Title: Genericity is easy? Formal and experimental perspectives

Abstract

In this paper, we summarize the formal semantics research on genericity, and identify some of the issues that remain unresolved. We then review the small, but growing, body of experimental and developmental work on the topic, mainly by psychologists rather than linguists, and summarize its main aims and outstanding questions. We conclude with a discussion of ways some of the unresolved issues and discrepancies between the two strands of inquiry might be addressed in future and ongoing research, and, critically, we emphasize the importance of combining theoretical and experimental research methods and considerations in the same studies.

1. Introduction

Generic statements have been central in the formal semantics literature since the '70s. Questions about genericity have also been recently addressed in experimental and developmental psychology, where researchers have proposed the **generics-as-default** view (see Hollander, Gelman and Star 2002, Leslie 2008, Leslie, Khelmani and Glucksberg 2011, Gelman 2010). This experimental perspective is welcome, as it can provide robust and replicable evidence about the interpretation of generics in different contexts, which may contribute towards resolving the debate between the different semantic analyses of the source of generic interpretation (see Krifka, Pelletier, Carlson, ter Meulen, Cherichia and Link 1995 and Mari, Beyssade and del Prete 2013 for overviews of the topic). On the other hand, the literature on the processing and acquisition of genericity has often ignored or misrepresented the relevant linguistic analyses and stands to benefit from the wealth of insights and the systematicity found in the theoretical linguistic literature.

In this paper, we will first summarize the formal semantics research on genericity, and identify some of the issues that remain unresolved. We will then review the experimental work with adults and children and summarize the issues that literature also leaves unresolved. We'll then conclude with a discussion of our own ongoing research that addresses some of these unresolved issues. Throughout the paper, we emphasize the importance of combining theoretical and experimental research methods and considerations in the same studies.

2. Genericity

There seem to be two fundamental ways of expressing generalizations in language: quantificational and generic. Quantificational generalizations can be expressed in quantitative, statistical terms. Statements like *some lions live in cages*, *most tigers have yellow eyes* or *all cats eat mice* refer to the quantity that satisfies the relevant property. In a semantic theory, these generalizations seem relatively easy to handle, because they can be modelled in terms of set-inclusion relations (cf. Barwise and Cooper, 1981). Thus, for instance, for the sentence *some lions live in cages* to be true, the intersection of the set of lions with the set of things that live in cages must be non null and for the sentence *all*

cats eat mice to be true the set of cats must be a subset of the set of individuals that eat mice.

On the other hand, *generic* generalizations do not seem easily reducible to these terms, but seem to reflect richer and more complex relations between the kind and the property. Generic statements like *tigers have stripes*, *the lion is a proud animal* and *a cat is a mammal* make general claims about kinds of entities and refer to a property that is characteristic of the kind in question. They express properties that have been characterized as 'non-accidental' (Dahl, 1975), 'essential' (Gelman, 2003), or properties that bear a 'principled connection' to the kind (Prasada and Dillingham, 2006).

Traditionally, there have been two types of phenomena classified as **generic** (Krifka et al., 1995). The first one involves **kind-referring** noun phrases (NPs henceforth), as in (1) where the subject NP *the potato* does not refer to a particular potato, but rather to the kind Potato itself. The second one involves propositions, called 'characterizing sentences', which do not describe specific or isolated facts, but a general property or regularity that summarizes groups of particular episodes or facts, as in (2). These two phenomena can also co-occur, as in (3). In this paper, we will be mainly focusing on sentences of the third type.

(1) The potato was first cultivated in South America.
(2) John goes for a walk after dinner.
(3) The potato is eaten raw or cooked.

The main characteristics of generics include the following: a) temporal unboundedness, b) law-likeness, c) association with dispositions, d) resistance to contextual restriction and e) toleration of exceptions. Temporal unboundedness, or atelicity, is the property by which a statement is true relative to an indefinitely large interval, or even in a timeless way, rather than relative to a time interval with definite bounds. The law-like or nomic character of generics is further linked to temporal unboundedness in the sense that laws express regular patterns of events, rather than singular events (Dahl, 1975). Finally, generic statements have been argued to express dispositions and abilities, which do not depend on particular circumstances (Dahl 1975, Chierchia and McConnell-Ginet 2000). We don't discuss the first three characteristics here in detail, but see Mari et al. (2013: 43-53) for an insightful discussion. In the next section we turn to the remaining two main characteristics of generics.

2.1 Resistance to contextual restriction

According to the received view (Krifka, 1987: 7) generics differ from universals in that they cannot be contextually restricted. Thus, while the nominal argument of *every,* in this case *lion,* is subject to **quantifier domain restriction** (QDR) in the sense of Stanley and Szabò (2000) and can be contextually restricted to the set of lions in this cage by covert domain variables at LF or some other appropriate level of representation, this is not a possible

interpretation for the generic NP *lions,* which expresses a property of lions in general, rather than of the specific set of lions in the cage under discussion[1]:

(4) Context: There are lions and tigers in this cage.
    a. Every lion is dangerous. (Can mean 'Every lion in this cage is dangerous')
    b. Lions are dangerous. (Cannot mean 'Lions in this cage are dangerous')

2.2 Tolerance to exceptions

Generic statements tolerate exceptions (Carlson 1977, Gelman 2003, Krifka et al. 1995 and Lawler 1973), in contrast to universally quantified statements. Take for example the generic statements below:

(5) Tigers have stripes.
(6) Cats have four legs.

Both statements can be truthfully uttered even in the face of exceptions, such as the existence of stripeless tigers or three-legged cats. By comparison, the universally quantified statements below are false if there is even one tiger that doesn't have stripes or one cat that doesn't have four legs.

(7) All tigers have stripes.
(8) All cats have four legs.

Clearly, generics do not have the straightforward truth and licensing conditions of quantified generalizations. Even though generics have been studied for more than four decades, the question Pelletier (2010:9) poses remains unanswered: "How many exceptions can a generic statement tolerate and still be true?" He provides the following examples to illustrate the differences in the number of exceptions allowed for different generic statements:

(9) Snakes are reptiles.
(10) Telephone books are thick.
(11) Guppies give live birth.
(12) Lions have manes.
(13) Italians are good skiers.
(14) Frenchmen eat horsemeat.
(15) Unicorns have one horn.

In (10-15), we see that the percentage of exceptions ranges from a few abnormal cases to around 50% and even to 99%. The exception tolerance of generics is thus quite complicated. (16) (due to Leslie, 2007) seems to be true even though fewer than 1% of mosquitoes actually carry the virus (Hayes et al., 2005), while (17) is not, even though considerably more than half of all books published are indeed paperback (Shaffer, 2012):

[1] This is only one possible way to derive domain restriction, but it suffices for the purposes of this discussion. We return to domain restriction in section 3.

(16) Mosquitoes carry the West Nile virus.
(17) Books are paperbacks.

Recently, Greenberg (2007) sheds some light on how to investigate this issue further. She argues that, contra Krifka (1987), generics may be subject to contextual restriction after all. She draws a critical distinction between two types of exceptions: exceptional individuals/situations and contextually irrelevant individuals/situations. On the one hand, exceptional individuals/situations are non standard or abnormal with respect to some relevant aspect, i.e. legitimate exceptions to 'dogs have four legs' are dogs that have mutations, have had an accident, etc. An implicit contextual restriction to 'normal' or 'typical' individuals can account for how generics tolerate these exceptions, and such an implicit restriction may also block the availability of more specific contextual restriction in (4b). On the other hand, drawing on Carlson (1999), the tolerance to contextually irrelevant individuals/situations is dependent on utterance context or is contributed by presuppositions, implicatures or real world knowledge triggered by the predicate. For instance, in considering *snakes lay eggs*, male individual snakes are excluded from the context because the predicate *lay eggs* is only felicitously applied to the subset of animals that can give birth, namely, females. We return to a fuller discussion of exceptions and domain restriction in our review of the experimental literature.

Despite these refinements, the tolerance of exceptions remains a puzzling feature of generic sentences, given that the variable range of possible exceptions makes them difficult to handle in a semantic theory.

2.3 Classification of generics

The variability in the tolerance of exceptions discussed in the previous section and the fact that generic statements as a group have a wide variety of interpretations has lead some people to suggest that they do not form a uniform class (Lawler, 1973). Even if we want to treat generics as a single phenomenon though, it seems essential to acknowledge that there exist different types of generics. Leslie et al. (2011: 19, table 1) define the following types:

a) **quasi-definitional**: property must be universally true of all the members of the kind; no exceptions, e.g. *triangles have three sides*
b) **majority characteristic**: property must be central, principled or essential (Gelman 2003; Medin and Ortony 1989) – namely it must be directly related to the nature of the kind in question. It must also be prevalent though not universally shared among members of the kind; while some exceptional members (e.g. albino tigers) fail to possess it, all the normal members of the kind must possess it, e.g. *tigers have stripes*
c) **minority characteristic**: property must be central, principled or essential (as above). However, it must only be held by a minority of the kind. Restricted to methods of gestation, methods of nourishing the very

young, and characteristic physical traits exhibited only by one gender, ex. *lions have manes*[2]

d) **majority**: property must be prevalent among members of the kind, but must not be a principled connection (Prasada and Dillingham 2006, 2009), ex. *cars have radios*

e) **striking**: property must only be exhibited by a small minority of the kind, and must signify something dangerous which is to be avoided, ex. *sharks attack people*

Leslie et al. (2011) distinguish these 5 types of generic generalizations from false generalizations that share the form of generics, but are not true:

f) **false generalization**: property must be prevalent among members of the kind and there must be a sufficiently salient alternative property (e.g. being left-handed), so that the generic form of the predication sounds false or mistaken, e.g. *Canadians are right-handed*

The degree of exceptionality is one of the defining parameters of the above-described categories. The quasi-definitional ones do not allow any exceptions (9), the majority characteristic ones allow for some exceptions (5), the minority characteristic ones allow for over than 50% of exceptions (11-12) and finally the striking ones allow for a vast number of exceptions (13), (16). The other defining parameter seems to be whether the property is a characterizing or striking one or just a statistical generalization (17).

Striking and minority characteristic generics pose a particular problem for quantificational accounts, since the relevant property holds of only a minority of members of the kind in question.

This detailed classification of generics can help to shed some light on the interaction of exceptionality and type of property found in generics.

2.4 Generics cross-linguistically

Although genericity is common in all languages, different languages employ different grammatical devices for expressing generic meaning and make use of various grammatical and semantic or pragmatic cues, which may contribute to the interpretation of a certain sentence as generic (see Chierchia 1998, Longobardi 2001, Behrens 2005, Farkas and deSwart 2007). Even though most of the examples above involve bare plural nominals (BPs), generic statements are not only expressed with BPs. As Krifka et al. (1995:8) argue, generic statements can include a range of NP types:

(18) a. John drinks coffee.
b. My brother drinks coffee.
c. A teacher drinks coffee.
d. Every teacher drinks coffee.

[2] Although Leslie et al. (2011) don't make the fact explicit, this subcategory is exclusively restricted to biological organisms exhibiting sexual dimorphism, and possibly, maturation characteristics (see Cimpian, Gelman and Brandone 2010b for experimental results suggesting the latter.)

e. Coffee is healthy.

The important observation here is that genericity is not encoded in a unique and unambiguous way by the use of exclusively generic forms (e.g. by a generic determiner or quantifier). This is not a particular characteristic of English. Generic meaning is not known to be encoded by a dedicated overt GEN marker in any language. Rather, generic interpretation typically results from the interaction of a number of variable factors: the lexical semantics of the constituting elements, pragmatic knowledge, discourse situation, grammatical marking of definiteness and quantification, syntactic position of the NPs and grammatical marking of tense, aspect, and mood on the predicates. Thus, although in English genericity is typically expressed via a BP, in several other European languages such as Spanish or Greek, a definite plural NP is by far the most frequently used type of NP used in generic statements (19) (see Marmaridou-Protopapa 1984, for Greek)[3]:

(19) I tighris ehun righes.
the tigers have stripes
'Tigers have stripes.'

While the disparity of means of expression of a phenomenon cross-linguistically is not rare, what *is* remarkable is that genericity is not encoded in a unique and unambiguous way by the use of exclusively generic forms (e.g. by a generic determiner or quantifier) in any known language.[4] Thus, an interesting question is how interlocutors recognize that a generic statement has been made and whether the absence of a dedicated and unique way for marking statements as generic is a theory-critical observation. We return to this issue in section 4, which discusses the generics-as-default view. In the next section, we will discuss the formal semantics view that relies on a quantificational analysis of genericity, which is the backdrop against which the **generics-as-default** view was proposed.

3. The formal semantics analysis of genericity

Generics have been studied since the seventies (Lawler 1972, 1973, Dahl 1975, Nunberg and Pan, 1975, Carlson 1977) and they still remain a rather controversial topic when it comes to deciding how to build their logical form and how to model their truth conditions (see recent discussion in Mari et al. 2013). Two proposals stand out in the formal semantics literature, the modal approach, as laid out in Krifka et al. (1995), and the probabilistic approach, developed by Cohen (1999a, 1999b, 2004), which has received attention lately.

[3] It should be noted that the sentences above are ambiguous between a definite (specific) and a generic interpretation and that the context would disambiguate which one is the intended meaning. See Ionin et al. (2011, 2013) for the same ambiguity in Spanish.

[4] We focus here on languages that have articles and the way they use them in order to express genericity. In languages without articles such as Finnish, which morphologically conflates referential marking and role marking, the morphological case of a phrase might be a relevant feature in generic marking. Korean and Tagalog employ topic-marking elements with generic phrases, while in Vietnamese, for instance, some types of generic phrases contain a classifier as opposed to classifierless generics. For a discussion of the typological parameters of genericity see Behrens (2000).

3.1 The modal approach

Krifka et al.'s (1995) version of the modal approach has become the received view of generics. This view treats generic sentences as modalized conditional statements that involve a universal quantifier. This proposal was an answer to the following puzzle: though generics seem similar to universals, they are both more restrictive and less restrictive than universals. Generics are more restrictive, because they are law-like. This is why mere accidental generalizations like *books are paperbacks,* even though statistically true do not qualify as true generics. But generics are also less restrictive than universals, given that they allow for exceptions.

Modal accounts assume a phonologically null Q-adverbial quantifier 'GEN' that is an unselective variable binding operator similar to adverbs of quantification like *usually, typically, always*, as analysed in Lewis (1975). This operator is sentential and is represented by a tripartite structure as in (20) taken from Krifka et al. (1995:26), showing the general form of adverbial quantification:[5]

(20) GEN [restrictor] [matrix]
Q [x_1,…,x_i; y_1,…,y_i] (Restrictor [x_1,…,x_i]; Matrix [{x_1}…, {x_i},y_1,…,y_i])

Krifka et al. (1995) propose an intensional analysis of GEN, according to which a sentence with an indefinite singular is interpreted as a conditional sentence with the *if*-clause providing the restriction for GEN. GEN is interpreted as an intensional unselective universal quantifier meaning 'must'. On the assumption that indefinites contribute a free variable ranging over individuals (cf. Heim 1982), this variable can be bound by the available universal quantifier as well. As Mari et al. (2013: 67) illustrate, Krifka et al. follow a classical modal framework, in which *W* is a set of worlds, *D* is a domain of entities, and ≤ an ordering source on worlds according to normality. Thus, a generic sentence like (21) is represented as follows:

(21) a. A dog barks.
b. If something is a dog, it barks.
c. $\forall w' \leq_w$, x [dog(x,w')][barks(x,w')]
Paraphrase: in all worlds, which are 'normal', if something is a dog in those worlds, then it barks in those worlds.

3.2 The probabilistic approach

A probabilistic approach has been defended by Cohen (1999a, 1999b, 2004), according to which it is probability rather than modality that forms the basis of

[5] The tripartite structure was introduced by Heim (1982) and Farkas and Sugioka (1983) as a major novelty against Carlson's unitary operator *Gn.* A major motivation for the tripartite structure implicit in quantification is that it readily accommodates intuitions of ambiguity, such as those associated with sentences like "typhoons arise in this part of the Pacific", which can be interpreted as either "typhoons in general have a common origin in this part of the Pacific", or as "there arise typhoons in this part of the Pacific". See Krifka et al. (1995) for discussion.

the semantics of generics, at least for 'absolute generics' such as *ravens are black*. This account holds that *As are B* is true just in case the probability of an arbitrary *A* being a *B* is greater than 0.5, that is, greater than chance. Cohen (2004:531) introduces a homogeneity condition, according to which "the generic **gen**(ψ,φ) presupposes that its domain, ψ, is homogeneous, in the following sense: for any psychologically salient criterion by which ψ may be partitioned into subsets, the conditional prob- ability of φ ought to be roughly the same given every such subset of ψ." Salient partitions are e.g. space, numerical scales, gender, subject matter and abstract domains. As Mari et al. (2013:84) illustrate, in Cohen (1999a), he proposes that there is a covert generic quantifier GEN, which gives rise to the following representation:

(22) Birds fly.
GEN (bird(x), fly(x)) P(fly | bird) > 0.5 (the probability of an object flying given that the object is a bird is greater than 0.5)

3.3 A quantificational account of genericity

The common feature of both accounts presented above is the fact that they treat generics as quantificational, akin to quantificational adverbs. Thus the formal semantics accounts of generics do not assume a categorical distinction between the two kinds of generalization, generic and quantificational.

We have given here a simplified picture of the literature. As a recent overview of the topic (Mari et al. 2013) shows, the picture is more complicated. A spate of theories postulate modal operators in possible-world semantics (Krifka et al., 1995 among others), non-monotonic inferences (Asher and Morreau, 1995), prototypicality (Nunberg and Pan, 1975), stereotypicality (Geurts, 1985) and/or probability of the information conveyed (Cohen 1996) as relevant factors. See also Leslie (2007, 2008) for arguments that every extant account of generics that treats them as quantificational has fatal flaws.

It might be, though, that the theoretical impasse is due to limited reliable data, as these issues have been addressed through the researcher(s)' native-speaker intuitions, which may limit consensus even about the most fundamental facts about genericity. In addition to this possible limitation, the linguistic analyses do not address the issue of how listeners know that there is a generic operator in a sentence, or, especially, how children learning a language would come to posit such an operator. Since the early 2000s, generics have drawn the attention of psychologists (see Hollander et al. 2002, Leslie 2008, Leslie et al. 2011, Gelman 2010) who offer an alternative view of generics that could solve this puzzle.

4. The psychology literature: the **generics-as-default** view

Much of the psychology literature focuses on the following two fundamental questions:

a. How do children acquire generics in the absence of dedicated words or morphemes that encode genericity cross-linguistically (Dahl 1985)? Relatedly, when are generics acquired?
b. What is the status of generics in the language/cognition interface?

One possible answer to these questions is given by the **generics-as-default** view. The main tenet of this approach is that children do not need to learn anything in order to acquire generics, as generics are the default and innate mode of thinking. Thus, generics come essentially for free. This approach treats generics as categorically different from quantifiers in some respects, and postulates that generics come first in acquisition. In this view, it is the universally (e.g. *all*) and existentially (e.g. *a*, *some*) quantified statements that must be learned as children develop.

In the remainder of this section we will review the main evidence used by defenders of this view in order to gain a better understanding of it. Consider the following passage by Leslie (2007:381):

> *Children do not ever learn truth conditions for generic claims. Rather, the generalizations that generic sentences express correspond to the cognitive system's most primitive, default generalizations. The ability to generalize pre-dates the acquisition of language; infants as young as 12 months readily form category-wide generalizations on the basis of experience with a few instances of the category (Graham, Kilbreath, and Welder 2001). There must, then, be an early-developing cognitive mechanism responsible for these most basic generalizations.*

In this view the learnability question does not even arise and the lack of a unique cue to identify generics is not a challenge for children. Generics are just the kind of generalization children first make. When these generalizations are expressed in language, they take the form of generic statements.

This view has consequences for a model of the language/cognition interface. The **generics-as-default** view posits a 'generic bias', according to which generics come earlier than quantified statements. This idea is linked to the view of cognition that assumes two different systems made popular by Kahneman and colleagues (2002)[6], which include a distinction between System 1, a fast, automatic, effortless lower-level system and System 2, a slower, more effortful higher-level rule-governed system.

What is important for our discussion is that Leslie (2007) argues for a categorical distinction between generics and quantifiers parallel to the dual systems view. Generic statements are argued to be cognitively primitive generalizations, which are not concerned with quantity, in contrast to quantificational generalizations that are expressed with universal or existential quantifiers. Leslie argues that generics are part of System 1, while quantificational statements are part of System 2.

One piece of evidence that Kahneman uses for the existence of the two systems is the fact that they can lead to conflicting judgments.[7] Conflicts can

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[6] The idea that there are two distinct systems of cognition, one of which is intuitive in nature, and one of which is reflective has been common across scientists who study human reasoning in different domains, i.e. in conditional and probabilistic reasoning (Evans and Over 1996, Sloman 2002, Stanovich 1999), decision making (Kahneman and Frederick 2002) and social cognition of various sorts (Petty and Cacioppo 1986, Chaiken et al. 1989).

[7] Leslie (2007:395) provides the following example to illustrate Kahneman's theory: "A bat and a ball cost $1.10 in total. The bat costs $1 more than the ball. How much does the ball cost?" Most people report an initial inclination to answer "10 cents".This first fast and automatic response would be supplied by System 1 and even though it seems correct, it is not. In order to

arise between what people judge on an intuitive basis and what people judge on a reflective basis when people are given a task that requires a response of the type that System 2 would provide, i.e. rule-based and reflective, but they give a response that relies on the fast and automatic System 1. In these cases, we might say that System 1 is 'erroneously' employed, and thus, overused. Inspired by this rationale, Leslie speculates that it might be possible to find an error of this sort when one tests the interpretation of generic and quantificational statements, if people are given a task that requires a System 2 response (quantifiers) but they give a System 1 response (generic). Errors then would arise when "people interpret quantified statements as though they were generics" (Leslie 2007:398).

4.1 Initial motivation for the **generics-as-default** view

The previous section has presented the main motivation behind the *generics-as-default* view. In this section we present further motivation, as well as briefly discussing the evidence that has been brought up to support this view from both an adult and an acquisition perspective.

Marked/unmarked forms: No known language has a dedicated marker for genericity. Rather, genericity seems to be the result of different cues. On the basis of that, Leslie (2008:24) argues that generics are the unmarked surface form, whereas quantified statements are marked. Citing Chomsky (2000) she relates this to other cases of marked/unmarked phenomena in language, as seen for instance in the following case: the default meaning of *John climbed the mountain* is to interpret it as 'John climbed up the mountain', whereas the marked interpretation 'John climbed down the mountain', is expressed by explicitly adding the preposition *down*.[8]

Deaf children: Goldin-Meadow et al. (2005) studied American and Chinese congenitally deaf children who have never been exposed to either spoken language or sign language, and so go on to develop their own communicative gesture system called 'home signs'. They found that these children routinely employ gestures that are most naturally understood as generics (Leslie 2007:383) and, furthermore, that the amount of generics found in these children was very close to the amount found in hearing children, a remarkable fact given that congenitally deaf children were never exposed to any kind of language, including generic language.[9]

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arrive to the correct response of "5 cents" people would have to invoke algebraic reasoning, which forms part of effortful, conscious, rule-governed reasoning supplied by System 2.

[8] We note here that in semantic and pragmatic theory there is a well-established association of marked forms with the complement of the interpretation that is stereotypically assigned to the unmarked counterparts (in this case, given that the semantics of 'climbing the mountain' encompass both climbing up and climbing down, the complement of the stereotypical interpretation, climbing *up* the mountain, is climbing down). See, for example, Lehrer (1985) for an analysis of the phenomenon above that relies on non-equi-biased antonyms, and Levinson (2000) for a more general theory of markedness and stereotypical interpretation. In other words, the interpretation of the marked pair of some form of expression is given with contrast to the preferred interpretation of the unmarked. However, returning to generics, it is not clear to us that what the complement of the stereotypical interpretation of generics would be, or that quantified statements are interpreted with contrast to the interpretation assigned to generics.

[9] Of course, for these observations to be strong evidence in favour of the *generics-as-default* view, one must also document if the use of generics in hearing or deaf children exceeds the use of quantified statements.

Pirahã language: Everett (2005) argues that Pirahã lacks universal quantifiers like *all,* yet nonetheless features generics. Everett discusses examples like *kaoáibogi hi sabí 'áagahá* (evil spirits are mean) and argues that their truth conditions correspond to the truth conditions of generics in the sense of being tolerant to exceptions. It should be noted that the facts themselves are contested (cf. Nevins, Pesetsky and Rodrigues 2009, Sorensen 2012).

Reasoning: Indirect support is claimed to be found in Jönsson and Hampton (2006)'s data with respect to the quantifier *all*, where adults judged that it was more likely, e.g., that *all ravens are black*, than that *all young jungle ravens are black*. From a logical point of view, such judgments are erroneous, because the first sentence entails the second. Leslie et al. (2011) provide an alternative interpretation of these results, according to which participants interpreted the universal statements as generics, that is, they relied on the corresponding true generic *ravens are black* that could be true even if jungle ravens were of a different colour when young.

The **generics-as-default** view makes the following predictions:

A. **Age/Ease of Acquisition***:* children are expected to produce and comprehend generics with greater ease than the quantifiers, and at earlier ages

B. **Generic Overgeneralization***:* "nongeneric generalizations would, from time to time, inappropriately exhibit some characteristics of generics, especially if the information-processing demands were made great enough." (Leslie, 2008:25) This has been coined the Generic Overgeneralization (GOG) effect, which we will discuss in detail in the next section.

C. **Processing costs***:* Quantified generalization require the "conceptual system to override or inhibit its default operation" (Leslie, 2008:23)

The first two predictions have been tested in a growing literature, as follows.

4.2 The acquisition of generics

As predicted by the GaD, which argues that generics should be easy for young children to produce and understand, generic statements can be found in the speech of children at the earliest multi-word stages. Gelman, Goetz, Sarnecka and Flukes (2008) report data from a study of the developmental emergence of generics by examining longitudinal transcripts of parent-child conversations taken from the CHILDES project (MacWhinney and Snow 2000). The study included eight children aged 2;0 to 3;7 at first recording who were followed to ages 3;1 to 4;11. The two key findings are first, that generics are frequent in children's natural speech: all six children, for whom there were data at age two, produced generics and by age four children produced generics as frequently as adults. Secondly, children do not simply imitate their parents' generic talk, but they actively initiate generic conversations. For instance, here is a sample of a child-initiated sequence between Adam (aged 3;6) and his mother (Gelman et al., 2008:14):

ADAM: Why Paul keeps going over here?
MOTHER: He thinks he's grown a little

ADAM: Why he can't play with children?
MOTHER: H'm?
ADAM: Why *babies can't play with children*?
MOTHER: Because they're just babies.

Finding generic utterances in early child speech is certainly consistent with the GaD hypothesis, and not obviously predicted by the formal semantics approaches, which postulate a null GEN operator and complex licencing conditions for generic interpretations. However, neither the Gelman et al. (2008) study nor the other studies reporting generic utterances in early child speech contrast the rates of generic production with the rates of production of quantified or specific utterances in the same children at the same ages. Without that direct comparison, these studies only provide partial support for the GaD hypothesis.

In fact, although there are now nearly 20 studies investigating when and how children produce and understand generics (see Appendix), clear, strong evidence for the GaD hypothesis, in line with the above predictions, is quite rare. Only two studies report clear evidence that young children show an early advantage for generics vs. quantified generalization, as predicted by the GaD. Hollander et al. (2002) asked 3 and 4 year old children and adults to answer questions like *Are {fires/all fires/some fires} hot?*. They found that while both 3 and 4 year olds were adult-like in their responses to generic questions, only the 4 year olds were adult-like with *all* and *some* questions. The three year olds answered all 3 question types as if they were generic, exactly as predicted by the GaD hypothesis. Leslie and Gelman (2012) asked 3 and 4 year olds and adults to recall novel facts about familiar animal kinds, where the facts were introduced in either a generic or quantified generalization. They found that both children and adults reliably recalled generic facts as generic, but recalled many quantified facts as generics (a GOG effect). The children in this study also differed from adults in their responses to the 2 quantified statement types used in this study (*all* vs. *all of these*), suggesting they had not yet mastered the semantics of quantification and specificity.

By contrast, in almost all the other studies published to date, even children as young as 2 years old are found to be very good, and very adult-like, in their comprehension of both generic and quantified/specific statements. For instance, Gelman and Raman (2003) showed 2, 3 and 4 year old children and adults pictures of atypical category instances (e.g. two penguins) and asked them questions like *Do birds fly?* or *Do the birds fly?*. Both adults and children interpreted non-generic questions as referring to the items in the present context (by answering 'no') and generic questions as referring to the kinds generically (by answering 'yes'). Thus, the authors conclude that even 2 year olds are already sensitive to subtle morpho-syntactic cues (e.g., *the Xs* versus *Xs*) to distinguish generic from specific reference. While not counter-evidence to the GaD hypothesis, nor is this obviously predicted by it.

An extension of the GaD hypothesis is offered by Gelman, who speculates (2010: 114):

> *If I am correct, the task for children is not to acquire a list of all the ways that generics can be marked, but rather to learn to recognize when an*

utterance is specific. If children assume a conceptual distinction between generic and specific reference, then they can identify as generic those utterances that are not somehow marked specifically. It is in this sense that I propose generics as a default.

Note, however, that even this modified GaD hypothesis, which proposes that not only are generics themselves easy and freely available to the youngest children, but also that children know that generics contrast with specific interpretations, and can thus use morpho-syntatic cues to acquire the grammar of specificity, still predicts an asymmetry. The youngest children should not yet have learned which morphemes mark specific and quantified interpretations, and should make many more errors (non adult behaviours) with these utterances. Hollander et al. (2002) and Leslie and Gelman (2012) are the only studies to offer evidence in line with this prediction. The developmental studies, then, mostly only offer data that is partially consistent with the GaD proposal.

Adult processing studies have also been argued to support the GaD view.

4.3 Adult processing of generics

We focus on Leslie et al. (2011) to illustrate the GOG effect. Similar results have been reported in other experiments that used truth value judgment tasks (Khemlani, Leslie, Glucksberg and Rubio Fernandez 2007, Khemlani, Leslie and Glucksberg 2009, 2012 and Meyer, Gelman and Stilwell, 2011) or recall tasks (Leslie and Gelman, 2012). Other studies have focused on prevalence estimation (Prasada and Dillingham 2006, 2009, Cimpian, Gelman and Brandone 2010a, 2010b) and the role of prevalence, cue validity and normalcy in the licensing of generics (Prasada, Khelmani, Leslie and Glucksberg 2013).[10]

4.3.1 The GOG effect

Prediction 1 above has been argued to be instantiated in the Generic Overgeneralization Effect (GOG). Leslie et al. (2011) use this to refer to "the tendency to overgeneralize the truth of a generic to the truth of the corresponding universal statement" (Leslie et al. 2011:17). As discussed above, Hollander et al. (2002) and Leslie and Gelman (2012, experiment 4) report this effect in children, but it is also evident is adults.

The first detailed investigation of the GOG effect is found in Leslie et al. (2011). In their experiment 1, participants had to perform a truth value judgement (TVJ) task on sentences that were presented in one of three forms: generic, universal (*all*), or existential (*some*). The statements involved different kinds of properties as discussed above (§2.3): quasi-definitional (*triangles have three sides*), majority characteristic (*tigers have stripes*), minority characteristic (*ducks lay eggs*), majority non-characteristic (*cars have radios*), striking (*pit bulls maul children*), and false generalizations (*Canadians are right-handed*).

[10] It should be noted that there is other experimental work on generics that is not motivated by the generics-as-default hypothesis, see Ionin et al. (2011a, b, 2013), where genericity is studied from a cross-linguistic and second language acquisition perspective, and Prasada, Salajegheh, Bowles and Poeppel (2008) who measure ERP responses to generic and non-generic utterances.

The authors report experimental evidence that adults sometimes judge universal statements as true, despite knowing that they are truth-conditionally false. For example, participants judged a quantified statement like *all tigers have stripes* as true, even though they know it is false given that there are albino tigers. The authors claim that the participants made this 'error' because they relied on the corresponding generic statement (*tigers have stripes*), which is true. They find that the GOG effect occurs in more than half the trials when the statement involves characteristic properties: 78% for majority characteristic and 51% for minority characteristic statements.

Leslie et al. consider some alternative explanations before concluding that the GOG effect is the most suitable interpretation of their results: a) subkind interpretation, according to which people interpret *all ducks lay eggs* as 'all kinds of ducks lay eggs' and thus *all ducks lay eggs* is true under this interpretation, b) ignorance of the facts, according to which people actually think that all ducks (both male and female) lay eggs and c) domain restriction, according to which people interpret *all ducks lay eggs* as a claim only about the relevant restricted set of female fertile ducks (as per Carlson 1999, Greenberg 2007, discussed above).

The authors discarded the first explanation through a paraphrase task, which asked participants to provide paraphrases of the statements they had just read (their experiment 2b). Subtypes were almost never referred to in the paraphrases, which the authors take to mean this kind of interpretation is not readily available to participants, and thus can't explain the GOG effect, though this is hardly a knock down argument. The second explanation was ruled out on the basis of a knowledge test that showed that people knew the relevant biological facts (their experiment 3).

Let us focus here on the third possible explanation, which they addressed in experiment 2a. In order to check for the possibility of domain restriction in the sense of Stanley and Szabó (2000), as discussed above, they provided the participants with population estimates for the kind in question in the following form:

(23) ''Suppose the following is true: there are 431 million ducks in the world. Do you agree with the following: all ducks lay eggs.'

This information was supposed to prime quantification over every individual duck in the world, and thereby make it difficult/impossible to interpret *all* as restricted to only the ducks that are presupposed by *lay eggs*. If acceptance of *all ducks lay eggs* in the first experiment was driven by contextual quantifier domain restriction, the authors predict that it would disappear in the context of population information of the kind above. Nevertheless, the authors report that the GOG effect still occurred on a substantial portion of trials, with an acceptance rate for *all* statements at 55% for majority characteristic statements and 30% for minority characteristic statements, which is less than when the statements appeared with no preceding context, but is still a high percentage. The authors thus conclude that domain restriction cannot be the sole explanation for the GOG effect.

5. Taking stock: on how to investigate generics

To wrap up, we raize some issues with both the experimental evidence for the GaD view, and with current formal semantic analyses, and sketch out the ways our own recent and ongoing research seeks to address these issues.

5.1 Critical review of the **generics-as-default** view

Leslie et al.'s experiment 2a and their interpretation of the results are challenged by the following observations. In the first place, the contexts Leslie et al. use to induce specific/individual interpretations do not make salient the exceptions that would make the universal quantification over individuals interpretation untrue. Merely providing participants with population estimates is not enough to make domain restriction to only the relevant (potentially egg laying) ducks impossible, and may even serve to make this subset interpretation salient by priming a 'biology class' mode of thinking[11].

Second, claims about universal quantifiers in general ought to be further refined. Languages have different types of universal quantifiers, so even if we accept that *all* is associated with a GOG effect, it is not obvious that other universal quantifiers should also trigger it? *All* is a quantifier that may or may not be interpreted with respect to the context given, and is thus atypical. For instance *all cats eat mice* might be interpreted as referring to cats in general or to some contextually salient cats, whereas *all the cats ate mice* is necessarily linked to a salient set. To account for such data, Brisson (2003) proposes that *all* is not a quantifier at all, while Lasersohn (1999) proposes that it has a maximizing effect acting as a pragmatic slack regulator. Both accounts would predict that *all ducks lay eggs* would be judged as true, without *all* being mis-interpreted as a generic. However, other universal quantifiers such as *every* that do not share the special properties of *all* would not be, e.g. compare *all ducks lay eggs* to *every duck lays eggs*.

Finally, a paraphrase task does not provide conclusive evidence to exclude the sub-kind interpretation. The distinction between implicit knowledge and explicit knowledge is one of the most fundamental distinctions in the cognitive sciences: just because participants were not consciously aware that they were interpreting *all ducks* as 'all species of duck' does not mean that they did not do so.

On the basis of these objections, we argue that alternative explanations for the GOG effect have not been ruled out. The main alternative that remains to be investigated is **quantifier domain restriction** (QDR). Domain restriction is routinely invoked in quantification (Heim 1991) and listeners are known to be 'charitable' in seeking interpretations that would render statements true (Grice 1975). Furthermore, such 'charitable' domain restriction is more likely if the universally quantified statement used does not require linking with a set under discussion, as is the case with *all* and *every*, compared to *each*, which does (Partee 1995). Given that *all* so easily lends itself to a domain restricted interpretation, it is an unfortunate choice for a universal quantifier to test the predictions of the **generics-as-default** view.

[11] Leslie et al. do not provide a complete set of materials, only the one example of a context and generalising statement pair, so we can only speculate about the extent to which this example is representative.

In addition to these issues, we also believe that one of the clear predictions that follows from the **generics-as-default** view has not been adequately tested by the proponents of this view. If generics are the default interpretation, this makes predictions about their processing. Given that generics are claimed to be part of System 1 of Khaneman's cognition system, which is fast and effortless, they are predicted to be faster to process than quantified statements, which are part of System 2, which is slower and requires more cognitive effort. Meyer et al. (2011) found that participants did sometimes judge universally quantified statements (*All dogs have four legs*) as true when participants were instructed to respond as quickly as possible, but not when there was no time pressure, consistent with predictions, but that study again used *all* and did not include any measure to assess whether participants fully read each word (see for example Ferreira and Henderson, 1990). Lazaridou-Chatzigoga and Stockall (2013) address this issue by recording two time measures: the time it takes participants to read the statements and the time it takes participants to make the necessary truth-value judgment. Lazaridou-Chatzigoga and Stockall compare generic statements to statements with *all*, *all the*, and *every*. Statements involved either a majority or minority characteristic property read after a preceding context. They find that the time to read the statements was significantly faster for the generic majority characteristic condition than any other condition. This might suggest that some, but not all, generic statements are *easier* to process than the corresponding universally quantified statements, which is partially consistent with the **generics-as-default** view. However, the time to make the TVJ for minority characteristic generic and 'all' statements was much longer than the other two universal quantifiers (*all the*, *every*), or for majority characteristic statements, suggesting that the picture is more complicated than it might seem and that further investigations of the time course of generic and quantificational interpretation are required.

In additional work in progress, we begin to address this issue by carefully manipulating factors such as quantifier type (generic, *all*, *all the*, and *every*), and preceding context, in order to contrast an emphasis on supporting evidence or on contradictory evidence with no emphasis at all. Using different levels of context, and quantifiers with different domain restriction properties, will help to clarify the influence context might have on both generics and universally quantified statements, and the reading and response time measures will allow us to distinguish between costs associated with initial sentence processing vs. subsequent truth value evaluation to see when these effects are in operation.

Another issue that previous experimental work has overlooked is the variation in the realization of generics and universally quantified statements both within a language and across languages. The **generics-as-default** view has mainly focused on BP generics and on *all* universal statements. BPs are only one of the possible NPs that can appear in generic characterizing statements, given that in English generics can be also expressed with indefinite singulars like *a cat has a tail* or with definite singulars like *the cat is a domestic animal*.

It might be that the GOG effect is restricted to *all* quantified statements due to unique features of *all* (see Brisson 2003 and Lasersohn 1999). Despite the fact that Leslie et al. have only used *all* in their experiments, their claims are about universal quantifiers in general. Previous experimental work has not paid close attention to the fine-grained distinctions between different varieties of universal quantifiers that exist within a language, as for instance exemplified

in the observation that *all*, *every* and *each* are all universal quantifiers, but differ in terms of distributivity: a collective interpretation is more readily available for *all*, while it is less possible for *every* and impossible for *each* (cf. Beghelli and Stowell 1997).

Furthermore, if generics are the default interpretation then that would mean that cross-linguistically generics should be less marked than other quantificational statements. This however is not trivially true since we saw above that in languages such as Greek, generics are formed with the definite determiner as in *i tighris ehun righes* (the tigers have stripes) rather than a BP which is not less marked than quantified statements such as the existentially quantified merikes tighris (some tigers). Not only are generics marked in Greek, Spanish, French, etc, but also generic statements are ambiguous between generic and specific readings. *I tighris ehun righes* can also mean 'the (specific) tigers have stripes', so the generic form is not differentiated from the specific either, raising issues for Gelman's (2010) speculation about how children learn to make the distinction. This is because, based on the observation that generics share the form of specific sentences, the GaD view is committed to the view that children learning Greek will interpret *i tighris ehun righes* as a generic rather than a specific sentence by default. In other words, generics are not just the default mode of interpreting quantifiers, but also the default mode of interpreting statements that may be either generic or specific. This would seem to be a very strong claim, but one that the GaD view is committed to. We are currently running experiments with English and Greek adults to systematically compare the interpretation of generic and quantified statements across languages with distinct generic morpho-syntax. Follow up studies will investigate specific vs generic interpretation in adults, and in developmental studies testing the markedness claims.

Focusing on the developmental literature, very few studies report any instances of over-generalization, or other behaviour consistent with the proposal that generics are the default privileged mode of making generalizations. In the studies we discussed above the observations seem to be compatible with the **generics-as-default** view, but the vast majority of other studies in the field seem to show that in study after study, even very young children make systematic, and adult-like, distinctions between generics and quantified generalizations. Thus, children seem to know the morpho-syntax and aspects of the semantics/pragmatics of quantifiers from early on, without any attested delay in the acquisition of quantifiers with respect to generics. This pattern is certainly not what would be obviously predicted by the formal semantics analyses, but it is not strong support for the GaD view either.

Finally, the literature has mainly focused on whether children are able to distinguish generics from quantifiers, and on whether children use the frequency with which a property holds of a kind in licencing generic interpretations. As discussed above, however, genericity cannot be reduced to statistical generalization or prototypicality. Building on Chambers et al. (2008), we are investigating whether children will be more tolerant of exceptions when the property is striking, rather than neutral. This is a promising way to introduce one of the parameters we saw playing a role in the classification of generics in section 2.3 in order to test whether children truly have adult-like generic interpretations.

Irrespective of whether one agrees with the **generics-as-default** view or not, it's clear that the experimental investigation of genericity is worth pursuing.

We now turn to issues in the formal semantics literature that remain unresolved and might be profitably addressed by experimental research.

5.2 Issues arising from the theoretical literature

With respect to the issues arising from the theoretical literature that the previous experimental literature has not addressed yet we identify the following issues.

The first is the possible tension between contextual restriction, in Krifka's terms (Krifka 1987), and domain restriction as invoked by Stanley and Szabò (2000) and Carlson (1999)/Greenberg (2007). One way to differentiate these processes would be on the basis of their explicit/implicit nature. Contextual restriction recall, is argued to be the mechanism by which a quantified, but not a generic, statement can be interpreted with respect to specific individuals explicitly mentioned in the previous discourse. Domain restriction, by contrast, is proposed as the mechanism restricting the interpretation of *ducks lay eggs* to only the 'relevant' female fertile ducks, via an **implicit** connection between the predicate *lay eggs* and some real world knowledge about the individuals who could potentially be denoted by this predicate. Lazaridou-Chatzigoga and Stockall (2013) find that minority characteristic generic statements like *ducks lay eggs*, and *all* quantified statements (*all ducks lay eggs*), preceded by a context making specific male ducks salient, elicit very slow TVJs, as compared to *all the* or *every* statements, consistent with participants having to engage in a costly process of domain restriction. However, this initial study did not manipulate enough features of the context to be conclusive. Our ongoing work will help us investigate these different levels of restriction.

The second issue has to do with the claim found in the modal approach that generics are subject to domain restriction (either to 'normal' or 'prototypical' individuals, or to those individuals presupposed/implied/entailed by the predicated property. If the reason *chickens lay eggs* is true is that domain restriction to only female chickens is triggered by the predicate *lay eggs*, then why is *chickens are hens* false? We saw that it may be possible to explain why *books are paperbacks* is not a possible generic by appealing to a notion of 'characterizing' property, but it is not obvious how to draw a distinction between the property 'female adults of this species lay eggs', and the property 'female adults of this species are called hens' that is anything more than ad hoc and descriptive.

One could try to appeal to pragmatic felicity considerations, such that *chickens are hens* is blocked because of the under-informative nature of a statement which would be equivalent to 'female chickens are hens' (which would only be felicitous in the metalinguistic sense, that 'the females of the kind of chicken are called 'hens''). However, *chickens are hens* does not seem to be 'infelicitous' in the way that, say *the girl went home* is infelicitous if uttered out of the blue, with no salient/unique referent for *the*, or under-informative in the way that *a student passed the test* is under-informative if, in fact, all the students passed the test. Rather, it is false in the actual world

(although we can imagine a future in which reproductive technologies and farming practices lead to it being true).

The third issue is the learnability and processing challenge raised by any theory in which generic interpretations are determined by one or more covert elements, despite generic generalizations failing to have an unambiguous overt morpho-syntactic form. The **generics-as-default** hypothesis offers a solution to this problem, but the formal semantics literature does not. Our ongoing work comparing generics in English and Greek will, we hope, allow us to begin to understand what effect the form of a generic statement has on its processing and interpretation, and thus begin to address this question.

Conclusions

Both the formal semantics research exploring a compositional, modal semantics approach to generics, and the experimental research investigating the **generics-as-default** hypothesis have substantially contributed to our understanding of how generics work. However, by juxtaposing these two lines of research, we highlight the significant challenges for each approach. The formal semantics models do not offer any clear explanation for the robust child language findings that generic utterances, and generic interpretations are prevalent in children as young as 2 years old, despite not being associated with any overt morpho-syntactic marker in any known language. On the other hand, the evidence for the generics as default proposal is undermined by a lack of cross-linguistic comparison, or serious engagement with the formal semantics of quantification and specificity. Resolving either of these issues will require interdisciplinary work, integrating the tools and perspectives of both strands of investigation. We hope this paper will serve to stimulate more such work.

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No	Study	Ages	Language	Task	Manipulation	Results
1	Gelman and Tardif 1998	19-23 months (10 Mandarin, 20 English)	English and Mandarin Chinese	mother-child interaction	Study 1: naturally-occurring speech samples of children interacting with their caregivers in or around the home. Study 2: natural speech gathered within a laboratory setting Study 3: generic comprehension in a sample of adults	1. Generic noun phrases were reliably identified in both languages, although they occurred more than twice as frequently in English as in 2. Generic usage was domain-specific, with generic noun phrases used most frequently to refer to animals 3. The coding of utterances as generic versus non-generic has psychological reality for ordinary speakers of both English and Mandarin
2	Pappas and Gelman 1998	26 mother-child pairs: 12 younger children (range 1;11-3;0), mean age 2;6) and 14 older children (range 3;2-4;9, mean age 3;9).	English	mother-child interaction	Mother-child pairs were videotaped while looking through a book of animal pictures. Each page depicted either a single instance of a particular category (e.g. a crab) or multiple instances of a particular category (e.g. many crabs)	1. With respect to the manipulation, the form of non-generic noun phrases was closely linked to the structure of the page, the form of generic NPs was independent of the information depicted 2. Twenty-four of the 26 mothers produced at least one generic, with rates ranging across mothers from 0 to 41% of all utterances produced. Overall, fully 11% of mothers' utterances produced during the picturebook reading sessions included a generic. 3. Generics were also found in the speech produced by young children. Although the overall percentage of generics was rather modest (1% of the utterances produced the twoy.o. and 5% of the utterances produced by three- and foury.o.), more than half the subjects produced at least one generic noun phrase during the book-reading session (50% of the twoy.o. and 79% of the three- to four y.o.).
3	Gelman, Star, Flukes 2002	Study 1: 37 4y.o. mean age 4;7 (range 3;11-5;5), 36 adults	English	Study 1: inference estimation task with familiar kinds and new facts about them Study 2: percentage estimation task (adults only): what percentage of the category applies to the category (rating scale 0% to 100% in increments of 10%)	Study 1 and 2: {All bears/Bears/Some bears} like to eat ants.	1. Sensitivity to type of wording among both preschoolers and adults, with "all" eliciting the most inferences, "some" eliciting the fewest inference, and generics in between "all" and "some". 2. Children made fewer category-based inferences from generics than did adults.
4	Hollander, Gelman and Star 2002	Study 1:18 3y.o., 18 4y.o., 36 adults Study 2: 48 4y.o., 37 adults	English	Study 1: comprehension study with 3-and 4y.o. and adults Study 2: elicited production study with 4y.o. and adults (prompts for children, paper-and-pencil for adults) 3 kinds of cues: "What can you tell Zorg about {dogs/all dogs/some dogs}?	Study 1: Are {fires/all fires/some fires} hot? 3 kinds of properties: a) wide scope b) narrow scope c) irrelevant scope Study 2: 12 categories	1. 4-year-old children—like adults—treated generics as distinct from both indefinites ("some") and universal quantifiers ("all"). In contrast, 3y.o. did not differentiate among generics, "all," and "some. 2. Preschool children and adults distinguished generics from "some" in scope. Generics are consistently broader in scope than "some" statements. Furthermore, adults but not children treat generics as narrower in scope than "all" statements.
5	Gelman and Raman 2003	Study 1A: 16 4y.o. + 25 adults Study 1B: 18 2y.o. + 16 3y.o. Study 2B: 12 2y.o., 12 3y.o., 12 4y.o. Study 2C: 12 2y.o., 12 3y.o., 12 4y.o.	English	Study 1A: TVJ task with atypical individuals Study 1B: same as 1A Study 2B: same as 2A Study 2C: same as 2A	Study 1A,B: generic/non-generic (dogs/the dogs) Study 2B: mismatch/singular match Study 2C: mismatch/plural match	1. Studies 1A,B: children by 2 years of age use linguistic form to differentiate generic from non-generic 2. Studies 2B,C: children by 3 years of age use pragmatic context as a cue for generic meaning
6	Gelman and Raman 2007	Study 1: 32 3y.o., 35 4y.o., 33 adults Study 2: 24 4y.o. Study 3: 30 4y.o., 33 adults Study 4:36 4y.o., 47 adults	English	Recall task	A picture with generic "Bears climb trees"/non-generic condition "This bear climbs trees"	1. Participants in all age groups correctly distinguished generic from non-generic in their recall 2. Memory for predicate content (e.g. "climb trees") was largely unaffected for genericity, although memory for category labels (e.g. "bears") was at times better for the generic condition

7	Gelman and Bloom 2007	Study 2: 21 5y.o. Study 3: 16 5y.o.	English	Yes/No task	Study 2: generic vs. specific Do {dobles/these dobles} have claws? ''Here's how dobles get claws'', – not ''my dobles'' or ''these dobles' Study 3: Property origins information (either present from birth or acquired artificially) was provided about ''my dobles''	1. Children and adults distinguish generic from non-generic and they interpret generics as referring to kinds (under certain contexts both children and adults accepted 'dobles have claws' even when all the dobles in the available context were claw-less) 2. Adults distinguished inborn from acquired properties, judging inborn properties even when lost as predicated of a generic kind, whereas children did not distinguish inborn from acquired properties
8	Chambers, Graham and Turner 2008	Study 1: 96 4y.o. Study 2: 24 4y.o.	English	Property verification (see whether the property would be extended to a new exemplar of a novel kind)	Study 1: 2 conditions (generic/non-generic, i.e. this/these) x 2 conditions (strong/weak evidence) Study 2: 2 conditions (generic/non-generic) + presentation of exceptions	1. Children reliably extended the property to new instances after hearing generic but not non-generic sentences. 2. The influence of generic language was much greater than effects related to the amount of tangible evidence provided (the number of creatures bearing the critical property). 3. Mean verification rates were higher when the property was expressed in generic sentences compared with non-generic sentences even when incompatible evidence was presented.
9	Cimpian and Markman 2008	Study 1: 36 3y.o. and 36 4y.o. Study 2: 24 3y.o. and 24 4y.o. Study 3: 24 3y.o. and 24 4y.o. Study 4: 3y.o. and 24 4y.o.	English	Determine whether an utterance with ambiguous scope is generic (e.g. 'They are afraid of mice', spoken while pointing to 2 birds)	Study 1: non informative/generic/non-generic NP Study 2: generalizable/non-generalizable property Study 3: doctor/teacher condition Study 4: conflict condition (generic)/no NP	1. 4y.o. take advantage of a) the immediate linguistic context, b) their previous knowledge and c) the social context to determine whether an utterance with ambiguous scope is generic, while 3y.o. were sensitive only to the first two 2. 4y.o. prefer to base their interpretation on the explicit NPs in the linguistic context compared than on previous knowledge, 3y.o. showed no clear preference
10	Gelman, Goetz, Sarnecka and Flukes 2008	8 children (2;0 to 3;7 at first recording, followed longitudinally through to ages 3;1 to 4;11; 6 males, 2 females) from the CHILDES database	English	CHILDES Mother-child interaction	Phase 1: identifying generics, Phase 2: Coding of discourse sequences, Phase 3: Content and form coding	1. Children talk about kinds from an early age, from 2 1/2 y.o. 2.Children initiate generic talk 3. Generics are most often used to refer to kinds of animals or people
11	Gelman, Waxman and Kleinberg 2008	48 mother-child pairs with children aged from 3.5 to 5.0	English	Mother-child interaction about 24 sets of items (12 animal sets and 12 artifact sets)	Each set had 4 instantiations: simple object, simple picture, complex object, and complex picture: 2 conditions (simple/complex)	Mothers and children provided relatively more focus on kinds when talking about pictures, and relatively more focus on individuals when talking about objects. The current results demonstrate that this effect is independent of the items' complexity.

12	Graham, Nayer and Gelman 2011	Study 1: 96 30m.o. Study 2: 48 24m.o. Study 3: 100 30m.o.	English	Study 1: Imitate the target action Study 2: Imitate the target action Study 3: Imitate the target action	Study 1: Sentence-prompt group/sound effect prompt group + generic/non-generic condition Study 2: generic/non-generic paired with an action on an object Study 3: Study 2: generic/non-generic paired with an action on an object + plurality controlled	After hearing nongeneric phrases, 30-month-olds, but not 24-month-olds, imitated more often with the model than with the nonmodel exemplar. In contrast, after hearing generic phrases, 30-month-olds imitated equally often with both exemplars.
13	Leslie and Gelman 2012	Study 2A:26 3y.o., 30 4y.o. Study 2B: 16 preschoolers Study 3: 16 3y.o. Study 4A: 32 preschoolers + 42 adults Study 4B: 16 preschoolers + 10 adults	English	Recall task of novel facts about familiar animal kinds	Study 2A: same as 1A Study 2B: same as 1B Study 3: generic vs. no Study 4A: one-kind vs. subkind + generic/all Study 4B: all/all of these (one-kind only)	Study 2A: a) GEN correct recall 41% + Q correct recall 18%, b) Q more often recalled as GEN (36%) than GEN recalled as Q (12%) Study 2B: Marked tendency to recall Q as GEN Study 3: GEN correct recall 52% + Q correct recall 21% Study 4A: adults (86%) and children (76%) endorse generics similarly, while there is a difference with *all:* adults <1%, children 58% Study 4B: adults rejected *all of these* on 100%, while children agreed to *all of these* at 21%
14	Brandone and Gelman 2009	Exp 1: 33 adults and 25 4/5y.o. Exp 2: 29 adults and 24 4/5 y.o. Exp 3 : 16 preschoolers	English	Elicited production (generate properties about novel animals and artifacts)	Exp 1: real animals vs. artifacts and generic vs. neutral prompt Exp 2: new matched pairs of maximally similar novel animals and artifacts Exp 3: same as Exp 2 with some modification on the artifacts	The likelihood of producing a generic even without prior knowledge about these items is significantly greater for animals than artifacts
15	Brandone, Cimpian, Leslie and Gelman 2012	Study 1: 14 5 y.o., 14 adults Study 2: 12 5 y.o.	English	TVJ task: definitely yes/definitely no for adults and a little yes/a little no for children [LS: am confused - you say children and adults had different TVJ tasks? Please clarify, as this description doesn't match to the reported results]	Study 1: Characteristic/non-characteristic property Study 2: Characteristic/non-characteristic property (only with *is*)	Children gave significantly more 'definitely yes' responses for characteristic than non-characteristic items (i.e. they evaluate generics based on more than just quantitative information)
16	Tardif, Gelman, Fu and Zhu 2012	Study 2: 13 3 y.o., 18 4y.o., 18 7y.o. Study 3: 60 5y.o., 60 7y.o., 35 adults, 92 adults	Mandarin Chinese	Study 2: confirmation of generic NPs Study 3: Elicited production	Studies 1,2,3: generic/all/some and property of broad/narrow/irrelevant scope	Mandarin-speaking children begin to distinguish generics from 'all' or 'some' as early as five years. The developmental trajectory for Chinese appears prolonged relative to English and this seems to reflect difficulty with 'all' and 'some' rather than difficulty with generics.
17	Gelman, Leslie, Was and Koch 2015	48 3y.o., 48 5y.o., 121 adults	English	TVJ task with novel animal kinds	Wording: General Q (all/some)/Specific Q (all of these/some of these)/generic Frequency levels: 0%, 25%, 75% and 100%	Generics: both adults and children demonstrate a stepwise increase with frequency level, though the patterns differ for children: 3y.o. reached ceiling at 75% and 5y.o. indicated a break between the lower and the higher frequency levels Universal Qs: Children, like adults, endorsed both general and specific Qs more often at the 100% than all other levels. Unlike adults, children showed differentiation among the lower frequency levels: 25% and 75% differed significantly from one another Existential Qs: Children: 3y.o. a) general Qs: scores at 0% and 25% levels are lower than at 75% and 100% levels, b) 3y.o. for specific Qs and c) 5y.o. for both general and specific Qs: all frequency levels differ from one another, with the exception of 75% and 100%, which are equal