object was introduced, the speaker referred to it either as a “spoon I made” or as a “spoon I found”, and children had to decide whether it was used to eat cereal from a bowl or to start a car. Of interest was whether children would be more likely to indicate that the key-like object was used to eat cereal if the person who called it a “spoon” actually made the object than if that person merely found it.

1. Method

Participants. Sixty-four 3- and 4-year-olds (mean age = 3 years, 11 months; range = 3; 0–4;10) participated in a single 10- to 15-minute session. Thirty-four boys and 30 girls participated. Children were recruited from preschools or from a database of interested families. Five additional children participated, but were excluded due to experimenter error (4) or a camera malfunction (1).

Design. Approximately equal numbers of boys and girls were randomly assigned to either a “made” or a “found” condition. The average age of children in the made and found conditions was 3;11 and 3;10, respectively. Each child participated in four trial blocks.

Stimuli. Four sets of stimuli were created by pairing together similarly-shaped familiar artifacts: key-spoon, shoe-car, cup-hat, and button-ball. Color photographs of a prototypical exemplar of each artifact were obtained from a digital library of photo-objects (Hemera Technologies, Gatineau, Quebec, Canada). These are referred to as demonstration exemplars. In addition, three test exemplars were created for each stimulus set: two were additional typical exemplars of the categories represented by that set, and the third was a hybrid of the two categories in that set. The hybrid had features of both categories, but was computer-generated to look more like a member of one category than the other. The result was a key-like exemplar (with some spoon-like features), a car-like exemplar (with some shoe-like features), a hat-like exemplar (with some cup-like features), and a button-like exemplar (with some ball-like features). These four hybrids are displayed in Fig. 1. Previous research showed that 3- and 4-year-olds spontaneously treated these hybrids as members of the categories they most resembled (e.g. the key-like exemplar was spontaneously treated like a key; Jaswal, 2004). A set of warm-up stimuli was also used and consisted of pictures of typical dolls and shovels.
All images were sized to approximately 2 to 4 inches wide and 2 to 5 inches tall. Each image (and its left-right reverse) was printed in color, cut out, and mounted into a small stand so that it could stand on its own.

Each of the eight categories was associated with a particular familiar function, as shown in Table 1. Color photographs of a prop associated with each function were obtained from the photo-object library. For example, the key was associated with starting a car, and the photo used to illustrate this function was of a minivan. These prop photos were mounted onto one of two 8.5 × 11-inch easels.

### Table 1

<table>
<thead>
<tr>
<th>Stimulus set</th>
<th>Function (background photo in bold)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key</td>
<td>Starts the car</td>
</tr>
<tr>
<td>Spoon</td>
<td>Used to eat cereal from the bowl</td>
</tr>
<tr>
<td>Shoe</td>
<td>Goes on the baby’s foot</td>
</tr>
<tr>
<td>Car</td>
<td>Drives on the road</td>
</tr>
<tr>
<td>Cup</td>
<td>Sits on the table</td>
</tr>
<tr>
<td>Hat</td>
<td>The man wears it</td>
</tr>
<tr>
<td>Button</td>
<td>Goes on the coat</td>
</tr>
<tr>
<td>Ball</td>
<td>Drops through the hoop</td>
</tr>
</tbody>
</table>

Fig. 1. Hybrid artifacts. Children saw the stimuli in color.

2. Procedure

Children were tested individually in a small room at their school or in the laboratory. They sat at a small table with the researcher across from them. Each session began with a warm-up trial to introduce the task. On one easel, the experimenter displayed a photo of a bed and, using the doll stimulus, demonstrated and explained that a doll slept in the bed. Next, on the other easel, the experimenter showed a photo of a bucket and, using the shovel
stimulus, demonstrated and explained that a shovel could be used to scoop sand into or out of the bucket. Children were then shown additional doll and shovel exemplars in alternating order and were asked where each went, until they succeeded in placing a doll with the bed and a shovel with the bucket (or pointing to the bed and bucket photographs) consecutively. Correct selections were praised, and incorrect selections were corrected. Twelve children (19%) required correction on the warm-up trial.

Test trials were similar to the warm-up trial. For example, the experimenter displayed a photo of the minivan on one easel and showed that the demonstration key could be used to start the van. The experimenter then displayed a photo of the bowl on the other easel, and showed that the demonstration spoon could be used to eat cereal from the bowl. In order to reduce memory load, the demonstration key and spoon were left standing in front of the photo of the minivan and bowl, respectively. Children were then shown the three test exemplars (another typical key, another typical spoon, and the key-like hybrid), one at a time and in a pseudo-random order (described below). Their task was to indicate, by acting out or pointing to the minivan or the bowl, whether each test exemplar was used to start the car or to eat cereal.

The researcher introduced each typical test exemplar by referring to it twice with the category label consistent with its appearance: “Look at this! This is an X. Can you show me what this X does?” Each hybrid was also referred to twice with a category label, but the label used did not match what one would expect based on the hybrid’s appearance (i.e. the key-like hybrid was referred to as “this spoon”; see Fig. 1). Additionally, the frame in which each hybrid was introduced differed depending on condition. In the made condition, the hybrid was introduced as something the researcher had made; in the found condition, it was introduced as something the researcher had found: “Now I am going to show you something that I made/found! Look at this! This is an X I made/found. Can you show me what this X I made/found does?” This was the only difference between the two conditions. Regardless of their response, children were given neutral feedback in a positive tone (“Okay!”), and the researcher then proceeded to the next test exemplar or the next set of stimuli.

The order of the three test exemplars in each trial block was random with the constraint that across the four trial blocks, the hybrid was presented first, second, and third at least once each. The order of the four trial blocks was counter-balanced across children according to a Latin Square design. Finally, the left-right positions of the prop photographs were counter-balanced within children so that the function consistent with the label the speaker used for a hybrid could be demonstrated twice on the left and twice on the right, and across children so that each prop photograph appeared an equal number of times on the left and right.

Coding was conducted off-line via videotape, and involved noting which of the two functions (e.g. starting the car vs. eating cereal) children selected for each test exemplar.

3. Results

Preliminary analyses failed to reveal any effects or interactions involving gender or age, and so these factors were not considered further. Inferences about the typical items
confirmed that children understood the task. When the speaker presented a typical artifact exemplar and referred to it with a label that matched its appearance, children in the made and found conditions both inferred that it had the function associated with the given label 99% of the time. For example, when the speaker introduced the typical key as a “key”, preschoolers in both conditions readily inferred that it was used to start a car rather than to eat from a bowl.

Performance in the two conditions differed, however, on the hybrid trials. Children who heard a hybrid introduced as something the speaker found based their inference about its function on the unexpected label the speaker provided just 59% (SD = 34%) of the time. Those who heard the same hybrid introduced as something the speaker made did so 77% (SD = 32%) of the time, significantly more often, t(62) = 2.11, P < 0.05.

Because children could make an inference about a hybrid’s function that was either consistent with its label or with its appearance, chance was 50%. Children in the made condition made label-based inferences more often than would be expected by chance, t(31) = 4.74, P < 0.001. Those in the found condition were equally likely to make label-based and perceptually based inferences, t(31) = 1.59, P > 0.10. In other words, when the speaker introduced the key-like object as a “spoon I made”, children were more likely to infer that it was used to eat cereal out of a bowl rather than to start the car. When the speaker introduced the same object as a “spoon I found”, children were ambivalent. They were as likely to infer that it was used to eat cereal as to start the car.

The difference between the made and found conditions was also evident at the individual level. Table 2 shows the number of children who made 0, 1, 2, 3, or 4 label-based inferences about the four hybrids. As the table shows, the distribution of responses in the two conditions was different, with more children in the made condition than the found condition making more label-based inferences, χ²(4, N = 64) = 10.15, P < 0.01. Finally, the condition difference was also evident in an analysis by stimulus. For all four hybrids, more children in the made condition than the found condition selected the function that was consistent with the speaker’s label.

The difference between the conditions was not because children in the found condition failed to hear or process the labels. When children did not make a label-based inference, they usually made a comment indicating that they questioned whether the label was appropriate. Working from transcripts, two coders independently coded children’s spontaneous comments about the hybrids into one of three categories: explicit denials of the speaker’s label (including rejections and corrections); other comments about the speaker’s label and/or the appearance of the hybrids (including “looks like” statements, questions, expressions of confusion, etc.); and irrelevant comments. Table 3 shows examples of each. The coders agreed on 97% of the 119 comments; the few disagreements were resolved through discussion.

Table 2
Number of children making 0, 1, 2, 3, or 4 label-based inferences about hybrid stimuli

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Made condition</td>
<td>2</td>
<td>2</td>
<td>6</td>
<td>4</td>
<td>18</td>
</tr>
<tr>
<td>Found condition</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>11</td>
<td>7</td>
</tr>
</tbody>
</table>
Table 3
Categories of spontaneous comments made about hybrid stimuli

<table>
<thead>
<tr>
<th>Category</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denials, rejections, corrections</td>
<td>Age 3:0: on hearing a car-like object called a “shoe I found:” “No silly, that is a car! That car has wheels silly”. Age 4:1: on hearing a hat-like object called a “cup I found:” “That is not a cup! It is a hat”.</td>
</tr>
<tr>
<td>Other comments relevant to the appearance and/or label</td>
<td>Age 3:8: on hearing a car-like object called a “shoe I found:” “That is a funny shoe. It kind a looks like a car. It has wheels”. Age 4:6: on hearing a button-like object called a “ball I made:” “It is not just a basketball. It has holes in it. Maybe it is a basketball-button”.</td>
</tr>
<tr>
<td>Irrelevant</td>
<td>Comments including “I love it, I love it, I love it!”</td>
</tr>
</tbody>
</table>

Fig. 2 shows the distribution of these spontaneous comments in each condition as a function of whether children subsequently made a label-based or perceptually based inference. As described earlier and as shown by the relative size of each ring in the figure, children in the made condition made more label-based inferences than those in the found condition (and vice versa for perceptually based inferences). However, as shown by the shading within the rings, the distribution of spontaneous comments between conditions was very similar. In both conditions, most label-based inferences were made without any comment. In contrast, at least half of the perceptually based inferences in both conditions were preceded either by an explicit denial of the label the speaker had just provided.
(e.g. “That’s not a spoon! That’s a key!”), or by a comment pointing out that the label did not match the object’s appearance (e.g. “But the shoe is on wheels!”). Thus, children were quite likely to object to the speaker’s label when they made a perceptually based (rather than label-based) inference.

4. Discussion

Three- and 4-year-olds were more likely to base an inference about an artifact’s function on an anomalous label when that label was provided by the artifact’s creator than when it was provided by its discoverer. The difference between these two conditions is striking. Given the pragmatic demands of the task—playing an unusual game with an unfamiliar adult who confidently and ostensively provided well-known labels for each object—children in both the made and found conditions might have been expected to go along with whatever labels the speaker used. Nevertheless, children in the made condition were more receptive to the speaker’s anomalous labels than those in the found condition.1

These results are consistent with Bloom and Markson’s (1998) anecdotal report that preschoolers were resistant to accepting a label for a picture they had drawn when the label did not match what they intended the picture to be. Additionally, the results extend to even younger children: German and Johnson’s (2002, Study 2) finding that 5-year-olds tended to favor the creator’s label when they were asked directly which of two labels was a novel artifact’s “real” name. Recognizing that the creator of an artifact has the prerogative to give its name may be an early step in the acquisition of the design stance, the adult intuition that artifacts are intentionally created to fulfill a particular function (Bloom, 1996; Dennett, 1987; Kelemen, 2004).

The present study is unique in that it used artifacts that resembled familiar categories and familiar labels that did not match those categories. Reasoning about an object’s function on the basis of its label required children to “disbelieve their eyes”, something they were more willing to do when the creator of an object provided a label than when the discoverer did so. For example, children who heard a speaker refer to a key-like object as a “spoon I made” were more likely to infer that it was used to eat cereal rather than to start a car than those who heard the same object referred to as a “spoon I found”. This suggests that children recognized at least implicitly that the creator called the object a “spoon” because he or she intended for it to carry out the function of a spoon (even though it looked well-suited to carry out the function of a key).

1 One alternative interpretation of these data is that perhaps it was not so much that children were more receptive to a label provided by the creator of an artifact as that they discounted an unexpected name from its discoverer. This alternative can be ruled out, however. When children in a related study (Jaswal, 2004, Study 1) heard a speaker ostensively label the same hybrid stimuli used here, they made label-based inferences about function, on average, about half of the time—just as children in the found condition of the present study did. Thus, children are not any more likely to discount a label from someone who claims to have found the labeled object than someone who simply makes an assertion about what it is called.
The results of this study also speak to an on-going debate about whether labels should be considered atheoretical features of objects (e.g. Jones & Smith, 1993; Mareschal, 2003; Sloutsky, 2003) or theory-laden cues to kind (e.g. Bloom, 2000; Gelman, 2003). If a label were an atheoretical feature of an object, analogous to the object’s perceptual features, it should not have mattered whether it was provided by someone who created the object or someone who found it. The fact that it did matter suggests that children interpret labels in light of their theories about the objects being labeled and about the person who provides the labels. In particular, they seem to expect that the creator of an artifact has privileged knowledge about what that object was intended to be, and this can have implications for what function it was meant to have.

Acknowledgements

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