INFANTS' USE OF SYNTACTIC CUES TO LEARN PROPER NAMES AND COUNT NOUNS

by

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Abstract

The general purpose of this study was to investigate infants’ understanding of objects as individuals and as category members by examining their understanding of proper names and count nouns. Forty-eight infants participated in one of two experiments. In both experiments, infants were taught a novel word for a stuffed animal presented on a puppet stage. The novel word was presented syntactically either as a proper name (e.g., “He’s called DAXY”) or as a count noun (e.g., “He’s called a DAXY”). The animal was moved to a new location on the stage, and a second identical-looking animal was placed where the first toy was originally located. Infants were then asked to look at one of the objects as a referent for the novel word. Infants’ looking behaviour was recorded. At 20 months (Experiment 1), but not at 16 months (Experiment 2), infants were more likely to look at the labeled object as a referent for the novel word in a condition in which they heard a proper name than in either a condition in which they heard a count noun or a baseline condition in which they heard no word. By 20 months of age, infants thus used syntactic information to distinguish appropriately between proper names, referring to objects as individuals, and count nouns, referring to objects as category members.
# TABLE OF CONTENTS

Abstract .................................................................................................................. ii
Table of Contents ................................................................................................. iii
List of Figures ........................................................................................................ iv
INTRODUCTION ................................................................................................. 1
EXPERIMENT 1 ...................................................................................................... 11
  Method .................................................................................................................. 11
  Participants .......................................................................................................... 11
  Stimuli .................................................................................................................. 12
  Apparatus ............................................................................................................ 12
  Procedure ............................................................................................................ 12
  Results and Discussion ....................................................................................... 14
EXPERIMENT 2 ...................................................................................................... 18
  Method .................................................................................................................. 18
  Participants .......................................................................................................... 18
  Stimuli .................................................................................................................. 18
  Apparatus ............................................................................................................ 18
  Procedure ............................................................................................................ 18
  Results and Discussion ....................................................................................... 18
GENERAL DISCUSSION ....................................................................................... 21
References ............................................................................................................ 26
Footnotes ............................................................................................................... 29
List of Figures

Figure 1 Procedure used in Experiments 1 and 2 .........................................................30

Figure 2 20-month-olds’ mean proportions of 1st looks to the unlabeled object following the first phoneme of the noun phrase of the test question for each condition .31

Figure 3 16-month-olds’ mean proportions of 1st looks to the labeled object following the first phoneme of the noun phrase of the test question for each condition ......32
Introduction

The ability to reason about a physical object (e.g., a cat) either as a category member (e.g., as a cat) or as an individual (e.g., as Fifi) is a central feature of human cognition. Much of our reasoning about objects involves treating them as category members. Knowing an object’s category membership is important because it enables us to draw inferences concerning that object. For example, if an object belongs to the category “cat”, we may infer that it is an animal with a set of characteristic behaviours (e.g., eats fish, meows, purrs, etc.). Thinking about objects in terms of categories thus permits us to form generalisations, which in turn are essential for inductive learning—a critical part of our everyday lives (Bloom, 2000). On the other hand, the capacity to think about objects as individuals is also an essential part of our lives. Individuals are the entities that we enumerate and track through space and time. Our feelings and emotions like love are generally tied to specific individual people, animals, and other objects, rather than to any interchangeable member of a given category (Pinker, 1997). Thus, human cognition requires the flexibility to think about a physical object either as a category member or as an individual.

The difference between the interpretation of objects as category members and that of objects as individuals is reflected in the grammar of most languages of the world (e.g., Macnamara, 1982). In English, there is one grammatical category whose members refer to objects as individuals (i.e., proper names) and another whose members refer to objects as category members (i.e., count nouns).\(^1\) Syntactically, these grammatical categories behave differently. Count nouns can be used in conjunction with determiners (e.g., “the cat”) and adjectives (e.g., “big cat”), and they can be pluralized (e.g., “cats”). In contrast,
proper names usually cannot be preceded by determiners (e.g., “the Fifi” is not grammatical) or adjectives (e.g., “big Fifi” is not grammatical), and they cannot be pluralized (e.g., “Fifis” is not grammatical). The existence of this syntactic distinction suggests that one approach to studying the development of children’s flexible understanding of objects as category members and as individuals is to examine the development of their understanding of count nouns and proper names. This is the goal of the present research.

Several studies have been conducted to investigate children’s understanding of proper names and count nouns. One of the first investigations was carried out by Katz, Baker, and Macnamara (1974; with additional data from Macnamara, 1982). They tested young children’s understanding of labels for animate toys (i.e., dolls). The children who participated in Katz et al.’s study were 17 to 24 months of age, and those who participated in Macnamara’s study were 15 to 28 months of age. Children were presented with a pair of dolls differing in hair colour. They then heard a novel word paired with one of the dolls. In one group, the label was presented syntactically as a proper name (e.g., “This is ZAV”), and in the other group, the label was presented syntactically as a count noun (e.g., “This is a ZAV”). Using the novel label, the experimenter then asked the children to perform actions with one of the dolls. For example, in the Proper Name condition, the experimenter asked, “Can you give me ZAV?” and in the Count Noun condition, the experimenter asked, “Can you give me a ZAV?” The results showed that children (girls as young as 17 months and boys as young as 28 months) were more likely to use the labeled doll to perform the actions in the Proper Name condition than in the Count Noun condition. In addition, in the Proper
Name condition, children showed a preference for the labeled doll, but in the Count Noun condition, they had no preference for either doll. The authors concluded that the children used syntactic information (i.e., the presence or absence of the determiner, “a”) to decide if the novel word was a proper name referring to the object as an individual, or a count noun picking out the object as a category member.

To clarify children’s interpretations of the novel label in the preceding research, Gelman and Taylor (1984) replicated Katz et al.’s study with a slightly different methodology. They argued that children who showed no preference for either doll in Katz et al.’s (1974) and Macnamara’s (1982) task could have interpreted the novel label as a count noun (i.e., they thought that the word named a category such as doll), or simply could have responded by guessing (i.e., they did not know which object to choose, and so they selected randomly). To determine which of these two possibilities was accurate, Gelman and Taylor replicated Katz et al.’s task, but they presented two animate toys along with two distracter items of a different category. Children were on average 2 1/2 years old. Gelman and Taylor then labeled one of the toys with a proper name or a count noun and asked children to perform simple actions with the labeled toy. If children chose only objects of the same category and ignored the distracter items, it would suggest that they treated the word as designating a category (i.e., treated it as a count noun). On the other hand, if children picked randomly among all four objects, it would suggest that they were guessing. Gelman and Taylor found that in the Proper Name condition, children chose the labeled toy most of the time. In the Count Noun condition, they chose one of the two objects of the same category most of the time, ignoring the other two toys; they gave little evidence of picking at chance among all four objects. These results are
consistent with the hypothesis that by 2 1/2 years, children understand that count nouns refer to objects as category members, whereas proper names refer to objects as individuals.

Liittschwager and Markman (1993) raised a concern regarding the interpretability of the results of the preceding studies (Gelman & Taylor, 1984; Katz et al., 1974; Macnamara, 1982). They noted the problem that the labeled object in these studies always possessed a salient property that differentiated it from the unlabeled object (e.g., the labeled doll had blonde hair whereas the unlabeled doll had brown hair). Because of this fact, children's choice of the labeled object could have been motivated by more than one interpretation. One possibility is that the children interpreted the novel word as labeling the object as an individual (e.g., Mary). However, Liittschwager and Markman noted that it is also possible that such a choice reflected an interpretation of the novel word as an adjective designating the salient property (e.g., blonde). The syntactic context of proper names and adjectives does not distinguish them, since both proper names and adjectives may be used in sentences without a determiner (e.g., “This is Mary” and “This is blonde”). In addition, it is noteworthy that the possibility that the children interpreted the novel word as referring to a restricted category (e.g., blonde dolls) also could not be ruled out by the results of the previous studies (Gelman & Taylor, 1984; Katz et al., 1974; Macnamara, 1982).

To remove the uncertainty surrounding the interpretation that could be assigned to children's performance, Liittschwager and Markman (1993) conducted a new study in which they presented 3-year-olds with an animate object (e.g., a stuffed bear) that possessed a distinctive marker (e.g., the bear was wearing a bib). The object was labeled
with a novel proper name or a novel count noun (e.g., “This is Dax” or “This is a dax”).
After introducing the new word, the experimenter moved the labeled object to a new
location and removed the distinctive marker. An identical-looking object was then
placed in the location where the first object had been placed originally. Because the
distinctive marker had been removed, both objects were now identical. Using the new
word, the experimenter asked the child to choose an object (e.g., “Where’s Dax?” or
“Where’s a dax?”). The results were consistent with those of Katz et al. (1974) and
Gelman and Taylor (1984): the children in the Proper Name condition chose the labeled
object most of the time, whereas the children in the Count Noun condition chose either
object roughly equally as often. Thus, Liittschwager and Markman provided less
ambiguous evidence than the previous studies that children can distinguish between
proper names and count nouns and understand that these lexical categories are used to
refer to individuals and categories, respectively.

Sorrentino (1999) argued that Liittschwager and Markman’s (1993) results were
still subject to an ambiguity of interpretation. She noted that in Liittschwager and
Markman (1993), it was still possible that children may have interpreted the new label as
referring to a property (e.g., bib-wearing) or to a restricted category (e.g., bears wearing a
bib). Because Liittschwager and Markman removed the marker from the object when
they moved it to the second location, children were faced with two objects, neither of
which may have satisfied a property interpretation (e.g., bib-wearing) or a restricted
category interpretation (e.g., bears wearing a bib). In these cases, children may have
chosen the labeled object simply because it was the only object that had been labeled
previously with the new word. To remove this ambiguity, Sorrentino presented 3 1/2-
year-old children with an animate object possessing a distinctive marker. As in Liittschwager and Markman (1993), she labeled it with a novel count noun or proper name; placed it in another location; removed the salient marker; and introduced another identical-looking animate object in the location where the first object had been originally placed. The main difference between Sorrentino's study and Liittschwager and Markman's (1993) study was that after Sorrentino removed the salient marker from the first object, she placed it on the unlabeled object. Sorrentino (1999) reasoned that if the children interpreted the new label as referring to a salient property or to a restricted category involving the salient property, they should have chosen the unlabeled object. Sorrentino found that in the Proper Name condition, children largely chose the labeled object rather than the object with the salient property. This was thus a clear demonstration that children interpreted a novel proper name as referring to an individual rather than to a property or a restricted category.

The results reported by Liittschwager and Markman (1993) and Sorrentino (1999) provided clearer evidence than earlier studies of children's appropriate understanding of proper names and count nouns. However, it should be noted that Liittschwager and Markman (1993) and Sorrentino (1999) used participants who were at least 2 years older on average than the ones tested in the original study by Katz et al. (1974). In addition, Liittschwager and Markman (1993) and Sorrentino (1999) did not investigate further the gender difference that was found by Katz et al. (1974) (i.e., the finding that girls succeeded at the task approximately 1 year before the boys). To investigate children's learning of proper names and count nouns under the age of 3, and to address the issue of gender differences, we (Hall, Lee, & Bélanger, 2001) conducted a series of six
experiments using a modified version of Liittschwager and Markman’s (1993) procedure. We were interested in investigating whether younger children – boys and girls – represent proper names and count nouns in the same way as 3-year-olds, or whether they interpret them in a different way at first, and then later develop an understanding that is closer to that of 3-year-olds and adults.

In the first four experiments of Hall et al. (2001), children between the ages of 20 and 37 months were presented with a pair of surrogate animate toys (e.g., boy dolls, girl dolls, bears, or dogs). In these experiments, no distinctive properties distinguished the toys at any time. One object was labeled with either a proper name (e.g., “This is ZAV”) or a count noun (e.g., “This is a ZAV”). The sentence was repeated five times, after which the labeled object was moved to another location a few centimetres to the left or the right. The other identical-looking toy was then placed on the table, where the first object had been placed originally. Using the novel label, we then asked children to choose one of the toys (e.g., “Where’s ZAV?” or “Where’s a ZAV?”). The results from these four studies showed that girls as young as 24 months and boys as young as 37 months were more likely to choose the labeled toy in the Proper Name condition than in the Count Noun condition. The girls were therefore able to distinguish between proper names and count nouns 15 to 19 months earlier than in previous studies (i.e., Liittschwager & Markman, 1993; Sorrentino, 1999). We also noted that, as Katz et al. (1974) had found previously, boys were able to distinguish between count nouns and proper names appropriately approximately 1 year later than girls. The findings suggest that children’s ability to distinguish appropriately between proper names and count nouns may emerge around 24 months. The results also raise the question of whether the year
difference between girls and boys represented younger boys’ inability to use syntactic cues to differentiate between proper names and count nouns or whether it reflected an ability that was simply more fragile than in girls.

To address this question, we (Hall et al., 2001) conducted two further experiments with a slightly different methodology. In our fifth experiment, we tested 23-month-old boys by providing a richer and more elaborate linguistic and non-linguistic context for learning the novel word. There were four main differences between the methodology in this study and the one used in Experiments 1 to 4: (1) we reduced the number of trials from four to one; (2) we increased the number of different sentence frames in which we taught the novel word; (3) we made the teaching interactive by having children perform actions in response to requests using the novel label; and finally, (4) we attempted to elicit the novel word from the children. With this increased exposure to the new word, 23-month-old boys were able to differentiate appropriately between proper names and count nouns. In the Proper Name condition, boys restricted the new word to the labeled object significantly more often than they did in the Count Noun condition. This was the first demonstration that 2-year-old boys – like 2-year-old girls in our earlier experiment – could distinguish between proper names and count nouns. In a sixth and final experiment, we used the same procedure to test younger girls (i.e., 20-month-olds) to see whether they too could succeed on it. However, the girls in this experiment did not choose the labeled object more often in the Proper Name condition than in the Count Noun condition. This result suggests that they were unable to use the syntactic cues to distinguish proper names and count nouns, and that they treated these two lexical categories in a similar way.
The results of Hall et al. (2001) establish clearly that by the age of 23 or 24 months, but not at 20 months, both boys and girls can distinguish appropriately between the grammatical categories of proper name and count noun. However, these results leave open the question of how to explain even younger children's understanding of proper names and count nouns. There are reports of children using proper names consistently to refer to an individual such as a person or a pet and of their using count nouns to refer to categories as young as 16 months of age (e.g., Macnamara, 1982). In addition, the evidence reported in Katz et al. (1974) suggests that 17-month-old girls can distinguish between proper names and count nouns. What is the nature of young children's understanding of these lexical categories? Are they represented the same way in the mind of a young 16- or 17-month-old as in the mind of a 24-month-old or an adult? If they are, it raises the possibility that the methods used up to now underestimated children's ability to distinguish appropriately between proper names and count nouns under the age of 2 years. It is possible that the task of actively choosing an object is too difficult for younger children to perform. To address the difficulties involved in assessing infant language and cognition, several types of methodologies have been pioneered to study infant language and cognition. If younger children have a distinct and appropriate understanding of proper names and count nouns, we might be able to demonstrate it by using one of these methodologies.

One way to reduce the demands on the child in the task used in Hall et al. (2001) would be to use the child's looking behaviour as a dependent measure rather than the child's action of choosing a toy. In the current study, 20-month-old infants (Experiment 1) and 16-month-old infants (Experiment 2) were taught a new label for an object, as they
were in Experiments 5 and 6 of Hall et al. (2001). However, instead of having to choose manually one of the two identical toys after tracking it through space, infants only had to look at the toy that they thought was the referent of the new label. Infants were first presented with an animate surrogate (i.e., a stuffed animal) on the left or right side of a puppet stage. A new label presented syntactically as a proper name (e.g., “DAXY”) was then given to one group of infants and it was offered as a count noun (e.g., “a DAXY”) to a second group of infants. The toy was then slowly moved to the other end of the table. A second identical-looking toy was then placed in the position where the first toy had been placed originally, and infants were asked to look at a toy (e.g., “Where’s DAXY?” or “Where’s a DAXY?”). Children’s looking behaviour was measured. We also tested a third group of infants to assess baseline looking preferences in this task. The infants in this third group were presented with a similar puppet show, but they did not hear a novel label paired with the object.

Our three predictions were the following: First, infants should have looked at the labeled toy more often when they heard the toy labeled with a proper name than when they heard it labeled with a count noun. The rationale for this prediction is that when the toy was labeled with a proper name, the labeled toy should have been treated as the only referent of the new label. On the other hand, when the toy was labeled with a count noun, both toys should have been seen as acceptable referents for the new label. Second, infants should have looked at the labeled toy equally often when they heard the toy labeled with a count noun and when they heard it marked with no label. When infants did not hear a novel word, their looking behaviour should have indicated their baseline looking preferences, and this behaviour should have been the same as their behaviour
when they heard a novel count noun – in both cases, looking at either object was acceptable. Our third prediction was that infants should have shown a general preference for looking at the unlabeled toy, because it was the last toy to be presented on the puppet stage, and it should therefore have attracted the infants’ attention more than the labeled object.

In sum, we conducted two experiments involving 20- and 16-month-old infants. We used a modified version of the task used in Hall et al. (2001), adapted so that the dependent measure was children’s looking behaviour rather than their reaching and retrieving. By relieving children of the requirement to choose actively one or both objects, we expected that our new task would offer a more sensitive measure of young children’s understanding of proper names and count nouns than the original version.

Experiment 1

Method

Participants. Participants in this study were 24 infants (12 girls and 12 boys), ranging in age from 18 to 22 months (M = 20.1 months). All participants had been exposed to English as their first language and had not been exposed to another language more than 20% of the time (as reported by parents). Equal numbers were assigned to the Count Noun (CN) condition (M = 19.7 months; SD = 1.2 months), the Proper Name (PN) condition (M = 20.1 months; SD = 1.4 months), and the No Word (NW) condition (M = 20.7 months; SD = 1.6 months). An additional 12 infants were tested, but excluded because they failed to complete the task (N = 9) or because of experimental error (N = 3). Infants were recruited through advertisements placed in papers and pamphlets given out at family events in the local community.
Stimuli. Four pairs of identical-looking stuffed animals were used (i.e., ducks, fish, bears, and dogs). The animals’ heights were 13 cm, 10.5 cm, 15 cm, and 16 cm respectively. These animals were used because of the high likelihood of the occurrence of their category labels (i.e., the words “duck”, “fish”, “bear”, and “dog”) in 20-month-olds’ productive vocabularies (Dale & Fenson, 1996).²

Apparatus. The apparatus consisted of a black wooden puppet stage placed on a large table covered with a black tablecloth. Black curtains were attached to the back and the sides of the stage so that the infant could not see the first experimenter (E1) who sat behind the stage. Two small desk lamps (40 W) were placed on each side of the stage to illuminate the area where the objects were presented. The lamps were connected to extension cords and to a power bar located in a different part of the room, from which a second experimenter (E2) was able to control the lights. Another light (40 W) was placed on each side of the stage, to illuminate the infant’s face. One hidden video camera was placed under the stage to record the infant’s looking behaviour. Another video camera was placed behind the child and the parent, facing the stage, and recorded what was happening on the stage. A video mixer (Videonics MX1) connected to both cameras sent both images simultaneously to a single television screen (split screen) located where E2 was sitting.

Procedure. Before the study began, E2 explained the procedure, stressing the importance for the parents of keeping their eyes closed during the experiment and of refraining from moving and talking as much as possible. These precautions were attempts to prevent any inadvertent influence of the parent on the child’s looking behaviour.
The experiment took place in a room that was dark except for the lights on each side of the stage. Children sat on their parent’s lap facing the puppet stage, at a distance of 1.15 m from the stage. E2 began the study by turning the stage lights on to indicate the start of the first trial. E1 then presented a pair of identical-looking stuffed animals on the stage. E1 attracted the child’s attention by saying, “Look at them! They look the same!” and then removed both toys from the stage (see Figure 1, Step A). E1 then introduced the new label in the PN and CN conditions: she showed one of the toys on the right or the left side of the stage (counterbalanced) (see Figure 1, Step B), and she then read from a script in which the novel label was presented syntactically as a proper name (script version 1) or as a count noun (script version 2) in a series of different sentence frames. In a third version of the script, no novel label was used (NW condition).

In the PN condition, the script began as follows: “Look at him! He is called DAXY! And do you know what? DAXY loves to jump! He’s called DAXY! And when DAXY is tired, he likes to sleep and snore. DAXY is very friendly.” Then E1 slowly moved the toy to the other end of the stage (92 cm away) while attracting the child’s attention by saying, “Look here!” (see Figure 1, Step C). A second identical-looking toy was then placed in the position where the first toy had been placed originally (see Figure 1, Step D), and E1 attracted the child’s attention to it by saying, “Look here! Look here!” E1 then removed her hands from the stage and said, “Where is DAXY? Look at DAXY! Where is DAXY?” waiting 5 seconds between each prompt. E2 then turned the stage lights off to mark the end of the first trial. Five seconds later, the lights were turned back on, and a second trial began with a different pair of toys and a different label. The same procedure was repeated for the third and fourth trials.
In the CN condition, the same procedure was used, but the label was presented syntactically as a count noun (e.g., with a determiner). Infants heard the following script: “Look at him! He is called a DAXY! And do you know what? This DAXY loves to jump! He’s called a DAXY! And when this DAXY is tired, he likes to sleep and snore. This DAXY is very friendly.” At the end of the trial, infants were asked, “Where is a DAXY? Look at a DAXY! Where is a DAXY?”

Finally, in the NW condition, infants heard a similar script that contained no novel label: “Look at him! Look at him! And do you know what? He loves to jump! Look at him! And when he is tired, he likes to sleep and snore. He is very friendly.” At the end of the trial, El said, “Look! Look! Look!”

Infants had to complete at least two trials out of four to be included in our final sample. A trial was defined as successfully completed if the infant looked at either the labeled or unlabeled object following at least two out of the three prompts. The novel words were “DAXY” for the duck, “ZAVY” for the dog, “BLICKY” for the bear, and “FEPPY” for the fish. The order of presentation of the animals was counterbalanced, as was the labeled toy’s location on the stage (left or right).

Results and Discussion

As mentioned earlier, our first prediction was that if infants of this age distinguish appropriately between proper names and count nouns, they should have looked at the labeled toy more frequently in the PN condition than in the CN condition. Also, we predicted that there would be no difference between the looking behaviour of the infants in the CN condition and those in the NW condition. Finally, we expected to find a
novelty preference; that is, we expected infants generally to look at the unlabeled object more often than the labeled object.

We recorded the infants' looking behaviour (i.e., whether the infant looked at the labeled or unlabeled object) following the onset of the first phoneme of the noun phrase of our test question in the PN and CN conditions. In the NW condition, we recorded infants' looking behaviour following the onset of the first phoneme of the word "look", because there was no noun phrase in this prompt. We recorded the looking behaviour from this point because of evidence that 18- to 24-month-old infants process verbal information rapidly and recognise words based on incomplete acoustic information (e.g., Fernald, Pinto, Swingley, Weinberg, & McRoberts, 1998). A primary coder coded the infants' looking behaviour following each of the three prompts within each trial, for a total of 12 eye gaze responses for four trials. A second coder, blind to the condition, independently coded the videotapes of half the children selected randomly. Overall consistency between coders was 81%. When there were discrepancies between the scores of the two coders, the scores of the first coder were retained for analyses. There was no systematic inconsistency between coders.

To begin, we examined whether there was a difference between the numbers of trials completed by the infants in each condition. A one-way analysis of variance (ANOVA) showed no difference between the number of trials completed in the PN condition (M = 3.75; SD = 0.46), the CN condition (M = 3.75; SD = 0.46), and the NW condition (M = 3.63; SD = 0.74), F (2, 21) = .13, p = .88.

We then turned to our first two predictions. A 3 x 2 ANOVA was performed with Condition (PN, CN, and NW) and Gender (male and female) as between-participant
factors. The dependent measure was the mean proportion of the four trials on which infants looked at the labeled object first following our prompts. We used the mean proportion of trials rather than individual trials in order to get a more accurate measure for each subject because individual trials were sometimes more variable. See Figure 2.

We included gender as a factor in our analyses because previous studies have found gender effects, with girls showing an earlier differentiation of proper names and count nouns than boys (Hall et al., 2001; Katz et al., 1974; Macnamara, 1982). This analysis yielded a significant main effect of Condition, $F(2,18) = 4.33, p = .03$, but no significant main effect of Gender, $F(1,18) = .10, p = .75$, and no significant Condition x Gender interaction, $F(2,18) = 1.66, p = .22$.

Consistent with our first prediction, Newman-Keuls multiple comparisons showed that the proportion of first looks to the labeled object in the PN condition ($M = .53, SD = .15$) was significantly higher than that in the CN condition ($M = .32, SD = .17$), $q(18) = 3.77, p = .04$. Also, in support of our second prediction, there was no difference between the proportion of first looks to the labeled object in the CN condition ($M = .32, SD = .17$) and the NW condition ($M = .34, SD = .17$), $q(18) = 0.38, p = .79$. In addition, the proportion of first looks to the labeled object was significantly greater in the PN condition ($M = .53, SD = .15$) than in the NW condition ($M = .34, SD = .17$), $q(18) = 3.40, p < .05$.

We then explored the consistency of infants' looking at the labeled object across trials. We classified participants as being consistent lookers at the labeled object if they looked at the labeled object following more than 0.50 of the prompts (out of 12 possible prompts). A Chi Square test on the resulting numbers ($N = 5$ in the PN condition; $N = 1$
in the CN condition; \( N = 0 \) in the NW condition) yielded a significant effect of Condition; \( \chi^2 (2) = 9.33, p = .01 \). This result also supports our first two predictions: more infants in the PN condition than in the CN condition looked consistently at the labeled object and almost equal numbers of infants in the CN condition and NW condition looked consistently at the labeled object.

To address our third prediction – that infants would show a novelty preference for the unlabeled object – one-tailed single-sample \( t \)-tests were performed to compare the proportion of looks to the labeled object in each condition to chance. For these analyses, we defined chance as 0.50 because on each trial, infants looked at one of two possible objects. One-tailed tests were used because we predicted that infants would look at the labeled object less often than would be predicted by chance alone, due to an expected novelty preference. The results revealed that infants looked at the labeled object significantly less often than chance both in the NW condition, \( t (7) = -2.69, p = .02 \), and in the CN condition, \( t (7) = -3.04, p = .01 \). These results suggest that, as predicted, infants had a preference for looking at the unlabeled object. In the PN condition, however, infants did not look at the labeled object less often than chance, \( t (7) = .64, p = .28 \), suggesting that the use of the proper name tended to draw the infants’ attention away from the novel object and back to the previously labeled object.

In sum, the results of this experiment showed that 20-month-old infants can use syntactic cues (i.e., the presence or absence of a determiner) to determine if a novel word is a proper name, referring to an individual, or a count noun, referring to a category. Recall that previous research has failed to find this ability in 20-month-old children using a methodology in which children were required to actively choose an object (Hall et al.,
2001). The present results are therefore a new contribution to the literature. However, these findings led us to wonder whether we could find evidence for this ability using our new methodology with even younger infants. In Experiment 2, we thus tested 16-month-old infants on the same task as in Experiment 1.

Experiment 2

Method

Participants. Participants in Experiment 2 were 24 infants (12 girls and 12 boys), ranging in age from 14 to 18 months (M = 15.6 months). Equal numbers were assigned to the CN condition (M = 15.7 months; SD = .9 months), the PN condition (M = 15.8 months; SD = 1.1 months) and the NW condition (M = 15.3 months; SD = .8 months). An additional three infants were tested, but excluded because they failed to complete the task. Participants were recruited as in Experiment 1.

Stimuli. These were the same as in Experiment 1.

Apparatus. This was the same as in Experiment 1.

Procedure. This was the same as in Experiment 1.

Results and Discussion

Our predictions were the same as in Experiment 1: if infants this age distinguish appropriately between proper names and count nouns, (1) they should look at the labeled toy more frequently in the PN condition than in the CN condition, therefore treating the labeled toy as an individual; and (2) they should look at the labeled toy equally often in the CN condition and in the NW condition. We also predicted that infants would look at the unlabeled object more often than the labeled object, because the unlabeled object was
the last object to be presented on the puppet stage and so should have drawn attention and interest.

The same procedure as in Experiment 1 was followed in coding the videotapes. However, in addition to coding for whether infants looked at the labeled or unlabeled object after the first phoneme of the noun phrase of the test question, we also coded for whether infants looked at the labeled or unlabeled object following the last phoneme of the noun phrase of the test question. We conducted this alternate coding because some recent evidence suggests that 15-month-old children (unlike 18- to 24-month-olds) demonstrate word recognition only after hearing the end of the word (Fernald et al., 1998). We performed a paired-sample t-test to compare the infants' proportion of looks to the labeled object using these two methods of coding. The t-test revealed no significant difference between the two sets of scores, \( t(23) = -1.69, p = .10 \). We therefore will report analyses based on the first coding of the data only (i.e., the looking behaviour recorded after the first phoneme of the noun phrase of the test question, as in Experiment 1). Overall consistency between coders was 88%. When there were discrepancies between the scores of the two coders, the scores of the first coder were retained for analyses. There was no systematic inconsistency between coders.

To begin, we examined whether there was a difference between the numbers of trials infants completed in each condition. A one-way ANOVA suggested no difference between the number of completed trials in the PN condition (\( M = 3.38; SD = .74 \)), the CN condition (\( M = 3.75; SD = .71 \)), and the NW condition (\( M = 3.75; SD = .46 \)), \( F(2, 21) = .89, p = .43 \).
To address our first two predictions, we then examined whether there were differences in the number of times infants looked at the labeled object in each condition. As in Experiment 1, a 3 x 2 ANOVA was performed with Condition (PN, CN, and NW) and Gender (male and female) as between-participant factors. The dependent measure was again the mean proportion of four trials on which infants looked at the labeled object first following our prompt. See Figure 3. This analysis yielded no significant main effect of Condition, $F(2,18) = .32, p = .73$, no effect of Gender, $F(1,18) = .06, p = .81$, and no interaction, $F(2,18) = .17, p = .85$. Therefore, contrary to our first prediction, there was no difference between the mean proportions of trials on which infants looked at the labeled object in the PN condition ($M = -33; SD = .14$) and in the CN condition ($M = -38; SD = .15$). Consistent with our second prediction, however, there was no difference between the mean proportions of trials on which infants looked at the labeled object in the CN condition ($M = -38; SD = .15$) and in the NW condition ($M = -32; SD = .13$). In addition, the proportion of first looks to the labeled object was similar in the PN condition ($M = -33, SD = .14$) and in the NW condition ($M = -32, SD = .13$).

As in Experiment 1, we next classified participants as being consistent labeled object lookers if they looked at the labeled object following more than 0.50 of the prompts (out of a possible 12 prompts). There was no difference between the numbers of infants who looked consistently at the labeled object in the PN condition ($N = 1$), in the CN condition ($N = 1$), or in the NW condition ($N = 1$). Again, our first prediction (that infants would look at the labeled object more often in the PN condition than in the CN condition) was not supported. However, these results again supported our second
prediction – there was no difference between the looking behaviour of the infants in the CN condition and the NW condition.

To address our third prediction – that infants would show a novelty preference for the unlabeled object – one-tailed single-sample t-tests were performed to compare the proportion of looks to the labeled object in each condition (i.e., PN, CN, and NW) to chance, chance again being defined as 0.50. The results revealed that infants looked at the labeled object significantly less often than would be expected by chance in all three conditions: NW condition, t (7) = -3.84, p = .003, in the PN condition, t (7) = -3.51, p = .005, and in the CN condition, t (7) = -2.35, p = .03. These results suggest infants had a general preference for looking at the unlabeled object in every condition, and that the use of the proper name did not lead to a weakening of their preference for looking at the unlabeled object.

In sum, the results of this experiment revealed no evidence that 16-month-old infants can use syntactic cues (i.e., the presence or absence of a determiner) to interpret a novel word as a proper name, referring to an individual, or as a count noun, referring to a category.

General Discussion

This research has focused on the early development of children’s understanding of objects as individuals and as category members by examining the emergence of their understanding of proper names and count nouns. We investigated whether the use of a methodology that relieved infants of the need to choose an object actively as a referent of a novel label would lead to evidence of an understanding of proper names and count nouns at a younger age than previously reported in the literature (e.g., Gelman & Taylor, 1984;
Our findings provide the first clear indication that by 20 months, but not at 16 months, infants map novel proper names onto individual objects significantly more often than novel count nouns. Very few other studies in the literature have investigated the emergence of a sensitivity to form class distinction in infants under 2 years of age. However, the results of the present research are consistent with that of Waxman and Markow (1998) who reported that 21-month-old infants were more likely to choose objects on the basis of their properties when they heard a novel adjective than when they heard no word or a novel noun.

Although these findings reveal an earlier understanding of proper names and count nouns than previously reported, they leave open the question of the nature of infant’s understanding of proper names and count nouns prior to 20 months of age. Macnamara and his colleagues (Katz et al., 1974; Macnamara, 1982) have reported experimental and anecdotal evidence of proper name understanding at 16 or 17 months of age. Also, it is well known that proper names and count nouns emerge in children’s productive vocabularies quite early and are among their first words (e.g., Gentner, 1982, and Nelson, 1973, both reported the presence of proper names in the productive vocabularies of 13-month-old infants). For example, how do children interpret proper names earlier than 20 months of age? First, it is possible that infants do not represent proper names as designating individuals before 20 months of age, but rather that they represent proper names in the same way as count nouns. Some researchers have argued that infants’ earliest word representations are linked to categories, regardless of the word’s lexical class (e.g., Waxman, 1994). However, the anecdotal and experimental
evidence reported by Macnamara (Katz et al., 1974; Macnamara, 1982) suggests that these two categories are represented differently by 16 or 17 months of age. Second, it is possible is that infants represent proper names differently than count nouns, but not as denoting individual objects – for example, perhaps they designate properties or restricted categories as discussed by Sorrentino (1999). One way of testing the plausibility of this second possibility would be to replicate the current study (Experiment 2) using the same methodology, but with pairs of objects that are distinguished by a salient property, as in Katz et al. (1974). If infants restrict the referent of a novel proper name to an individual distinguished from another member of the same category by a salient marker – that is, if they look at the labeled object more than at the unlabeled object – it would suggest that young infants (16-month-olds) interpret proper names as denoting properties or restricted categories, rather than as denoting individuals. These first two possibilities would suggest a discontinuity in lexical-semantic development: infants' first representations of proper names would be different from the representations of adults or even 20-month-olds. These representations would then undergo some sort of (as yet) unspecified change to yield the mature representations.

However, there is a third possibility: it is possible that even infants younger than 20 months of age represent proper names as distinct from count nouns, in a way that is essentially similar to that of older children and adults, that is, as marking individual objects. Consistent with this possibility, there is other evidence from Waxman and her colleagues (Waxman, 1999) that indicates that in a type of habituation task, infants as young as 13 to 14 months appear to appreciate the distinction between words presented as adjectives and count nouns. To test the plausibility of this third possibility, we could
try to make the current methodology more sensitive for use with younger infants. For example, we could conduct a modified replication of the current study with objects such as dolls, rather than stuffed animals. Perhaps stuffed animals do not represent surrogate animate objects for younger children. It is possible that toys such as dolls (or alternatively, real, living people) would be better candidates for receiving proper names, because only people are seen as likely candidates for receiving proper names. Another way to test whether younger infants can succeed at appropriately distinguishing between proper names and count nouns would be to use a similar methodology to the one used in the present research, but one that would not create a novelty preference for the unlabeled object. In other words, it is possible that the novelty bias evident in the current experiments was too strong for the younger infants to overcome in the presence of the novel label presented as a proper name. One way of reducing the novelty preference for the unlabeled object would be to have both objects present on the stage at all times. Alternatively, we could present a fixation card midway between both objects before the test question. This card should attract the child’s attention to the centre of the stage, therefore reducing the preference for the unlabeled object. We expect that further studies such as the ones proposed here will increase our understanding of children’s early representations of proper names and count nouns, as well as the development of children’s conceptual distinction between individuals and categories.

Identifying when infants first show the ability to distinguish appropriately between proper names and count nouns is an important first step in understanding how this ability emerges in development. Infants’ ability to distinguish appropriately between proper names and count nouns suggests that they represent the necessary associated
concepts (i.e., individual and category) at that age. However, the manner in which infants form links between words (e.g., proper names and count nouns) and these concepts (e.g., individuals and categories) is open to speculation. One proposal in the literature is that infants start with the assumption that all novel words refer to categories, that is, function as count nouns (e.g., Waxman, 1994). Subsequently, they use various sources of information to learn the links between different categories and their associated concepts. Important types of information may include pragmatic and social information (e.g., Baldwin, 1991, 1993; Hall, 1996, 1999) and syntactic information (e.g., Katz et al., 1974), among others. A second proposal is that word learning constraints such as the whole-object assumption (leading children to assume that novel words refers to objects as wholes) and the taxonomic assumption (leading children to extend novel words to objects of the same category) may play an important role in forming linkages between categories and count nouns (e.g., Markman, 1994). Constraints such as the mutual exclusivity assumption (leading children to accept only one novel word to refer to an object) may help infants override the two preceding constraints and help them form links between, for example, individuals and proper names (e.g., Markman, 1994). Further research with infants, including infants acquiring languages other than English or more than one language, is needed to explore the issue of when infants begin to distinguish appropriately between words of different lexical categories and how these representations are linked to existing concepts in the infants’ mind.
References


Footnotes

Languages also provide other ways to refer to individuals. For example, individuals can also be denoted by definite descriptions such as “the girl with the pink dress” or by pronouns such as “she”.

The issue of whether to use familiar objects (e.g., stuffed dogs, ducks, fish, and bears) or unfamiliar objects (e.g., stuffed monsters) for this task is a complex one. When children are taught a novel count noun for a familiar object—that is an object for which they already know a count noun—they are reluctant to accept the new label as referring to a category (e.g., Hall, 1991). For example, they are reluctant to learn the count noun “poodle” for a dog when they already know the word “dog”. On the other hand, when children are taught a novel word for an object with which they are unfamiliar (e.g., a stuffed monster), they tend to interpret the new word as a category label (i.e., as a count noun) whether the novel word is presented as a count noun or as a proper name (e.g., Hall, 1991). In light of this finding, in the current study, we chose to use familiar objects to increase the likelihood that the infants would interpret the novel words presented syntactically as proper names as referring to individual objects.
Figure 1.

Procedure used in Experiments 1 and 2

A) Two identical-looking stuffed animals were presented on a puppet stage, and then removed.

B) One of the animals is presented to one side of the stage.

C) The animal was slowly moved to the other side of the stage.

D) The other identical-looking animal was then placed where the first one had originally been located.
Figure 2.

20-month-olds’ mean proportions of 1\textsuperscript{st} looks to the unlabeled object following the first phoneme of the noun phrase of the test question for each condition.
Figure 3.

16-month-olds’ mean proportions of 1st looks to the labeled object following the first phoneme of the noun phrase of the test question for each condition.