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Differences in Preschoolers' and Adults' Use of Generics about Novel Animals and Artifacts: A Window onto a Conceptual Divide

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Abstract

Children and adults commonly produce more generic noun phrases (e.g., Birds fly) about animals than artifacts. This may reflect differences in participants' generic knowledge about specific animals/artifacts (e.g., dogs/chairs), or it may reflect a more general distinction. To test this, the current experiments asked adults and preschoolers to generate properties about novel animals and artifacts (Experiment 1: Real animals/artifacts; Experiments 2-3: Matched pairs of maximally similar novel animals/artifacts). Data demonstrate that even without prior knowledge about these items, the likelihood of producing a generic is significantly greater for animals than artifacts. These results leave open the question of whether this pattern is the product of experience and learned associations or instead a set of early-developing theories about animals and artifacts.

Generic noun phrases (e.g., *Birds fly*) have been hypothesized to "provide a window onto human concepts" (Gelman & Tardif, 1998, p. 215). By referring to a category as an abstract whole (*birds in general* as opposed to any particular bird or birds), generics express generalizations about shared properties of category members. Research demonstrates that both children and adults produce significantly more generics for categories within the domain of animals than for those within the domain of artifacts (e.g., Gelman, Coley, Rosengren, Hartman, & Pappas, 1998; Gelman, Goetz, Sarnecka, & Flukes, 2008; Gelman & Tardif, 1998; Goldin-Meadow, Gelman, & Mylander, 2005). However, why this pattern is found is unclear.

Some have proposed that the animacy bias in generics may reflect a broad differentiation between animal and artifact concepts. For example, animal concepts are more likely to be richly structured and essentialized than artifact concepts (e.g., Gelman, 2003). On this view, the greater proportion of generics in conversation regarding animals may reflect fundamental differences in how these concepts are structured. However, one alternative hypothesis is that this bias may instead reflect lower-level differences in children's familiarity with or generic knowledge base about the particular animal versus artifact categories being discussed (e.g., dogs versus chairs): children may simply know more generic information about specific, basic-level animal kinds than about specific, basic-level artifact kinds. For example, they may have learned numerous generic properties of dogs (e.g., Dogs have fur, four legs, cold noses; Dogs bark, wag their tails, dig for bones, retrieve sticks) but few generic properties of chairs (e.g., Chairs are for sitting; Chairs have legs and a seat). The current experiments aim to test the

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second hypothesis by examining how adults and young children talk about novel animals and artifacts for which they have equivalent knowledge.

Generics Defined

Generic noun phrases offer an especially powerful means of conveying generalizations about shared properties of category members (Carlson & Pelletier, 1995). Generics are expressed in English using bare plurals, indefinite singulars, and definite singulars, and are accompanied by verbs that are typically nonpast and nonprogressive in aspect and tense. Consider the following generic statements:

- **a.** *Zebras* are mammals.
- **b.** *A zebra* has stripes.
- **c.** *The zebra* resides in Africa.

Generics can be contrasted with non-generic expressions such as the following:

- **a.** There are *some zebras* at the zoo.
- **b.** *A zebra* escaped from its cage.
- **c.** *The zebra* is standing next to the tree.

As the above examples suggest, generics in English are not uniquely associated with a particular linguistic form; rather, generic function is indicated by a combination of various morphosyntactic, semantic, and pragmatic cues (Gelman & Raman, 2003; Gelman & Tardif, 1998).

Despite the lack of a distinct linguistic form, generics are nonetheless distinct in meaning: Generics refer to a category as an abstract whole, rather than to an individual or a group of individuals (Carlson & Pelletier, 1995; Lawler, 1973). Put another way, generic statements refer to *kinds* (Carlson, 1977) or to individuals as representatives of kinds (Herey, 1985). The predicate of a generic statement typically expresses relatively essential, enduring, and timeless qualities about that kind (Carlson & Pelletier, 1995; Prasada & Dillingham, 2006). Properties stated generically are often definitional, recurrent, or law-like (Dahl, 1975), and can be contrasted with those that are accidental, transient, or contextually and individually bound. Thus, generic statements articulate properties that are "generally," "typically," "characteristically," or "normally" true of a kind (Lyons, 1977).

Generic readings cannot be equated easily with readings associated with any one quantifier. Unlike statements using "some" (e.g., "*Some boys* play with trucks"), generics (e.g., "*Boys* play with trucks") invoke the entire category. However, unlike statements using universal quantifiers such as "all," "every," or "each", generic statements allow for exceptions (Lawler, 1973). For example, whereas the statement "*All boys* play with trucks" is certifiably false, the generic statement "*Boys* play with trucks" is considered true despite the fact that some boys do not in fact play with trucks. Because of their generalizability and resilience against counterexamples, generic constructions have been proposed to be an especially powerful and robust way to express properties that are characteristic of a kind (Gelman, 2003).

Generic Language Input, Comprehension, and Production

Generics and generic concepts are central to the ways in which adults reason about the world (e.g., Prasada, 2000; Prasada & Dillingham, 2006). Moreover, a growing body of evidence has shown that generics are also present in the language spoken and heard in children's daily lives. Observational evidence suggests that generic statements are actually surprisingly common both in parental talk and in children's own spontaneous conversations by about 2 ½ years of age

(Gelman et al., 1998; Pappas & Gelman, 1998). For example, in a database on parent-child conversations regarding picture books depicting animals and artifacts, Gelman et al. (1998) reported that 90% of mothers of 35-month-olds and 69% of mothers of 20-month-olds produced at least one generic statement during a brief (roughly 15-minute) book-reading session. On average, generics accounted for approximately 3 to 4% of maternal utterances.

Generics were also found in children's spontaneous speech. Results from Pappas and Gelman (1998) suggest that, when discussing picture books depicting animals, 1% of utterances of 2-year-olds and 5% of utterances of 3- to 4-year-olds contained generics. More than half of the children tested produced at least one generic during the book-reading session (50% of 2-year-olds and 70% of 3- to 4-year-olds). While these percentages are modest, they stand in contrast to the general finding and assumption that children's language focuses on the here and now (Snow & Ferguson, 1977). Data from the study of generics suggest that, in ordinary conversation, mothers and children make relatively frequent reference to categories as entities abstracted away from any specific context (see also Gelman et al., 2008).

Data also suggest that by a very young age, children comprehend the conceptual implications of the subtle distinction between generic and non-generic noun phrases. For example, in both comprehension and spontaneous production, 4-year-olds (but not 3-year-olds) understand the meaning of generic statements to be intermediate between “all” and “some” statements (Hollander, Gelman, & Star, 2002). By 4 years of age, children also use generics to constrain inductive inferences. Upon learning a novel property taught in generic, “all,” or “some” form, both adults and 4-year-olds generalized the property most often in the case of “all” statements and least often in the case of “some” statements, with the case of generic statements falling in the middle.

Finally, data show that children use a variety of morphosyntactic, semantic, and pragmatic cues to detect generic meaning. Results from Gelman and Raman (2003) suggest that by 2 years of age, children are able to use linguistic form class to discern whether an utterance is generic or non-generic in meaning. For example, children recognize that in the context of a picture of two penguins it is not the case that “*the birds* fly” whereas it is the case that “*birds* fly.” Moreover, by 3 to 4 years of age, children are also able to make use of the convergence of linguistic and nonlinguistic contextual information to reach a generic interpretation. For example, in the context of a picture of two tiny elephants, 3- and 4-year-olds agree that “They are small”; however, in the context of a picture of a single tiny elephant, 3- and 4-year-olds nevertheless agree that “They are big.” Cimpian and Markman (2008) have shown that when determining whether or not an ambiguous sentence (e.g., “They are afraid of mice”, used to describe a picture of two birds) is generic, preschoolers also attend to the immediate linguistic context (i.e., whether a preceding sentence contained a generic noun phrase or a non-generic noun phrase), their prior knowledge about different types of properties (i.e., whether the property is generalizable, such as properties about insides or sensory abilities; or temporary/accidental, such as being tired or sick), and information about the social context (i.e., whether the sentence was presented in the context of a visit to a veterinarian's office or to a library). Together, these results suggest that by 3 to 4 years of age children interpret generics through the use of multiple linguistic, conceptual, semantic, and pragmatic cues.

In sum, support is accumulating for an early emerging capacity to produce and interpret generics. Generics appear in maternal speech to children as early as 20 months of age; children produce generics as early as 2 years of age, increasing their production dramatically between the ages of 2 and 4; and, as early as 4 years of age, children readily grasp the subtle semantic implications of generic knowledge and language.

Domain-Specificity of Generic Language

There are no formal restrictions on which domains can support generics: It is possible to make generic claims about animals, artifacts, plants, foods, and so on. Nonetheless, a striking and consistent finding throughout the generics literature is that generic language use is *domain-specific*. That is, the domain of animals is particularly likely to elicit generic language. Artifacts, foods, and inanimate natural kinds (e.g., rocks, trees, water) do not elicit generics to the same extent that animals do (Gelman et al., 1998; 2008; Gelman & Tardif, 1998; Goldin-Meadow et al., 2005). Of particular interest in prior research, has been the comparison between animals and human-made artifacts. Controlling for the amount of speech in each domain, in input studies of generics, both mothers and children consistently produce more generic statements for the domain of animals than for that of artifacts (e.g., Gelman et al., 1998; 2008; Gelman & Tardif, 1998; Goldin-Meadow et al., 2005). For example, Gelman et al. (1998) reported that 5.50% of maternal utterances were generic statements in reference to animals (e.g., "Bats are one of those animals that is awake all night"), whereas only 1.04% were generics in reference to artifacts (e.g., "A wok is how people in China cook. Well, actually, a wok is how people in America cook like Chinese people"). Data suggest that children, too, produce more generics for animals than for artifacts. A study comparing hearing and deaf children in both the United States and China revealed that, across all four groups, 3- and 4-year-old children used generics to refer to animals reliably more often than they used them to refer to artifacts (Goldin-Meadow et al., 2005; see also Gelman et al., 2008).

Although the phenomenon of domain differences in generic language production has been documented in a number of studies, it remains an open question as to *why* animals elicit so many more generics than do artifacts. Gelman and colleagues (Gelman et al., 1998; Gelman & Tardif, 1998; Goldin-Meadow et al., 2005) have proposed that the observed domain-specificity in generic language use reflects abstract differences in children's and adults concepts of animals and artifacts. Evidence supports the claim that early in life children are aware of the distinction between these domains (e.g., Gelman, 1988; Keil, 1989, 1994; Wellman & Gelman, 1998). Abundant research has shown that infants clearly distinguish animates from inanimates, perhaps on the basis of perceptual cues alone (i.e., physical cues, such as parts, curvilinear vs. rectilinear contour, texture; and dynamic cues, such as self-generated motion, goal-directed motion, contingency; see Rakison & Poulin-Dubois, 2001, for a review). Moreover, direct comparisons of preschoolers' animal and artifact concepts have yielded differences on numerous dimensions, including: internal parts (R. Gelman, 1990; Simons & Keil, 1995), object identity (Keil, 1989), functionality (Greif, Kemler Nelson, Keil, & Gutierrez, 2006; Keil, 1994), inheritance (Hirschfeld, 1995; Springer, 1992), origins (Gelman & Kremer, 1991; Keil, 1989), self-generated movement (R. Gelman, Durgin, & Kaufman, 1995; Massey & R. Gelman, 1988), and spontaneous growth and healing (Backscheider, Shatz, & Gelman, 1993; Rosengren, Gelman, Kalish, & McCormick, 1991). These comparisons have revealed clear domain differences in children as young as 3 or 4 years of age. Specifically, children believe that (1) animals have richly structured internal parts that differ from their exteriors, whereas artifacts have the same parts inside and outside; (2) the inner parts of animals cause self-generated movement, whereas the inner parts of artifacts are unrelated to movement; (3) animals retain their identity across transformations, whereas artifacts do not; (4) animals originate by means of a natural, self-generated process, whereas artifacts originate by means of a human creator; (5) animals inherit properties such as coloring and size from biological parents, whereas artifacts do not; (6) the traits of animals serve the purpose of enhancing survival, whereas the traits of artifacts serve the social purpose of benefiting people; and (7) animals grow and heal according to predictable and internally prompted patterns, whereas artifacts require external agents of change. Thus, although on some tasks robust domain differentiation does not appear until age 8 or 9 (e.g., Gelman, 1988; Gelman & O'Reilly, 1988; Kelemen, 1999; Kelemen & DiYanni, 2005), a large body of research has clearly demonstrated that already by 3 or 4 years of age, children have extensive knowledge about the ways in which animals and artifacts differ.

This detailed domain-specific knowledge is argued to reflect broader differences in the way concepts in the animal and artifact domains are construed. In the domain of animals, children and adults engage in essentialist reasoning; that is, they view animal categories as having an underlying reality or a true, unobservable nature that gives rise to their identity and underlies other shared similarities (Gelman, 2003; Medin & Ortony, 1989). In contrast, children and adults generally do not engage in essentialist reasoning about artifacts (Diesendruck & Gelman, 1999; Diesendruck, Gelman, & Lebowitz, 1998; Kalish, 1995; but see Bloom, 2000, for an alternative account). That is, they do not view artifact categories as having an underlying nature that is essential to their identity. As such, animal categories are typically construed as more richly structured and “kind-like”, with deeper similarities and greater coherence than artifact categories (e.g., Gelman, 1988, 2003; Keil, 1989).

Based on these broader differences in the structure of animal and artifact concepts, there are several potential explanations for the domain differences in generic language use. First, because generics are used to refer to kinds and to express properties that are generally, typically, or characteristically true of those kinds, the domain of animals should more readily lend itself to the use of generic language as compared to the domain of artifacts. Given an animal, participants should more readily think about the kind to which that animal belongs and hence use generic language to talk about generalizable properties that members of that kind share; given an artifact, on the other hand, participants should more readily consider that artifact as an individual and hence use non-generic language to discuss the properties of that individual. A second, related possibility is that—controlling for the tendency to construe animals and artifacts as kinds—children and adults may regard animal kinds as having more predictive power (deeper similarities, greater coherence, etc.) than artifacts kinds. On this view, participants may use more generics in conversation regarding animals because they believe that more properties of animals are generalizable and thus can be expressed in generic form. Although these hypotheses are theoretically distinct, both predict a predominance of generic language use for animals as a result of abstract differences in the nature and structure of animal and artifact kinds.

There are also leaner interpretations of the domain specificity of generic usage that, as of yet, have not been tested. One such possibility is that the greater proportion of generics elicited by animal categories may reflect differences in the amount of generic knowledge participants possess about the *particular* animal and artifact categories being discussed (e.g., dogs, chairs), rather than in their expectations about the domains of animals and artifacts in general. Children and adults may use more generics in conversation regarding animals, not because they view animal concepts as more richly structured and kind-like than artifact concepts, but rather because they simply know more generalizable facts about those particular, familiar, basic-level categories. The purpose of this paper is to test this hypothesis.

Another open issue is the extent to which the *content* of propositions expressed about animals versus artifacts might contribute to domain differences in generic language use. As discussed earlier, research has shown that as early as 3 to 4 years of age, children demonstrate detailed knowledge about the abstract differences between animals and artifacts, including which properties pertain to which domain (e.g., Gelman, 1988; Greif et al., 2006; Keil, 1989; Wellman & Gelman, 1998). In the current experiments, we set out to test whether these differences in property content are responsible for domain differences in generic language use. One possibility is that domain differences are a direct consequence of differences in the kinds of properties animals and artifacts elicit. For example, if animals elicit more talk about deep properties (e.g., behavior, function, taxonomy, internal parts) and less talk about surface properties (e.g., external parts, color, size, shape, texture, patterning, attractiveness) than artifacts do, participants may produce more generics for animals than for artifacts simply because the generic form is used more often to express properties that are deep and essential than those that are accidental, transient, or individually bound (Dahl, 1975). By examining the content of children's and adults' generic and non-generic utterances, we set out to determine whether domain differences in generic language use result from differences in the kinds of properties children and adults produce about animals versus artifacts or rather from differences in whether or not participants generalize properties of individual animals and artifacts to the level of the kind.

Finally, most previous research demonstrating domain differences in generic language use has focused on the use of bare plural generics (e.g., “*Bats* are one of those animals that is awake all night”). However, recent work on generic language in parent-child conversations has provided preliminary evidence suggesting that domain may interact with generic form (Gelman et al., 2008). Specifically, Gelman and colleagues (2008) found that, whereas bare plural generics were most common for animates, indefinite singular generics (e.g., “*A wok* is how people in China cook”) were most common for artifacts. In the current experiments we explore this issue further. We ask: Will this domain-by-generic-form interaction replicate in the case of novel items? And, if so, what are the conceptual implications of using bare plural generics for the domain of animals and indefinite singular generics for the domain of artifacts?

Although our primary focus is on children, in the current experiments we examine both adults and preschoolers. This comparison enables us to investigate several questions regarding adult generic language use (i.e., Does adults' domain-specific generic language use generalize beyond familiar instances to wholly novel animal and artifact kinds? Is this pattern influenced by the content of the utterances produced across domains? Do animals and artifacts elicit different kinds of generic utterances?) and to begin to explore the developmental origins of these patterns.

The Current Studies

In three experiments, we tested whether domain differences in generic use reflect a general differentiation between the domains of animals and artifacts or instead can be attributed to the amount of knowledge speakers possess about specific, familiar animal versus artifact kinds. We presented preschoolers and adults with a series of pictures of novel animals and artifacts for which they have equivalent (lack of) knowledge. In Experiment 1, stimuli were pictures of real yet unfamiliar animals and artifacts; in Experiments 2 and 3, stimuli were matched pairs of completely novel animals and artifacts created to be as similar as possible across domains (each participant saw only one picture from each pair). In all experiments, each picture displayed numerous properties, any of which could be construed as either generally true of the whole category or as specific to that individual category member. Participants were asked to generate properties about each picture. Prompts came in two forms. To maximize the number of generics produced, in the generic condition participants were explicitly prompted to use generic language (e.g., “What can you tell me about tapirs?”). To reveal how participants spontaneously construed the novel animals and artifacts (as kinds or as individuals), in the neutral condition participants were not explicitly prompted to use generic or non-generic language (e.g., “What can you tell me?”). Children's and adults' speech was coded for the proportion of generic and non-generic utterances produced within each domain. We also examined the content of those utterances to determine the nature (surface vs. deep) of the generics produced.

If the domain-specificity of generic language use observed in previous studies was a result of children's and adults' greater familiarity with and/or more extensive generic knowledge base about the specific animals and artifacts used as stimuli, in the current series of experiments using novel stimuli about which participants have equivalent (lack of) knowledge, domain differences should not be observed: Participants should *not* produce more generic statements about animals than artifacts. In contrast, if the greater proportion of generics about animals reflects a more general distinction between the animal and artifact domains, in the current series of experiments domain differences should remain: Despite their lack of familiarity with the stimulus items, children and adults should nevertheless produce more generic statements about novel animals than about novel artifacts. In support of the hypothesis that broad differences in the structure of animal and artifact concepts drive generic language use, we predicted that both children and adults would produce more generic statements about novel animals than novel artifacts.

Experiment 1

Method

Participants—Twenty-five preschoolers ranging in age from 48.0 to 63.0 months of age (*M* = 55.90 months; *SD* = 3.94 months, 14 males, 11 females) and 33 college students (17 males, 16 females) participated. Participants were predominantly European American and from middle income homes. All participants were residents of a small Midwestern city. Children were recruited from local preschools and adults were undergraduates at a large public university.

Materials—Materials included photographs of 6 unfamiliar animals and 6 unfamiliar artifacts presented against a white background (see Figure 1). Each item was given a label. Novel labels were assigned to the artifacts. Animals were referred to by either their real common names or a simplified version of their scientific names.

Items were selected based on pretesting with a separate group of 8 preschoolers. During pretesting, children were presented with a series of pictures of both familiar and unfamiliar animals and artifacts arranged in a random order. Participants were asked to sort the pictures into two boxes: one box was for pictures of “animals”; the other was for pictures of “things that are *not* animals.” As they sorted the pictures, children were also asked to identify and label any familiar items. The stimuli for the current experiment were chosen based on the following criteria: (a) all participants categorized them correctly (i.e., animal or not); (b) no child labeled them correctly; (c) no more than two children provided the same incorrect label.

To confirm that the items were equally novel across domains (i.e., that the animals were not viewed as more similar to familiar animals than the artifacts were to familiar artifacts), a separate group of adults (n = 11) rated how similar each animal was to other animals they had seen before and how similar each object was to other objects they had seen before, using a scale from 1 to 7, with 1 indicating “Not at all similar” and 7 indicating “Extremely similar”. There was no difference between the similarity ratings given to animals and to artifacts (*M*s = 3.42 and 3.35, respectively), $t(10) = .24$, $p = .81$, $d = .056$.

Procedure

Children: Children were tested individually in a quiet room. The experimenter introduced each child to a puppet named Poppy. Children were told, “This is my friend Poppy. Poppy is an alien from outer space. On Poppy's planet, it is really, really dark. It's so dark that nobody can see anything and they don't even have eyes. See? Poppy doesn't have any eyes! He can't see anything! Poppy brought some pictures for us to look at, but since he can't see he needs your help to tell him about the pictures. Can you help Poppy by telling him about what's in the pictures?” Children were then asked to look at the pictures and talk freely about them. The motivation for using a puppet without eyes was to suggest that Poppy was completely ignorant about these stimuli and to encourage children to produce both surface and deep properties.

The session began with a practice phase using the test procedure but with pictures of familiar foods (i.e., apple, cookie). The remaining pictures were presented in one of two semi-random orders such that no more than 3 items from each domain appeared sequentially. Conversations were audiotaped for subsequent transcription.

Children were assigned to one of two conditions. To stimulate generic language production, in the *generic condition* children were explicitly prompted to generate bare plural generics. There were two practice trials involving familiar foods (apples and cookies). For example, children were shown a picture of an apple and were told, "You know what this is! This is an apple. What can you tell Poppy about *apples*?" The second practice trial had the same structure as the first. Children were shown a picture of a cookie and were told, "You know what this is, too! This is a cookie. What can you tell Poppy about *cookies*?" In the test phase children were introduced to each unfamiliar animal and artifact and prompted to generate generic language. For example, children were told, "This is a krivel. What can you tell Poppy about *krivels*?" Participants were also encouraged to ask questions about each item using the following instructions: "Do you have any questions about *krivels*? What would you like to know about *krivels*?" These instructions remained the same for each item.

To access the ways in which children spontaneously construe animal and artifact kinds, in the *neutral condition* children were prompted using neutral language. On the two consecutive familiar trials during the practice phase, participants were explicitly instructed as to which form to use for that trial, with both bare plural generic and non-generic wording modeled (counterbalancing the order: generic, non-generic or non-generic, generic). For example, on the first trial some children heard, "You know what this is! This is an apple. What can you tell Poppy about *this apple*?" On the second trial, those children were told, for example, "You know what this is, too! This is a cookie. What can you tell Poppy about *cookies*?" Then in the test phase children were introduced to each unfamiliar animal and artifact without an explicit prompt to use generic or non-generic language. For example, children were told, "This is a pangolin. What can you tell Poppy?" To help indicate the picture as the subject of the question, the experimenter gestured toward the picture while providing the label and question. Participants were also encouraged to ask questions about each item using neutral language: "Do you have any questions? What would you like to know?" The experimenter again gestured generally at the picture to help clarify the request.

The experimenter allowed the children to speak freely about each stimulus item. When the children paused, the experimenter encouraged further responses by asking "What else?" or "What else can you tell Poppy?" The experimenter continued such prompting until the child explicitly indicated that he or she was done (e.g., "Nothing else" or "That's it"). Thus, the children and not the experimenter determined when the conversation about each stimulus item was over.

Adults: The procedure for the adults was comparable to that for the children, with some modifications. For ease of data collection, adults were tested in a group setting using a written format. Each participant received a packet of pictures arranged in one of two semi-random orders. There were three parts to each packet. In Part 1, participants were instructed to, "Look at each picture individually and list as many attributes as you can think of." Item labels and prompts were printed on each page. In the generic condition, participants were prompted to produce bare plural generics. An example of the prompt for the generic condition is as follows: "This is a krivel. What can you tell me about krivels?" In the neutral condition, participants were not explicitly directed to use generic or non-generic language. An example of the prompt for the neutral condition is as follows: “This is a krivel.” Participants were given 90 seconds to respond to each item.

In Part 2, adults were given the opportunity to ask questions about the animals and artifacts introduced in Part 1. The purpose of this was to encourage more generic talk, by allowing participants to express properties about which they were uncertain. They were instructed to, “Look at each picture individually and write down as many questions as you can think of.” As in Part 1, participants were given 90 seconds for each item. Prompts were again printed on each page. In the generic condition, participants were prompted to generate questions with bare plural generics (e.g., “This is a krivel. What would you like to know about krivels?”). In the neutral condition, participants were given a neutral prompt (e.g., “This is a krivel.”).

Importantly, in both Parts 1 and 2, adults were instructed to write their responses using complete sentences. This manipulation ensured that responses could be coded reliably as generic or not.

Finally, to confirm that each item was unfamiliar, in Part 3, participants were shown a thumbnail image of each of the items seen previously. They were asked to, “Put a checkmark next to the animals or objects that were familiar to you *before* today.” Whenever an individual indicated that an item was familiar, that item was removed from that individual's analyses.

Transcribing and coding: Children's audiotaped sessions were transcribed by the experimenter. Intelligible utterances were transcribed verbatim; unintelligible utterances were also noted. Transcripts were then divided into utterances. Utterances were first identified on the basis of intonational contour and timing: any continuous unit of conversation that was free of full stops was identified as an utterance. As such, utterances could consist of sentences, phrases, or even single words. Utterances were further subdivided such that each utterance contained no more than a single subject noun phrase. For example, compound utterances such as “They are black and they live in trees” were divided into two distinct utterances “They are black” and “They live in trees.” Adults' written responses were divided into utterances using the same criteria.

Transcripts of children's verbal responses and adults' written responses were coded according to the following system. First, off-task responses (e.g., “I'm hungry”) and those that could not be interpreted (e.g., those that were unintelligible or nonsensical) were discarded. The remaining on-task responses were then coded as picture-relevant or not. Non-picture-relevant responses included on-task statements or questions that were not related to the animal or artifact in the picture (e.g., “I don't know anything else”; “What's the next one?”). The picture-relevant utterances were then coded for whether or not they explicitly referred to the target animal or artifact. Utterances that explicitly referred to the target animal or artifact included those containing the name of the item (e.g., “What's a krivel?”; “Tarsiers have big eyes”), a pronoun referring to the item (e.g., “What's that?”; “It picks up things”; “Why do they need claws?”; “It looks like a dinosaur to me”), or a possessive pronoun (e.g., “Why is his nose small?”; “Their legs are striped”). Utterances that did not explicitly refer to the target animal or artifact included those referring to a specific part or feature of the animal or artifact without the use of the item's name or a pronoun (e.g., “What's that sticking up?”; “What's that ball thing?”; “Legs”; “Brown, and pink, and a little bit of white”).

Next, each noun phrase referring to the target animal or artifact was examined for whether or not it expressed a property that was inherited from participants' knowledge of the superordinate category. Since the purpose of this experiment was to present participants with unfamiliar items about which they have *no prior knowledge*, we eliminated from further analyses all utterances expressing known properties of all members of the superordinate category. This was of particular concern for the animal stimuli because the domain of animals is well-structured and its members share many similarities. For example, participants know that all members of the superordinate category "animal" eat, grow, and reproduce in one way or another. Therefore, general statements such as "It eats," "They grow," or "It has babies" merely reflect prior knowledge of the superordinate category and not observations or predictions about the target animals. In contrast, statements such as "It has striped legs," "They run very fast," or "They eat leaves" instead reflect observations or predictions about the target animals and not prior knowledge about animals in general. Because the domain of artifacts is less well-structured and its members share fewer similarities, it was less clear which properties of artifacts should be considered true of all members of the superordinate category. Two possibilities include "They are inanimate," and "It is used for a function." In our data, one utterance was deemed true of all members of animals: "Inside his neck is his throat." No utterances were deemed true of all artifacts.

The remaining on-task, picture-relevant utterances that refer to the target animal or artifact and are not inherited from participants' knowledge of the superordinate category will be referred to as *target utterances*. Target utterances were then coded as generic or non-generic. Coding of generics is discussed in detail in prior publications (e.g., Gelman, Coley, & Gottfried, 1994; Gelman et al., 1998; Pappas & Gelman, 1998). Generics have two major properties: (1) There is a general category the speaker refers to: The speaker is not referring to any particular individual or instance. Thus, generics typically do not have any of the following before the noun: (a) a number (e.g., "two birdies"), (b) a pronoun (e.g., "my marbles"), (c) the word "some" (e.g., "some balloons"), or (d) the word "the" (e.g., "the doggies"); and (2) the statement or question is not tied to a particular situation or point in time. This means that the statement or question is in present tense. It usually cannot be in the past, in the future, or in the progressive (-ing) form.

Examples of generics observed in this study are as follows: "Bongos take really slow steps"; "What do luzaks do?"; "They have huge eyes"; "You clean the floor with them." All sentences referring to particular individuals or to a particular situation or point in time were coded as non-generic. Examples of non-generics observed in this study are as follows: "I don't have that at my house"; "What is it?"; "It looks like a horse"; "You can't really use this"; "Tarsier looks cute"; "I wish I had that guy"; "He climbs up trees." All generic responses were additionally coded as bare plural (e.g., "Bongos have skinny legs"; "They have a handle"; "Their eyes are huge") or indefinite singular (e.g., "A tarsier is kind of greenish"; "A luzak looks like a CD player"; "What do you do with a scobbit?").

Finally, all picture-relevant utterances referring to the animal or artifact in the picture were coded for the type of attribute they described. Utterances about attributes clearly visible in the picture (e.g., external parts, color, size, shape, texture, patterning, attractiveness) were categorized as *surface* utterances; utterances about unseen properties (e.g., traits, behavior, use, function, mental state, taxonomy, habitat, inventor, internal parts) were categorized as *deep* utterances. Utterances could also be categorized as *both*—conveying both surface and deep information (e.g., "It uses those big wings to fly"), or as *other* (e.g., "I wish I had a tarsier").

A second coder coded the responses of 33% of the children and adults. Disagreements were resolved by discussion. Cohen's kappas were .96 (picture-relevant or not), .94 (explicit reference to the target animal or artifact or not), .97 (generic plural, generic singular, non-generic), and .93 (surface, deep, both, other), indicating high inter-rater reliability.

Results

Was the experimental manipulation successful in eliciting generic language?— Overall, our experimental manipulation was successful in eliciting generic language. Nineteen out of 25 children and 28 out of 32 adults produced at least one generic noun phrase during the course of the experiment. Frequencies of generic utterances ranged from 0 to 57 for children (M = 13.84, SD = 14.18) and from 0 to 81 for adults (M = 22.24, SD = 20.96). Children produced quite a range of generic properties, including mention of color (“They're blue and pink and pink and white”; “They're all red”), parts (e.g., “They have humungous eyes”; “They have a handle”), shape (e.g., “They're really shaped like a triangle”; “They look like a C”), texture (e.g., “They have spiky backs”; “They're all hairy”), behavior/function (“They can climb really good”; “They eat little bugs and stuff”; “Scobbits, like, turn and make funny noises”; “You can push buttons on them”; “They have a red thing that you pull”), and habitat (“They live in the jungle”).

Do domain, condition, and/or age group influence the likelihood of producing a generic utterance?—Our central question was whether children and adults were more likely to produce generic utterances about animals than about artifacts. In order to model the likelihood of producing a generic utterance, a logistic regression was conducted. Logistic regression is used to model the relationship between a categorical response variable, in this case production of a generic or non-generic utterance, and one or more explanatory variables, in this case condition (generic vs. neutral), age group (children vs. adults), and, most importantly, domain (animal vs. artifact). The traditional logistic regression model assumes that observations are independent. However, in the current experiment, all participants contributed data for both domains. To account for correlations among observations from the same participant, the method of generalized estimating equations (GEE) was used (Liang & Zeger, 1986). The GEE method estimates the regression parameters assuming that the observations are independent, uses the residuals from this model to estimate the correlations among observations from the same participants, and then uses the correlation estimates to obtain new estimates of the regression parameters. This model is comparable to the standard logistic regression model; however, it accounts for the presence of correlated data.

The model we tested used the following variables as predictors: condition (generic vs. neutral), age group (children vs. adults), domain (animals vs. artifacts), and their interactions. Results revealed that the likelihood of producing a generic utterance differed across condition, age group, and domain. Specifically, there was a main effect of condition, Wald χ^2 (1) = 45.36, $p < .001$, $Exp(\beta)$ = 2.97 (1.26, 7.02): as predicted the likelihood of producing a generic utterance was greater in the generic condition, when participants were explicitly prompted to produce generics, than in the neutral condition, when participants were not explicitly directed to produce generics. Results also revealed a main effect of age group, Wald χ^2 (1) = 4.57, $p = .033$, $Exp(\beta)$ = .66 (.29, 1.54), and a significant interaction of age group and condition, Wald χ^2 (1) = 12.01, $p < .001$, $Exp(\beta)$ = 8.91 (2.59, 30.69). Children were more likely to produce generics than were adults, and children were more sensitive to the manipulation of condition than were adults. Although for both children and adults the likelihood of producing a generic was greater in the generic than in the neutral condition, children showed a greater effect of condition than did adults. These differences most likely resulted from the fact that children were tested orally whereas adults were tested using a written format. Hearing a generic prompt served as a more powerful invitation to produce a generic response than did reading a generic prompt.

Most importantly, results also revealed a significant main effect of domain, Wald χ^2 (1) = 10.13, $p < .001$. The model estimates that the odds of producing a generic utterance about an animal are 51% greater than the odds of producing a generic about an artifact, $Exp(\beta)$ = 1.51 (1.17, 1.95). This effect of domain was consistent across age groups and across conditions: there were no interactions between domain and age group, Wald χ^2 (1) = .017, $p = .90$, domain and condition, Wald χ^2 (1) = .59, $p = .44$, or domain, age group, and condition, Wald χ^2 (1) = 1.42, $p = .23$ (see Table 1 for the mean proportion of generic utterances in each age group, condition, and domain)[1]. Thus, results show that, even with unfamiliar items about which participants have no prior knowledge, the likelihood of producing a generic utterance is greater for the domain of animals than for the domain of artifacts.

Are the domain differences related to the content of the properties generated?—Our next set of analyses examined the role of property content (surface versus deep properties) in the likelihood of producing a generic utterance about animals and artifacts. We asked whether domain differences in generic language use resulted from overall differences in the kinds of properties participants produced about animals versus artifacts: Were participants more likely to produce deep properties about animals than about artifacts? To examine this question, we modeled the likelihood of producing a deep property (generic or non-generic) using logistic regression. The GEE method was again used to account for the presence of correlated data.

The model we tested used the following variables as predictors: condition (generic vs. neutral), age group (children vs. adults), domain (animals vs. artifacts), and their interactions. Results revealed that the likelihood of producing a deep property indeed differed across age group. Specifically, there was a main effect of age group, Wald χ^2 (1) = 14.47, $p < .001$, $Exp(\beta)$ = .54 (.32, .90). The likelihood of generating a deep property was significantly higher for adults than for children. That children, as compared to adults, emphasized surface over deep properties is not surprising given the visual emphasis of the children's instructions (i.e., "Since Poppy can't see anything he needs your help to tell him about what's in the pictures").

Importantly, results also revealed a marginal main effect of domain, Wald χ^2 (1) = 3.46, p = .063, $Exp(\beta)$ = 1.17 (.92, 1.48). The odds of producing a deep property about an artifact were marginally greater than the odds of producing a deep property about an animal. This marginal effect of domain was consistent across age groups and across conditions: there were no interactions between domain and age group, Wald χ^2 (1) = .18, p = .67, domain and condition, Wald χ^2 (1) = .13, p = .72, or domain, age group, and condition, Wald χ^2 (1) = .017, p = .90. These data run counter to the argument that animals elicit more talk about deep properties and, because the generic form is used more often to express properties that are deep and essential, thus elicit more generics. Our data show that animals do not elicit more deep properties. Therefore, it cannot be the case that the domain-specificity of generic language is driven solely by overall differences in the kinds of properties animals and artifacts afford.

Does domain influence the likelihood of using the indefinite singular generic?—Our final set of analyses explored differences in the linguistic form of the generic language produced. Preliminary evidence from Gelman et al. (2008) has suggested that domain may interact with generic form: artifacts may elicit more generics in the indefinite singular form. To test whether this effect was present in our own data, we conducted an additional analysis examining the use of indefinite singular (e.g., "A luzak looks like a CD player") and bare plural (e.g., "What do luzaks do?") generics. Because children rarely produced indefinite singular generics (only 8 out of 24 children produced any singular generics; M = 1.12, SD = 2.30), only the adults were included in this analysis.

Using logistic regression, we modeled the likelihood of using the indefinite singular form when producing a generic. The GEE method was used to account for the presence of correlated data. The model used the following variables as predictors: condition (generic vs. neutral) and domain (animals vs. artifacts).

[1]To determine whether or not participants' ability to produce generics increased or decreased as the trials progressed, we conducted an analysis in which we compared the likelihood of producing a generic utterance about the first animal and artifact to the likelihood of producing a generic utterance about the last animal and artifact. The model we tested used the following variables as predictors: age group (children vs. adults), domain (animals vs. artifacts), order (first vs. last), and their interactions. Results revealed that the likelihood of producing a generic utterance remained relatively constant throughout the experiment. All effects involving order were nonsignificant.

Results revealed a main effect of domain, Wald χ^2 (1) = 15.64, $p < .001$. The model estimates that the odds of producing an indefinite singular generic about an artifact are .32 times the odds of producing an indefinite singular generic about an animal, *Exp(β)* = .32 (.18, .56). The mean proportion of generics about animals that took the indefinite singular form was .28 (*SD* = .35); the mean proportion of generics about artifacts that took the indefinite singular form was .50 (*SD* = .40). The main effect of condition was nonsignificant, Wald χ^2 (1) = .68, $p = .41$. Thus, consistent with Gelman et al. (2008), these results suggest that, although the domain of animals elicits more generic utterances overall, the domain of artifacts uniquely elicits more indefinite singular generics. We will return to this finding in greater detail in the General Discussion.

Discussion

Overall, the findings from Experiment 1 indicate that the domain-specificity of generic language use is not merely the result of participants' greater familiarity with and/or more extensive generic knowledge base about the specific animals and artifacts used as experimental stimuli. Our data demonstrate that children and adults are more likely to produce generic utterances about animals even when they are unfamiliar with the stimulus items. In addition, content analyses show that domain differences in generic language use cannot be explained by differences in the types of properties generated about animals versus artifacts. The greater likelihood of producing generics about animals results not from the kinds of properties participants generate but rather from whether or not participants generalize those properties. Taken together, the results of Experiment 1 are consistent with the hypothesis that generic language use reflects an abstract distinction between animals and artifacts.

Experiment 2

Experiment 1 controlled for the possibility that greater generic language use in the domain of animals resulted from differences in children's and adults' familiarity with or generic knowledge about the particular animals and artifacts used as stimuli. However, because the stimuli used in Experiment 1 were photographs of real animals and artifacts, there remain further differences between the animals and artifacts used as stimuli that may have contributed to domain differences in generic language use. For example, the animal stimuli may have elicited more generics due to greater complexity, differences in the number of features presented, or their similarity to familiar items. To control for this possibility, in Experiment 2 we created matched pairs of animals and artifacts designed to be as identical across domains as possible. Members of each pair were equated for the number and type of features presented, and were thus equally interesting and complex. If the domain differences in generic language use observed in Experiment 1 were simply due to incidental differences between the items selected for the two domains, then these effects should disappear in Experiment 2. In contrast, if domain differences in generic language use were due to more general differences in participants' expectations about animals and artifacts, then participants in Experiment 2 should also be more likely to produce generics about animals than about artifacts.

Method

Participants—Twenty-four preschoolers ranging in age from 49.90 to 63.00 months (*M* = 57.21 months; *SD* = 3.81 months, 12 males, 12 females) and 29 college students (20 males, 9 females) participated. Participants were predominantly European American and from middle income homes. All participants were residents of a small Midwestern city. Children were recruited from local preschools and adults were undergraduates at a large public university. None had participated in Experiment 1.

Materials—Twelve pairs of color drawings were created, each pair consisting of a novel animal and a novel artifact. Pairs were equated as closely as possible while maintaining the overall appearance of an animal or artifact, respectively (see Figure 2). Members of each pair were the same color and overall shape, possessed the same number of features, and were designed to be equally complex. A separate group of adults (n = 11) rated how similar each animal was to other animals they had seen before and how similar each object was to other objects they had seen before, using a scale from 1 to 7, with 1 indicating “Not at all similar” and 7 indicating “Extremely similar”. Participants confirmed that the animal stimuli were not viewed as more similar to familiar animals than the artifact stimuli were to familiar artifacts (*M*s = 3.41 and 2.98, respectively), $t(10) = 1.39$, $p = .20$, $d = .43$.

Pictures were divided into two sets of 12 pictures each containing 6 animals and 6 artifacts. Importantly, each set included only one member of each pair. Each participant viewed one set only and, thus, saw only one member of each pair. Pictures were presented in one of two semi-random orders such that no more than three items from each domain appeared sequentially.

Procedure

Children: The procedure was identical to that in Experiment 1, with two modifications. First, because of the total novelty (and potential ambiguity) of the experimental stimuli, the experimenter provided children with the superordinate category of each item as she introduced it. Animals were introduced as “animals” (e.g., “This is a kind of animal called a modie”) and artifacts were introduced as “toys” (e.g., “This is a kind of toy called a krivel”). Because children are unfamiliar with the superordinate category “artifact,” an alternative category was necessary. We needed a single category that was clearly inanimate but that, like the category “animals,” was highly familiar to young children and could cover a wide range of items. The category “toys” was selected as best fitting these criteria.

The second modification to the procedure in Experiment 2 was regarding the request for questions. Children tested in Experiment 1 did not seem to understand the request for questions about the animals and artifacts (e.g., “Do you have any questions about krivels? What would you like to know about krivels?” or “Do you have any questions? What would you like to know?”). In response to these prompts, the majority of children repeatedly responded that they did not have any questions. Due to the failure of the question-eliciting attempt in Experiment 1, children in Experiment 2 were not specifically prompted to ask questions about the items.

Adults: Parts 1 and 2 of the procedure were identical to those in Experiment 1 with one exception. As in the procedure for the children, items were introduced with the superordinate categories “animal” (e.g., “This is a kind of animal called a krivel”) and “toy” (e.g., “This is a kind of toy called a krivel”). In addition, because the stimuli in Experiment 2 were completely novel, in Part 3 adults were not asked to identify familiar items. Instead, participants were asked to indicate the complexity of each item on a scale from 1 to 7, with 1 indicating that the animal or toy is “Not at all complex” and 7 indicating that the animal or toy is “Extremely complex” (see Table 2 for complexity ratings).

Transcribing and coding: Transcribing and coding procedures were identical to those in Experiment 1. However, because the artifacts were given the superordinate category label “toy,” artifact statements were evaluated based on whether or not they expressed properties that are true of all toys. Six utterances were deemed true of all members of the superordinate category and were hence eliminated from further analyses (*Animals*: “They have bodies,” “They have a body,” and “Reesles have baby reesles”; *Toys*: “You can play with them,” “You have to put them away,” and “Taifels are toys”).

A second coder coded the responses of 33% of the children and adults. Disagreements were resolved by discussion. Cohen's kappas were .97 (picture-relevant or not), .98 (explicit reference to the target animal or artifact or not), .97 (generic plural, generic singular, non-generic), and .87 (surface, deep, both, other), indicating high inter-rater reliability.

Results

Was the experimental manipulation successful in eliciting generic language?— Overall, the experimental manipulation was successful in eliciting generic language. Sixteen out of 24 children and 18 out of 29 adults produced at least one generic noun phrase during the course of the experiment. Frequencies of generic utterances ranged from 0 to 48 for children ($M = 12.33$, $SD = 15.27$) and from 0 to 85 for adults ($M = 21.69$, $SD = 28.00$). Participants again produced quite a range of generic properties, including mention of color, parts, shape, texture, and behavior/function.

Were the animal and artifact stimuli equivalent in complexity?— Because Experiment 2 rests on comparing talk about matched pairs of animals and artifacts that were designed to be equal in complexity, our first step was to compare the complexity ratings provided by adults for the animal and artifact pairs (see Table 2). Of the 12 matched pairs, two pairs differed significantly in complexity (Luzak: $t(13) = 2.25$, $p = .028$; Taifel: $t(13) = 5.10$, $p < .001$). In both cases the artifact was rated as more complex than the animal. This complexity difference actually works against our hypothesis, because greater complexity for artifacts may allow more opportunities for generic talk about artifacts. Comparisons across pairs, however, revealed that, overall, animals and artifacts did not differ significantly in complexity.

Did children construe the animal and artifact stimuli as intended?— Due to the ambiguous nature of our stimuli, our first concern was whether children and adults interpreted our stimuli as intended (i.e., animals as animals, artifacts as artifacts). Upon close analysis of both children's and adults' transcripts, we discovered that in many cases children were misconstruing the artifacts as animals. In fact, all 24 children described at least one of the artifacts as if it were an animal (e.g., “They have silly toes”; “Where are his eyes?”). To maintain a clear domain distinction, we include in our analyses only those items that were interpreted as intended (i.e., artifacts interpreted as artifacts). Items were removed from an individual child's analyses if he or she: (1) stated that the toy possessed features that only belong to animals (e.g., eyes, a face, a head); (2) used a gendered pronoun (i.e., “he” or “she”) to describe the toy; (3) assigned the toy membership in an animate category (e.g., “It's a fish”; “These are aliens”); or (4) endowed the toy with the capacity for animate behaviors (e.g., “They eat like this”; “And it can fly away”). On average 9.48 ($SD = 8.01$) utterances per child were removed from the transcripts, constituting an average loss of 47.4% ($SD = 25.9$) of the target utterances about artifacts.

Do domain, condition, and/or age group influence the likelihood of producing a generic utterance?— As in Experiment 1, our central question was whether children and adults were more likely to produce generic utterances about animals than about artifacts. In order to model the likelihood of producing a generic utterance, a logistic regression was conducted. The GEE method was again used to account for the presence of correlated data.

The model we tested used the following variables as predictors: condition (generic vs. neutral), age group (children vs. adults), domain (animals vs. artifacts), and their interactions. Results revealed that the likelihood of producing a generic utterance differed across condition and domain. Specifically, there was a main effect of condition, Wald $\chi^2(1) = 7.60$, $p = .006$, $Exp(\beta) = 5.44$ (1.63, 18.12): as predicted, the likelihood of producing a generic utterance was greater in the generic condition, when participants were explicitly prompted to produce generics, than in the neutral condition, when participants were not explicitly directed to produce generics. The main effect of age group, Wald χ^2 (1) = .15, p = .70, and the age group by condition interaction, Wald χ^2 (1) = .15, p = .70, were nonsignificant.

Most importantly, results also revealed a significant main effect of domain, Wald χ^2 (1) = 15.30, $p < .001$. The model estimates that the odds of producing a generic utterance about an animal are 67% greater than the odds of producing a generic about an artifact, $Exp(\beta)$ = 1.67 (1.29, 2.16). This effect of domain was consistent across age groups and across conditions: there were no interactions between domain and age group, Wald χ^2 (1) = .16, p = .69, domain and condition, Wald χ^2 (1) = .24, p = .63, or domain, age group, and condition, Wald χ^2 (1) = .94, p = .33 (see Table 1 for the mean proportion of generic utterances in each age group, condition, and domain)[2]. Our findings demonstrate that even when stimuli are matched pairs of novel animals and artifacts designed to be as identical across domains as possible, the likelihood of producing a generic about animals is greater than the likelihood of producing a generic about artifacts.

Does domain influence the likelihood of producing a generic utterance across matched pairs?—The matched pair design of Experiment 2 allowed us to explore whether the effect of domain held up across item pairs as well as across participants. To test this question, a logistic regression was conducted in which we modeled the effect of domain on the likelihood of producing a generic utterance. The GEE method was again used to account for the presence of correlated data across members of each pair. Results revealed that the likelihood of producing a generic utterance differed across domain, Wald χ^2 (1) = 17.28, $p < .001$. The model estimates that the odds of producing a generic about the animal members of the pairs are 43% greater than the odds of producing a generic about the artifact members of the pairs, $Exp(\beta)$ = 1.43 (1.21, 1.70). This pattern of results provides additional evidence that when animal and artifact stimuli are equated in complexity and in the number and appearance of features presented, the likelihood of producing a generic is greater for animals than for artifacts.

Are the domain differences related to the content of the properties generated?—Our next set of analyses examined the role of property content (surface versus deep properties) in the likelihood of producing a generic utterance about animals and artifacts. We first considered whether domain differences in generic language use resulted from overall differences in the kinds of properties participants produced about animals versus artifacts: were participants more likely to produce deep properties about animals than about artifacts? To examine this question, we modeled the likelihood of producing a deep property (generic or non-generic) using logistic regression. The GEE method was again used to account for the presence of correlated data.

The model we tested used the following variables as predictors: condition (generic vs. neutral), age group (children vs. adults), domain (animals vs. artifacts), and their interactions. The only significant effect was a main effect of age group, Wald χ^2 (1) = 12.81, $p < .001$, $Exp(\beta)$ = .32 (.18, .60). The likelihood of generating a deep property was significantly higher for adults than for children. That children as compared to adults emphasized surface over deep properties is not surprising given the visual emphasis of the children's instructions (i.e., “Since Poppy can't see anything he needs your help to tell him about what's in the pictures”). Importantly, results also showed that the main effect of domain was nonsignificant, Wald χ^2 (1) = .039, p = .84: there was no effect of domain on the likelihood of producing a deep property. All other main

[2]To determine whether or not participants' ability to produce generics increased or decreased as the trials progressed, we conducted an analysis in which we compared the likelihood of producing a generic utterance about the first animal and artifact to the likelihood of producing a generic utterance about the last animal and artifact. The model we tested used the following variables as predictors: age group (children vs. adults), domain (animals vs. artifacts), order (first vs. last), and their interactions. Results revealed a significant interaction between order and domain, Wald χ^2 (1) = 4.19, p = .04, $Exp(\beta)$ = .49 (.26, .94). However, in neither domain was the effect of order significant.

effects and interactions were also nonsignificant (condition: Wald χ^2 (1) = .22, p = .64; age group by condition: Wald χ^2 (1) = .57, p = .84; condition by domain: Wald χ^2 (1) = 2.43, p = .12; age group by condition by domain: Wald χ^2 (1) = 3.21, p = .075). These data run counter to the argument that animals elicit more talk about deep properties and, because the generic form is used more often to express properties that are deep and essential, thus elicit more generics. Our data show that animals do not elicit more deep properties than artifacts do. Thus, domain differences in generic language use are not merely a function of the kinds of properties animals and artifacts afford.

Does domain influence the likelihood of using the indefinite singular generic?—In our final set of analyses, we again explored the effect of domain on the likelihood of producing an indefinite singular generic. Because children rarely produced singular generics (only 2 out of 24 children produced any singular generics; M = .21, SD = .83), only the adults were included in this analysis. Using logistic regression, we modeled the likelihood of using the indefinite singular form when producing a generic. The GEE method was again used to account for the presence of correlated data. The model used the following variables as predictors: condition (generic vs. neutral), domain (animals vs. artifacts), and their interaction.

Results revealed a main effect of domain, Wald χ^2 (1) = 14.32, $p < .001$. The model estimates that the odds of using an indefinite singular generic about an artifact are .29 times the odds of using an indefinite singular generic about an animal, $Exp(\beta)$ = .29 (.17, .51). The mean proportion of generics about animals that took the indefinite singular form was .16 (SD = .30), whereas the mean proportion of generics about artifacts that took the indefinite singular form was .27 (SD = .32). The main effect of condition, Wald χ^2 (1) = .94, p = .33, and the interaction of condition and domain, Wald χ^2 (1) = .39, p = .53, were nonsignificant. These results again suggest that, although the domain of animals elicits more generic utterances overall, the domain of artifacts elicits more singular generics. We will return to this finding in greater detail in the General Discussion.

Discussion

Overall, the findings from Experiment 2 indicate that the domain-specificity of generic language use cannot be explained fully by differences in the familiarity, complexity, number of features, or overall perceptual appearance of the animal and artifact stimuli. Our findings demonstrate that even when stimuli are matched pairs of novel animals and artifacts designed to be as identical across domains as possible, the likelihood of producing a generic for animals is greater than that for artifacts. Moreover, content analyses also show that domain differences in generic language use cannot be explained by domain differences in the likelihood of generating deep properties: participants were no more likely to produce a deep property about animals than artifacts. Instead, domain differences appear to be a consequence of the ways in which participants generalized properties of animals and artifacts. Thus, as in Experiment 1, the results of Experiment 2 are consistent with the hypothesis that generic language use reflects an abstract differentiation between animals and artifacts.

As mentioned earlier, many children in Experiment 2 failed to construe the artifact stimuli as inanimate. There are at least three possible reasons why children described the toys as if they were animals. First, the items may have looked too animate. Because the animal and artifact drawings were designed to be nearly identical, the toys possessed features that could be mistakenly interpreted as animal features (e.g., arms, legs, noses). Perceptual features such as these have been argued to play a major role in whether children construe an object as an animal or an artifact (e.g., Rakison & Butterworth, 1998; Rakison & Poulin-Dubois, 2001). Second, the superordinate category label "toy" may have allowed for these items to be construed as representations of animals, much like a stuffed dog is a toy but can be talked about as if it were an actual dog because it represents an actual dog (see Gelman & Ebeling, 1998; Jones & Smith, 1993). Finally, the fact that animals and toys were introduced in a semirandom order rather than in blocks may have made it harder for children to keep the domains distinct. This lack of transparency of the novel items may have influenced children's language production. Specifically, it is possible that the lack of transparency of the novel artifact stimuli decreased the likelihood that children would generalize the artifact properties. To further examine this possibility, in Experiment 3, we attempt to correct these issues with the interpretation of the animal and artifact stimuli and to present a clearer test for young children.

Experiment 3

The purpose of Experiment 3 was to decrease the likelihood that children would interpret the artifact stimuli as animate. We did so by making subtle adjustments to the stimuli and procedure. In Experiment 3, we asked: When novel stimuli are correctly interpreted as animals or artifacts, will preschoolers be more likely to produce generics about animals than about artifacts?

Method

Participants—Sixteen preschoolers ranging in age from 48.80 to 65.50 months (M = 58.30 months; SD = 5.08 months; 9 males, 7 females) participated. Participants were predominantly European American and from middle income homes. All participants were residents of a small Midwestern city and were recruited from local preschools. None had participated in Experiments 1 or 2.

Materials—Experiment 3 used the same stimuli as in Experiment 2, except the artifact stimuli were modified slightly to appear less animate. For example, features children interpreted as eyes (e.g., screws, buttons) were modified to appear less eye-like, and appendages and overall shape were adjusted to be more angular. Pairs remained equated for complexity and number of features (see Figure 3). A separate group of adults (n = 11) rated how similar each animal was to other animals they had seen before and how similar each object was to other objects they had seen before, using a scale from 1 to 7, with 1 indicating "Not at all similar" and 7 indicating "Extremely similar". Participants confirmed that the animal stimuli were not viewed as more similar to familiar animals than the artifact stimuli were to familiar artifacts (*M*s = 3.70 and 3.00, respectively), $t(10) = 1.55$, $p = .15$, $d = .27$.

Procedure—The procedure was identical to that in Experiment 2 with three modifications. First, to decrease the likelihood that artifacts were construed as animals, instead of presenting the pictures in a semi-random order as in Experiment 2, animal and artifact stimuli in Experiment 3 were blocked such that participants saw all six artifacts followed by all six animals or vice versa. The order of the blocks was counterbalanced across subjects.

Second, to correct for the possibility that the superordinate category "toy" in Experiment 2 was too vague or too open to an animate interpretation (e.g., stuffed animals, toy animals), in Experiment 3 each item was assigned a specific, inanimate superordinate category. Artifact superordinate categories included: furniture, tools, musical instruments, games, vehicles, and machines (see Figure 3). Thus, for example, children were told, "This is a kind of furniture called a krivel. What can you tell Poppy about krivels?"

Finally, because the generic condition in Experiment 2 proved more powerful than the neutral condition at eliciting generics and domain differences, in Experiment 3, all participants were assigned to the generic condition.

Transcribing and coding: Transcribing and coding procedures were identical to those in Experiment 1. However, because the superordinate category labels differed among the artifact stimuli, statements were evaluated based on whether or not they expressed properties that are true of all furniture, tools, musical instruments, games, vehicles, and machines, respectively. Five utterances were deemed true of all members of the superordinate category and were hence eliminated from further analyses (*Animals*: "They eat" and "They look for something to eat"; *Tools*: "You try and fix something with it" and "You can fix things with it"; *Musical Instruments*: "It makes music").

A second coder coded the responses of 33% of the children. Disagreements were resolved by discussion. Cohen's kappas were .96 (picture-relevant or not), .96 (explicit reference to the target animal or artifact or not), .99 (generic plural, generic singular, non-generic), and .91 (surface, deep, both, other), indicating high inter-rater reliability.

Results

Was the experimental manipulation successful in eliciting generic language?— Overall, the experimental manipulation was successful in eliciting generic language. All 16 participants produced at least one generic noun phrase during the course of the experiment. Frequencies of generic utterances ranged from 3 to 99 ($M = 28.25$, $SD = 24.39$). Children again produced quite a range of generic properties, including mention of color, parts, shape, texture, and behavior/function.

Did children misconstrue the artifact stimuli as animate?—The first major issue of concern was whether the modifications made to the stimuli and procedure in Experiment 3 decreased the frequency with which children misinterpreted the artifact stimuli. To address this question, we identified each utterance in which an artifact was referred to in animate terms. Our data show that many children continued to refer to some of the artifacts in animate terms. Specifically, 9 out of the 16 children interpreted at least one artifact as if it were animate (e.g., "They kind of look like they have hands"). Nonetheless, overall, the domain manipulation was more successful in Experiment 3. Whereas in Experiment 2, 9 out of 24 children interpreted more than 3 items inappropriately, in Experiment 3, none of the children did so. Moreover, whereas in Experiment 2 children interpreted the artifact stimuli inappropriately 51% of the time, in Experiment 3, children did so only 26% of the time, a statistically significant decrease, $t(38) = 2.92$, $p = .003$, $d = .95$. Thus, although our modifications to the stimuli and procedure in Experiment 3 did not eliminate entirely the problem of misconstruing artifacts as animals, they did improve the success of the domain manipulation. Accordingly, data from all children on all responses are included in subsequent analyses.

Does domain influence the likelihood of producing a generic utterance?—As before, our central question was whether children and adults were more likely to produce generic utterances about animals than about artifacts. In order to model the likelihood of producing a generic utterance, a logistic regression was conducted with domain as the only predictor variable. The GEE method was again used to account for the presence of correlated data. Results revealed that the likelihood of producing a generic utterance differed across domain, Wald χ^2 (1) = 7.92, $p = .005$. The model estimates that the odds of producing a generic utterance about an animal are 68% greater than the odds of producing a generic about an artifact, $Exp(\beta) = 1.68$ (1.17, 2.41) (see Table 1)[3]. Thus, as in Experiment 2, when stimuli were matched

[3]To determine whether or not children's ability to produce generics increased or decreased as the trials progressed, we conducted an analysis in which we compared the likelihood of producing a generic utterance about the first animal and artifact to the likelihood of producing a generic utterance about the last animal and artifact. The model we tested used the following variables as predictors: domain (animals vs. artifacts), order (first vs. last), and their interaction. Results revealed that the likelihood of producing a generic utterance remained relatively constant throughout the experiment. All effects involving order were nonsignificant.

pairs of novel animals and artifacts designed to be as identical across domains as possible, domain influenced the likelihood of preschoolers using generics about animals versus artifacts.

Does domain influence the likelihood of producing a generic utterance across matched pairs?—As in Experiment 2, the matched pair design of Experiment 3 allowed us to explore whether the effect of domain held up across item pairs as well as across participants. To test this question, a logistic regression was conducted in which we modeled the effect of domain on the likelihood of producing a generic utterance. The GEE method was again used to account for the presence of correlated data across members of each pair. Results revealed that the likelihood of producing a generic utterance differed across domain, Wald χ^2 (1) = 4.05, p = .044. The model estimates that the odds of producing a generic about the animal members of the pairs are more than double the odds of producing a generic about the artifact members of the pairs, $Exp(\beta)$ = 2.55 (1.02, 6.33). This pattern of results provides additional evidence that when animal and artifact stimuli are equated in complexity and in the number and appearance of features presented, the likelihood of producing a generic is greater for animals than for artifacts.

Are the domain differences related to the content of the properties generated?—Our final set of analyses examined the role of property content (surface versus deep properties) in the likelihood of producing a generic utterance about animals and artifacts. We first considered whether domain differences in generic language use resulted from overall differences in the kinds of properties participants produced about animals versus artifacts (i.e., were children more likely to produce deep properties about animals than about artifacts?). Using logistic regression, we modeled the likelihood of producing a deep property (generic or non-generic) across domains. The GEE method was used to account for the presence of correlated data. Results showed that the main effect of domain was nonsignificant, Wald χ^2 (1) = .022, p = .88: there was no effect of domain on the likelihood of children producing a deep property. These data run counter to the argument that animals elicit more talk about deep properties and, because the generic form is used more often to express properties that are deep and essential, thus elicit more generics. In contrast, our data show that animals do not elicit more deep properties than artifacts do. As in Experiments 1 and 2, domain differences in generic language use cannot merely be a function of the kinds of properties animals and artifacts afford.

Discussion

Overall, the results from Experiment 3 extend those found in Experiments 1 and 2. Our findings indicate that when stimuli are matched pairs of novel animals and artifacts designed to be as identical across domains as possible, and when those stimuli are viewed as members of the intended superordinate category, the likelihood of children producing a generic about animals is greater than the likelihood of producing a generic about artifacts. Content analyses also show that domain differences in generic language use cannot be explained by domain differences in the likelihood of generating deep properties: children are no more likely to produce deep properties about animals than about artifacts. Thus, as in Experiments 1 and 2, the results of Experiment 3 are consistent with the hypothesis that generic language use reflects an abstract differentiation between animal and artifact concepts.

It is important to note that several children in Experiment 3 still experienced some difficulty interpreting the ontological status of a subset of the artifact stimuli. Although it is possible that this lack of transparency may have decreased the likelihood of children generalizing properties of the artifacts used in Experiments 2 and 3, this cannot explain the domain-specificity of generic language use more broadly. The greater likelihood of producing generics for animals than artifacts has now been shown in children and adults with novel stimuli (Experiments 2 and 3), with real but unfamiliar stimuli (Experiment 1), and with familiar animals and artifacts

(Gelman et al., 1998; Gelman et al., 2008; Gelman & Tardif, 1998; Goldin-Meadow et al., 2005).

General Discussion

Research on generics has demonstrated that, although there are no formal linguistic restrictions on which content domains can receive generic expression, children and adults consistently produce more generics for the domain of animals than for the domain of artifacts (e.g., Gelman et al. 1998; Gelman et al, 2008; Gelman & Tardif, 1998; Goldin-Meadow et al., 2005). However, because all prior research has considered generics produced about *familiar* animals and artifacts, to date it has been impossible to rule out the hypothesis that the domain-specificity of generic language use reflects differences in participants' familiarity with or factual knowledge about the particular experimental stimuli being discussed. In the current studies we presented novel animals and artifacts about which participants have equivalent (lack of) knowledge and asked whether domain differences in generic language use remain.

We found that even when stimuli were controlled for familiarity and prior knowledge (Experiment 1) and for complexity, number of features presented, and overall appearance (Experiments 2 and 3), preschoolers and adults were significantly more likely to produce generics about animals than about artifacts. This was the case both when participants were explicitly prompted to construe the animals and artifacts as kinds (in the generic condition) and when they were free to construe the animals and artifacts as kinds or as individuals (in the neutral condition). That children and adults are still more likely to produce generics for novel animals than for novel artifacts given highly controlled stimuli and no prior knowledge rules out a number of low-level explanations for the domain-specificity of generic language use.

The current experiments also explored the extent to which the *content* of propositions expressed about animals versus artifacts might contribute to domain differences in generic language use. Because generics typically express properties that are deep and essential rather than accidental, transient, or individually- or contextually-bound (Dahl, 1975), the domain differences in generic language use could be explained by differences in the kinds of properties participants chose to generate about animals versus artifacts: Participants could have produced more generic utterances about animals than artifacts simply because they were expressing more deep properties of animals and more surface properties of artifacts. However, this did not prove to be the case. Results of the content analyses revealed that children and adults generated both surface properties that were visible in the pictures (e.g., parts, color, size, shape, texture, patterning, attractiveness) and also deep, less obvious properties (e.g., traits, behavior, use, function, taxonomy, habitat, inventor). Moreover, both children and adults expressed some of those surface and deep properties in generic form. Importantly, content analyses revealed that domain did not influence the likelihood of producing a deep property. In Experiments 2 and 3, participants were equally likely to produce a deep property for animals and artifacts; and in Experiment 1, participants were actually marginally more likely to produce a deep property for artifacts than for animals. These results demonstrate that it is not simply the case that domain differences in generic language use are a direct consequence of the kinds of properties one can generate about animals versus artifacts (i.e., more deep properties for animals than artifacts).

Possible explanations for domain effects

Although our experiments have ruled out several explanations for these domain effects, the central question remains: Why do preschoolers and adults produce more generics about animals than about artifacts? One rich interpretation, which we favor, is that the domain-specificity of generic language use is driven by a set of early-developing conceptual assumptions about the nature and structure of animal and artifact concepts. On this view, children's generic language use reflects their expectation that animal concepts are more richly structured, coherent, and "kind-like" than artifact concepts. In support of this hypothesis, research has demonstrated that by the age of 3 or 4, children have naive theories about the ways in which animals and artifacts differ, including in their internal parts (Gelman, 1990; Simons & Keil, 1995), identity (Keil, 1989), inheritance (Hirschfeld, 1996; Springer, 1992), origins (Gelman & Kremer, 1991; Keil, 1989), self-generated movement (R. Gelman et al, 1995; Massey & R. Gelman, 1988), and spontaneous growth and healing (Backscheider et al., 1993; Rosengren et al., 1991). For example, children believe that animals have richly structured internal parts that differ from their exteriors and cause self-generated motion, whereas artifacts have the same parts inside and outside and their inner parts are unrelated to movement (R. Gelman et al, 1995; Massey & R. Gelman, 1988). They believe that animals originate by means of a natural, self-generated process and inherit properties such as coloring and size from their biological parents; artifacts, on the other hand, originate by means of a human creator. Children believe that animals retain their identity across transformations whereas artifacts do not. Finally, young children expect that animals grow and heal according to predictable and internally prompted patterns; whereas artifacts require external agents of change. Together these beliefs converge on an early emerging expectation that animal kinds are more richly structured, essentialized, coherent, and "kind-like" than are artifact kinds.

On this view, there are at least two theoretically distinct, yet related reasons why animals may be treated as better candidates for generics. The first is that the domain of animals more readily lends itself to the consideration of kinds (Diesendruck et al., 1998; Gelman, 1988; Keil, 1989). On this view, based on their theoretical assumptions about animals and artifacts, participants more readily construe animals as kinds (instead of as individuals) and, because properties of kinds are commonly expressed in the generic form, participants use generics more in the domain of animals than in the domain of artifacts. We already know that different contexts can affect children's tendency to think about items as kinds versus individuals. For example, picture-book reading tends to encourage a focus on kinds, whereas object play tends to encourage a focus on individuals (Gelman, Chesnick, & Waxman, 2005). It may be that domain exerts a similar effect.

A second, distinct possibility is that—controlling for the tendency to construe animals and artifacts as kinds—children and adults may regard animal kinds as having more predictive power (deeper similarities, greater coherence, etc.) than artifact kinds. On this view, participants may use more generics in conversation regarding animals because they believe more properties of animals are generalizable and thus can be expressed in generic form. Although these hypotheses are theoretically distinct, with regard to the current experiments both predict a greater likelihood of producing generics about animals than about artifacts. Our data do not speak to the question of which hypothesis (if either) is responsible for the observed effects. Nonetheless, our data are consistent with this broader claim that children's and adults' generic language use reflects an expectation about the nature and structure of not only familiar but also novel animal and artifact kinds.

Although we favor the hypothesis that early developing conceptual differences underlie generic language use in both children and adults, there are alternative explanations for our findings that do not attribute naïve theories about animals and artifacts to preschoolers. One such possibility is that this generic language bias may exist for different reasons in children than in adults. That is, adults' generic language use may reflect a deep conceptual difference between animals and artifacts, whereas children's generic language use may simply be a reproduction of the statistical pattern found in adult speech. There is a great deal of evidence showing that infants and young children can readily learn statistical regularities present in the input (e.g., Gopnik & Schultz, 2007; Saffran, Aslin, & Newport, 1996; Xu & Tennenbaum, 2007). Thus, it may be that children abstract this domain-specific pattern of generic language use from adult speech and reproduce it in their own speech.

One preliminary piece of evidence against this view is that children produce a greater proportion of generics about animals than about artifacts even when they lack adult language input. Goldin-Meadow et al. (2005) studied the generic language use of American and Chinese children who were profoundly deaf, had received no signing input, and had created their own system of communicative gestures—"home sign". Goldin-Meadow et al. found that the home signs of these deaf children included gestures that referred to kinds, and that more of the kind-referring gestures were about animals than about artifacts. That deaf children who lack an adult model of generic language use spontaneously reproduce this domain-specific pattern provides compelling evidence against the argument that children's generic language use is simply a replication of the statistics found in adult speech. Nevertheless, these findings must be interpreted cautiously because it is impossible to definitively categorize a gesture in home sign as generic or nongeneric.

How could domain-specific patterns of generic language use be built up through statistical learning? Extracting a rule about what kind of language to use with what kind of thing would require computing statistical links between domain (animal vs. artifact) and language use (generic vs. specific reference). Cues to domain are readily available in the perceptual world. For example, animals typically have eyes, faces, and curvilinear contours and artifacts do not. Research has shown that even infants attend to these features and can use them to distinguish animals from artifacts (e.g., Rakison & Butterworth, 1998; Rakison & Poulin-Dubois, 2001). The rules of generic language use, however, are less transparent in the input provided to children. Most notably, there is no single linguistic form or marker to indicate genericity (Carlson & Pelletier, 1995; Gelman, 2004). Generics are expressed (in English) using bare plurals, indefinite singulars, and definite singulars.

Nevertheless, by correlating regularities in the input language with regularities in the perceptual world, children could learn a rule relating domain to generic language use. For example, children could learn that things with eyes are more commonly described using bare plural generic nouns than are things without eyes. Because perceptual cues to domain (e.g., eyes vs. no eyes) were available in our stimuli, this reduced rule is sufficient to explain our pattern of results. Thus, our data are consistent with the hypothesis that preschoolers' greater generic use in the animal domain is a developmental product of a sophisticated learning mechanism capable of creating an association between perceptual cues to domain and the use of generic versus specific language.

Another alternative to the view that early developing conceptual differences underlie generic language use is the possibility that our pattern of results derives from differences in the amount of direct experience people have with animals and artifacts. That is, it is likely that people in urban, industrialized societies have more direct and frequent experience with a range of artifact kinds (e.g., cups, chairs, shoes, bowls, books, computers, pillows, paper clips) than with a range of animal kinds (e.g., the family pet, an occasional bird or squirrel). At least in middle-class urban and suburban Western contexts, experience with animals (beyond humans and the family pet) comes mainly from books and zoos. As a result, people may have many opportunities to observe first-hand the affordances, functions, and properties of artifacts (e.g., that cups are for drinking, chairs are for sitting), and significantly fewer opportunities to directly observe the properties of animals. If indeed people generally have less direct experience with animals, properties of animals may be unlikely to be observed directly and thus more likely to be communicated via generic language. For example, a parent may be more likely to use the generic form to tell a child about generic properties of tigers than about generic properties of tables, because the child has already gleaned for herself much of what there is to know about tables. Consistent with this hypothesis, research has shown that the less one can interact directly with an item, the more one is likely to produce generic language about that item (Gelman et al., 2005). For example, pictures of objects (which cannot be interacted with directly) elicit more generics than do three-dimensional objects. In addition, when three-dimensional objects are encased in Plexiglas boxes (reducing the amount of direct interaction possible), generic language use declines (Gelman et al., 2005).

Although this direct experience view easily explains domain differences in the generics produced about familiar items in naturalistic contexts, it is less clear how it explains the domain differences observed in the current experiments—in which participants discussed completely novel items with which they had no direct experience. One way to explain our results using a direct-experience account is to assume that on the basis of prior experience with familiar animals and artifacts, children and adults come to associate direct experience (and, thus, non-generic language use) with artifacts and indirect experience (and, thus, generic language use) with animals. This learned association between domain (animal vs. artifact, objects with eyes vs. objects without eyes), type of experience (indirect vs. direct), and type of language use (generic vs. specific reference) could lead to a general tendency to use more generics about animals than artifacts even when those items are completely novel and participants' experience with them is equally direct (or indirect). On this view, domain-specific generic language use is not driven by naïve theories about animals and artifacts, but rather by experience and learned associations.

Thus, although the experiments presented here demonstrate the robustness of a domain difference in generic use and furthermore rule out the possibility that domain-specific generic language use is based wholly on specific knowledge about particular animal and artifact categories, it remains an open question whether this pattern of language use reflects statistical learning and experience or an early-developing, theory-driven conceptual distinction. Future research examining the role of perceptual features in cuing generic language use may shed light upon this issue. In the experiments presented here both linguistic cues (i.e., providing the superordinate category label “animal” or “toy”; Experiments 2 and 3) and perceptual cues (e.g., eyes, legs, for animals; buttons, screws, for artifacts; all experiments) to domain were available; therefore greater generic use in the animal domain may result from a learned association between perceptual cues to domain (e.g., eyes) and the use of generics. It remains to be seen whether linguistic cues labeling an item's ontological category alone are sufficient to produce a domain difference in generic language use. If the domain differences observed here are the results of a learned association, then in the absence of perceptual cues to domain there should be no difference in the likelihood of producing generics about animals and artifacts. In contrast, if a theory-driven, conceptual distinction underlies the domain differences in generic use, then the knowledge and expectations captured by the superordinate category label “animal” should be enough to trigger these domain differences. Future research can help tease apart these conflicting hypotheses by exploring how children and adults talk about animals and artifacts that are perceptually identical.

Research on children's and adults' use of generics about inanimate natural kinds may also prove informative. To date, research on the domain-specificity of generic language use has focused on the clearest conceptual divide—that between animals and human-made artifacts. Inanimate natural kinds (e.g., rocks, trees, water) have received far less attention (but see Gelman et al., 2008). Nevertheless, inanimate natural kinds provide an interesting test case. From a conceptual standpoint, inanimate natural kind concepts should be more like animal concepts. Inanimate natural kinds are based in nature, they are discovered rather than invented, and they capture many nonobvious properties. Thus, like animals, they should be construed as more richly structured and “kind-like”, with deeper similarities and greater coherence than artifact categories (see Atran, 1990; Au, 1994; Barrett, 2001; Carey, 1985; Malt, 1994; and Putnam, 1975 for discussions of biological and nonbiological, inanimate natural kind concepts). From a perceptual perspective, however, inanimate natural kinds lack the distinctive features associated with animals (e.g., eyes, faces) and thus may be more similar to artifacts. Finally, from an experiential perspective, inanimate natural kinds are more similar to human-made artifact kinds in that, as compared to animal kinds, people typically have more direct and frequent experience with and thus more opportunities to observe firsthand the properties of inanimate natural kinds (e.g., water, trees, grass, dirt, rocks).

If the domain differences observed in the current experiments are driven by conceptual differences between animals and artifacts, because of the greater conceptual similarity between animate and inanimate natural kind concepts, the generic language use about inanimate natural kinds should be more similar to that of animals than that of artifacts. In contrast, if these domain differences are driven by a learned association between perceptual cues to animacy and generic language use or by the amount of direct experience the target item affords, because of the greater perceptual and experiential similarity between inanimate natural kinds and artifacts, generic language use about inanimate natural kinds should be more similar to that of artifacts than that of animals. Thus, research on children's and adults use of generics for inanimate natural kinds may help tease apart these varying explanations and reveal the developmental origins of the domain-specificity of generic language use.

Interaction of domain and generic form (singular vs. plural)

Another important set of findings from the current experiments is the interaction of domain and generic form. Consistent with Gelman et al. (2008), in Experiments 1 and 2 we found that, although the likelihood of producing a generic was significantly greater for animals than for artifacts, the likelihood of producing a generic in the indefinite singular form was significantly greater for artifacts than for animals. What accounts for this interaction?

Linguists have argued that bare plural and indefinite singular generics differ not only in syntactic form, but also in semantic implications (e.g., Burton Roberts, 1977; Carlson, 1995; Cohen, 2001; Declerk, 1991; Greenberg, 2003; Krifka, 1987; Lawler, 1973). Specifically, unlike bare plural generics which can express *any* nonaccidental property, indefinite singular generics are restricted to properties that are in some sense necessary, essential, or inherent. Likewise, whereas bare plural generics express that a certain nonaccidental generalization is the case *in reality*, indefinite singular generics express that a certain nonaccidental generalization is the case *in principle* or *by definition*. Consider the following example: the bare plural statement "*Italian restaurants* are closed tonight" carries the generic reading that it is the case that—for some non-accidental reason—all/most typical Italian restaurants are closed on the night of utterance; in contrast, the indefinite singular statement "*An Italian restaurant* is closed tonight" fails to carry a generic reading because it does not express an essential or inherent property that is true by definition (Greenberg, 2003). Thus, whereas generics with bare plural subjects tend to carry a descriptive or an inductive flavor (e.g., [*Based on my experience with reality it is such that*] Chairs are for sitting/Gentlemen open doors for ladies), generics with indefinite singular subjects tend to carry a more analytic, normative, definitional, or law-like flavor (e.g., [*In principle or by definition*] A chair is for sitting/A gentleman opens doors for ladies).

Given that both animal and artifact generics can be expressed with either the bare plural or indefinite singular form, the pattern of results observed in Experiments 1 and 2 was not in any sense forced by the structure of the language; instead it was a choice on the part of the participants. The choice to use bare plural generics to express properties of animals more often than to express properties of artifacts implies that, overall, adults were more likely to view properties of animals (vs. artifacts) as linked to their kinds in a descriptive or inductive way. This mirrors the fact that, as mentioned earlier, animal categories are typically construed as more richly structured and "kind-like" than are artifact categories (e.g., Gelman, 1988; Keil, 1989). In contrast, the choice to use indefinite singular generics to express properties of artifacts more often than to express properties of animals implies that adults were more likely to view properties of artifacts (vs. animals) as linked to their kinds in a normative, definitional, or law-like way (see Bloom, 1996 and Margolis & Laurence, 2007 for related discussions of the representational status of artifact kinds).

Another separate implication of the domain by generic form interaction is that, when construing animals and artifacts as kinds, adults' representations of those kinds may vary by domain. For example, the choice of the bare plural form for animals may imply that adults view an animal kind as a coherent group of multiple individuals that share many similarities. In contrast, the choice of the indefinite singular form for artifacts may imply that adults view an artifact kind more in terms of a prototypical instance of that kind. Both the bare plural and indefinite singular forms are considered generic in that they refer to a category abstractly. However, the choice of one form over the other for a given category (i.e., animals, artifacts) may provide a window onto the nature of that category representation.

Finally, an interesting question arising from these data concerns the development of the bare plural versus indefinite singular distinction. Previous research has shown that in naturalistic speech about familiar items, children between the ages of 2 and 4 readily use both bare plural and indefinite singular generics (Gelman et al., 2008). Moreover, these children use bare plural generics disproportionately for animals and indefinite singular generics disproportionately for artifacts. We could not test for the interaction of domain and generic form in children's data in the current experiments due to the infrequency of children's indefinite singular generic use. (We may have biased children against using the indefinite singular generic form in both domains by using bare plural generic prompts (e.g., "What can you tell Poppy about blickets?") in the generic condition and in the initial training phase of both the generic and the neutral conditions.) Thus, future research should explore whether this domain by generic form interaction shows up not only when children talk about familiar animals and artifacts, but also when they discuss novel items about which they have no specific generic knowledge. Furthermore, if this finding can be extended to novel items, research should also consider whether this pattern of results is best explained by learned associations between domain (animal vs. artifact, objects with eyes vs. objects without eyes) and generic form (bare plural vs. indefinite singular generic) or by naïve theories about the differences between animal and artifacts.

Summary and conclusion

In conclusion, the experiments presented here extend prior work and demonstrate the robustness of the domain difference in generic use by showing that (1) both children and adults are more likely to generate generics about animals than artifacts even when the stimuli are completely novel and controlled for differences in complexity, number of features, and overall appearance, and (2) the type of generics adults produce about animals and artifacts varies by domain: artifacts uniquely elicit indefinite singular generics. The results of the current experiments thus rule out the possibility that the domain-specificity of generic language use can be explained by low-level differences in children's and adults' familiarity with or generic knowledge base about specific animals and artifacts. Nevertheless, our data leave open the developmental question of whether these patterns of generic language use are the products of experience and learned associations or instead a set of early-developing assumptions about the nature and structure of animal and artifact concepts.

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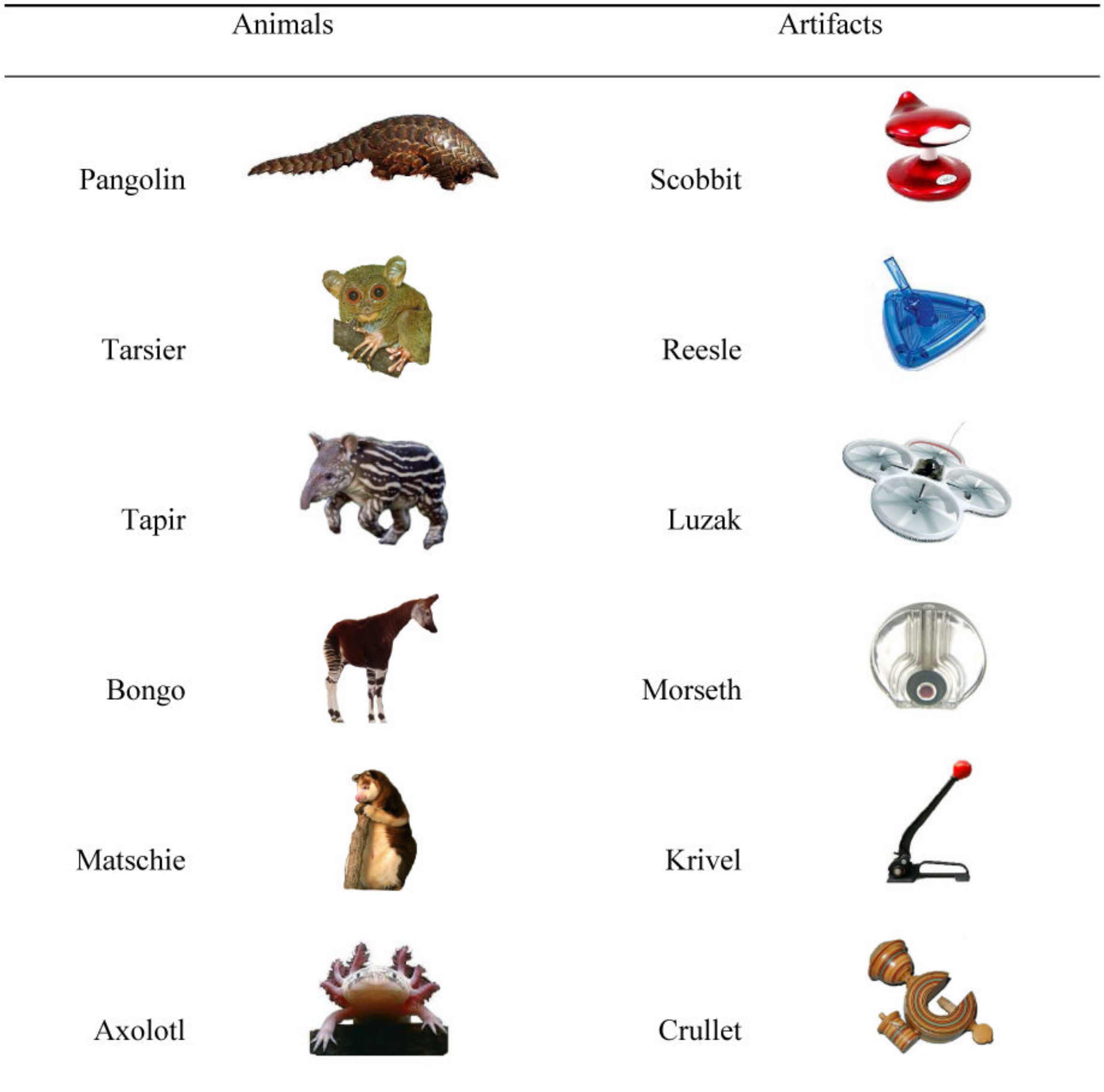

Figure 1.
Animal and artifact stimuli (Experiment 1).

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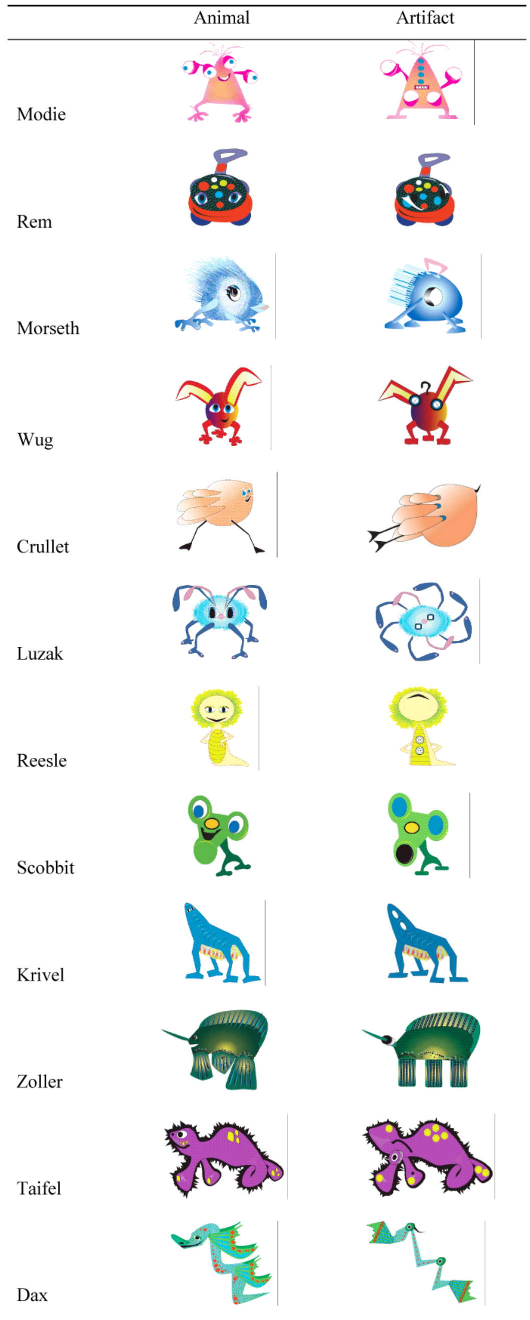

Figure 2.
Matched pairs of animal and artifact stimuli (Experiment 2).

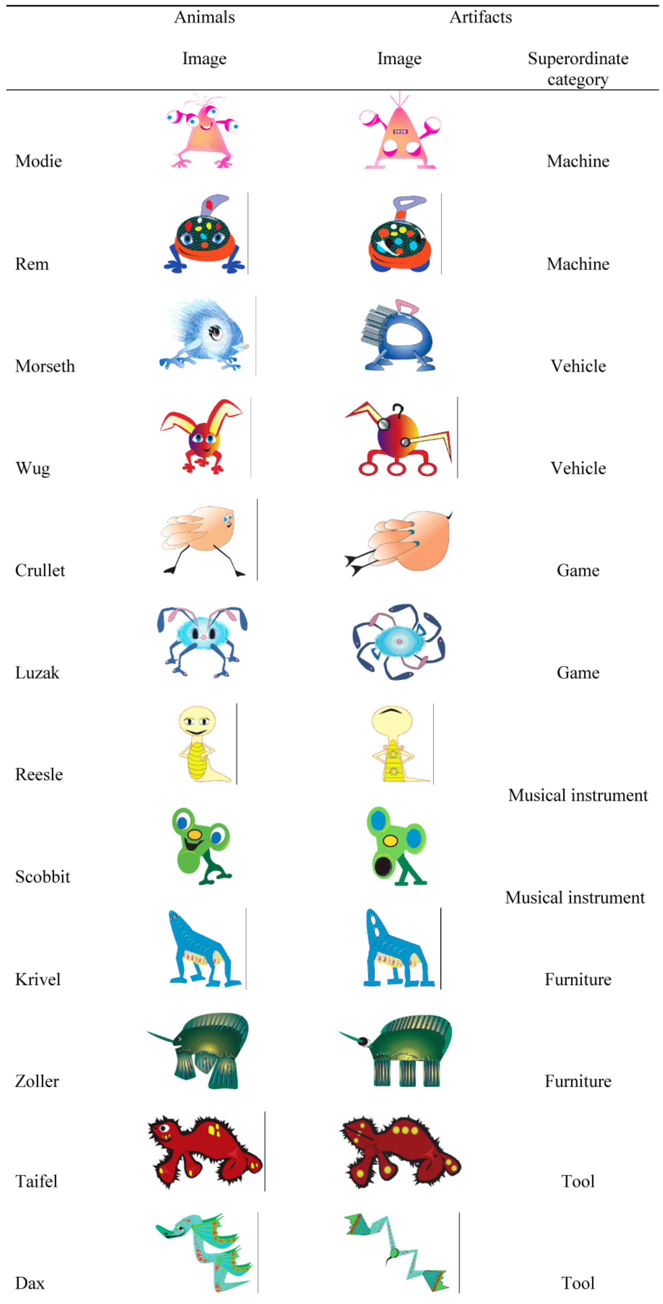

Figure 3.

Matched pairs of animals and artifact stimuli with superordinate category labels (Experiment 3).

Table 1

Mean proportion of generic utterances (SD) out of total utterances by domain, condition, and age group

			Domain	
Experiment	**Condition**	**Age Group**	**Animals**	**Artifacts**
1	Generic	Children	.83 (.21)	.70 (.25)
		Adults	.45 (.33)	.35 (.28)
	Neutral	Children	.17 (.21)	.13 (.17)
		Adults	.28 (.30)	.18 (.20)
2	Generic	Children	.48 (.36)	.42 (.43)
		Adults	.53 (.37)	.36 (.28)
	Neutral	Children	.12 (.22)	.05 (.13)
		Adults	.15 (.28)	.10 (.19)
3	Generic	Children	.69 (.31)	.56 (.37)

Table 2

Complexity ratings within matched pairs of Experiment 2 stimuli

	Mean complexity rating (*SD*)	
	Animal	**Artifact**
Modie	4.73 (1.28)	5.07 (1.59)
Rem	4.20 (1.15)	3.64 (1.60)
Morseth	4.07 (1.07)	5.13 (1.73)
Wug	4.07 (1.00)	5.00 (1.46)
Crullet	3.93 (1.07)	4.53 (1.13)
Luzak	4.20 (1.15)	5.21 (1.19)*
Reesle	4.29 (1.14)	4.33 (1.23)
Scobbit	4.36 (1.50)	3.33 (1.40)
Krivel	4.33 (1.11)	3.86 (1.83)
Zoller	4.07 (1.44)	4.64 (1.94)
Taifel	3.40 (0.91)	5.14 (1.23)*
Dax	4.14 (1.23)	4.07 (1.33)
Mean	4.15 (0.31)	4.50 (0.65)

*Significant domain difference ($p < .05$)