

Generic Language and Speaker Confidence Guide Preschoolers' Inferences About Novel Animate Kinds

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We investigated the influence of speaker certainty on 156 four-year-old children's sensitivity to generic and nongeneric statements. An inductive inference task was implemented, in which a speaker described a nonobvious property of a novel creature using either a generic or a nongeneric statement. The speaker appeared to be confident, neutral, or uncertain about the information being relayed. Preschoolers were subsequently asked if a second exemplar shared the same property as the first. Preschoolers consistently extended properties to additional exemplars only when properties were described in a generic form by a confident or neutral speaker. If a speaker appeared to be uncertain or if statements were made in a nongeneric form, properties were not consistently extended beyond the first exemplar. The findings demonstrate that children integrate the inductive cues provided by generic language with social cues when reasoning about abstract kinds.

Keywords: generics, speaker confidence, inductive inference

The potential to represent concepts as abstract generic kinds appears to be a universal phenomenon that is reflected in linguistic distinctions in many different languages (e.g., Gelman & Tardif, 1998) and even in the absence of any formal linguistic system (Goldin-Meadow, Gelman, & Mylander, 2005). In particular, language can signal whether a statement refers to a generic concept (e.g., *Dogs are smart*) versus an individual (e.g., *These dogs are smart*). Recent research with English-speaking children indicates that they are frequently exposed to generic language in early childhood and, in turn, produce generic utterances themselves as early as 2 years of age (Gelman, 2004; Gelman, Chesnick, & Waxman, 2005; Gelman, Coley, Rosengren, Hartman, & Pappas, 1998; Gelman, Goetz, Sarnecka, & Flukes, 2008; Gelman & Raman, 2003). By the time they reach 4 years of age, children successfully interpret generic language and use it to guide their inferences about characteristic properties of objects (e.g., Chambers, Graham, & Turner, 2008; Cimpian & Markman, 2008; Gelman, Star, & Flukes, 2002; Hollander, Gelman, & Star, 2002).

When viewed within the context of conceptual development, generic statements provide an extremely effective means for children to acquire knowledge about object kinds. This is because they are understood to assert information that pertains to whole categories, thereby bypassing the need to rely on evidence from actual exemplars, which may be encountered only very infrequently or may possess properties that are atypical or idiosyncratic. Further, generics can be used to communicate information about nonobvious characteristic properties that cannot be readily deduced even from frequent real-world experience with typical exemplars (e.g., "Carrots contain Vitamin A").

Previous research examining how children use generic language in category-based inference has shown that generics are understood as an extremely robust source of information about characteristic properties of kinds. For example, Gelman et al. (2002) tested 4-year-olds' interpretation of generic and quantified noun phrases in sentences such as "All bears/ Bears / Some bears like to eat ants." The findings demonstrated that children were most likely to attribute the property to a visually displayed exemplar following the sentence containing "All bears," less likely to attribute the property to an exemplar when presented with the generic bare plural "Bears" sentence, and least likely to make such attributions following the "Some bears" sentence. Children's capacity to recognize and apply generic language is also observed with unfamiliar kinds (Chambers et al., 2008; Gelman & Bloom, 2007). For example, Chambers et al. found that 4-year-olds readily detected the generic–nongeneric distinction in statements about novel creatures, such as "These are pagons. Pagons are friendly" versus "These are pagons. These pagons are friendly" and used this distinction to guide judgments about whether a subsequently presented exemplar possessed the described property (e.g., "Is this pagon friendly?"). Moreover, children appeared insensitive to more concrete experience-based forms of evidence that could serve as a basis for generalizations. For example, the likelihood of extending the property to a new exemplar did not increase when a

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larger number of exemplars possessing the property was presented along with the property statement. Perhaps more strikingly, even when an exception case was explicitly provided (e.g., “Except this pagon. This pagon isn’t friendly”), children continued to generalize properties described in generic sentence frames to subsequent exemplars. These findings suggest that children may adopt a kind of blind faith approach to the interpretation of generics, apparently bypassing more tangible forms of evidence known to guide inductive inferences in other situations (see, e.g., Xu & Tenenbaum, 2007). This outcome is interesting because a more conservative approach to generalization would arguably be advantageous when reasoning about unfamiliar kinds.

To date, however, the extent to which children subscribe to the notion that information provided in a generic sentence frame should prevail over other cues about characteristic properties is unclear. That is, do children uniformly interpret generic sentences as communicating “truths” regardless of contextual or pragmatic factors? Given that linguistically conveyed information is provided by other individuals, one important consideration may be whether an individual is perceived as a reliable source of information. Studies of word learning have demonstrated that when a new label is ascribed to an object by a speaker who appears unreliable or uncertain, children are reluctant to adopt the word–object mapping (e.g., Jaswal & Neely, 2006; Koenig, Clement, & Harris, 2004; Koenig & Harris, 2005; Sabbagh & Baldwin, 2001; Sabbagh, Wdowiak, & Ottaway, 2003). For example, Sabbagh and Baldwin (2001) found that when given an explicit statement about a speaker’s knowledge (i.e. “I know just which one is her blicket” vs. “. . . I don’t know what a *blicket* is,” p. 1057), 3- and 4-year-old children learned new words taught by knowledgeable speakers but did not learn such words from speakers who claimed they were unsure whether the referent of a novel word was correct. Similarly, Jaswal and Malone (2007) found that 3-year-olds were less likely to accept an unexpected label for an object when the speaker indicated uncertainty (e.g., “I think this is a spoon” in reference to a keylike object) versus when he or she simply labeled the object (e.g., “This is a spoon”). These findings clearly demonstrate that children track the reliability of information sources and use these pragmatic cues when deciding on the meaning of new words. This phenomenon can provide a benchmark for understanding how children use generics to reason about kind concepts. In particular, by observing children’s interpretation of generic statements produced by unreliable speakers, it should be possible to measure the extent to which generic language itself implies confidence in the information being presented.

The purpose of the present study was to investigate whether preschoolers’ understanding of generics reflects the same sensitivity to speaker certainty observed in word learning research or whether they make a blind faith assumption when generics are used. One goal was to replicate past research findings that 4-year-olds are sensitive to generic versus nongeneric cues and that these cues are subsequently used to guide inferences about novel kinds (e.g., “Feps live in trees” vs. “These feps live in trees”). A second goal was to investigate whether differences in a speaker’s professed level of confidence in her knowledge would cause a disruption in the extension of described properties. If children assume that utterances can communicate “truths” simply by virtue of their expression in generic sentence frames, then any sensitivity to a confident versus an uncertain speaker should only be observed

with nongeneric statements (e.g., “I *think* these feps live in trees”) and not with generic statements (“I *think* feps live in trees”). Alternatively, an interaction of linguistic and social cues may be observed, such that, even with generic statements, children will be more likely to extend properties to subsequent exemplars as the speaker appears correspondingly more confident in her assertion.

Method

Participants

The final sample consisted of 156 preschool-age children ($M = 4.63$ years, $SD = 0.29$, range = 4.01–5.37). Twelve children were excluded from the final sample for the following reasons: experimenter error ($n = 4$), failed warm-up trials ($n = 3$), outside of the correct age range ($n = 4$), or English was a second language ($n = 1$). Children were randomly assigned to one of six conditions, with sentence structure and speaker knowledge crossed as between participants variables (see Table 1 for participant details for each condition). Children were primarily Caucasian, came from varied socioeconomic backgrounds, and resided in homes in which English was the primary language spoken. Children were recruited from health clinics, child-care centers, and trade shows in a large western Canadian city.

Materials

Six sets of novel creatures were created for the induction task. We chose to use representations of animate kinds in this study, as research has documented that children and parents produce significantly more generic statements for animals as compared with artifacts (Gelman et al., 2005; Gelman et al., 2008). Animate kinds have more shared properties and promote deeper and richer inferences about properties compared with artifact kinds (Gelman & Tardif, 1998). Thus, children’s inferences about this kind of entity should be more stable overall and therefore conducive to examining the effects of genericity and speaker confidence.

Each set of novel creatures was composed of two objects of equal size and shape, differing only in color. Each set of creatures was assigned a novel count noun (*borp*, *fep*, *wug*, *lif*, *blicket*, and *plinker*). During testing trials, creatures were assigned one of the following properties: “sees things in the dark,” “eats plants,” “has two stomachs,” “sleeps during the day,” “has a sticky tongue,” and “lives in trees.” The specific property assigned to each novel

Table 1
Participant Demographics by Condition

Condition	<i>n</i>		Age (in years)		
	Boys	Girls	<i>M</i>	<i>SD</i>	Range
Generic					
Confident	11	15	4.55	0.33	4.01–5.23
Neutral	12	14	4.75	0.24	4.28–5.14
Uncertain	12	14	4.58	0.29	4.07–5.18
Nongeneric					
Confident	11	15	4.60	0.26	4.23–5.23
Neutral	11	15	4.67	0.28	4.21–5.23
Uncertain	13	13	4.61	0.33	4.01–5.37

Note. $n = 26$.

creature was counterbalanced across children such that each creature was described with all six properties within each group. During test trials, each of the six creature sets was introduced in a counterbalanced order such that no sets were consistently presented at the same point in the procedure across children. The counterbalanced assignment of properties to objects sets and the counterbalanced order of presentation of object sets was then yoked across the six conditions.

Procedure

Children were tested individually either in the lab or in a quiet area of their preschool. Children were first presented with three warm-up trials. During these trials, the experimenter presented children with a familiar object and labeled it. The experimenter then presented two additional items and asked children if each of the items was of the same kind as the first. One warm-up trial was designed to elicit a “yes” response to both items, another to elicit a “no” response to both objects, and the third to elicit both a “yes” and a “no” response.

Once the warm-up was complete, the experimenter presented children with an opaque box containing novel creatures. The description of the contents of the box varied according to group. For children in “confident” conditions, the experimenter emphasized her familiarity with the objects (e.g., “This box is filled with things I brought from home. I’ve had these things for a long time, so I have seen them before, and I know a lot about them”). For children in the “uncertain” conditions, the experimenter emphasized her lack of familiarity with the objects (e.g., “This box is filled with things I borrowed from my friend. My friend just gave them to me, so I have not seen them before, and I don’t know much about them”). Finally, for children in “neutral” conditions, no information about the experimenter’s confidence or lack of confidence about the objects was emphasized (e.g., “This box is filled with a whole bunch of things. There are lots of things in here that I’m going to show you.”). The confidence level expressed by the speaker in this phase corresponded directly to the confidence level the experimenter expressed during the test trials (i.e., a confident speaker who had introduced the experiment always presented confident statements on the test trials).

The experimenter began each of the six test trials by first presenting one creature from a given set, labeling that creature with a novel count noun, and describing a nonobvious property of the creature. The specific form of the property description varied according to group assignment, with two variations occurring across groups: whether the examiner used generic or nongeneric statements to describe properties (i.e. generic or nongeneric conditions) and the amount of certainty the examiner expressed about the items (i.e. confident, neutral, or uncertain conditions).

In the three generic groups, novel properties were introduced in sentences containing bare plural noun phrases. In the generic–neutral condition, no emphasis on knowledge or experience with the objects was provided (e.g., “This is a wug. *Wugs* can see things in the dark”). In the generic–confident condition, the speaker’s knowledge about the objects was emphasized (e.g., “This is a wug. *Wugs* can see things in the dark. Yes, I know *wugs* can see things in the dark.”) In the generic–uncertain condition, the experimenter’s lack of experience with creatures was emphasized (e.g., “It says it’s a wug [looking at a sticker underneath the object]. I think *wugs* can see things in the

dark”). In the nongeneric conditions, statements about properties were made with demonstrative noun phrases. Thus, these statements were as follows: nongeneric–neutral: “. . . *This wug* can see things in the dark”; nongeneric–confident: “. . . I know *this wug* can see things in the dark”; nongeneric–uncertain: “. . . I think *this wug* can see things in the dark.”

Once the description of the first creature was complete, the experimenter placed it in front of the child and then removed a second exemplar from the same category (but of a different color) from the box and placed it on the table. The experimenter then asked the child if the second creature shared the previously described property (e.g., “Does this *wug* see things in the dark?”). Children’s responses were recorded, and the experimenter proceeded to the next trial.

Results

Children’s answers on test trials were converted to a proportion score by summing their “yes” (1) and “no” (0) responses and dividing by the number of trials (see Figure 1). A one-way analysis of variance (ANOVA) indicated that there were no significant differences in children’s mean age across conditions ($p > .14$).

As noted earlier, if children are sophisticated in the way they combine linguistic and social information, then those in the generic groups should extend properties to the novel exemplar when the speaker appears more confident. In contrast, speaker confidence would likely have little effect in nongeneric conditions because the linguistic cues provide little motivation to extend properties regardless of the professed certainty of a speaker. As predicted, speaker confidence had a significant influence on extensions in the generic groups, $F(2, 77) = 3.90$, partial eta squared (η_p^2) = .094, $p < .03$. Follow-up comparisons on the confidence effect within the generic groups indicated that children extended properties significantly more often to a new exemplar when the speaker was confident or neutral than when the speaker was uncertain, $t(50) = 2.57$, $d = .73$, $p < .02$, and $t(50) = 2.31$, $d = .65$, $p < .03$, respectively. In contrast, children’s extensions of properties did not differ when properties were presented in generic frames by a confident versus a neutral speaker ($p > .60$). This pattern indicates that property extensions were reduced following generic statements only when uncertainty was explicitly communicated. In contrast, in the nongeneric condition, children’s property extensions did not differ as a function of emphasized certainty ($p > .47$).

We next examined whether property extensions in the various conditions differed more than would be expected by chance. Children in both the generic–confident and generic–neutral conditions extended novel properties at above-chance levels, $t(25) = 3.98$, $p < .001$, and $t(25) = 3.74$, $p < .001$, respectively. In contrast, children in the generic–uncertain condition responded at levels that would be expected by chance ($p > .54$). Comparisons for the nongeneric conditions also demonstrated response patterns at chance levels ($ps > .38$).

Finally, to understand children’s individual response patterns, we used a chi-square analysis to examine the consistency of children’s extensions. Specifically, children who extended a property on four or more of six trials were classified as extenders, whereas children who extended properties on only three or fewer trials were classified as nonextenders (See Table 2). An overall chi-square test indicated that the number of extenders versus nonextenders varied significantly by condition, $\chi^2(5, N = 156) =$

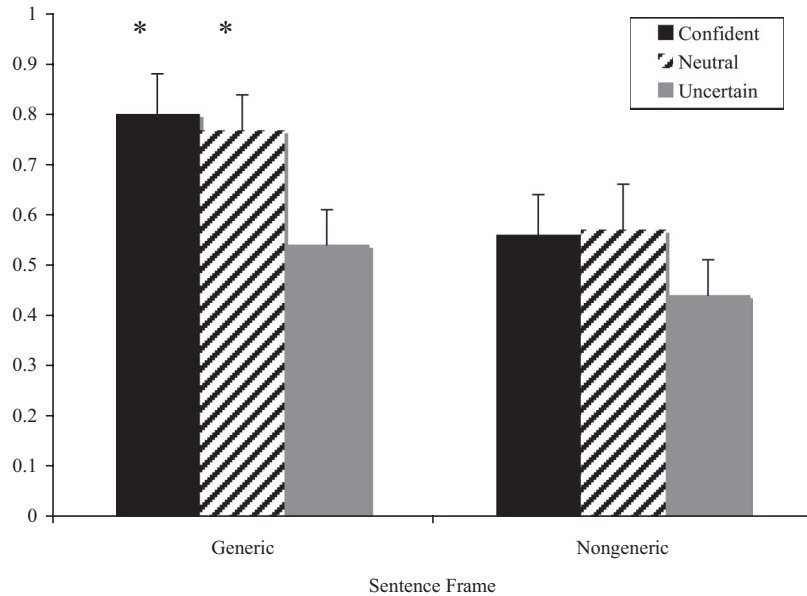


Figure 1. Proportion of property extensions (+ standard error) by condition, greater than chance, * $p < .05$.

17.88, $p < .05$. The majority of children in the generic–confident ($n = 22$) and generic–neutral ($n = 20$) conditions consistently extended properties to a second exemplar. In contrast, relatively equal numbers of children in the generic–uncertain, nongeneric–confident, and nongeneric–neutral conditions were or were not consistent extenders. Finally, the majority of children in the nongeneric–uncertain condition consistently restricted their extensions and thus followed the nonextender pattern ($n = 17$).

Discussion

The first goal of our study was to examine preschoolers' acquisition of generic knowledge about novel kinds. Our findings demonstrate that 4-year-olds were indeed sensitive to linguistic cues signaling generic interpretations. Children extended a property to an additional exemplar at above-chance levels only if that property was described in a generic sentence (e.g., “*Plinkers* live in trees”) and not when it was described in a nongeneric sentence (e.g., “*This plinker* lives in trees”). This outcome is consistent with the growing evidence that preschoolers are keenly attuned to linguistic

markers for genericity and that they use these cues to guide their inferences about novel and familiar kinds (e.g., Chambers et al., 2008; Gelman & Bloom, 2007; Gelman & Raman, 2003). In the current study, we used nonobvious properties that, from an adult perspective, seem to inherently convey attributes of *kinds* rather than *individuals* (e.g., sees things in the dark, has two stomachs). These contrast with the types of imperceptible properties used in previous work on children's understanding of generics in reference to novel kinds (e.g., “is friendly,” “is fast,” etc.; see Chambers et al., 2008), where the attributes were equally likely to convey transient or stable properties of kinds or individual instances. In this regard, it is interesting that generic and nongeneric statements continue to yield any difference in inference patterns whatsoever. One might expect that intrinsically stable and “characterizing” properties would uniformly lead to above-chance property extensions, perhaps resulting in a ceiling effect such that generic language would have little measurable impact. However, it is clear that children do not take the default position that properties, such as “has two stomachs,” should be associated with the kind concept. In the nongeneric conditions, children's likelihood of extending the property to a new exemplar never reached above-chance levels. Only when generic language was used to describe the property did children judge that the property should be extended to additional instances.

The second and more critical goal of the experiment was to investigate how linguistic and social cues work together to guide preschoolers' inductions. Taking the neutral speaker condition as a starting point, children's increased tendency to extend a property expressed in generic versus nongeneric descriptions was predicted in view of the findings of previous studies (which did not manipulate speaker confidence; e.g., Chambers et al., 2008; Gelman et al., 2002). What is important is how a speaker's increased or diminished confidence influenced children's responses relative to the results for the neutral condition. The results showed that children continued to extend the property to another exemplar following a generic description by a

Table 2
Number of Children Adapting Response Patterns by Condition

Condition	Nonextenders (yes on <4 trials)	Extenders (yes on >4 trials)
Generic		
Confident	4	22
Neutral	6	20
Uncertain	13	13
Nongeneric		
Confident	11	15
Neutral	11	15
Uncertain	17	9

Note. $n = 26$.

speaker explicitly communicating her confidence in the description, whereas children did not extend the property following such a generic description by an uncertain speaker. These differences clearly show that children do not put a kind of blind faith in generic statements that overrides social-pragmatic cues, such as the speaker's apparent confidence in her own assertion. An interesting aspect of this result is that speaker confidence had no statistically reliable effect on children's responses following nongeneric descriptions. Thus, sensitivity to speaker confidence was apparent only when generic descriptions were used.

Another intriguing result is that the likelihood of extending the property described by a confident speaker did not differ from the pattern observed when a neutral speaker was used. Thus, the influence of speaker confidence on generic inferences was not a continuous effect whereby any increase in confidence would correspondingly boost the tendency to generalize the described property, leading to a linear trend within the generic conditions. Rather, the results indicate that it is only when a speaker appears uncertain that children are reluctant to extend a generically described property to a new exemplar. When uttered by a neutral or a confident speaker, a generic statement appears to have exactly the same effect. This may reflect children's assumption that adults are generally good sources of information (Jaswal & Neely, 2006) and that a neutral statement can be taken as reliable even without the explicit communication of certainty. This particular outcome also yields an interesting speculation when considered in conjunction with word learning research. Explanations for the findings that children disregard labels provided by ignorant speakers include the proposal of an efficiency mechanism whereby children essentially filter information they hear, in order to avoid having to unlearn incorrect labels at a later date (Jaswal, 2004; Sabbagh et al., 2003; Sabbagh & Baldwin, 2001). Findings from the current study may constitute evidence of such a strategy at work in the realm of generic knowledge. Specifically, children may adopt a conservative tendency in which they will not apply information to entire categories until they are able to attain information from a reliable source. Such a strategy would be very adaptive when one considers that a feature of generic knowledge is that it is often resistant to falsification by subsequent exceptions (Prasada, 2000). For example, Chambers et al. (2008) demonstrated that preschoolers continued to generalize properties described in generic sentence frames to new exemplars, even when an exception case (i.e., one that did not possess the relevant property) had been explicitly provided. Thus, if a child accepts a generic fact (e.g. Plinkers live in trees), he or she would subsequently require a significant amount of falsification evidence to unlearn this fact, if it is, in reality, false. That is, the child would need to experience a lot of evidence that plinkers do *not* live in trees before this information is corrected, as generic knowledge, by nature, is resistant to falsification.

Overall, the current findings advance our understanding of children's acquisition of knowledge about unfamiliar kinds in several ways. First, the results provide incremental evidence that children attend to linguistic cues when interpreting generic descriptions of unfamiliar kinds. Next, and most importantly, the results demonstrate that children do not have a blind faith in generic statements but will also consider pragmatic information, such as the perceived quality of the speaker's knowledge. Children appear reluctant to believe generic facts communicated by uncertain speakers, which, together with word learning research, provides support for the existence of an efficiency mechanism to avoid the encoding of inaccurate information.

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