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#### **Authors**

Zapf, Jennifer A.  
Smith, Linda B.

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# Meaning Matters In Children's Plural Productions

**Jennifer A. Zapf (zapfj@uwgb.edu)**

University of Wisconsin-Green Bay  
Department of Psychology and Human Development  
2420 Nicolet Drive, MAC C310, Green Bay, WI 54311, USA

**Linda B. Smith (smith4@indiana.edu)**

Indiana University  
Department of Psychological and Brain Sciences  
1101 East Tenth Street, Bloomington, IN 47405, USA

## Abstract

The English plural is about the *number of individuals* in a set of like kinds. Two year old children use the plural but do not do so in all obligatory contexts. The present report asks whether the limitations on their use of the plural in any way related to meaning. Experiment 1 elicited plural productions from 2-year olds (n=26) for sets of size two and four and for instances of basic level categories that were either similar or identical. Children were much more likely to produce the plural of these well known nouns when there were four rather than two and when the instances were identical rather than merely similar. Experiment 2 examined spontaneous productions of parents speech to two-year-olds (n = 16). They showed a comparable similarity effect, but not a number effect. The results provide new evidence on children's acquisition of the English plural, showing that children's early productions are not just limited by knowledge of the noun and its plural form but also is limited by properties of the labeled sets in ways that are relevant to the underlying meaning of the plural.

**Keywords:** category knowledge; language learning; language acquisition; morphology; production

## Introduction

Two-year-old children learning English spontaneously produce the plural forms of nouns, using them to label sets containing multiple instances of the same kind. However, they do not use the plural in all required contexts (Cazden, 1968; Mervis & Johnson, 1991; Brown, 1973; Berko, 1958; Clark & Nikitina, in press). Past explanations of this limited productivity have focused on morphological rules, exceptions to those rules, and phonological constraints (Marcus et al., 1992; Marchman, Plunkett, & Goodman, 1997; Winitz, Sanders & Kort, 1981). The meaning of the plural, however, has not been studied in relation to its growing productivity. This report presents new evidence that meaning matters.

Formally, the English plural partitions sets into those with precisely one individual versus those with more than one. Although this seems natural to mature English

speakers, other meaning distinctions are possible. For example, the Russian plural distinguishes sets of one, sets with few members, and sets with many members. Many Indo-European languages have a separate plural form for sets of exactly size two. Sursurunga, an Austronesian language, has five plural forms that are dependent on the number of instances in the referred to set. Other languages such as Japanese have no plural but quantify sets through the use of quantifiers that depend on the kind of thing in the set. These cross-linguistic differences mean that learners have to figure out the relevant meaning categories for their language. This paper examines two factors that might be relevant to young children's figuring out the meaning of the English plural: the similarity of the instances in the set and the number of things in a set.

## Hypothesis 1: Similarity matters.

The plural is about the number of things *in a set* and thus requires that children think about the individuals as forming a coherent group, and not just as unrelated distinct things. This should be easier if those things are highly similar (e.g. Markman & Gentner, 2005; Mix, Huttenlocher, & Levine, 2002). Thus, although the plural forms of English count nouns can be used to label sets of highly similar things and sets of very different things (e.g. poodles, dogs, animals, and things), for young children the similarity of the instances in the to-be-labeled set may be critical. Accordingly, Experiment 1 presented children with sets that could be labeled by the same basic-level noun (e.g. "dog") but that varied in the similarity of the presented instances. Are two-year-old children more likely to use the plural to label four identical dogs, for example, than to label four individually recognizable but distinct dogs?

## Hypothesis 2: Number matters.

Considerable research suggests that infants and toddlers accurately and categorically distinguish small set sizes such as one versus two versus three (e.g., Schaeffer, Eggleston, and Scott, 1974; Kouider, et al., 2006), and

treat sets of one and also sets of two as unique categories (e.g., Wynn, 1990). As Barner and Snedeker (2005) recently suggested, this sophisticated and categorical apprehension of small numerosities could present problems for learning the English plural in that the plural requires children to treat sets of two, four, and one hundred as equivalent. In light of this, two opposing versions of the “number matters” hypothesis make developmental sense. First, young learners could preferentially attach the plural to sets of two, since these are well-differentiated from sets of one and easily quantifiable. If so, children might use the plural first for pairs of things before they use the plural for larger set sizes. Alternatively, if children first understand the plural as being about many instances, and if they understand many as distinct from both one and two, they may be most likely to use the plural when there are more things than just two in the set. This is also tested in Experiment 1. Are young children more likely to use the plural to label two dogs than four, or perhaps, are they more likely to use the plural to label four dogs than to label just two?

### Experiment 1

The experimental task, borrowed from Johnston, Smith, and Box (1997), elicits productions by asking children to describe things to a blind-folded teddy bear. In the present version, the child was presented on each trial with an array of objects as illustrated in Figure 1. Each array included two sets: a set of one (S Set) and a set of more than one (P set). The child’s task was to tell the bear “to get” one of the sets. On some trials, this was the S set and so a likely word to indicate that set would be the singular basic-level category term (e.g. “tree”). On the critical test trials the target set was the P set, potentially generating a plural noun (e.g. “pigs”). The size of the P set (two or four) and the similarity of instances within the P set (identical versus merely similar) was varied.

### Method

#### Participants

Participants were 34 children between 23 and 30 months of age (mean age = 26 months). They were assigned randomly to the two between-subjects conditions, P set size of two and P set size of four.

#### Stimuli and Design

Four unique three-dimensional instances (varying from 9 to 25 cm on the longest dimension) were selected from the following categories: dogs, flowers, monkeys, turtles, babies, birds, spoons, planes, boats, forks, cows, cars, hats, keys, dolphins, horses, trucks, bears, pigs, bunnies, bottles, crayons, giraffes, and books. These were chosen from a preliminary study such that all instances were readily recognizable by two-year-old children. In that

preliminary study, 28 children (mean age = 26 months) who did not participate in the main experiment indicated a named object in a three-choice forced-choice task. The four unique instances selected for each category were recognized by at least 90% of these children.

The four different instances formed the Similar-Instance P set size four. Two unique instances were randomly selected to form the Similar-Instance P set size two. Two or four identical replications of one instance were used to form the Identical-Instance P sets. Different unique instances were selected to form these Identical-Instance P sets for different children so that across children performance on identical sets could not be due to the particular instance used.

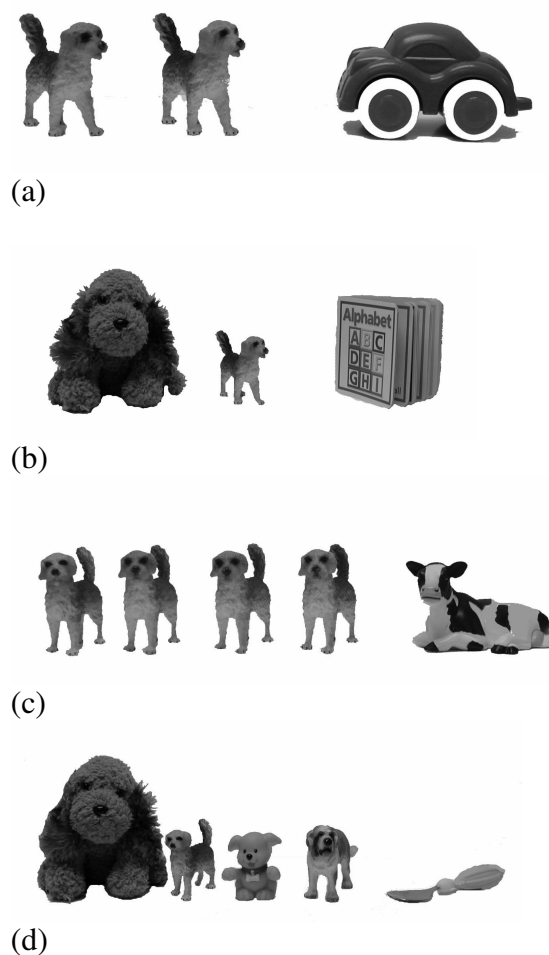


Figure 1: Sample stimuli sets from Experiment 1: (a) two identical dogs, (b) two similar dogs, (c) four identical dogs, and (d) four similar dogs. In the placement of objects during the experiment, the position of the target was counter-balanced.

**Procedure**

To begin a trial, the experimenter placed an S set and a P set on the table. The child was allowed to play with the objects for fifteen seconds to minimize subsequent choices based on toy preferences. The experimenter then arranged the objects into the two segregated sets (P and S) and placed the blindfold over Teddy’s eyes. The child was reminded that Teddy could not see but could hear. The experimenter then told the child, “Tell Teddy to get \_\_\_” at which time the experimenter gestured to the S set or the P set. After the child told Teddy what to “get,” the experimenter took the blindfold off and Teddy “got” what the child said. On each trial, Teddy retrieved whatever the child verbally specified. If the child said nothing or something ambiguous (e.g. “that”) the question was repeated once and if the child still did not respond or said something that did not unambiguously indicate one set, the experimenter went on to the next trial without Teddy retrieving anything. If the child used the singular form when a plural was called for, Teddy “got” one instance. No other feedback of any kind was given.

The session began with “warm up” trials in which the experimenter demonstrated the task twice (once indicating an S set and once a P set) and had the parent perform the task and then had the child immediately imitate the parent. Once these two “warm up” trials were complete, the ten experimental trials began.

On two of the trials the experimenter targeted the S set and on eight of the trials she targeted the P set. On half the P set trials the instances in the set were similar and on half they were identical. The identical and similar trials were blocked such that half the children received the identical trials first and the similar trials second and half received the similar trials first and the identical trials second. Size of the P set was two or four and varied between subjects. No child saw instances of the same basic-level category more than once.

**Results and Discussion**

Children primarily labeled the sets with basic level category nouns, either in the plural or singular form, doing so on 73% of trials of the P sets and on 76% of the S sets (here only one child on one trial ever used a plural form). The frequency of basic noun responses (plural plus singular) did not differ for the P sets and S sets,  $t(33) = -1.192$ ,  $p = .24$ , indicating that children were equally able to recognize the presented instances of these categories when presented as a single individual or in sets of multiple instances.

On the critical P set trials, children used the plural 51% of the time, using the singular form 22% of the time. They also sometimes said nothing (26%) , rarely, they used some alternative expression might be construed as correct (e.g. “these”) less than 1% of the time. The number of plural productions on P trials were submitted to a 2(set size) x 2 (order – similar/identical first) x 2

(similarity) ANOVA with similarity as a within subject factor. The analysis yielded three main effects: (1) number,  $F(1, 30) = 5.36$ ,  $p < .03$ , (2) order (identity trials first or second),  $F(1, 30) = 7.24$ ,  $p < .02$ , and similarity,  $F(1, 30) = 4.58$ ,  $p < .05$ . As is evident in Table 1, children produced the plural more often when labeling a set of four than a set of two and more often when labeling identical rather than similar instances. Set size and set composition thus matter to children’s early plural productions. For young children, sets with four identical items are a more potent elicitor of the plural than are sets with two; and sets of identical things are a more potent elicitor of the plural than are sets of similar things.

Table 1: Percent of children’s productions occurring in the plural form for target P sets in Experiment 1

Set	Order	Identical Trials	Similar Trials
2	Similar trials first	.18	.21
	Identical trials first	<u>.60</u>	<u>.50</u>
	Overall	.39	.36
4	Similar trials first	.60	.40
	Identical trials first	<u>.85</u>	<u>.70</u>
	Overall	.73	.55

The effect of order was unexpected and dramatic. When children were asked to label sets of size two, they more frequently produced the plural for sets with identical instances and for sets with similar instances *when the experiment began with the identity trials*. However, they much less frequently produced the plural – for the identity sets and the similar sets *when the experiment began with the similar trials*. This same pattern was obtained for set size four. It is as if first seeing multiple *identical* instances directed attention to the set and its quantity and this generalized to the Similar-Instance sets. In contrast, first seeing sets composed of basic-level category instances that varied in their individual properties seems to have directed attention away from the set as a whole yielding fewer plural productions even on subsequent sets containing identical things. One possibility is that this order effect may be the result of progressive alignment in which the identical items give rise to a strong sense of plurality and this, then, is carried over to the set of similar items (Kotovsky & Gentner, 1996; Markman & Gentner, 1993).

These results indicate that children’s early productions of the plural form depend on both the similarity and number of items in a basic-level noun category. These are new findings about the early use of the plural and raise many questions about the relevant underlying knowledge and processes. Before considering these issues, Experiment 2 addresses a pertinent question.

When parents talk about objects to their two-year-old children, do they show a similar pattern: increased plural productions for sets of identical rather than similar things and for sets of four rather than two?

## Experiment 2

### Method

#### Participants

Participants were sixteen parents of two year olds (mean age = 26 months), none of whom had participated in Experiment 1. They were randomly assigned to two between-subjects conditions, P set size of two and P set size of four.

#### Procedure

Stimuli sets, trials, and design were the same as in Experiment 1; however the task and instructions differed. On each trial, parent and child dyads were given an S set and a P set. The parent was asked to play with and talk about these objects with their children. Each trial lasted approximately thirty seconds. There were no warm up trials, no teddy bear, no queries from the experimenter, and no mention that the experiment had to do with how objects were labeled or the plural.

#### Results and Discussion

We counted the number of singular and plural nouns used by parents to refer to the P set items. These scores were submitted to a 2(set size) x 2(order-similar/identical first) x 2(similarity) ANOVA. The analyses yielded only a main effect of similarity,  $F(1, 12) = 16.85, p < .01$ . The interaction between set size and similarity approached significance,  $F(1, 12) = 3.92, p = .07$ . As shown in Table 2, parents were equally likely to use the plural to refer to sets of two versus four. However, whereas they often used the plural to refer to multiple identical instances, they rarely used the plural when talking about non-identical instances of the same category, and this was somewhat (though not reliably) more likely for sets of four things than for sets of two similar things.

Table 2: Frequency of parents' productions occurring in the plural form for target P sets in Experiment 2

Set Size	Identical Trials	Similar Trials	Total
2	8.6	6.8	15.4
4	9.8	3.9	13.7

### General Discussion

The present results indicate that children's early use of the plural is limited in part by the properties of the sets being labeled. Two year olds were more likely to use the plural when the multiple instances of a category were identical

rather than merely similar and when there were four rather than two instances. The English plural marks sets of *multiple* instances of *like* kinds, and thus similarity and number are relevant dimensions of meaning.

Both young children's plural productions and their parents' plural productions depended on the similarity of the multiple instances to each other. Thus, the same psychological processes may underlie this effect at both developmental levels. One likely key factor is that people typically attend to (and thus talk about) the differences among otherwise similar things, a bias that has been documented in a variety of domains from perception, to similarity judgment, to learning adjectives (Garner & Sutliff, 1974; Tversky & Gati, 2004; Waxman & Braun (2005); Sandhofer & Smith, 2004). In this way, the early similarity limitation on children's plural productions may reflect fundamental psychological processes as to when things should be treated as equivalent members of the same class or as distinct things. Under this view, these effects of similarity on plural production could nonetheless be viewed as principally reflecting pragmatic issues in the use of the plural. This surely is the case for adults who know that a set of four individually distinct dogs is called *dogs* even though in spontaneous speech they prefer to talk not about the set but the individuals. Is this also the case for children? This is less clear since their task was not spontaneous production; instead they were placed in a task that demanded a label for the set as a whole – a label they were better able to provide when the items were identical rather than when they were merely similar.

At the same time, this effect of similarity may also be revealing as to the nature of the conceptual work that underlies the acquisition of the plural. The plural requires that children represent the elements in a set in two ways, as discrete individuals that therefore can be counted and also as members of a single set that is being quantified. Such dual representations are known to be particularly difficult for two year olds (see DeLoache & Sharon, 2005; Mix, 2002). For young children, and perhaps also for adults, there may be a psychological tension between conceptualizing individuals and simultaneously conceptualizing them as members of a unified set. The former may be fostered by any factor that separates the individuals, such as non-overlapping boundaries, space, time, and perceptual differences (see Kellman & Shipley, 1992 and Barner & Snedeker, 2005 for relevant discussions and data). The second may be helped by factors, such as similarity, that highlight membership in a single nameable set. The experimental study of the interaction of these factors as a function of development would be useful to a deeper understanding of the conceptual underpinnings of the acquisition of the plural.

More plural productions for sets of size four than sets of size two characterizes two year olds' productions but not those of their parents. Past research on early number

concepts provides ample evidence that infants and young children quantify sets of size two (e.g., Wynn, 1990). Thus deficiencies in this regard seem an unlikely explanation of the observed pattern. Indeed, as Barner and Snedeker (2005) proposed, children's considerable knowledge about and categorical apprehension of the numerosity of small set sizes could limit their early understanding of the plural. One possibility is that children initially quantify sets as "one," "two," "three," and "more" (see Gelman & Gallistel, 1978; Ginsburg & Oppen, 1988; Wynn, 1990) and as a consequence have the English plural more strongly linked to larger set sizes than to "two" or "three." A key question for future research is whether it is specifically the link between the plural and "two" (and perhaps three) that is dampened or whether the plural is perhaps graded with respect to number for young children and thus generally stronger for larger than smaller numbers. The latter effect would be consistent with evidence on children's acquisition of dimensional terms such as "big" and "little" which are often first understood as applied to extreme values (e.g., Sera & Smith, 1987; Smith, Cooney, & McCord, 1986).

In conclusion, the results provide new evidence on children's acquisition of the English plural, showing that children's early productions are not just limited by knowledge of the noun and its plural form (Marcus et al., 1992) but also is limited by properties of the labeled sets in ways that are relevant to the underlying meaning of the plural. From the present results, the key conceptual issues being worked out by children as they learn the plural appear to be: (1) the construal of instances both as individuals and as members of a set and (2) the formation of a category of "more than one" that includes already distinguished number categories such as "two."

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