

Developmental Psychology

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Online First Publication, September 19, 2011. doi: 10.1037/a0025661

CITATION

Neary, K. R., Van de Vondervoort, J. W., & Friedman, O. (2011, September 19). Artifacts and Natural Kinds: Children's Judgments About Whether Objects Are Owned. *Developmental Psychology*. Advance online publication. doi: 10.1037/a0025661

Artifacts and Natural Kinds: Children's Judgments About Whether Objects Are Owned

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People's behavior in relation to objects depends on whether they are owned. But how do people judge whether objects are owned? We propose that people expect human-made objects (artifacts) to be more likely to be owned than naturally occurring objects (natural kinds), and we examine the development of these expectations in young children. Experiment 1 found that when shown pictures of familiar kinds of objects, 3-year-olds expected artifacts to be owned and inanimate natural kinds to be non-owned. In Experiments 2A and 2B, 3–6-year-olds likewise had different expectations about the ownership of unfamiliar artifacts and natural kinds. Children at all ages viewed unfamiliar natural kinds as non-owned, but children younger than 6 years of age only endorsed artifacts as owned at chance rates. In Experiment 3, children saw the same pictures but were also told whether objects were human-made. With this information provided, even 3-year-olds viewed unfamiliar artifacts as owned. Finally, in Experiment 4, 4- and 5-year-olds chose unfamiliar artifacts over natural kinds when judging which object in a pair belongs to a person, but not when judging which the person prefers. These experiments provide first evidence about how children judge whether objects are owned. In contrast to claims that children think about natural kinds as being similar to artifacts, the current findings reveal that children have differing expectations about whether they are owned.

Keywords: ownership, artifacts, natural kinds, principle-based reasoning, object origins

Ownership constrains behavior toward objects. Suppose you see a Frisbee on the ground and want to play with it. Whether you act on this desire likely depends on ownership. If the Frisbee belongs to a friend, it is probably permissible for you to play with it. If it belongs to someone else (even if you are unsure who), you will need permission to play with it. And if the Frisbee is not owned (perhaps it was purposely discarded), you are permitted to use it as you like and even come to own it yourself.

Although people must consider ownership (among other factors) when deciding whether it is permissible to use objects, how people do this is not obvious because ownership is invisible and abstract—the physical properties of an object do not determine whether it is owned, by whom, or what this implies about who may use the object. For example, consider a book with the name “Mike” signed on the inner cover. Although the signature provides a strong hint that the book is owned by someone named Mike, it neither causes the book to be owned nor does it guarantee the book

is owned. Someone could have signed the name Mike without owning the book, and even if the book once belonged to someone named Mike, he could have since sold or abandoned it. In this sense, ownership is similar to other much studied topics such as children's theory of mind, numerical cognition, and moral reasoning; like these other areas, ownership provides a domain for studying how children reason and learn about abstract entities and relations.

One kind of ownership judgment that children make concerns *who* the owner of an object is. The ability to make such judgments begins early in life. At 2 years of age (and probably younger) children can identify the owner of an object with which they are personally familiar (e.g., mother's shoe; Fasig, 2000). Two-year-olds learn who owns an object when explicitly told (e.g., “These are yours”; Eisenberg-Berg, Haake, Hand, & Sadalla, 1979). Children 2 years of age and older infer ownership by judging that the first person known to physically possess an object is its owner (Friedman & Neary, 2008). At 3 years of age, children appreciate that ownership can be transferred from one person to another in at least some contexts (Kanngiesser, Gjersoe, & Hood, 2010; Kim & Kalish, 2009), though children 3 years of age and older sometimes have difficulty appreciating such transfers (Blake & Harris, 2009; Friedman & Neary, 2008). Finally, older 3-year-olds infer that an object belongs to the person who decides whether others can use it (Neary, Friedman, & Burnstein, 2009).

A related ownership judgment concerns *whether* an object is owned. For instance, it might be judged that all cars in a parking lot are owned, even though the identities of the actual owners are unknown. Conversely, it might be judged that pinecones in the same lot are not owned. Such judgments are important. They allow

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Research was supported by a grant from the Social Sciences and Humanities Research Council of Canada awarded to Ori Friedman. This article benefited from discussions with members of the Culture and the Mind Project funded by the Arts and Humanities Research Council (Project Director: Stephen Laurence, University of Sheffield, Sheffield, England).

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appropriate choices to be made about whether an object can be handled, without requiring the extra information that might be needed to identify a specific owner. These judgments also influence judgments of the first sort about who the owner of an object is and judgments about how ownership can be acquired. If the Frisbee in the park does not belong to anyone, then you can acquire ownership of it by simply taking it. However, if the Frisbee does belong to someone, then you cannot acquire (rightful) ownership in this way; to acquire ownership, the owner would have to give or sell it to you. In contrast to the growing body of research examining how people judge *who* owns an object, no research has yet investigated how people judge *whether* an object is owned.

Artifacts and Natural Kinds

Judgments about whether an object is owned may vary depending on whether the object is an artifact or a natural kind. Artifacts are human-made objects such as teddy bears, forks, and shoes; natural kinds are naturally occurring objects such as pinecones, rocks, and seashells. People may expect artifacts to be more likely to be owned than natural kinds because ownership is closely linked with human investment in objects. For instance, making an object typically establishes ownership over it. Artifacts are the *products* of such investment, whereas natural kinds are not.¹ Hence, there are principle-based reasons to expect artifacts to be owned, which do not extend to natural kinds. This does not imply that people should expect *all* artifacts to be owned and *all* natural kinds to be non-owned. The claim is only that, in general, people may be more likely to expect artifacts to be owned than to expect this of natural kinds (Friedman, Neary, Defeyter, & Malcolm, 2011).

To make this principle-based reasoning more concrete, consider two examples. First, suppose you know little about an object except that it is a shoe. The fact that the object is a shoe gives you reason to assume that it belongs to someone because shoes are human-made, and making objects typically establishes ownership over them. Of course it could be that ownership of the shoe has been transferred from the shoemaker to someone else, but even so the shoe would still be owned. It would take very specific actions for the shoe to become non-owned. The shoe's owner would have had to relinquish ownership of it, without transferring ownership to someone else (e.g., perhaps by throwing it in the garbage). However, unless you have evidence that this happened, you may assume by default that the shoe is owned.

As a second example, suppose you know little about an object except that it is a pinecone. Now you have *no* reason to believe it is owned because pinecones normally occur naturally, without the human investment required for ownership to be established. Of course, someone might own the pinecone. Someone might have found the pinecone and brought it home, or perhaps the pinecone comes from a tree someone planted to harvest pinecones. However, these are very specific events where human effort is invested in the pinecone, and these events might not occur for other pinecones. Unless you have evidence that such events happened to the pinecone, you may assume by default that it is not owned.

Children's Intuitions

Nothing is currently known about children's judgments regarding whether objects are owned. It is not even known whether

children understand that some objects are non-owned. As a first step to examining these judgments, the current experiments examine whether preschoolers have differing expectations about the ownership of artifacts and natural kinds. On some accounts, children might not be expected to have such differing expectations. Kelemen (1999a, p. 244) claimed that young children know little about the causes responsible for natural kinds and, therefore, plug this gap in their knowledge by viewing natural kinds as similar to artifacts in having been "intentionally caused for a purpose." The most explored prediction of this view is that children should expect natural kinds to have artifact-like functions (e.g., DiYanni & Kelemen, 2005; Kelemen, 1999a, 1999b, 2003; but see Greif, Kemler Nelson, Keil, & Gutierrez, 2006). However, if children view natural kinds as similar to artifacts, and as intentionally caused for a purpose, then they might likewise expect natural kinds to be *owned* (at least to the extent that they expect this of artifacts).

Against this, there are reasons to predict that children should have differing expectations about the ownership of artifacts and natural kinds. First, children might be led to have differing expectations by engaging in principle-based reasoning (i.e., judging that products of human investment are owned). It is plausible that preschoolers could do this because they seem to have the relevant knowledge. They know that people make artifacts but not natural kinds (Gelman, 1988, Experiment 3; Gelman & Kremer, 1991; Keil, 1989, pp. 242–246), and they also link making an object (Kim & Kalish, 2009, Experiment 1) or creatively modifying it (Kanngiesser et al., 2010) with owning it. Also, given that preschoolers consider the origin of an object when deciding what to name it (e.g., Diesendruck, Markson, & Bloom, 2003; Gelman & Bloom, 2000), they might also consider origins in judging whether an object is owned. Differing expectations about the ownership of artifacts and natural kinds might also be supported by children's prior experience with objects. For instance, children might learn the general rule "shoes are owned" by observing that most shoes they encounter appear to be owned. Either way, such expectations are important because they would allow children to judge whether objects are owned with minimal information—such expectations allow children to make these judgments without necessarily knowing who previously interacted with a particular object, the object's location, or the specific ways people use the object or interact with it.

The current experiments investigate whether children have differing expectations about the ownership of artifacts and natural kinds. In line with recent work on children's reasoning about artifacts and natural kinds (e.g., Brandone & Gelman, 2009, Experiment 1; Greif et al., 2006; Rhodes & Gelman, 2009), children were shown photos of real artifacts and natural kinds removed from background contexts. As a simplifying strategy for this first investigation of how children judge whether objects are owned, children were only shown photos of discrete inanimate objects and, therefore, saw no pictures of animals—the most studied natural kinds. For ease of exposition, we primarily use "natural kinds" to refer to inanimate natural kinds, with the understanding that the experimental findings might differ if children were asked about

¹ This claim overlooks things such as farmed fruits and domesticated animals. These are typically considered natural kinds but are also products of human investment (e.g., selective breeding).

animals (a possibility considered further in the General Discussion). We chose objects that appeared portable and not physically rooted to a specific location—things that have the potential to be found inside or outside and that can be fully shown without revealing their location.

Experiment 1 examines children’s expectations about familiar kinds of artifacts and natural kinds (e.g., forks and pinecones), and the remaining experiments examine children’s expectations about unfamiliar kinds of objects. Experiment 3 also examines how children reason when given explicit information about whether objects are human-made.

Experiment 1

Method

Participants. Nineteen 3-year-olds were tested ($M = 3;8$ [years;months], range = 3;0–3;11, 10 girls). In this experiment, and those subsequent, participants were tested at their daycares and preschools. Most were Caucasian and from middle-class families, though demographic information was not formally collected. Also, different children participated in each experiment.

Design and procedure. A warm-up exercise was first administered to give children practice judging whether objects are owned. Children were shown four photos (sun, flowers, pet cat, moon) one at a time. Each picture was printed on its own cue card. Children were first told that the sun is not owned and that the flowers are owned. They were then asked whether the pet cat and the moon belong to anyone (“Does this belong to anyone?”). Almost all children said that the pet cat was owned and that the moon was not. Only three children responded otherwise on at least one of these trials. These children were corrected (e.g., “The cat is someone’s pet, so it belongs to someone”) and were included in all analyses (this was also done in the subsequent experiments using the warm-up exercise). Because all warm-up pictures showed natural kinds, and because half of these were owned, participating in the warm-up could not lead children to view artifacts as more likely to be owned than natural kinds (although it admittedly creates an asymmetry between artifacts and natural kinds).

Ten test trials were then administered. In each, children were shown a photo without the experimenter naming the object, and they were asked, “Does this belong to anyone?” Each photo

showed an object set against a white background (original backgrounds had been removed). Five photos showed artifacts (fork, teddy bear, soccer ball, shoe, truck), and five photos showed natural kinds (leaf, shell, rock, branch, pinecone). The objects were chosen to be highly familiar and recognizable to children. Figure 1 shows the pictures used. Trials were given in either of two orders: (1) leaf, ball, shoe, shell, bear, truck, pinecone, rock, fork, branch; or (2) ball, leaf, shell, shoe, pinecone, rock, bear, truck, leaf, fork.

Results and Discussion

Children received separate scores for artifact trials and for natural kind trials, and they were given a score of 1 each time they claimed an object was owned, and 0 each time they denied this (maximum in each condition = 5). Children’s responses differed by condition, $t(18) = 6.52, p < .01, \eta^2 = .70$. Artifacts were viewed as owned in 89% of judgments, $t(18) = 6.81, p < .01, \eta^2 = .72$, whereas natural kinds were viewed as owned in only 28% of judgments, $t(18) = -2.65, p = .02, \eta^2 = .28$. These findings reveal that 3-year-olds have differing expectations about the ownership of familiar artifacts and natural kinds, mostly viewing artifacts as owned and inanimate natural kinds as non-owned. More generally, the findings suggest that 3-year-olds can judge whether objects are owned and that they interpreted the test question as intended (i.e., it is difficult to infer how some other interpretation of the question could have led to the observed response pattern).

It is important to point out that these findings from the experiments are unlikely to have been swayed by children’s participation in the warm-up exercises. If children had mirrored the pattern in the warm-up, they should have endorsed half the natural kinds as owned and half as non-owned. Instead they endorsed natural kinds as owned at rates *less* than would be expected by chance. Hence, it is unlikely that the warm-up exercise explains the reduced rate of ownership endorsement for natural kinds. Also, for the warm-up exercises to have such an effect would require that children explicitly categorized objects in the warm-up exercise under the general category natural kinds, and we know of no evidence that preschoolers do this. It is also worth noting that the vast majority of children only learned the experimenter’s views on what is owned in the first two warm-up trials (sun is non-owned, flowers



Figure 1. Familiar artifact and natural kind pictures shown to children in Experiment 1.

are owned) because all but a few children responded as expected in the third and fourth trials.²

Because familiar kinds of object were depicted, children might have based judgments on prior experiences with objects of each kind. For instance, they might have judged that the teddy bear is owned because of prior experience with teddy bears. The remaining experiments test whether children also have differing expectations in the absence of such experience. In these experiments, children were shown *unfamiliar* kinds of artifacts and natural kinds.

Experiment 2A

Method

Participants. The participants were 22 3-year-olds ($M = 3;7$, range = 3;2–3;10, 14 girls), 27 4-year-olds ($M = 4;6$, range = 4;0–4;11, 15 girls), 17 5-year-olds ($M = 5;6$, range = 5;0–5;10, seven girls), and 15 6-year-olds ($M = 6;4$, range = 6;0–6;9, six girls).

Design and procedure. The general procedure was similar to that in Experiment 1, except rather than answering yes/no questions, children responded by sorting pictures. Children sat before two plain buckets (one red, one blue, but otherwise identical) and were told that they would be shown pictures, some of things that belong to someone and some of things that do not belong to anyone. Children were also told that the red bucket is for pictures of things that belong to someone, and that the blue bucket is for pictures of things that do not belong to anyone (“This bucket is for pictures of things that belong to someone. This bucket is for pictures of things that do not belong to anyone.”) The experimenter then checked whether children remembered which bucket was for owned things and which was for non-owned things. If children failed to remember, then the instructions were repeated, and their memory was checked again.

The warm-up exercise was then administered. Children were shown four cue cards, one at a time. Cards showed the same pictures used in the warm-up of Experiment 1; children were again shown familiar objects because the goal of the warm-up was to give children practice with the basic procedure using objects for which they would already have strong intuitions. For the first two pictures (sun, flowers), the experimenter explained whether the object was owned and which bucket the card should go in. For instance, children were told that the sun does not belong to anyone and so its card should go in the blue bucket, and the experimenter then put it in this bucket. For the next two pictures (pet cat, moon), children were asked which bucket each should go in, but the experimenter actually put the cards in the buckets. As in Experiment 1, almost all children indicated that the cat is owned and that the moon is not; the experimenter corrected the few children (three 3-year-olds and one 5-year-old) responding otherwise.

After the warm-up exercise, children were told that they would next see pictures of things that they have never seen before, some of things that belong to someone and some of things that do not belong to anyone. Six test trials were then administered. In each, children were first reminded which sorts of pictures belong in each bucket. Then children were given a card showing an unfamiliar object set against a white background, and they were asked to put the card into one of the buckets (“Where does this go?”). Three

cards showed unfamiliar artifacts, and three showed unfamiliar natural kinds; Figure 2 shows the pictures used.³ Artifact (a) and natural kind (n) trials were given in either of two orders: (1) a, n, a, n, n, a; or (2) n, a, n, a, a, n.

Results and Discussion

Children received separate scores for artifact trials and natural kind trials, and they were given a score of 1 each time they put a card in the “owned” bucket, and 0 each time they put one in the “non-owned” bucket (maximum in each condition = 3). A 2 (object-kind: artifact, natural kind) \times 4 (age: three, four, five, six) analysis of variance (ANOVA) revealed a main effect of object-kind, $F(1, 77) = 64.56$, $p < .01$, $\eta_p^2 = .46$; a trend for age, $F(3, 77) = 2.47$, $p = .07$, $\eta_p^2 = .09$; and an interaction between object-kind and age, $F(3, 77) = 7.60$, $p < .01$, $\eta_p^2 = .23$. As shown in Figure 3, although responses differed by condition, this difference was greater at older ages. Children 4 years of age and older had higher scores for artifacts than natural kinds: 4-year-olds, $t(26) = 4.86$, $p < .01$, $\eta^2 = .48$; 5-year-olds, $t(16) = 2.63$, $p = .02$, $\eta^2 = .30$; 6-year-olds, $t(14) = 9.13$, $p < .01$, $\eta^2 = .86$; 3-year-olds’ scores did not differ by condition ($p = .34$).

Further analyses revealed that 6-year-olds’ artifact scores exceeded the chance score of 1.5, $t(14) = 7.32$, $p < .01$, $\eta^2 = .79$, but that the artifact scores of 4- and 5-year-olds did not depart from chance ($ps > .15$). However, children at all three ages mostly viewed natural kinds as non-owned: 4-year-olds, $t(26) = -8.50$, $p < .01$, $\eta^2 = .74$; 5-year-olds, $t(16) = -2.12$, $p = .05$, $\eta^2 = .22$; 6-year-olds, $t(14) = -6.74$, $p < .01$, $\eta^2 = .76$.

These findings suggest that children 4 years of age and older have different expectations about the ownership of unfamiliar artifacts and natural kinds. Three-year-olds did not show signs of sharing these expectations. Although these findings suggest age-related changes in children’s reasoning about ownership, they might also reflect improvements in children’s ability to use the buckets to sort pictures. Although reminders about the buckets were repeated in each trial, younger children, and particularly 3-year-olds, may have had difficulty maintaining the instructions

² Further, removing the children who were corrected on these warm-up trials (i.e., and who therefore had the greatest opportunity to be swayed by the experimenter) has negligible effects on the mean scores. In fact, removing these children actually *lowers* the mean score for natural kinds. This was also found in the subsequent experiments that featured warm-up exercises—in all cases, natural kinds were viewed as owned more by children who were corrected than by those who were not (this conclusion is based on a comparison of means, not statistical tests). Hence, if the warm-up exercise had any effect, it might have induced children to view natural kinds as owned.

³ The unfamiliarity of the pictures was confirmed in a mini-experiment. A separate group of 15 children (range = 4;1–6;0, $M = 4;10$, $SD = 7.74$ months) were shown 12 pictures, one at-a-time. These included pictures of the six unfamiliar objects depicted in Figure 2, and pictures of six familiar objects (three artifacts and three natural kinds). After being shown each picture, children were asked, “Have you seen one of these before?” Children responded “yes” in 94% of responses about familiar objects but in only 24% of responses about unfamiliar objects (18% for artifacts and 31% for natural kinds). Also, some children probably exaggerated their knowledge. For instance, two children answered “yes” for all items, though it is very unlikely that they could have previously seen every item.

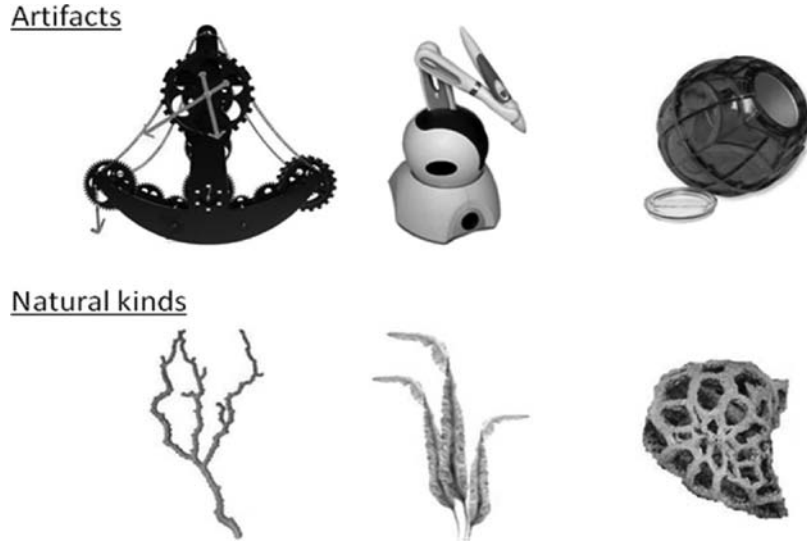


Figure 2. Unfamiliar artifact and natural kind pictures shown to children in Experiments 2A, 2B, and 3.

about the buckets in memory while concurrently reasoning about whether each object is owned. It could be that judging whether each object is owned caused the younger children to forget which bucket they should put each picture in. Hence, in the next experiment, we repeated the experiment with a new group of 3–5-year-olds, using the yes/no question used in Experiment 1.

Experiment 2B

Method

Participants. The participants were 27 3-year-olds ($M = 3;5$, range = 3;0–3;10, 14 girls), 16 4-year-olds ($M = 4;3$, range = 4;0–4;9, seven girls), and 14 5-year-olds ($M = 5;4$, range = 5;0–5;10, eight girls).

Design and procedure. Children were first given the warm-up exercise, which was conducted as in Experiment 1 (four 3-year-olds and one 4-year-old were corrected on at least one warm-up trial). Children were then told that they would next see pictures of things that they have never seen before, some of things

that belong to someone and some of things that do not belong to anyone. Six test trials followed. In each, children were shown a photo of an unfamiliar object, and they were asked “Does this belong to anyone?” The photos were the same as those used in Experiment 2A, and artifact (a) and natural kind (n) trials were given in the order a, n, a, a, n, n, or its reverse.

Results and Discussion

Children received separate scores for artifact trials and for natural kind trials, and they were given a score of 1 each time they claimed that an object was owned, and 0 each time they denied this (maximum in each condition = 3). Two 3-year-olds gave other responses on some trials (e.g., “maybe,” “I don’t know”), and these responses were scored 0, as if these were denials. A 2 (object-kind: artifact, natural kind) \times 3 (age: three, four, five) ANOVA found a main effect of object-kind, $F(1, 54) = 36.68$, $p < .01$, $\eta_p^2 = .40$, but not effect of age ($p = .76$) and no interaction between object-kind and age ($p = .14$). As shown in Figure 3, at each age, artifacts scores were higher than natural kind scores: 3-year-olds, $t(26) = 3.61$, $p < .01$, $\eta^2 = .33$; 4-year-olds, $t(15) = 3.30$, $p < .01$, $\eta^2 = .42$; 5-year-olds, $t(13) = 3.12$, $p < .01$, $\eta^2 = .43$. Children at each age mostly viewed natural kinds as non-owned—3-year-olds, $t(26) = -4.18$, $p < .01$, $\eta^2 = .40$; 4-year-olds, $t(15) = -0.410$, $p < .01$, $\eta^2 = .53$; 5-year-olds, $t(13) = -4.93$, $p < .01$, $\eta^2 = .65$ —but only endorsed artifacts as owned at chance rates (all $ps > .30$). Except for the improved performance of 3-year-olds, who responded identically to 4- and 5-year-olds, these findings are consistent with those from Experiment 2A.

Experiments 2A and 2B reveal that even when reasoning about unfamiliar kinds of objects, children have differing expectations about the ownership of artifacts and natural kinds. However, it was only at 6 years of age (Experiment 2A) that children mostly viewed artifacts as owned. This suggests that with age, children increasingly expect that artifacts are owned, at least when reasoning about unfamiliar kinds of objects.

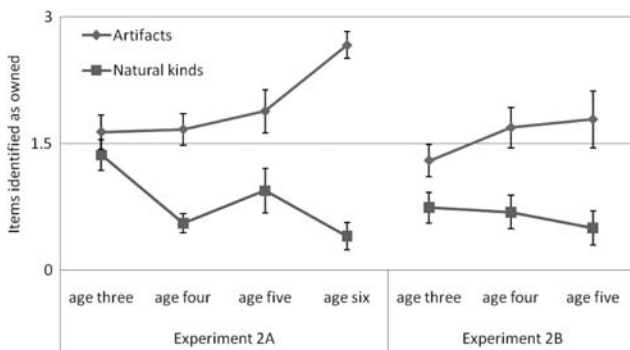


Figure 3. Experiments 2A and 2B: Number of artifacts and natural kinds identified as owned by children 3–6 years of age. Vertical lines depict standard errors of the means.

Alternatively, it could be that children less than 6 years of age were unsure whether the unfamiliar artifacts were made by people and, hence, were products of human effort and investment—or these children might not have spontaneously considered whether the objects were made. Perhaps these children would view artifacts as owned if it were more obvious whether these objects were made by people. The next experiment investigated this possibility.

Experiment 3

Method

Participants. Thirty-five 3-year-olds ($M = 3;5$, range = 3;0–3;11, 17 girls) and 34 4-year-olds ($M = 4;5$, range = 4;0–4;10, 14 girls) were tested, with children within each age group randomly assigned to one of two conditions: ownership or liking.

Design and procedure. Children were first given a warm-up exercise identical to that in Experiments 1 and 2B. More participants were corrected in the warm-up trials than in the previous experiments (in the ownership condition, this happened for eight 3-year-olds and three 4-year-olds). The warm-up trials were followed by test trials. In the ownership condition, these trials were like those in Experiment 2B except that children were *told* about each of the six objects shown. The experimenter used a different novel label to describe each object's category membership (e.g., "This is a dax") and explained whether objects from each category are made by people or not (e.g., "People [do not] make daxes"). After hearing this information, children were asked whether each depicted object is owned (e.g., "Does this dax belong to anyone?"). The liking condition was identical except children were instead asked whether each object is liked by someone (e.g., "Does someone like this dax?").

It was expected that children would be more likely to view artifacts than natural kinds as owned. Of particular interest was whether explicitly telling children about the origins of each object (i.e., whether it was made by people) would lead children to infer that artifacts are owned at rates exceeding chance. This manipulation was expected to aid performance by making explicit for children that the unfamiliar artifacts (but not the natural kinds) are products of human investment.

However, providing this information could sway children's responses for other uninteresting reasons. Perhaps hearing something affirmed about artifacts (i.e., they are made by people) would sway children to say "yes"; hearing something denied of natural kinds might likewise sway children to say "no." The liking condition was included to rule out this possibility. In this condition, children were also told whether each object was human-made. If children use an "affirmation-denial" strategy, then responses in the liking condition should parallel those in the ownership condition. Against this, it was expected that children's responses for artifacts and natural kinds in the liking condition would not diverge as much as their responses in the ownership condition.

Results and Discussion

Children received separate scores for artifact trials and for natural kind trials, and they were given a score of 1 each time they claimed that an object was owned, and 0 each time they denied this (maximum in each condition = 3). Two 3-year-olds and three

4-year-olds said "I don't know" on some trials, and these responses were scored 0, as if they were denials. An initial ANOVA revealed an interaction between age (three, four) and condition (ownership, liking), $F(1, 65) = 4.70$, $p < .05$. To simplify analysis, and to better characterize children's performance at each age, we conducted separate analyses for 3- and 4-year-olds.

Three-year-olds. A 2 (object-kind: artifact, natural kind) \times 2 (condition: ownership, liking) ANOVA revealed a main effect of object-kind, $F(1, 33) = 40.85$, $p < .01$, $\eta_p^2 = .55$; a main effect of condition, $F(1, 33) = 5.89$, $p = .02$, $\eta_p^2 = .15$; and an interaction between object-kind and condition, $F(1, 33) = 15.51$, $p < .01$, $\eta_p^2 = .32$. As can be seen in Figure 4, children were more likely to view artifacts than natural kinds as owned, $F(1, 18) = 56.54$, $p < .01$, $\eta_p^2 = .76$, but their responses in the liking condition did not differ for artifacts and natural kinds, $F(1, 15) = 2.88$, $p = .11$, *ns*. Further analyses, and those of primary interest, showed that 3-year-olds mostly viewed artifacts as owned, $t(18) = 2.07$, $p = .05$, $\eta^2 = .19$, and natural kinds as non-owned, $t(18) = -11.67$, $p < .01$, $\eta^2 = .88$.

Four year-olds. A 2 (object-kind: artifact, natural kind) \times 2 (condition: ownership, liking) ANOVA revealed a main effect of object-kind, $F(1, 32) = 65.57$, $p < .01$, $\eta_p^2 = .67$, and an interaction between object-kind and condition, $F(1, 32) = 9.76$, $p < .01$, $\eta_p^2 = .23$; there was no effect of condition, $F(1, 32) = 0.189$, $p = .67$, *ns*. As can be seen in Figure 4, children's scores were higher for artifacts than natural kinds in both conditions, though the difference between scores was much larger in the ownership conditions, $F(1, 17) = 70.93$, $p < .01$, $\eta_p^2 = .81$, where the effect size was almost double that in the liking conditions, $F(1, 15) = 10.97$, $p < .01$, $\eta_p^2 = .42$. Further analyses showed that 4-year-olds mostly viewed artifacts as owned, $t(17) = 2.94$, $p < .01$, $\eta^2 = .34$, and natural kinds as non-owned, $t(17) = -7.40$, $p < .01$, $\eta^2 = .76$.

These findings are consistent with those from the previous experiments in showing that children have differing expectations about the ownership of artifacts and natural kinds, and in showing that children view natural kinds as non-owned. However, 3- and 4-year-olds judged unfamiliar artifacts to be owned at rates exceeding chance; this was not found in the previous experiments (on unfamiliar artifacts) below 6 years of age. Children's greater endorsement of artifacts as owned in the current experiment probably resulted because they were told whether each type of object is

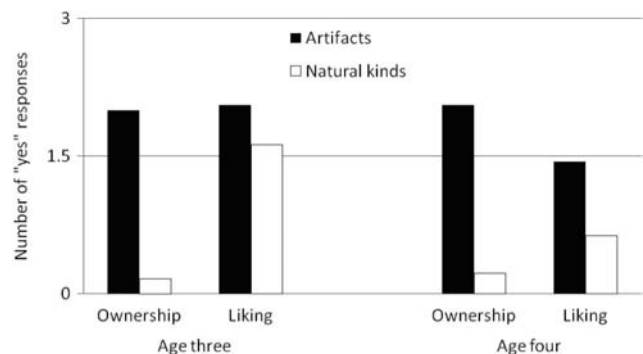


Figure 4. Experiment 3: Number of artifacts and natural kinds to which children said "yes" when asked whether each is owned (ownership condition) or liked (liking condition).

human-made. Findings from the liking condition rule out the possibility that children responded using a low-level strategy to say “yes” when something was affirmed of an object type, and to say “no” when something was denied. If children had used such a strategy, then responses would not have differed across the ownership and liking conditions. Contrary to this, responses did differ, and this was most apparent in the results of 3-year-olds.

One concern about the preceding experiments on unfamiliar objects could be that the artifacts were more desirable than the natural kinds. (This is plausible because 4-year-olds in Experiment 3 were more likely to view artifacts as liked than natural kinds, though no difference was found for 3-year-olds.) If children’s ownership judgments are influenced by the desirability of objects, this might contribute to their differing expectations about unfamiliar objects. A final experiment was conducted to rule out this possibility. In this experiment, children were shown unfamiliar artifacts and natural kinds in pairs, and they either judged which object from each pair is owned by a certain person (ownership condition) or judged which object from each pair is preferred by the person (liking condition). This experiment provides a new measure of whether children view artifacts as more likely to be owned than natural kinds, and the “liking” condition offers a way to see whether preferential choice of artifacts occurs because these objects are more desirable than natural kinds. The forced-choice method is more complicated than simply showing individual pictures because it requires children to simultaneously consider two unfamiliar kinds of objects and to consider the relative likelihood of each being owned. This might be difficult for young children—for example, it might require them to remember the likelihood of one object being owned while considering this for the other object. Hence, it was anticipated that 3-year-olds would have difficulty with these judgments, and so only children 4–5 years of age were tested.

Experiment 4

Method

Participants. Twenty-eight 4- and 5-year-olds ($M = 4;9$, range = 4;0–5;11, 13 girls) were randomly assigned to one of two conditions: ownership ($n = 13$) or liking ($n = 15$).



Figure 5. Experiment 4: Unfamiliar artifact and natural kind pictures shown to children. Pictures were shown in pairs; each artifact in this figure was paired with the natural kind below it.

Design and procedure. No warm-up exercise was given. Children were shown a page displaying a photo of an unfamiliar woman’s face, set against a white background; they were told that the woman is named Sally. Children then completed six test trials. In each, children were shown a different page. Each page showed a smaller photo of the face (centered at the top) and photos of two unfamiliar objects (with backgrounds removed): one artifact and one natural kind. Figure 5 shows the six pairs of objects used. Two of the natural kinds were from Experiments 2A and 2B, but none of the artifacts were used in previous experiments. For approximately half the children, the side of the page on which artifacts appeared across the six trials was left, right, right, left, right, left; this order applied to natural kinds for the other children. In trials in the ownership condition, children were asked about each pair of objects, “Which one belongs to Sally?” In the liking condition, children were instead asked, “Which does Sally like better?”

Results and Discussion

Children were given a score of 1 for each choice of an artifact, and 0 for each choice of a natural kind (maximum score = 6). Because there were relatively few children in each condition, we did not include age as a factor in our analysis. Children’s choices differed by condition, $t(26) = 2.28$, $p = .03$, $\eta^2 = .17$, with artifacts chosen over natural kinds in 72% of judgments about which object belongs to Sally ($M = 4.31$), $t(12) = 2.69$, $p = .02$, $\eta^2 = .38$, but in only 47% of judgments about which object she likes better ($M = 2.80$), $t(14) = -0.45$, $p = .66$.

These findings are consistent with those from the Experiments 2A, 2B, and 3 in suggesting that children are more likely to view unfamiliar artifacts as owned than unfamiliar natural kinds. Although children viewed the natural kinds as equally desirable for the character, they were still more likely to judge that she owned the artifacts. Hence, children’s differing expectations about the ownership of artifacts and natural kinds are not based on differences in the desirability of objects in each category.

General Discussion

The findings reveal that young children have differing expectations about whether artifacts and natural kinds are owned. Children

had different expectations about the ownership of artifacts and natural kinds, both when considering familiar (Experiment 1) and unfamiliar (Experiments 2A, 2B, 3, and 4) kinds of objects. These differences did not result from differences in how likeable objects from each category were. Although children chose unfamiliar artifacts over natural kinds when judging which belongs to a person, they chose between the objects at chance when judging which object the person likes more (Experiment 4).

Children at all ages consistently expected natural kinds (both familiar and unfamiliar) to be non-owned. Judgments about artifacts were more varied. When reasoning about familiar artifacts, even 3-year-olds expected them to be owned (Experiment 1). However, it was only at 6 years of age that children mostly viewed unfamiliar artifacts as owned at rates exceeding chance (Experiment 2A), at least when they just saw pictures of objects with no other information provided. However, when explicitly told that the unfamiliar artifacts were human-made, even 3- and 4-year-olds mostly endorsed them as owned (Experiment 3).

These findings provide considerable information about how children judge whether objects are owned. First, the findings show that even 3-year-olds can judge whether objects are owned and that they appreciate that some objects are non-owned. Second, the findings support the view that children hold differing expectations about the ownership of artifacts and natural kinds, and they view artifacts as more likely to be owned than natural kinds.⁴ Third, the findings show that children can judge whether objects are owned without seeing particular objects used by particular people. As such, the findings do not fit well with a recent account in which visual “person–object” associations drive young children’s ownership judgments (Blake & Harris, 2011). Fourth, the findings show that children do not just base their judgments on simple rules that specify whether particular kinds of objects are owned—rules such as “shoes are owned” and “pinecones are not owned.” If children were limited to using such rules, they should have had no expectations about the unfamiliar kinds of objects. Fifth, the findings suggest that children are capable of using principle-based reasoning (connecting human investment with the establishment of ownership) to judge whether objects are owned: Children 3 and 4 years of age only endorsed unfamiliar artifacts as owned at rates exceeding chance when told that the artifacts were human-made. The fact that children were sensitive to this information suggests that they believe that human-made objects are owned.

The findings are also informative about children’s reasoning about artifacts and natural kinds. The findings provide counterevidence to the claim that children know little about natural kinds (and specifically about their origins) and therefore view them as similar to artifacts in having been intentionally caused for a purpose (e.g., Kelemen, 1999a; Kelemen & Carey, 2007). If children viewed natural kinds and artifacts similarly, they should have endorsed both as owned at similar rates. Instead, children clearly had different expectations about artifacts and natural kinds, and these differences were even evident in 3-year-olds—the youngest children tested. Also, if children knew more about artifacts than about natural kinds, we might expect children to have more consistent intuitions about artifacts than natural kinds. Instead, children were most consistent in their expectation about natural kinds—children at all ages expected familiar and unfamiliar natural kinds to be non-owned. As such, these findings undermine one explanation for findings that children “promiscuously” view all

objects as having functions (e.g., DiYanni & Kelemen, 2005; Kelemen, 1999a, 1999b, 2003; though see Greif et al., 2006, for evidence that this tendency may be quite restricted).

The findings may also conflict with the more general claim that young children only gradually come to see the relevance of origins for object properties (Kelemen & Carey, 2007), at least insofar as ownership is viewed as an object property. It is difficult to judge whether children in the current studies consistently considered the origins of objects (i.e., whether they were human-made) in judging whether they were owned. Nonetheless, children showed sensitivity to this information when it was explicitly provided to them (Experiment 3), as evidenced by the increase in their endorsement of unfamiliar artifacts as owned when this information was provided.

Differing Expectations About Artifacts and Natural Kinds

Why do children have differing expectations about the ownership of artifacts and natural kinds? As noted above, it cannot be that children just rely on rules about specific *kinds* of objects (i.e., rules like “shoes are owned”) because such rules cannot explain children’s expectations about unfamiliar kinds. However, children could also rely on rules that are more general. For instance, if children notice that objects made of plastic are typically owned then, in the absence of other information, they may expect *any* object made of plastic to be owned. Likewise, experience with plants might lead children to expect plants to be non-owned. That is, experience with objects may lead children to draw generalizations about which features of objects (e.g., made-of-plastic) or object categories (e.g., plants) are predictive of ownership. Drawing such generalizations might allow children to make judgments about familiar and unfamiliar kinds of objects alike—even if an object is unfamiliar, children might still be able to judge that it is made of plastic or that it is a plant. From the perspective of this “generalizations” account, children’s differing expectations suggest that artifacts are more likely than natural kinds to have features or category-membership predictive of ownership, with the reverse true for non-ownership. That children could form such generalizations is plausible because many observable features distinguish artifacts from natural kinds (Keil, Greif, & Kerner, 2007, pp. 234–235).⁵

⁴ Again, it might be protested that children might only have learned that objects can be non-owned from the warm-up exercises. However, as noted above, this would leave unexplained why children were strongly biased to view natural kinds as non-owned when two of the four natural kinds in the warm-up exercises were owned. Even so, it would be good for future research to test children’s intuitions without such warm-ups.

⁵ In this version of the generalizations account, children store in memory generalizations such as “things made of plastic are owned.” However, an alternative account could be developed in which children do not store such generalizations. Instead, when judging whether some object is owned, children might try to recall experiences with similar objects and then assess whether they were likely to have been owned. One drawback of this account is that it requires an explanation of how children decide which objects are similar. For instance, when faced with a plastic plant, children would have to decide whether to recall previously encountered plants or previously encountered plastic things.

Alternatively, children's differing expectations about artifacts and natural kinds might instead arise from principle-based reasoning. On this view, children appreciate that making an object establishes ownership over it, and they use this ownership principle in judging whether objects are owned. Hence, they might reason that artifacts are likely to be owned *because* these objects are made by people, and that natural kinds are unlikely to be owned *because* these objects are not. This object origins account predicts that children's judgments about whether an object is owned will depend on their ability to judge whether it is human-made. Children might have had difficulty judging that unfamiliar artifacts are human-made when only shown pictures of them (Experiments 2A and 2B). This difficulty was removed when children were told whether objects were human-made (Experiment 3). Hence, young children's increased endorsement of unfamiliar artifacts as owned in Experiment 3 might have resulted because the information about object origins better enabled them to apply principle-based reasoning.

Considering object origins is not the only principle-based means that might lead children to have differing expectations about the ownership of artifacts and natural kinds. Artifacts have functions that serve people, whereas natural kinds typically do not. Children readily view artifacts as having human-serving functions (e.g., Casler & Kelemen, 2005); whether they view natural kinds as also having such functions is a matter of ongoing controversy (e.g., DiYanni & Kelemen, 2005; Greif et al., 2006). If children expect artifacts, and not natural kinds, to exist *for* some function (as argued by Greif et al., 2006), then these expectations might figure in children's reasoning about ownership. The notion of *use* is central in accounts of the privileges conferred by ownership (e.g., Snare, 1972). For instance, owners are entitled to use their property, whereas non-owners require permission to use it. Preschoolers show awareness of this distinction (e.g., Neary et al., 2009). Use is also closely linked with function—an object's function determines how it is typically used. Hence, children might expect artifacts to be owned because they have functions and therefore exist to be used. Reasoning about human-serving functions would give children no reason to expect natural kinds to be owned, assuming that children do not view them as having human-serving functions (though again, whether children view natural kinds this way is an unresolved question).

Hence, there are several reasons why children might have differing expectations about whether artifacts and natural kinds are owned. The three accounts considered above allow for distinct explanations for why 3–5-year-olds were less likely to view unfamiliar artifacts as owned than were 6-year-olds, and also why 3–5-year-olds were more likely to view natural kinds as non-owned: Children might have had difficulty inferring whether the unfamiliar artifacts have properties predictive of being owned (generalizations account), are made by people (object origins account), or exist to serve a function (human-serving functions account). Presumably all three kinds of inferences would be easier to draw for familiar artifacts and would be more easily drawn by 6-year-olds. Because the three accounts are not mutually exclusive, they might also be combined to explain children's performance. For instance, it could be that 3–5-year-olds' judgments about unfamiliar artifacts are primarily based on generalizations about the objects' features and that 6-year-olds' superior performance signals the onset of principle-based reasoning.

The three accounts also imply distinct explanations about how children (and adults) might reason about objects that are *exceptions* to the generalizations that artifacts are owned and natural kinds are not. For instance, it is plausible that children might expect common fruits such as apples and bananas to be owned, even though they are natural kinds. According to the generalizations account, children might expect this because they have formed the generalization that objects in these particular categories (i.e., *apple*, *banana*) are owned. According to the object origins account, children might expect these fruits to be owned because they know that these fruits are grown on farms and purchased from supermarkets and are therefore the products of human investment. Furthermore, according to the human-serving functions account, children might hold this expectation because they believe that these fruit have a clear function—to be eaten.

Another area likely to be illuminating is children's reasoning about the ownership of animals. In the current experiments, children were not asked whether animals are owned (except the pet cat in the warm-up phase), and so the current findings cannot be assumed to extend to animal kinds. It is an open question whether people reason about owned animals as they reason about owned inanimate objects, though our expectation is that adults typically treat ownership similarly in both cases. For instance, it is permissible to ride your own horse or a horse that is non-owned (though this might be very dangerous), but permission is required to ride someone else's horse; similar examples can be generated for many other behaviors directed to animals (e.g., bringing cats into your house; hunting deer).⁶

Even so, children's intuitions about whether animals are owned might differ from their intuitions about inanimate natural kinds. Many animals directly encountered by children are owned—many people own pets, farmers own livestock, and zoos own more exotic animals. If children view pets, livestock, and zoo animals as owned, then the generalizations account might predict that children should expect unfamiliar kinds of animals to also be owned. The object origins and human-serving functions accounts might lead to more nuanced predictions. Wild animals (like other natural kinds) do not typically require human intervention for their existence, and children may not spontaneously expect them to have human-serving functions (Greif et al., 2006). Hence, if children reason on the basis of object origins or human-serving functions, they might expect unfamiliar wild animals to be non-owned. Livestock, though, are reared by people and can easily be viewed as having human-serving functions, so the principle-based accounts might predict that children view such animals as owned.

Regardless of which kind of reasoning underlies children's judgments, the current experiments reveal that young children have differing expectations about the ownership of artifacts and natural kinds, both familiar and unfamiliar. The experiments pro-

⁶ Animals may differ from inanimate objects in some additional considerations affecting which behaviors are permissible in regards to them. For instance, unnecessarily damaging inanimate objects is wasteful but usually not prohibited; however, harming animals is cruel, and so this behavior might be prohibited even for owners. It is important to recognize that such considerations, which limit which actions can be taken in relation to a thing, can apply to inanimate objects too. For instance, it is not acceptable to use a baseball bat to purposely destroy a neighbor's window even if you happen to own the bat.

vide first evidence about how children solve a basic problem of ownership—judging whether objects are owned. Furthermore, contrary to the suggestion that children reason similarly about artifacts and natural kinds (e.g., Kelemen & Carey, 2007), the current findings provide clear evidence that in the case of ownership, children reason about them differently.

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Received September 28, 2010

Revision received July 27, 2011

Accepted August 9, 2011 ■