Overcoming appearances: Teleological essentialism in children's categorization

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Abstract

Overcoming appearances in categorizing is an important intellectual achievement. But children often rely heavily on appearances, as classic shape similarity (e.g., Landau, Smith, & Jones, 1988), and perceptual transformation tasks (F. C. Keil, 1989) demonstrate. We propose that children can use purposes to overcome appearances when categorizing not only artifacts, but biological kinds as well. Across three experiments, with 570 US-based children, we find support for this proposal. Children successfully categorized dissimilar-looking objects together based on shared purposes, both at basic (Experiment 1) and superordinate levels (Experiment 2), and these effects were comparable for artifacts and biological kinds. In Experiment 3, which focused on objects undergoing radical transformations, children also used an object's purpose to judge that it maintained its identity in the face of radical perceptual transformations, and this improvement was at least as strong for biological kinds as for artifacts. We discuss our results in the context of essentialism. Some have proposed that scientific essences—placeholders for what gives something its identity that science fills out—might help children overcome appearances, but this requires a protracted development since scientific elaboration is challenging and rare (S. Gelman, 2003). As one alternative, we suggest that children can readily treat purposes as identity-relevant, and that this may reflect an early teleological construal of what makes something the kind of thing it is.

Keywords: appearances; categorization; teleology; essentialism; development.

Linnaeus initially missed it (Linnaeus, 1735). Brisson came close to capturing it (Brisson, 1756). But Linnaeus returned to claim it: Whales aren't fish (Linnaeus, 1758). Common sense makes a compelling case otherwise. Whales certainly look like most of the animals that we classify as fish. And for most of human history, the striking perceptual similarity of whales to fish has led common sense to prevail on this matter.

It's a significant intellectual achievement that humans can categorize things in ways that go beyond perceptual similarities—grouping things that look different into the same category and things that look alike into different categories. When perceptually dissimilar things are united into a single category that includes perceptually typical and atypical members, new inductive generalizations are enabled, and advances in knowledge can be achieved. Such is the case in moving whales from the fish to mammal category, which took most of scientific history (Romero, 2012).

Of course, appearances are not always misleading. Much of the time they provide reasonably reliable guides to what things are. But many of our most important scientific and cultural advances require treating appearances as only one source of information among others. There is not just one way to do this. Sometimes going beyond appearances involves attending to non-obvious biological features, as in the reclassification of whales as mammals. Sometimes it involves discovering underlying causes, as when DNA sequencing revealed that fungi—long classified as plants because they grow from the ground and lack mobility—are actually more closely related to animals than plants. And sometimes it involves understanding what something is for, as when anatomical study revealed that the rocky bumps on a chiton's shell—once classified as mere armor because they blend seamlessly into the animal's hard exterior—are actually eyes, containing microscopic lenses that enable vision.

Going beyond perceptual similarity in categorization isn't merely something that is relegated to the annals of scientific achievement. It's crucial even in ordinary classification. Consider the large variety of superordinate categories, from vegetables to furniture, that people form (e.g., Rosch & Mervis, 1975). It would be nearly impossible to form these superordinate categories by relying only on appearances. Nevertheless, perceptual features are immediately available. And they play an important role in early word learning and categorization (e.g., Baldwin, 1989; Booth, Waxman, & Huang, 2005; Diesendruck & Bloom, 2003; Gershkoff-Stowe & Smith, 2004; Graham & Diesendruck, 2010; Jara-Ettinger, Levy, Sakel, Huanca, & Gibson, 2022; Jones & Smith, 1993; Landau et al., 1988; Macario, 1991; Peretz-Lange & Kibbe, 2024; Samuelson & Smith, 2005; Smith, Jones, Landau, Gershkoff-Stowe, & Samuelson, 2002). Two classic sets of findings well illustrate the difficulty that children have in overcoming a reliance on appearances in categorization: shape similarity and transformation tasks.

Shape similarity plays a powerful role in early word learning and categorization. If, for instance, children are taught a new word in "dinosaur language", shown an apple and told it's a "dax", a shape match, such as a tennis ball, and a category match that is perceptually dissimilar, like a banana, when asked to find another dax, preschoolers select the shape match (e.g., Baldwin, 1992; Gentner & Namy, 1999; Imai, Gentner, & Uchida, 1994; Landau et al., 1988). Labels can help children overcome a reliance on perceptual similarity (e.g., Cimpian & Markman, 2005; S. A. Gelman & Markman, 1986; Markman, 1989; S. R. Waxman, 1990) for basic-level categories, such as clocks, cookies and flowers (Cimpian & Markman, 2005), and help children generalize properties of perceptually dissimilar basic-level category members (e.g., S. A. Gelman & Markman, 1986, 1987). Labels are less effective at the superordinate level (e.g., Cimpian & Markman, 2005).

Children also struggle to overcome appearances when categorizing things that undergo radical perceptual transformation. If children are shown a raccoon that is made to look like a skunk, they show a protracted developmental pattern before they come to think that undergoing perceptual transformation doesn't actually make it a skunk (F. C. Keil, 1989). In fact, it isn't until children are around 9 that they overcome a reliance on perceptual features in radical transformation tasks.

Much of the time children and adults alike determine what something is by consulting its perceptual features. But solely relying on appearances poses serious limitations. How might we overcome them? Sometimes we need to consider what makes something the kind of thing it is. We propose that children can treat purposes, or what something is for, as determining what makes it the kind of thing that it is. And we show that children can leverage purposes to overcome a reliance on appearances in classic cases involving shape similarity and radical perceptual transformation. Importantly, we argue that children can rely on purposes to overcome appearances not only when categorizing artifacts, but also when categorizing *biological kinds*.

Purposes and categorization

Both children and adults can override perceptual similarity by relying on purposes in artifact categorization (e.g., Nelson, Frankenfield, Morris, & Blair, 2000; Rips, 1989; Rose & Schaffer, 2017). For instance, Rips (1989) found that adults judge that an object that looks like a lampshade is actually an umbrella when they are told that it was originally designed to protect people from rain. Work on artifact categorization often focuses on two central factors that play a role in determining what something is for—intended function and current use (Joo, Yousif, & Knobe, 2023; Prinzing et al., 2025). And developmental research has mostly centered on whether there are developmental changes in the role of intended function and current use in categorizing artifacts (e.g., Asher & Nelson, 2008; Defeyter & German, 2003; Defeyter, Hearing, & German, 2009; Diesendruck, Markson, & Bloom, 2003; S. A. Gelman & Bloom, 2000; German & Johnson, 2002; Jaswal, 2006; Matan & Carey, 2001; Prinzing et al., 2025; Rips, 1989). For instance, adults tend to think that an artifact designed for making tea but currently used for watering flowers is a teapot (Matan and Carey 2001; though see Joo et al. 2023). So do 6-year-old children. However, 4-year-old children weigh current over intended function. Nonetheless, even 4-year-old children rely on current use to determine what something is for and thus what it is. Children and adults can use what an artifact is for to determine what it is (see also Prinzing et al., 2025). But what about *biological kinds*?

Kelemen et al. (2003) examined whether children generalize animal behavior based on category membership. Children were introduced to two perceptually dissimilar animals, for instance, a shrew and a duck. For each, they were told about a behavior the animal engages in. The shrew tries to find insects and the duck tries to find weeds. Then children were shown the test animal, a platypus, that was overall perceptually similar to the shrew. While the platypus was perceptually dissimilar to the duck, it shared a functionally adaptive characteristic with it: a bill. The key question was whether children would think that the platypus tries to find insects or weeds. 4- to 5-year-old children were inclined to think that the platypus would try to find weeds. While this demonstrates that children can infer behavior based on shared functionally adaptive features, our question is whether children can also use what something is for—its purpose—to *categorize* biological kinds.

Rose and Nichols (2019) found that if a bee is made to look like a spider but preserves the purpose of bees, making honey, adults categorize it as a bee. What something is for can play a role in categorizing biological kinds, even in the face of conflicting perceptual appearances. Perhaps children can also rely on what something is for to determine what it is—even in the face of conflicting perceptual appearances—when categorizing biological kinds. If children are prompted to think about something's purpose, will that lead them to override perceptual similarity? Our proposal is that what something is for might be readily accessible to children (e.g., Butler & Markman, 2014; Deák, Ray, & Pick, 2002; Diesendruck & Bloom, 2003; Kelemen, 1999a; Kemler Nelson, Russell, Duke, & Jones, 2000; Zhu, Goddu, Zhu, & Gopnik, 2024) and as such aid children in going beyond perceptual appearances when categorizing biological kinds.

Our question

Our central question is whether teleological considerations will lead children to overcome their reliance on appearances. To address this, we focus on classic cases documenting the powerful role of perceptual appearances in categorizing, such as those involving striking shape similarities (e.g., Landau et al., 1988) and those involving complete and radical perceptual transformations (e.g., F. C. Keil, 1989). In asking whether providing information about purposes will lead children to overcome a reliance on appearances, we recognize that it would hardly be surprising if children categorized *artifacts* based on purposes. What is yet to be explored is whether children treat information about what something is for as similarly relevant to categorization in the *biological* domain. If children do treat teleological information in a strikingly parallel way across artifacts and biological kinds, then that would suggest that just as they can rely on information about purposes in categorizing artifacts, so too can they do so for biological kinds.

We emphasize at the outset that our claim is psychological. We are not trying to settle whether biological kinds actually have purposes. Rather, our focus is on how purposes are psychologically construed. In addition, when considering biological kinds, "purpose" can be understood in multiple ways. We take a broad view, recognizing that some biological purposes can be construed as intrinsic to the organism while others can be construed as relational or ecological. While decades of research indicate that children are strongly inclined to attribute purposes to biological kinds (e.g., Kelemen, 1999b; Kelemen et al., 2003), our focus is whether children might use information about purposes to *categorize* biological kinds.

We also emphasize that we are not claiming that information about purposes is the only information children can use to overcome a reliance on appearances when categorizing. Our narrower claim is that information about what something is for makes a robust and distinctive contribution to children's category and identity judgments, and that it does so for not only artifacts but also biological kinds. To explore this, we ask whether children successfully categorize dissimilar-looking objects together based on shared purposes, both at basic (Experiment 1) and superordinate levels (Experiment 2), and whether these effects are comparable for artifacts and biological kinds. We also ask whether children can use an object's purpose to judge that it maintained its identity in the face of radical perceptual transformations (Experiment 3), and whether these effects are comparable for artifacts and biological kinds.

All materials, data, analyses, and links to pre-registrations are available here: `https://github.com/davdrose/teleological_essentialism_development`

Experiment 1: Shape and purpose at the basic level

We begin by asking whether providing information about purposes will lead children to overcome a reliance on appearances when categorizing biological kinds and artifacts at the basic level. So, for instance, if children are shown a wolf spider and told what it is for, what other objects will they think are members of the same category? Will they think a different basic-level category member, a different shaped spider, such as a spiny orb weaver that has the same purpose, is a member of the same category? Or will they think that a member from a contrasting category that has the same shape as a wolf spider but a different purpose, a crab, is a member of the same category?

In exploring whether teleological information helps children overcome a reliance on appearances, we selected characteristic activities of artifacts and biological kinds that would be accessible to 3- and 4-year-old children. For instance, clocks tell time. Telling time is a characteristic activity of clocks. Indeed, when adults are asked what clocks are for, they tend to say that they are for telling time (Rose & Nichols, 2020). Likewise, spiders make webs. It's a characteristic activity of spiders. And when adults are asked what spiders are for, they tend to say that their purpose is to spin webs (Rose & Nichols, 2019). More generally, we selected activities and, in some cases, broader ecological roles that young children could plausibly construe teleologically. Consistent with our broad view of how purposes are psychologically construed, these included both intrinsic purposes (e.g., spiders making webs) and relational or ecological ones (e.g., trees for birds to live in). Following prior work on children's teleological reasoning (e.g., Kelemen, 1999b), we presented this information in an explicitly teleological form to communicate a teleological construal clearly and in developmentally accessible terms.

Methods

Participants

We recruited 180 participants through Lookit (Scott & Schulz, 2017) who were 3 to 4 years old and met our pre-registered inclusion criteria (*gender*: 86 female, 93 male, 1 no response/other; *language*: 172 English, 8 no response/other). Each age group included 90 participants. Families were compensated $5 for their participation.

Materials

To determine whether giving children information about what things are for would lead them to be less likely to categorize objects at the basic level on the basis of their shape, we created eight trials pitting shape against purpose, where six were test trials and two were warm-up trials. The test trials included three artifacts and three biological kinds. In all trials, children saw a target item, a shape and a taxonomic match to the target. The full set of materials is shown in Figure 1.

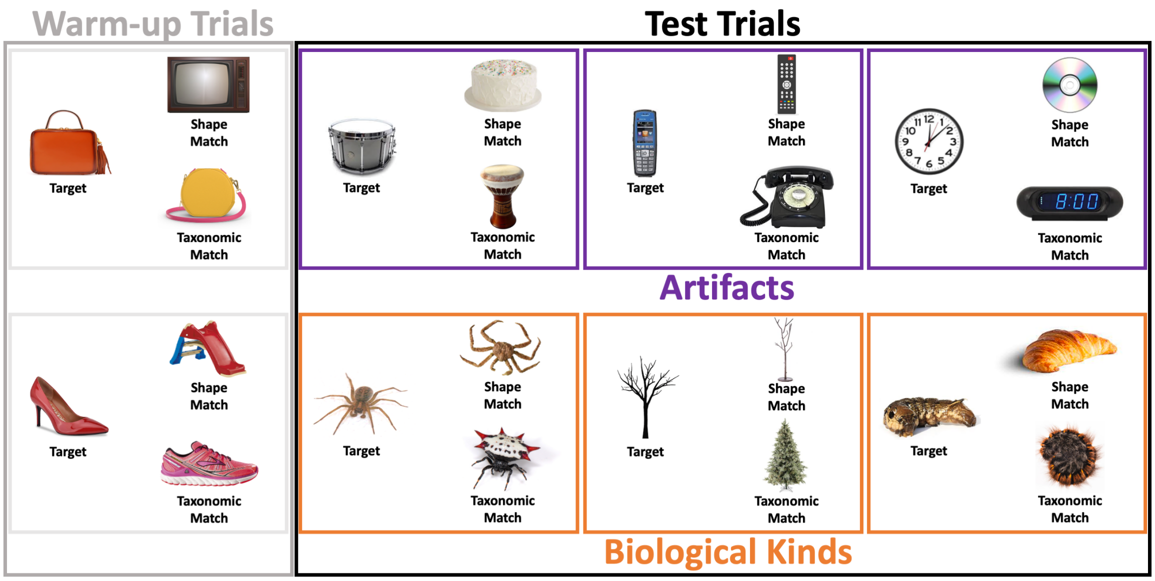

Figure 1

Experiment 1 items: *Items for the warm-up (left box in gray) and test trials (right box in black). The test trials included three artifacts (purple boxes) and three biological kinds (orange boxes). Each trial included a target item and a shape and taxonomic match to the target item.*

Procedure

The experiment was programmed using Lookit (Scott & Schulz, 2017), and children were tested asynchronously. Participants were first introduced to a puppet named Maggie. They were told that Maggie is learning puppet language and were asked if they wanted to help teach her puppet language. Once they agreed, participants then proceeded to the two warm-up trials. They were first shown, by itself, the target item, which was given a novel label (e.g., "See this? This is a zulu."). Then participants saw the shape match and the taxonomic match. On the final screen, participants saw all of the items. The target item wiggled and participants heard, "See this zulu?". Then they were asked, "Can you find another zulu? Is it the one on the top or the one on the bottom?". The objects in the top and bottom position on the screen wiggled when they were referred to. Children made their "top" or "bottom" responses out loud.

The test trials were presented in the same way as the warm-up trials. An example of the procedure is shown in Figure 2.

Design

Participants were randomly assigned to one of three conditions: a *label only*, *category neutral* or *purpose* condition. Participants were also randomly assigned to one of three orders of the test items. These three orders were the same in each of our three conditions. Across the three orders, each test trial had the taxonomic match appear either below or above the shape match.

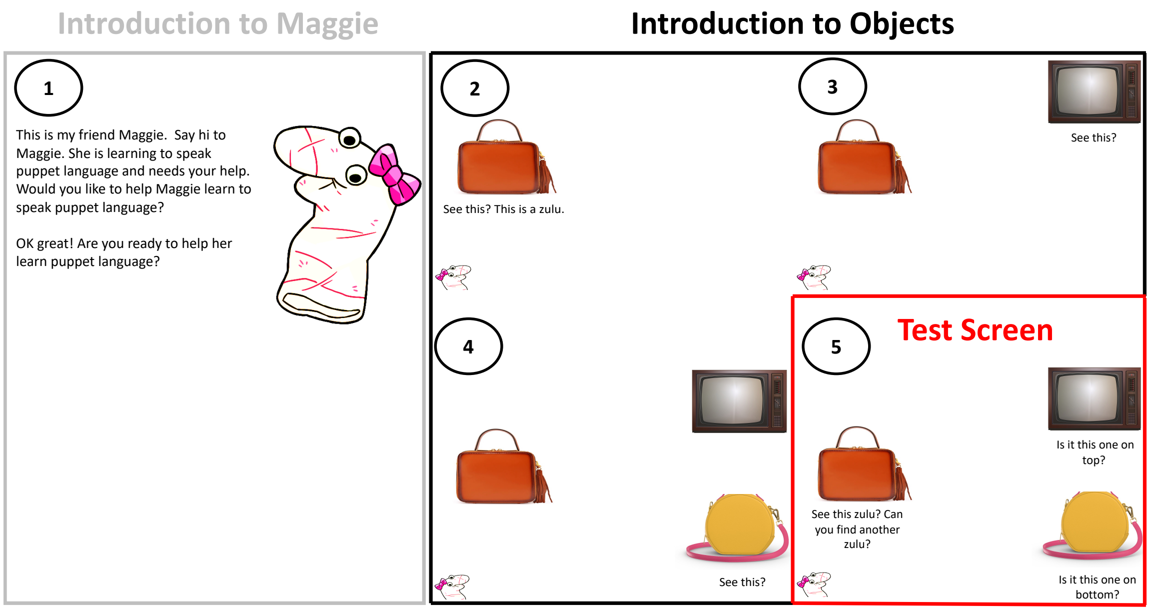

Figure 2

Experiment 1 procedure*: Overview of experimental procedure. Children were (1) first introduced to Maggie, then (2) introduced to the target object, (3) shown a shape match, (4) a taxonomic match and (5) asked whether the shape or taxonomic match was a member of the target object's category. Text was shown on the slides to participants.*

In the *label only* condition, a name was only given to the target item (e.g., "This is a Wubble"). We used novel labels because they are a standard methodological tool in the categorization literature to prevent children from relying on prior lexical knowledge (e.g., Landau et al., 1988). And we embedded these novel labels within our "teaching puppet language" framing to prevent pragmatic confusion when children were viewing familiar items.

In the *purpose* condition, in addition to a novel name, a purpose was given (e.g., "Wubbles are for making webs").

The *category neutral* condition was inspired by Gelman and Markman (1986, Study 3), and was included to match the demand characteristics of the purpose condition to ensure that children do not simply abandon their shape bias in response to any common property that a speaker asserts of two objects. Here the speaker drew attention to a property that two objects shared where that property was one that can be shared by many different kinds of objects, such as "Wubbles get wet when it rains".

Lastly, to ensure children understood the domains concerned artifacts and biological kinds, the visual stimuli clearly depicted recognizable artifacts and animals, providing unambiguous visual framing for the domain in question. An example of the kind of information provided in the different conditions is shown in Figure 3; the full information for each trial in each condition is in Table 1.

Table 1

*Complete set of novel labels and properties provided for Target, Shape Match, and Taxonomic Match objects across the Neutral, and Purpose conditions in Experiment 1**

Target Item	Novel Label	Condition	Target & Taxonomic Match Property	Shape Match Property
Purse (warmup)	Zulu	Neutral	found in stores	costs a lot of money
		Purpose	for carrying things in	for watching
Shoe (warmup)	Mupa	Neutral	owned by many people	many kids want it
		Purpose	for wearing	for sliding down
Drum	Feld	Neutral	heavy	wide
		Purpose	for making music	for eating at a birthday party
Phone	Gerp	Neutral	hard to see at night	sometimes looks far away
		Purpose	for calling people	for turning on your TV
Clock	Vemo	Neutral	sometimes very far away	sometimes very close
		Purpose	for telling time	for playing music
Spider	Wubble	Neutral	gets wet when it rains	stays dry on a sunny day
		Purpose	for making webs	for swimming
Tree	Hudi	Neutral	moves back and forth during a storm	many people like it
		Purpose	for birds to live in	for hanging your coat
Caterpillar	Miko	Neutral	wide	long
		Purpose	for eating leaves	for breakfast

**Note:* This table displays the specific properties provided in the Neutral and Purpose conditions. In the Label Only condition, the novel label was introduced for the target item (e.g., "This is a [Label]."), but no property information was provided for the target, shape match, or taxonomic match (e.g., "See this?"). In the Neutral and Purpose conditions, properties were embedded in identical carrier phrases. Target objects were introduced as "[Labels] are/get [property]" (e.g., "Wubbles get wet when it rains"). Match objects were introduced as "It is/stays [property]" (e.g., "It stays dry on a sunny day"). Across all test trials, the Target and Taxonomic match always shared the exact same property description.

Results

For all results reported in this paper, we fit Bayesian logistic mixed effects models. We will refer to a statistical result of interest as "credible" when the 95% credible interval excludes 0, except when reporting odds ratios, which we will interpret as credible when the credible interval excludes 1.

The results are shown in Figure 4. Our pre-registered hypothesis was that children would be more inclined to engage in taxonomic categorization in the purpose condition in comparison to either the label only or neutral conditions. This is what we found. 70% (95% confidence interval (CI) = $[66\%, 75\%]$) of responses were taxonomic in the purpose condition, with only 45% (95% CI = $[41\%, 51\%]$) categorizing taxonomically in the neutral condition, and 39% (95% CI = $[34\%, 45\%]$) in the label only condition. Children were more inclined to categorize taxonomically when given a purpose compared to when they were only given a label (odds ratio: 4.21, 95% credible interval (CrI) = $[2.65, 6.26]$) or category neutral properties (odds ratio: 3.19, 95% CrI = $[2.04, 4.77]$). We didn't make any

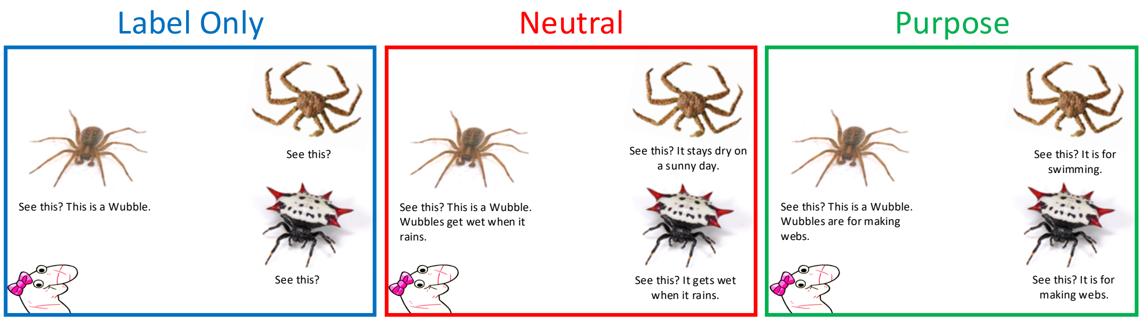

Figure 3

***Experiment 1 conditions**: Overview of experiment conditions. An example trial is shown for each condition: Label Only (blue), Neutral (red) and Purpose (green). In each, the standard, the "Wubble", is shown on the left and the shape match, the crab, and taxonomic match, spiny orb weaver, are shown on the top and bottom respectively. After seeing all of the objects, children were asked if they can find another Wubble and asked if it was the one on the top or bottom.*

predictions about whether the label only and category neutral conditions would differ, but found that there was no credible difference in taxonomic responding between the label only and category neutral conditions (odds ratio: $0.76,\ 95\%\ \text{CrI} = [0.49, 1.10]$).

We also pre-registered the hypothesis that rates of taxonomic responding in the purpose condition would be greater than chance. This is what we found ($95\%\ \text{CrI} = [65\%, 80\%]$). Though we didn't make any predictions about whether rates of taxonomic responding in the label only and neutral conditions would differ from chance, we found that they were credibly lower than chance in the label only condition ($95\%\ \text{CrI} = [30\%, 47\%]$) and not credibly different from chance in the neutral condition ($95\%\ \text{CrI} = [36\%, 55\%]$). Lastly, as a pre-registered exploratory analysis, we examined whether there were differences between artifacts and biological kinds. We found that these didn't credibly differ ($\beta = 0.16,\ 95\%\ \text{CrI} = [-0.10, 0.42]$).

Discussion

When 3- to 4-year-old children were given purposes for the objects, they no longer categorized based on shape: 70% of their responses were taxonomic. In contrast, when children were given category-neutral information, taxonomic responding remained low—only 45% of responses were taxonomic—and did not differ credibly from the label-only condition, where 39% of responses were taxonomic.

This pattern suggests that the robust effect uncovered in the purpose condition cannot be explained by a simple informational matching strategy. In the neutral condition where a property is clearly asserted for two of the three objects, children did not categorize those two together. Indeed, despite this communicative context, there is no hint that these demand characteristics helped at all. Instead, children continued to categorize by shape. In fact, it was the common purpose that robustly shifted children to categorize taxonomically.

Our findings do not suggest that teleological information wins out over other equally

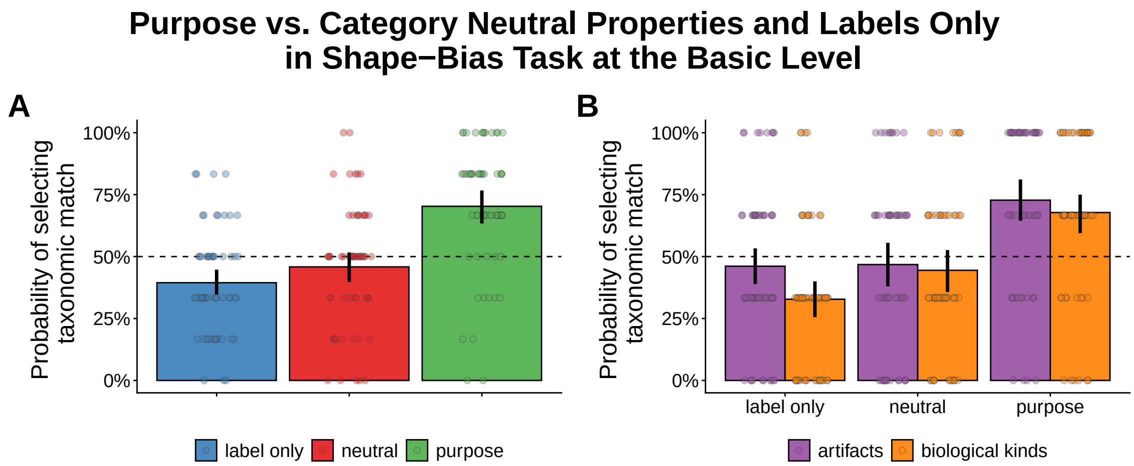

Figure 4

Experiment 1 results: *(**A**) The mean probability, shown for each bar, of selecting the taxonomic match in each condition: label only (blue), neutral (red) and purpose (green). Black lines for each bar are bootstrapped 95% confidence intervals. Small dots are average taxonomic responses for individual participants. (**B**) The mean probability, shown for each bar, of selecting the taxonomic match for artifacts (purple) and biological kinds (orange) in each condition: label only, neutral and purpose. Black lines for each bar are bootstrapped 95% confidence intervals. Small dots are average taxonomic responses for individual participants for the artifact (purple) and biological kinds (orange).*

diagnostic features, or that it is the only relevant information children could use in such tasks. As decades of research have demonstrated, shape itself is already a highly diagnostic feature with strong cue validity for children in this age range. Rather, our results demonstrate that teleology is itself highly diagnostic—powerful enough to robustly shift children away from their strong, default reliance on shape.

In fact, not only did providing purposes lead children to overcome a reliance on shape, it was just as effective for biological kinds as for artifacts. This suggests that children treat teleological information as relevant to category membership not only for artifacts, but for biological kinds as well. We next ask whether the benefits of teleology in overcoming a reliance on shape extend to the superordinate level.

Experiment 2: Shape and purpose at the superordinate level

Here we ask whether information about purposes will lead children to overcome a reliance on appearances when categorizing biological kinds and artifacts at the superordinate level. The superordinate level is more abstract than the basic level: category members have fewer features in common than at the basic level. For instance, the superordinate category *fruit* includes a motley: apples, bananas, pineapples and star fruit, to name a few. Members of superordinate categories can look very different from one another. Thus, categorizing at the superordinate level often requires looking beyond perceptual similarity. Yet in experimental tasks, children often struggle to do so: instead of choosing the superordinate

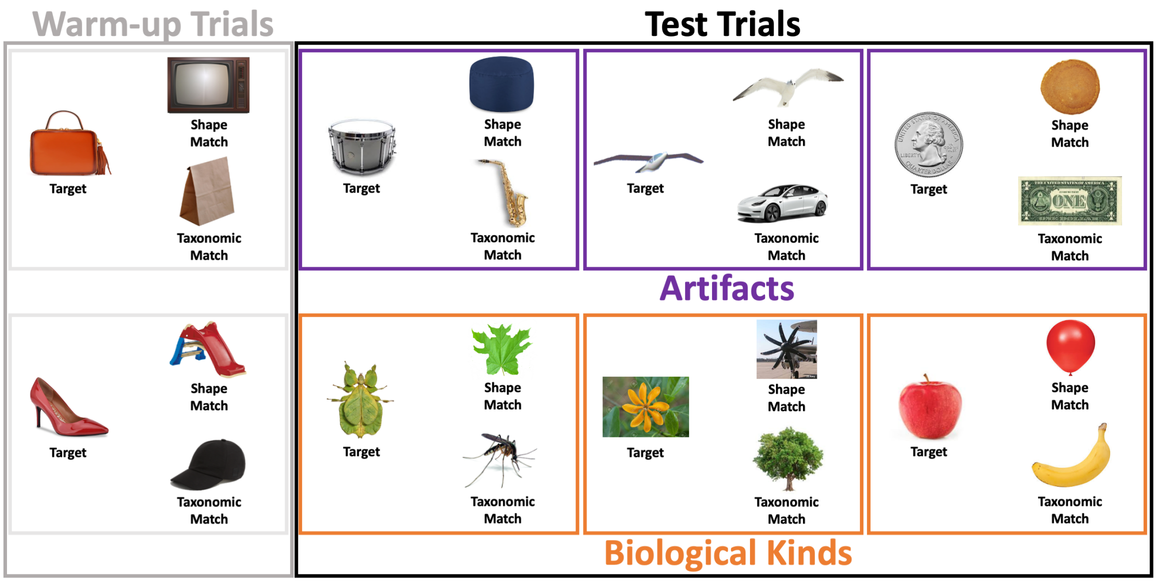

Figure 5

Experiment 2 items*: Items for the warm-up (left box in gray) and test trials (right box in black). The test trials included three artifacts (purple boxes) and three biological kinds (orange boxes). Each trial included a target item and a shape and taxonomic match to the target item.*

category match, they frequently select an item that matches in shape (Cimpian & Markman, 2005). The question, then, is whether teleological information can again help children go beyond appearances—and whether it does so similarly for artifacts and biological kinds at this more abstract level. To address this, as in Experiment 1, we used developmentally accessible teleological descriptions to test whether such information would guide children's judgments at the superordinate level.

Methods

Participants

We recruited 90 participants through Children Helping Science who were 3 to 4 years old and met our pre-registered inclusion criteria (*gender*: 46 female, 38 male, 6 no response/other; *language*: 78 English, 12 no response/other). Each age group included 45 participants. Families were compensated $5 for their participation.

Materials

To determine whether giving children information about what things are for would override their tendency to categorize objects at the superordinate level on the basis of their shape, we created eight trials pitting shape against purpose, where six were test trials and two were warm-up trials. The test trials included three artifacts and three biological kinds. In all trials, children saw a target item, a shape and a taxonomic match to the target. The full set of materials is shown in Figure 5.

Procedure

The procedure was the same as in Experiment 1, except that children were tested synchronously over Zoom.

Design

The design was the same as in Experiment 1. The full information for each trial in each condition is in Table 2.

Table 2

*Complete set of novel labels and properties provided for Target, Shape Match, and Taxonomic Match objects across the Neutral, and Purpose conditions in Experiment 2**

Target Item	Novel Label	Condition	Target & Taxonomic Match Property	Shape Match Property
Bag (warmup)	Zulu	Neutral Purpose	found in stores for carrying things in	costs a lot of money for watching
Clothes (warmup)	Mupa	Neutral Purpose	owned by many people for wearing	many kids want it for sliding down
Instrument	Abdy	Neutral Purpose	heavy for making music	wide for sitting on
Vehicle	Wub	Neutral Purpose	hard to see at night for helping people go to different places	sometimes looks far away for looking at in the zoo
Money	Bipo	Neutral Purpose	thin for buying things	light for eating
Insect	Edo	Neutral Purpose	sometimes very far away for biting people	sometimes floats in the wind for helping things live
Plant	Hudi	Neutral Purpose	moves back and forth during a storm for making air to breathe	blows around in the wind for moving things around
Fruit	Gerp	Neutral Purpose	gets wet when it rains for growing healthy and strong	stays dry on a sunny day for playing with at birthday parties

**Note:* This table displays the specific properties provided in the Neutral and Purpose conditions. In the Label Only condition, the novel label was introduced for the target item (e.g., "This is a [Label]."), but no property information was provided for the target, shape match, or taxonomic match (e.g., "See this?"). In the Neutral and Purpose conditions, properties were embedded in identical carrier phrases. Target objects were introduced as "[Labels] are/is [property]" (e.g., "Gerps get wet when it rains"). Match objects were introduced as "It is/stays [property]" (e.g., "It stays dry on a sunny day"). Across all test trials, the Target and Taxonomic match always shared the exact same property description.

Results

The results are shown in Figure 6. Our pre-registered hypothesis was that children would be more inclined to engage in taxonomic categorization in the purpose condition in comparison to either the label only or neutral conditions. This is what we found.

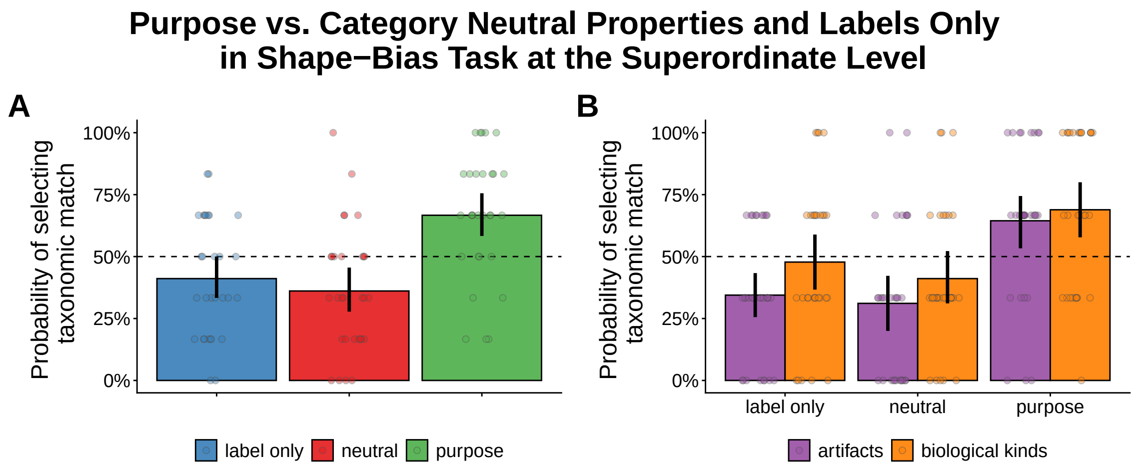

Figure 6

Experiment 2 results: *(**A**) The mean probability, shown for each bar, of selecting the taxonomic match in each condition: label only (blue), neutral (red) and purpose (green). Black lines for each bar are bootstrapped 95% confidence intervals. Small dots are average taxonomic responses for individual participants. (**B**) The mean probability, shown for each bar, of selecting the taxonomic match for artifacts (purple) and biological kinds (orange) in each condition: label only, neutral and purpose. Black lines for each bar are bootstrapped 95% confidence intervals. Small dots are average taxonomic responses for individual participants for the artifact (purple) and biological kinds (orange).*

67% (95% CI = $[60\%, 74\%]$) of responses were taxonomic in the purpose condition, with 41% (95% CI = $[34\%, 49\%]$) taxonomic responses in the label only condition, and 36% (95% CI = $[29\%, 43\%]$) in the neutral condition. Children were more inclined to categorize taxonomically when given a purpose compared to when they were only given a label (odds ratio: 3.41, 95% CrI = $[1.58, 6.12]$) or category neutral properties (odds ratio: 4.27, 95% CrI = $[2.04, 7.92]$). We also pre-registered that there would be no credible difference in taxonomic responding between the label only and category neutral property conditions. This is what we found (odds ratio: 1.28, 95% CrI = $[.60, 2.28]$).

We also pre-registered the prediction that rates of taxonomic responding in the purpose condition would be credibly greater than chance. This is what we found (95% CrI = $[57\%, 81\%]$). Our pre-registered prediction for the label only and neutral conditions was that they would not credibly differ from chance. We found that they were credibly lower than chance in the neutral condition (95% CrI = $[21\%, 47\%]$) but not credibly different from chance in the label only condition (95% CrI = $[27\%, 54\%]$). Lastly, we preregistered that we would explore whether there were differences between artifacts and biological kinds. We found that they didn't credibly differ ($\beta = -0.23$, 95% CrI = $[-0.66, 0.20]$).

Discussion

Even at the superordinate level, telling 3- to 4-year-old children the purposes of objects leads them to overcome a reliance on shape and categorize taxonomically instead.

In contrast, when children were given category-neutral information, taxonomic responding remained low—only 36% of responses were taxonomic; when they were given only a label, 41% of responses were taxonomic.

As in Experiment 1, the effect of teleology cannot be explained by a simple informational matching strategy. Even though the demand characteristics in this condition are comparable to that of the purpose condition—matching properties are being emphasized—it does not help children overcome their strong reliance on shape. But giving them teleological information does. In fact, not only did providing purposes lead children to overcome a reliance on shape, it was, again, equally as effective for biological kinds as for artifacts.

Across both the basic level (Experiment 1) and more abstract superordinate level (Experiment 2), children treated teleological information similarly when categorizing artifacts and biological kinds. If information about what things are for is identity-relevant for artifacts, then its comparable effect on biological-kind judgments suggests that children can also treat teleological information as relevant for categorizing biological kinds as well.

So far we have explored the cross-domain role of teleology in the context of classic shape bias studies. These tasks rely on determining whether an exemplar belongs to a target category by extending a novel label. In our final experiment, we extend our findings by asking whether knowing that things preserve their purpose across radical perceptual transformations helps children override their reliance on appearances.

Experiment 3: Purposes and Radical Perceptual Transformations

Overcoming appearances in situations where things undergo radical transformation—like a bee being made to look like a spider—is incredibly challenging for children (F. C. Keil, 1989). Indeed, they typically fail at this task until they are 9-years-old. Here we ask whether knowing a thing's purpose has been retained despite the perceptual transformation might help them overcome appearances.

In this study, purposes were selected on the basis of a two-part norming study showing that 4- to 6-year-old children spontaneously generated purposes for both artifacts and biological kinds, and that other children could reliably recognize which items had them. Experiment 3 therefore tests whether children use these teleological descriptions of what things are for to determine whether something persists across radical perceptual transformation.

Norming Part 1: Saying what something's purpose is

The goal for the first part of our norming experiment was to determine whether there were purposes for some artifacts and animals that children tended to agree on.

Methods

Participants

We recruited 45 participants through Children Helping Science and Lookit who were 4 to 6 years old and met our pre-registered inclusion criteria (*gender*: 25 female, 14 male, 3 no response/other; *language*: 30 English, 15 no response/other). Each age group included 15 participants. Participants were compensated $5 for their participation.

Materials

We created forty trials where 20 were artifacts and 20 were biological kinds. The full set of materials is shown in Figure 7.

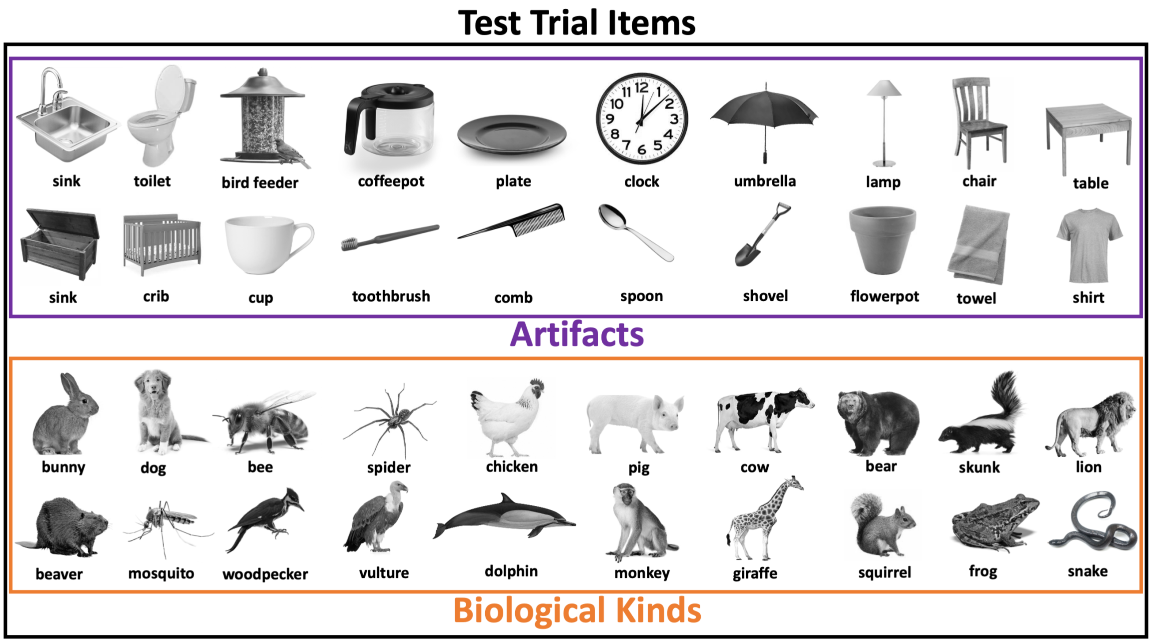

Figure 7

Norming Part 1 items*: All forty test items that children were asked what they are for. The top twenty (purple) are artifacts and the bottom twenty (orange) are biological kinds.*

Procedure

Participants were introduced to a puppet named Maggie, told that Maggie wants to learn what different things are for and that they would teach Maggie what different things are for. On each trial, participants were shown an object and told what it was (e.g., “See this? This is a sink.”). Then they were asked whether they could tell Maggie what that object is for (e.g., “Can you tell Maggie what sinks are for?”). Children made their responses out loud.

Design

Participants were given all 40 items in a random order.

Results

Our pre-registration didn’t include any hypotheses since we were only interested in identifying items that could be used in developing study materials. We computed the probability of each word produced for an item. Figure 8 shows the top items selected.

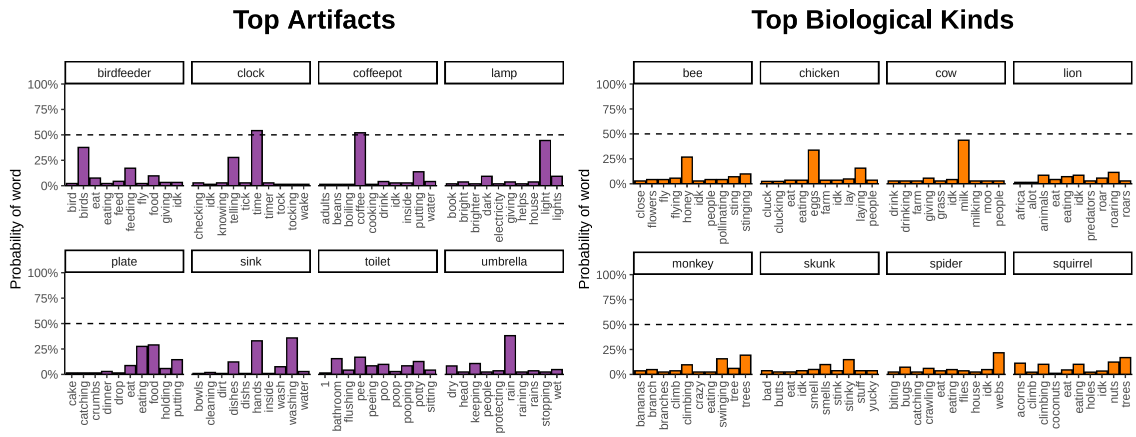

Figure 8

***Norming Part 1 top items**: Top items for which children tended to converge on a purpose. The top eight artifacts are on the left (e.g., clocks tell time) and the top eight biological kinds are on the right (e.g., chickens lay eggs).*

Discussion

Having identified artifacts and biological kinds for which there is some convergence on what children say their purpose is, we now, as the second part of our norming study, use the purposes that children tended to mention in this study and ask whether children can identify which objects have these purposes.

Norming Part 2: What has this purpose?

The goal for the second part of our norming experiment was to determine whether children could identify which objects had the purposes they attributed to them in the first part of our norming study.

Methods

Participants

We recruited 40 participants through Lookit who were 4 to 5 years old and met our pre-registered inclusion criteria (*gender*: 21 female, 19 male; *language*: 39 English, 1 no response/other). Each age group included 20 participants. Participants were compensated $5 for their participation.

Materials

We created 28 trials that included 14 artifact pairs and 14 biological kind pairs. These pairs included all 16 items from part 1 of our norming as well as additional items used in that experiment. The full set of item pairs is shown in Figure 9.

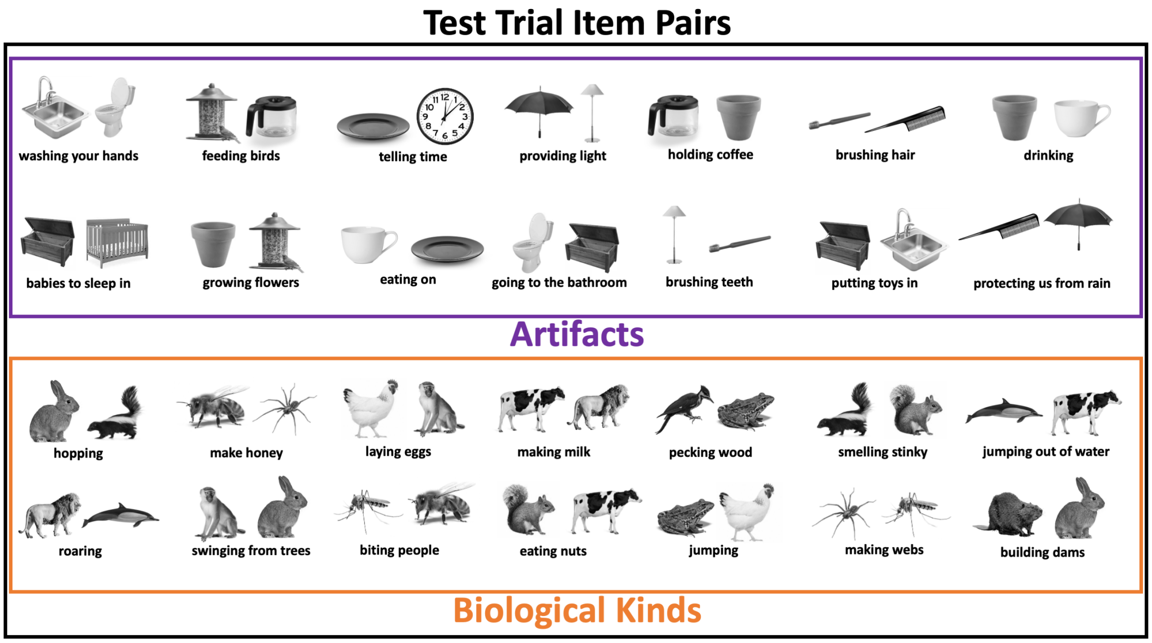

Figure 9

Norming Part 2 items*: Test trial item pairs with fourteen artifact pairs (e.g., a sink and toilet where the target purpose was washing hands) shown on top (purple) and fourteen biological kind pairs (e.g., a rabbit and skunk where the target purpose was hopping) shown on bottom (orange).*

Procedure

The procedure was similar to part 1 of our norming study. After being introduced to Maggie and told that they would teach her what different things are for, participants were then shown pairs of items. They were told what each item in the pair is (e.g., "See this? This is a sink. See this? This is a toilet"). Then they were asked which item in the pair is for some particular purpose (e.g., "Do you think sinks or toilets are for going to the bathroom?"). Responses were made out loud.

Design

The order of trials was randomized.

Results

Our pre-registration didn't include any hypotheses since we were only interested in identifying items that could be used in developing study materials. We computed the probability that the correct item was identified for a given purpose (see Figure 10).

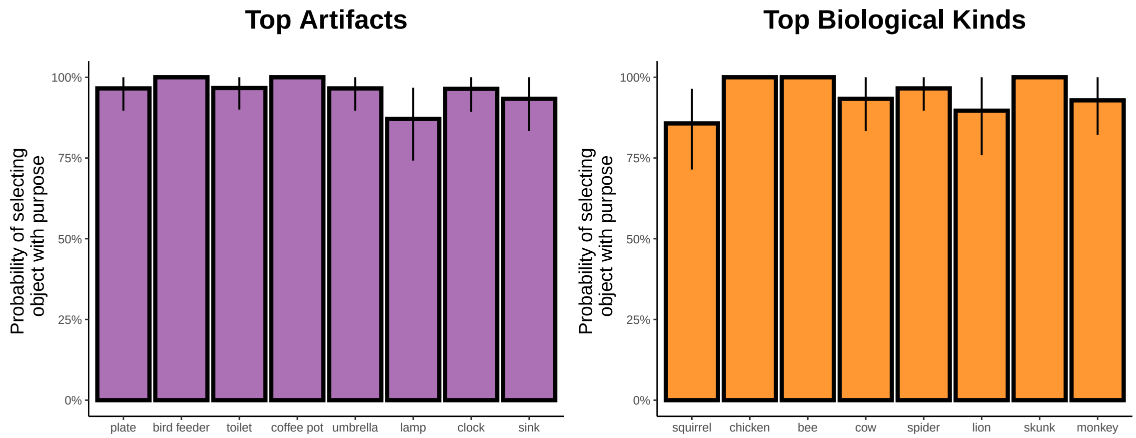

Figure 10

Norming Part 2 results*: Correct item selected when given a purpose and shown a pair of objects. Artifacts (purple) are shown on the left and biological kinds (orange) are shown on the right.*

Discussion

Children were overwhelmingly inclined to select the correct items when asked which of two objects had some particular purpose.

Main experiment

Our two-part norming study identified teleological descriptions that were both spontaneously produced by children and reliably recognized by them. We therefore used these items and purposes in the main experiment task, which tested whether teleological information would support identity judgments across radical perceptual transformations. Because radical transformation tasks are incredibly challenging for young children, we recruited 5- to 9-year-olds for this main experiment, aligning with the standard developmental window in which performance on these tasks is typically assessed (e.g., F. C. Keil, 1989).

Methods

Participants

We recruited 300 participants through Lookit who were 5 to 9 years old and met our pre-registered inclusion criteria (*gender*: 156 female, 143 male, 1 no response/other; *language*: 274 English, 26 no response/other). Each age group included 60 participants. Families were compensated $5 for their participation.

Materials

To determine whether giving children information about what things are for would help them override their reliance on appearances when objects undergo radical perceptual

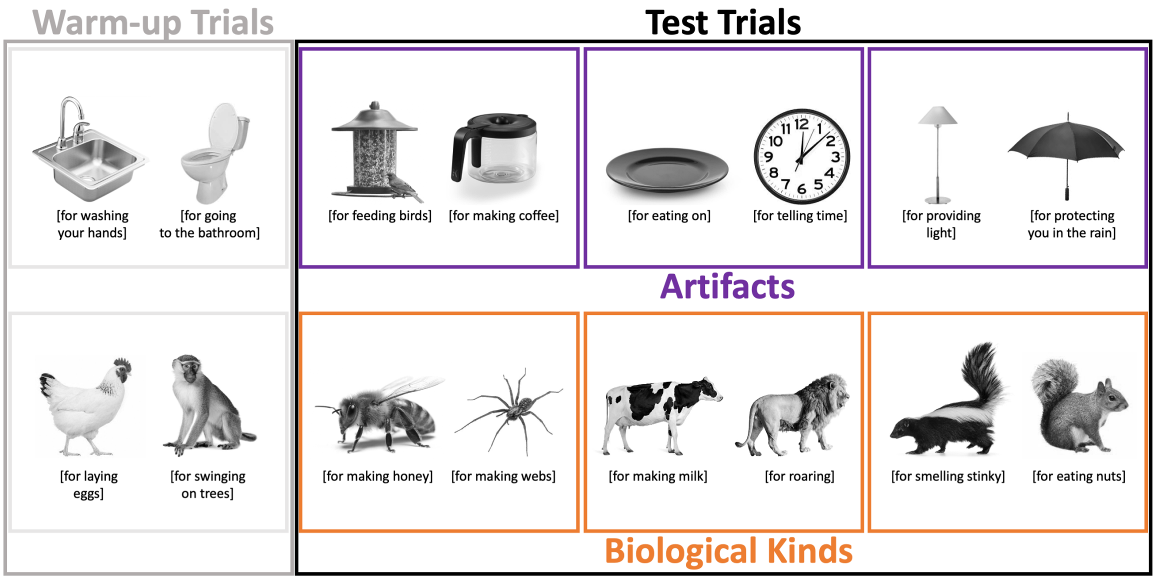

Figure 11

***Experiment 3 items**: Item pairs for the warm-up (left box in gray) and test trials (right box in black). The test trials included three artifact pairs (purple boxes) and three biological kind pairs (orange boxes). Information included in the brackets was given only in the purpose condition.*

transformation, we created 8 trials involving perceptual transformations on four pairs of artifacts and four pairs of biological kinds (see Figure 11).

Procedure

The experiment was programmed using Lookit (Scott & Schulz, 2017), and children were tested asynchronously. Each child was first introduced to Maggie and told that they, along with Maggie, would learn about Andy's projects. Next, they were introduced to Andy and shown his workshop. Children were told that Andy has various supplies for his projects including crayons, paper, tools, and a toolbox, and that he will use his supplies to change things.

Children began with two warm-up trials. They were shown an object (e.g., a sink) and told that Andy was going to use this for one of his projects. Maggie then identifies the item (e.g., "That's a sink.") and then children are told that Andy will change the object with his supplies. They are then given a description of how the object is changed (e.g., made rounder, given a handle and lid) and then shown, on a new screen, a different object (e.g., a toilet) and told that the thing Andy changed with his supplies now looks like this. Maggie then says what the item looks like (e.g., "That looks like a toilet."). Children are then reminded that the thing Andy changed now looks like what is shown on the screen (e.g., a toilet) and asked what the object is ("Do you think this is a sink or a toilet?"). Children made their responses out loud. The procedure for the test trials was the same.

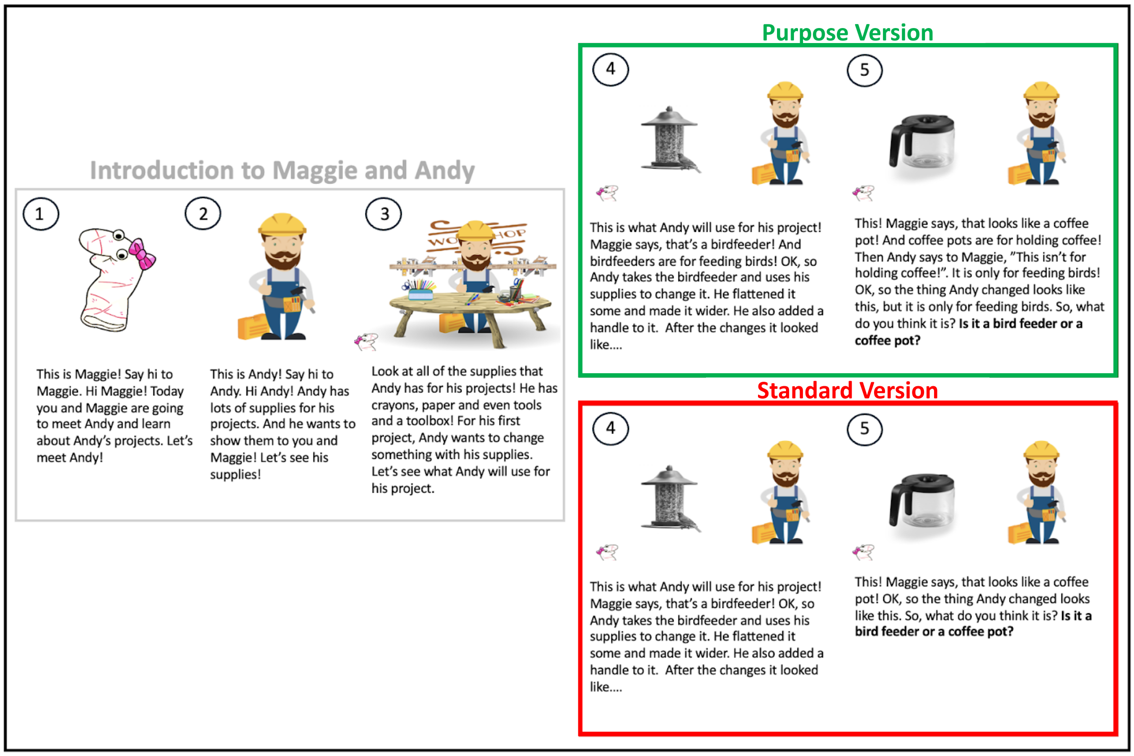

Figure 12

Experiment 3 procedure*: Overview of transformation experiment procedure. Children began by (1) being introduced to Maggie, (2) introduced to Andy and (3) shown the supplies that Andy uses to change things (left; gray). Children in the purpose version (top; green) were then (4) introduced to the object Andy is going to change with Maggie identifying what it is and what it is for. Then (5) children are shown what the object looks like after the change, Maggie says what it looks like and what it is for, while Andy says that it is for what the original object was for. Children are then asked what the object is. The standard version (bottom; red) is the same except Maggie doesn't mention a purpose when she sees the initial object (4) or when she sees the changed object (5). Text was not shown on the slides to participants.*

Design

Children were assigned to the purpose version or standard version. For each condition, there were three orders where the order of the warm-up trials was fixed but the order of the test trials varied. Due to a coding error, one of our three orders of trials had test trials randomized for each participant. The other two trial orders were fixed for each participant.

The standard version was based on Keil's (1989) original transformation task, and participants were told about the perceptual transformation an object underwent, such as a bee being made to look like a spider. The purpose version was based on Rose and Nichols (2019), and in addition to being told about the perceptual transformation the

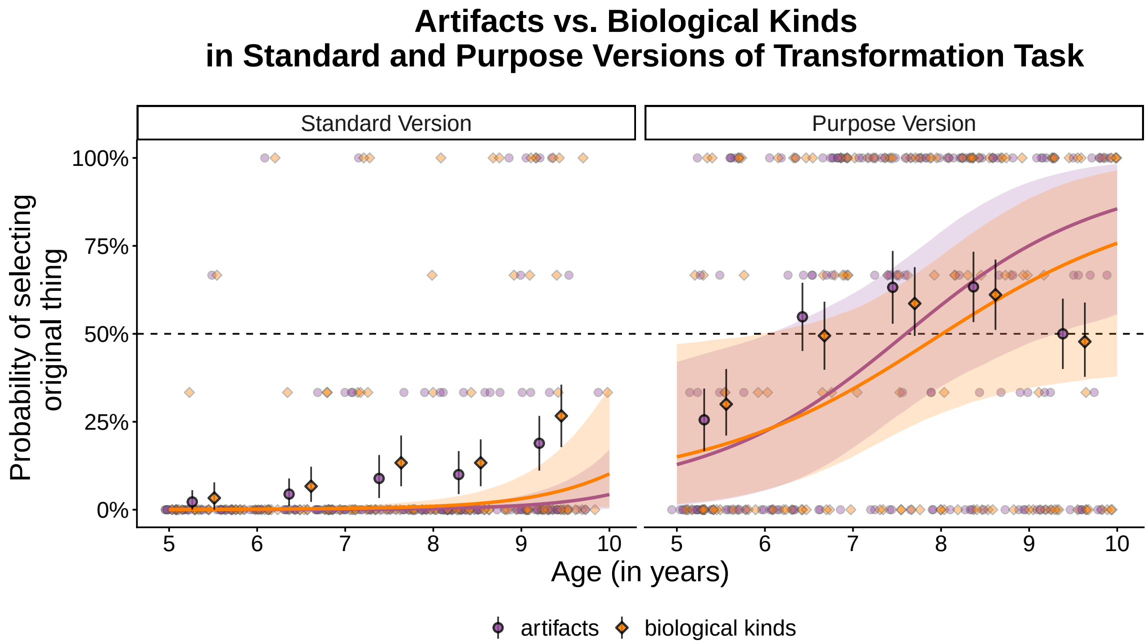

Figure 13

Experiment 3 results: *Probability of judging that the changed object was still a member of its original category in the standard (left panel) and purpose (right panel) conditions. For each condition, regression lines show the fits of Bayesian logistic mixed effects models with 95% credible intervals with model predictions for artifacts (purple) and biological kinds (orange) over age. Large dots are means for each age group for the artifact (purple) and biological kind (orange) items with bootstrapped 95% confidence intervals. Small dots are average responses for individual participants that the item was a member of its original category for the artifact (purple) and biological kinds (orange).*

object underwent, children were also told the purpose of the object. For instance, when a bee was changed to look like a spider, children were told that it doesn't spin webs but only makes honey (see also e.g., Rose & Nichols, 2019).

Examples of the purpose and standard versions, along with the procedure, are shown in Figure 12.

Results

The results are shown in Figure 13. We coded responses so that 1 = judging that the transformed object was still a member of its original category and 0 = judging that the transformed object changed categories. We first focus on the results comparing the standard and purpose versions that were predicted based on this manipulation.

In line with our pre-registered prediction, in contrast to the standard version, we found that children in the purpose version of the transformation task were more likely to think the object retained its original identity despite the radical transformation for both artifacts (purpose: 51%, 95% CI = $[47\%, 56\%]$, standard: 9%, 95% CI = $[6\%, 12\%]$, odds ratio: 752, 95% CrI = $[46, 5032]$) and biological kinds (purpose: 49%, 95% CI = $[45\%, 55\%]$, standard: 13%, 95% CI = $[10\%, 16\%]$, odds ratio: 500, 95% CrI = $[18.9, 3795]$). Importantly, the extent to which purpose information shifted children's judgments did not credibly differ between artifacts and biological kinds (odds ratio: .76, 95% CrI = $[0.16, 1.68]$). We also found, as predicted, that children were overall less likely to judge that the object changed categories as they got older (artifacts: $\beta = 1.05,\ 95\%$ CrI $= [0.53, 1.68]$; biological kinds: $\beta = 1.00,\ 95\%$ CrI $= [0.43, 1.67]$). We predicted that the difference between the purpose and standard versions in the extent to which children judged that the object retained its category membership after the transformation would increase with age, but we didn't find evidence of this (artifacts: $\beta = -0.53,\ 95\%$ CrI $= [-1.64, 0.52]$; biological kinds: $\beta = -0.59,\ 95\%$ CrI $= [-1.75, 0.58]$).

We also made specific pre-registered predictions for each condition. For the purpose version, we predicted that older children would be more likely to judge that the object didn't change its category after the transformation. We found evidence of this ($\beta = 0.77,\ 95\%$ CrI $= [0.14, 1.48]$). And for the standard version, we predicted, in line with Keil's original finding, that children would overall be more likely to think biological kinds retained their original category membership after the transformation. However, we didn't find evidence supporting this (odds ratio: 2.68, 95% CrI = $[.25, 7.27]$). We did, however, and as predicted, find that older children in the standard version were more inclined to think that the objects overall, whether artifacts or biological kinds, retained their original category membership after being changed ($\beta = 1.14,\ 95\%$ CrI $= [.44, 2.07]$). Lastly, we predicted that in the standard version the difference between thinking biological kinds and artifacts retained their category membership would widen with age such that children, as they got older, would be more inclined to think biological kinds retained their category membership. But we didn't find evidence of this ($\beta = 0.01,\ 95\%$ CrI $= [-0.54, 0.59]$).

Discussion

Keil (1989) originally found that children categorized both artifacts and biological kinds based on their appearance, though with age they became less inclined to do so for biological kinds. Here we asked whether teleological information might help children overcome appearances in radical transformation cases, and whether it would do so similarly for both artifacts and biological kinds.

Children were first asked what a range of artifacts and animals were for. They spontaneously generated these purposes for both artifacts and biological kinds, and could reliably identify which items had those purposes. Interestingly, for several central items, including bees, spiders, and clocks, children converged on the same purposes that adults did in prior work (Rose & Nichols, 2019, 2020). These child-generated purposes and items were then used in the transformation task.

We found that when children were given teleological information about the transformed objects, the standard appearance-based pattern found in transformation tasks changes sharply. In the purpose version, children were much more likely to judge that an object retained its original identity despite radical perceptual transformation, and this was true for both artifacts and biological kinds. This suggests that the role of teleology extends beyond categorization tasks to diachronic identity judgments about persistence through change. And teleological considerations play a role in these persistence judgments even in the face of highly diagnostic cues—for instance, something looks exactly like a spider. But children can nonetheless override the strong diagnostic evidence that it is a spider and categorize it as a bee by using information that it is for making honey. Moreover, our results again reveal a striking parity between domains. If preserving purpose is naturally taken to sustain identity for artifacts, then the fact that preserving purpose has an equally powerful effect for biological kinds suggests that children can also use what something is for to determine what it is when considering biological kinds.

General Discussion

Knowledge of a thing's purpose can play a powerful role in children's categorization and identity judgments. In Experiments 1 and 2, 3- and 4-year-old children relied on information about what objects are for to override their strong reliance on shape. They did so at both the basic level (Experiment 1) and the more challenging superordinate level (Experiment 2). Information about purpose also helped children go beyond appearances in radical transformation tasks (e.g., F. C. Keil, 1989). When an object underwent radical changes in its perceptual features, children were more inclined to think that it retained its identity when it preserved its purpose (Experiment 3). Indeed, telling 5-year-old children the purposes of objects made them about as likely as 9-year-old children in the standard procedure, with no purpose information, to judge that an object retained its identity across radical perceptual transformation.

Importantly, this pattern was not limited to artifacts. Across all three experiments, teleological information worked in strikingly similar ways for artifacts and biological kinds. That parallel suggests that children are treating information about what things are for as relevant to what things are in both domains. Our proposal is that one natural way to understand this pattern is in terms of teleological essentialism: children may sometimes treat what something is for as part of what makes it the kind of thing that it is.

Teleological essentialism and scientific essentialism

Teleological essentialism is the view that people tacitly regard essences in terms of a purpose (Rose & Nichols, 2019, 2020). On this view, what makes something the kind of thing that it is can, at least in some cases, be understood in terms of what it is for. Our findings are consistent with the idea that children, like adults, sometimes treat what something is for as determining what it is.

Rose and Nichols (2019) found that across a range of standard tests of essentialist thinking, adults rely on teleological considerations. For instance, in a transformation task where a bee is made to look like a spider, if adults learn that it preserves the purpose of bees, making honey, adults say it is still a bee. But if the bee undergoes transformation and ends up with the purpose of spiders, spinning webs to catch and kill insects, people think it is no longer a bee. They found a similar pattern in switched-at-birth tasks. If baby bees are raised by spiders and end up spinning webs, adults categorize them as spiders. Standard tests of essentialist thinking show that adults categorize biological kinds based on their purpose. This suggests that adults sometimes elaborate essences in terms of purposes.

Our findings suggest that children might too. What something is for is readily accessible to children and they can use what something is for to determine what it is in the face of striking and conflicting perceptual evidence. They can rely on purposes to overcome appearances at the basic level, the more challenging superordinate level, and in even more challenging tasks involving radical perceptual transformation. They can do so for artifacts. And importantly, they can also do so for biological kinds. This parity suggests not merely that teleological information is one cue among others, but that children are treating it as relevant to determining what things are. That conclusion is especially warranted because in Experiment 3, the purposes were not simply imposed: they were purposes that children themselves spontaneously generated and that other children reliably recognized. Notably, for several central items, including bees, spiders, and clocks, children converged on the same purposes that adults did in prior work on teleological essentialism (Rose & Nichols, 2019, 2020). Together, this suggests that children, like adults, can treat what something is for as determining what it is for both artifacts and biological kinds.

It's useful to contrast our proposal, teleological essentialism, with another view of essentialism: scientific essentialism. Kripke (1980) and Putnam (1975) maintained that for natural kinds, science uncovers properties that make things what they are—what makes something a lemon isn't that it is yellow, tart, with a certain kind of peel, but that it has the genetic structure of lemons. This insight has been codified in an influential view of essentialism in psychology—scientific essentialism (e.g., S. Gelman, 2003; F. C. Keil, 1989). Scientific essentialism acknowledges that laypeople rarely possess knowledge of the underlying features of things that science deems essential. Instead, scientific essences are typically represented in terms of placeholders that are restricted to natural and social kinds (Atran, 1998; S. Gelman, 2003; S. A. Gelman, 2013; F. Keil, 1994; F. C. Keil, 1989). And there is a great deal of research on various aspects of scientific essentialism (see e.g., S. A. Gelman, 2004, for a review)—including that preschoolers can reason about the insides of things (S. A. Gelman & Wellman, 1991) and think that animals raised by different animals will grow up to be like their birth parents (e.g., S. A. Gelman & Wellman, 1991; S. Waxman, Medin, & Ross, 2007).

Scientific essentialism relies on placeholders. But Gelman and O'Reilly (1988) tried to provide elaborations, not in categorization tasks, but in induction tasks. If given scientific-sounding information about the insides of things, such as that something "has auxin inside", will children generalize those properties? Their ability to do so is limited. While children had no trouble generalizing scientific properties at the basic level—thinking that two different colored apples would have auxin inside—they struggled to generalize them at the superordinate level, where perceptual differences between items are much more extreme.

We are not claiming that scientific essentialism has no place in children's reasoning about category membership and identity (Neufeld 2021; Joo and Yousif 2022; though see Toorman 2023). In fact, we would have liked to introduce elaborations of scientific essences in our own studies. But previous attempts have been unsuccessful (e.g., S. A. Gelman & O'Reilly, 1988), and it is hard to see how to provide meaningful elaborations of scientific essences to preschoolers. Part of the issue is that placeholders for scientific essences lack content that can be leveraged in categorizing. And elaboration of scientific essences requires abstract knowledge of sophisticated concepts, such as DNA, that will have a protracted development. In contrast, from an early age, teleological considerations can already serve to elaborate some placeholders.

Domain parity and biological purposes

We recognize that our proposal may well be surprising. While it is natural to think that what something is for is relevant to determining what it is when categorizing artifacts, purposes may not seem relevant to biological kinds. Thus, one might be tempted to suggest that children can't be using purposes to categorize biological kinds.

But if one grants that what something is for can matter to what it is in the artifact case, then the fact that the same kind of teleological information played a comparable role in the biological-kind case calls for a principled basis for treating the two domains differently. One possible source of such a distinction comes from work suggesting that children ask what artifacts, but not biological kinds, are for (Greif, Kemler Nelson, Keil, & Gutierrez, 2006). But asking what one would like to know about an object is different from categorizing it. While children may not spontaneously seek out teleological information for animals, our data show that when they are presented with it, what something is for plays a powerful role in categorization across both domains.

A similar cross-domain pattern also appears in explanation. Children explain the existence of both artifacts and animals in terms of what they are for (Kelemen, 1999b; Kelemen et al., 2003). Adults, too, use similar criteria when determining what something is for across a wide range of domains, from artifacts to animals and even human lives (Prinzing et al., 2025). Of course, it remains an open question whether children's understanding of biological purposes is identical to their understanding of artifact purposes. But the important point is that both artifacts and biological kinds can be understood teleologically.

Still, one might insist that, in the biological-kind cases, children are not relying on purpose as such, but only on highly diagnostic behavior. One might observe that the purposes utilized in these studies—such as a spider making webs or a bee making honey—are simply diagnostic patterns of activity. Perhaps the word "for" merely draws attention to these behaviors rather than triggering genuine teleological reasoning. Yet, consider clocks. Telling time is something clocks do. It is also highly diagnostic of category membership. More generally, it is hard to see what purposes could amount to, in practice, if not characteristic things that kinds do, and equally hard to see how teleological information could guide categorization if it were not at least partly diagnostic.

We are not claiming that teleological information is the *only* kind of high-validity information that matters. Indeed, shape itself is often highly cue-valid for young children in matching tasks, which is precisely why it exerts such a strong pull in Experiments 1 and 2. Likewise, in the transformation cases of Experiment 3, looking like a spider is highly diagnostic of category membership.

Yet even against these highly diagnostic perceptual cues, what something is for mattered—and it mattered just as much for biological kinds as it did for artifacts. The parity between artifacts and biological kinds therefore supports a simple, consistent interpretation: children are treating what something is for as relevant to what it is in both domains. Children can and do overcome a reliance on appearances by relying on what things are for, and they do so for both artifacts and biological kinds.

Purposes and relational essences

How exactly people represent biological purposes remains an open question. One possibility is that they can be construed in different ways. Some may be treated as relatively intrinsic to the kind itself: for example, a spider's purpose might be understood in terms of building webs. Others may be treated as more relational, as when a vulture's purpose is understood in terms of clearing carrion as part of a broader ecological system (e.g., Dink & Rips, 2017; Medin & Atran, 2004; Unsworth et al., 2012; S. R. Waxman, Medin, et al., 2013).

Recognizing that purposes can be relational—and not just intrinsic—lends itself to a broader conception of essences than the one emphasized by scientific essentialism. Scientific essentialism, as it is usually characterized in psychology, treats essences as intrinsic rather than relational. Yet, even in biology, essences can be construed relationally (Griffiths, 1999; Okasha, 2002; Sterelny & Griffiths, 1999). Anatomy offers compelling examples. Consider the heart: what makes something a heart is not just its internal makeup, but the role it plays in circulation—namely, pumping blood through the circulatory system. Teleological essentialism can accommodate such relational essences. In that respect, teleological thinking can support a broader conception of essentialist thought, one that is continuous with many aspects of scientific understanding, including anatomy and ecology.

Teleological placeholders and future directions

Our findings suggest that children can treat purposes as relevant to what makes something the kind of thing it is. This does not mean, however, that children must already know what those purposes are. For some kinds, they may already have relatively stable beliefs about what they are for. For example, we found that children, like adults (see e.g., Rose & Nichols, 2019), largely converged on the view that bees are for making honey and spiders are for spinning webs. But for at least some animals, children showed less convergence. One possibility is that they have teleological placeholders. Children may be prepared to elaborate these placeholders with plausible purposes. The purposes we gave children in Experiments 1 and 2 suggest that they are prepared to use information about what something is for to elaborate such placeholders and to make use of that information in categorization. How children elaborate teleological placeholders, however, remains an important question for future work.

Conclusion

Across three experiments, we found that teleological information helped children go beyond appearances in both categorization and identity judgment. Children used purposes to categorize perceptually dissimilar items together at both the basic and superordinate levels, and they used preserved purpose to judge that objects retained their identity across radical perceptual transformations. Crucially, these effects were not limited to artifacts, where purpose-based reasoning might be expected, but appeared in parallel for biological kinds as well. Taken together, these findings suggest that teleological information provides children with a powerful and early-available way of thinking about what makes something the kind of thing that it is. Teleological essentialism suggests a reorientation of the landscape surrounding research on essentialist thinking and its development, opening new ways to think about how essences might be construed.

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