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Do all ducks lay eggs? The generic overgeneralization effect

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ABSTRACT

Generics are statements such as "tigers are striped" and "ducks lay eggs". They express general, though not universal or exceptionless, claims about kinds (Carlson & Pelletier, 1995). For example, the generic "ducks lay eggs" seems true even though many ducks (e.g. the males) do not lay eggs. The universally quantified version of the statement should be rejected, however: it is incorrect to say "*all* ducks lay eggs", since many ducks do not lay eggs. We found that adults nonetheless often judged such universal statements true, despite knowing that only one gender had the relevant property (Experiment 1). The effect was not due to participants interpreting the universals as quantifying over subkinds, or as applying to only a subset of the kind (e.g. only the females) (Experiment 2), and it persisted even when people judged that male ducks did not lay eggs only moments before (Experiment 3). It also persisted when people were presented with correct alternatives such as "some ducks do not lay eggs" (Experiment 4). Our findings reveal a robust generic overgeneralization effect, predicted by the hypothesis that generics express primitive, default generalizations.

Introduction

Statements such as "tigers are striped", "ravens are black", "ducks lay eggs" and "ticks carry Lyme disease" are known as *generics*. Insofar as they are not used to convey information about a particular individual but rather information about a kind, these statements express generalizations (Carlson, 1977; Carlson & Pelletier, 1995). Generics have been widely studied by linguists and philosophers, and have recently attracted the attention of psychologists (Chambers, Graham, & Turner, 2008; Cimpian, Brandone, & Gelman, 2010; Cimpian, Gelman, & Brandone, 2010; Gelman, 2003; Gelman & Bloom, 2007; Gelman, Goetz, Sarnecka, & Flukes, 2008; Gelman & Raman, 2003; Gelman, Star, & Flukes, 2002; Gelman & Tardif, 1998; Goldin-Meadow, Gelman, & Mylander, 2005; Hollander, Gelman, & Star, 2002; Khemlani, Leslie, & Glucksberg, 2009; Khemlani, Leslie, Glucksberg, & Rubio-Fernandez, 2007; Prasada & Dillingham, 2006; Prasada & Dillingham, 2009). This paper presents four studies designed to investigate the relationship between people's interpretations of generics and their interpretations of the quantifiers "all" and "some".

From a logical point of view, statements like "all tigers are striped", which we will refer to as *universally quantified* statements, are only true if every single tiger is striped. The existence of a single stripeless tiger is enough for the universal statement "all tigers are striped" to be false. Unlike universally quantified statements, generics such as "tigers are striped" can be true even if there are some stripeless tigers (Carlson, 1977; Gelman, 2003; Krifka et al., 1995; Lawler, 1973). Further, some generic statements are judged true even though a large percentage of the kind lack the property in question. For example "ducks lay eggs" and "mosquitoes carry the West Nile virus" are true, but male and immature ducks never lay eggs, and over ninety-nine percent of mosquitoes do not carry the West Nile virus (Carlson, 1977; Cohen, 1996; Leslie, 2007; Leslie, 2008; see also Cimpian, Brandone, et al., 2010; Cimpian, Gelman,

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et al., 2010). Recent empirical work confirms that people often judge that these generics are true even when they know that a large percentage of the kind lacks the predicated property (Cimpian, Brandone, et al., 2010; Cimpian, Gelman, et al., 2010; Khemlani et al., 2007; Khemlani et al., 2009).

Sentences involving the quantifier "some" (henceforth, *existentially quantified statements*), e.g. "some tigers are albinos" or "some dogs have only three legs," are true so long as there is at least one albino tiger or one three-legged dog. The corresponding generic statements "tigers are albinos" and "dogs have only three legs", however, are rejected (Carlson, 1977; Carlson & Pelletier, 1995; Khemlani et al., 2009). Some generics are also rejected even though *most* members of the kind have the property – for example, people reject "books are paperbacks" and "Canadians are right-handed", despite knowing that more than fifty percent of the kind has the property (Carlson, 1977; Carlson & Pelletier, 1995; Khemlani et al., 2009). For these reasons, semanticists distinguish the meanings of generic statements from the meanings of both universally and existentially quantified statements (e.g., Carlson, 1977; Krifka et al., 1995; Lawler, 1973).

Unlike quantifiers such as "all", "most", or "some", generics are difficult to analyze from the semantic perspective since they cannot be described in set-theoretic terms (Leslie, 2007). Semantic analyses thus suggest that generics should be much more difficult to acquire and process than quantifiers, due to their greater logical complexity (Leslie, 2008; see also Carlson, 1977; Cohen, 1996; Krifka et al., 1995; Pelletier & Asher, 1997). However, recent developmental findings suggest that generics may be as easy as quantifiers for young children to acquire and process, and in some cases even easier (Gelman, Coley, Rosengren, Hartman, & Pappas, 1998; Gelman & Tardif, 1998; Gelman, Hollander, Star, & Heyman, 2000; Hollander et al., 2002; Gelman, 2003; Gelman & Raman, 2003; Goldin-Meadow et al., 2005; Gelman et al., 2008; Hollander, Gelman, & Raman, 2009; Graham, Nayer, & Gelman, in press; Pappas & Gelman, 1998; Papafragou & Schwarz, 2005/2006; Tardif, Gelman, Fu, & Zhu, in press).

The generics-as-defaults hypothesis

In light of these considerations and others, several theorists have proposed that generics may express default generalizations (Csibra & Gergely, 2009; Gelman, 2010; Gelman & Brandone, 2010; Hollander et al., 2009; Leslie, 2007; Leslie, 2008). That is, the cognitive system may have an automatic, early-developing way of generalizing information from individuals to kinds (Baldwin, Markman, & Melartin, 1993; Graham, Kilbreath, & Welder, 2001; Keates & Graham, 2008; Leslie, 2008). These primitive kind-based generalizations are, according to this hypothesis, later articulated in language as generics. If correct, this hypothesis would explain why generics are understood and produced by young children, despite the semantic complexity that linguists have claimed generics exhibit (Carlson & Pelletier, 1995; Cohen, 1996; Gelman, 2003; Leslie, 2007; Leslie, 2008). The generalizations expressed by quantified statements, in contrast, represent more sophisticated generalizations – not the primitive default ones expressed by generics (Leslie, 2008).

Leslie (2008) notes that such a hypothesis would explain otherwise puzzling cross-linguistic data: generic interpretations are always associated with less marked syntactic forms than quantified statements (Dahl, 1985; Krifka et al., 1995). For example, in English, one uses the words "all" or "every" to mark a universal generalization, and the word "some" to mark an existential generalizations. However, there is no word "gen" that is used to mark a generic generalization – English speakers do not say "gen tigers are striped" like they say "all tigers are striped". Instead, the generic interpretation is associated with the *absence* of a quantifier word: "tigers are striped". Similar patterns are found cross-linguistically – no known language contains a word "gen" that exclusively marks a generic generalization. Rather, like English, generics are signaled in part by the absence of quantifier terms (Carlson & Pelletier, 1995; Dahl, 1985). Default interpretations are often associated with less-marked surface forms (Chomsky, 2000). Thus this cross-linguistic pattern can be explained if generics express default generalizations. Quantifier words such as "all" and "some" signal that the cognitive system must generalize in a non-default manner, whereas the unmarked generic form allows the cognitive system to rely on its default way of generalizing.

The hypothesis that generics, unlike quantifiers, express default generalizations generates a number of empirical predictions (Gelman, 2010; Leslie, 2008). For example, if understanding quantified statements requires deviating from the default mode of generalization, then both children and adults should sometimes fail to execute this deviation, and so should incorrectly treat quantified statements as generics. This tendency might be more pronounced in young children, but if the generics-as-default hypothesis is correct, adults should also be prone to making these errors, at least under some circumstances. Prior research conducted by Hollander et al. (2002) and Tardif et al. (in press) found evidence that young children may indeed treat quantified assertions as generics. However they did not find this with their adult participants.

In their study, Hollander et al. (2002) investigated the extent to which children and adults differentiated generics from universal and existential claims by asking them a variety of yes/no questions, each of which appeared either in universal form (e.g. "do all shoes have laces?"), generic form (e.g. "do shoes have laces?"), or existential form (e.g. "do some shoes have laces?"). They found that four-year-olds and adults successfully differentiated between all three types of questions in their answers, but three-year-olds did not. Instead, the three-year-olds gave the same responses regardless of whether the question was in universal, generic, or existential form. The difference between the age groups was due entirely to differences in their responses to the two quantifiers – Hollander et al. found no developmental differences in the responses to the generic questions across these three age groups. The three-year-olds responded as the adults did to the generic questions – but then *also* responded in that same way to the universally and existentially quantified questions. The three-year-olds apparently handled the generic questions