Learning Proper Names and Count Nouns: Evidence From 16- and 20-Month-Olds

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In 4 experiments, we examined 16- and 20-month-old infants’ understanding of proper names and count nouns. In each experiment, infants were taught a novel word modeled linguistically as either a proper name (e.g., “DAXY”) or a count noun (e.g., “a DAXY”) for a stuffed animal shown on a puppet stage. This animal was moved to a new location on the stage, and a second identical-looking animal was placed in the original animal’s starting location. We then assessed infants’ looking behavior in response to the word they had heard. At 20 months (Experiments 1 and 3), but not at 16 months (Experiments 2 and 4), infants were significantly more likely to look first at the original object in response to hearing the word in the proper name condition than in the count noun condition or in a baseline condition in which they heard no word. The results suggest that distinct and appropriate form–meaning links involving proper names and count nouns emerge in children’s language between 16 and 20 months.

Words from different categories are reliably associated with distinct sorts of meanings in the adult language (e.g., Bloom, 2000; Macnamara, 1986; Pinker, 1996; Waxman, 1998). For example, in the English sentence, “This is a DAXY,” the word DAXY is a count noun that picks out objects that share category membership; in the sentence, “This is a DAXY one,” it is an adjective that labels objects with a common property; and in the sentence, “This is DAXY,” it may be a proper name that denotes an individual object. The task of establishing links between lexical categories and their meanings poses a special challenge for learners, because different word categories are expressed grammatically in different ways across the
world’s languages. As a result, children cannot begin the task of word learning with advance knowledge of where instances of different lexical categories will appear in their own language. Understanding how children acquire these form–meaning connections has been the focus of much recent work in the study of language acquisition (e.g., Hall, Waxman, & Hurwitz, 1993; Jaswal & Markman, 2001; Landau, Smith, & Jones, 1992; Mintz & Gleitman, 2002; for reviews, see Bloom, 2000; Waxman & Booth, 2001; Woodward & Markman, 1998).

In a series of recent articles, Waxman and her colleagues have examined the origin and development of form–meaning links in infancy, focusing on count nouns and adjectives. Using manual habituation tasks and preference for novelty or word extension as their dependent measure, these authors have obtained evidence that young infants do not initially distinguish between novel count nouns and adjectives: At 11.5 months, infants appear to have a general expectation that both types of words highlight both category- and property-based commonalities among sets of objects (Waxman & Booth, 2003). By 14 months, however, count nouns highlight specifically category-based commonalities, although adjectives continue to highlight a wider range of commonalities (both category- and property-based; e.g., Booth & Waxman, 2003; Waxman, 1999; Waxman & Booth, 2001; Waxman & Markow, 1995). Evidence that adjectives highlight specifically property-based commonalities has been found under restricted conditions at 14 months (Booth & Waxman, 2003), at 21 months (Waxman & Markow, 1998), and at 24 months (Waxman & Booth, in preparation, cited in Waxman & Booth, 2001). Together, these findings suggest a specific course of acquisition for form–meaning connections in the lexicon: A general link common to all open class words (or at least adjectives and count nouns) evolves into specific links particular to each lexical category. In the course of this evolution, the count-noun-to-object-category link appears to be established earlier than the adjective-to-object-property connection, suggesting that it may be the foundational form–meaning connection (see Waxman, 1998, 2004).

To date, the evidence to support the preceding proposal about lexical acquisition has come from the study of count nouns and adjectives. Yet infants must also establish form–meaning links for other lexical categories. In this research, we examined infants’ understanding of a different pair of connections: those for count nouns and proper names. The meaning contrast between count nouns and adjectives is reflected in whether a word highlights a category- or a property-based commonality among a set of objects. However, the meaning distinction between count nouns and proper names is very different: It is reflected in whether a word highlights a category-based commonality among objects or marks an individual object in and of itself. An exploration of the origins of form–meaning links for count nouns and proper names thus provides a way to broaden the evidence bearing on the acquisition of form–meaning links in the lexicon.
A simple way to test whether children have mastered form–meaning links involving proper names and count nouns is to offer them a novel word for one of two familiar stuffed dolls or animals of the same kind. If children know that a proper name (e.g., “DAXY”) refers to an individual object, then they should interpret this kind of word as labeling the designated object as an individual and restrict it to only that object. If they know that a count noun (e.g., “a DAXY”) refers to an object category, then they should take this type of word as marking the object as a category member and extend it to either object. Using this type of methodology (with reaching or pointing as the dependent measure), several researchers have obtained evidence suggesting that girls as young as 17 months and boys as young as 28 months have formed connections between proper names and count nouns and their appropriate meanings (e.g., Gelman & Taylor, 1984; Katz, Baker, & Macnamara, 1974; Macnamara, 1982).

Recently, however, a number of researchers have noted an interpretative problem with the preceding research. The two dolls or animals used in the tasks always differed from each other in terms of a salient property, such as hair or dress color. As a result, if children restricted a novel word to the labeled object, it could be because they thought the word named the individual object (appropriate for a proper name) but it could also be because they thought the word named one of the object’s properties (such as its hair or dress color, appropriate for an adjective). To address this problem, researchers have designed tasks in which restricting a novel word to a labeled object in an extension task establishes more unambiguously that the label designates the object as an individual (e.g., Hall, Lee, & Bélanger, 2001; Liittschwager & Markman, 1993; Sorrentino, 2001). For example, Hall et al. (2001) used a task similar to the one used in earlier studies but made a simple modification: They used pairs of stuffed animals that looked identical to each other and so did not differ in terms of any salient physical properties.

Using these modified tasks, researchers have obtained more clear-cut evidence about young children’s understanding of links from proper names and count nouns to their appropriate meanings (e.g., Hall et al., 2001; Liittschwager & Markman, 1993; Sorrentino, 2001). However, in these more unambiguous tasks, the youngest age at which children have shown sensitivity to these connections is about 2 years of age (Hall et al., 2001). In two separate experiments, children under 2 years (20-month-olds) failed to distinguish appropriately between proper names and count nouns (Hall et al., 2001, Experiments 1 and 6). These results suggest that distinct and appropriate connections from these word categories to their meanings are not in place roughly until children’s second birthdays, generally in line with Waxman’s and others’ (e.g., Booth & Waxman, 2003; Waxman, 1999; Waxman & Booth, 2001; Waxman & Markow, 1995) findings about the establishment of a consistent link for adjectives (distinct from that for count nouns) by the end of the second year.
There are, however, reasons to pursue the possibility that children younger than 2 years possess knowledge of distinct connections from proper names and count nouns to their appropriate meanings. First, it is possible that infants acquire form–meaning links for different lexical categories at different times. Specifically, proper names and adjectives have very distinct kinds of meanings, and so the proper name–individual object connection need not emerge at the same time as the adjective–object property link. Second, anecdotal reports suggest that some children as young as 16 months use proper names consistently to refer to individuals such as people or pets and that they use count nouns to refer to multiple members of a category before the age of 2 (e.g., Macnamara, 1982). Finally, recent experimental evidence suggests that 6-month-old infants understand that the words “mommy” and “daddy” apply to their own individual mother and father, respectively (Tincoff & Juszcyk, 1999). These considerations motivate further study of infants’ early understanding of proper names and count nouns.

We began by hypothesizing that the failure of children under 2 years to show an appropriate differentiation of proper names from count nouns in Hall et al. (2001) was a reflection of the methodology used in that research. It is possible that the Hall et al. task, requiring children actively to choose an object, was too difficult for younger participants to perform. One way to reduce the demands in the task used in Hall et al. is to use looking behavior as a dependent measure, rather than the action of choosing a toy. This was our approach in this study.

In Experiment 1, 20-month-old infants were taught a new label (either a proper name or a count noun) for one of two identical-looking objects, as in Hall et al. (2001; Experiments 5 and 6). However, instead of having to choose manually (or point to) one of the toys as a referent for the word at test, infants had only to look at the toy that they thought was the referent of the new label. We also tested another group of infants to assess baseline looking preferences in this task. The infants in this last group heard no novel label paired with the object.

We coded infants’ looking behavior in each condition to obtain two dependent measures: the proportion of first looks to the original (labeled) object following our test prompts and the proportion of time spent looking at the original object on a test trial. Our primary interest was in the first look measure, because it reflects an immediate response to the test prompts and so is analogous to the measures used in previous research with older children, in which proper names promoted greater reaching or pointing to the labeled object than did count nouns (e.g., Gelman & Taylor, 1984; Hall et al., 2001; Macnamara, 1982). If infants have forged links from proper names and count nouns to their appropriate meanings, then we expected that they would look first at the original toy more often in the proper name condition than in the count noun condition, because only the proper name should prompt them to look specifically at the original object. We also predicted that infants would look first at the original toy equally often if they heard it labeled with a count noun and if they heard it marked with no label, because in both cases looking
at either object is acceptable. In addition, we predicted that infants would show a baseline preference for looking first at the second (unlabeled) toy, simply because it was the last toy to be presented on the puppet stage, attention was drawn to it, and it therefore should have attracted their interest.

We also analyzed the data from the looking time measure, assessing three analogous predictions: that infants would look longer at the original (labeled) object in the proper name than in the count noun condition, that they would look equally long at the original object in the count noun and no word conditions, and that they would have a baseline tendency to look at the second (unlabeled) object. A priori, we did not expect this measure to discriminate among conditions as well as the first look measure. Our reasoning was that the first look measure assessed infants’ behavior in direct response to the test prompts, like the measures used in previous research (i.e., reaching or pointing). In contrast, the looking time measure assessed behavior over the entire trial, which lasted 15 sec. Because the two toys were always indistinguishable in their properties, we suspected that infants might look at them both equally in all conditions over the extended trial, even if their first look behavior differed across conditions.

EXPERIMENT 1

Method

Participants. Twenty-four infants (12 girls and 12 boys), ranging in age from 18 to 22 months \( (M = 20.1 \text{ months}) \), participated in this study. All had been exposed to English as their first language. Equal numbers were assigned to the Count Noun (CN) condition \( (M = 19.7 \text{ months}, SD = 1.2 \text{ months}) \), the Proper Name (PN) condition \( (M = 20.1 \text{ months}, SD = 1.4 \text{ months}) \), and the No Word (NW) condition \( (M = 20.7 \text{ months}, SD = 1.6 \text{ months}) \). An additional 12 infants were tested but excluded because they failed to complete the task \( (N = 9) \) or because of experimenter 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. We chose these animals because of the likelihood that their category labels (i.e., the words “duck,” “fish,” “bear,” and “dog”) would be known to children (Dale & Fenson, 1996).\(^1\)

\(^{1}\)We used objects that we expected to be familiar to children to avoid the possibility that children would show a bias to make an object category interpretation of any word used to label them. For example, Hall (1991) found that preschoolers often misinterpreted proper names as object category labels when they were applied to novel but not familiar objects (see also Imai & Haryu, 2001; Markman & Wachtel, 1988).
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 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. These stage lamps were connected via extension cords to a power bar located in a different part of the room, from which a second experimenter (E2) was able to control them. Two other lamps (40 W) were 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 behavior. A second video camera was placed behind the child and the parent, facing the stage, and recorded the events on the stage. The two cameras were connected to a video mixer (Videonics MX1), which sent their images simultaneously to a single television screen (split screen) located where E2 sat.

Procedure. E2 began by explaining the procedure to parents and asking them to keep their eyes closed during the experiment and to refrain from moving and talking as much as possible. These precautions were attempts to prevent any inadvertent influence of the parents on children’s performance.

The experiment took place in a room that was dark except for the lights on each side of the stage. Children sat on their parents’ 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 at the center of the stage. E1 attracted children’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 showed one of the toys on one side of the stage (see Figure 1, Step B), and she read from a script in which a novel label was modeled five times as a proper name (e.g., “DAXY” in the PN condition) or as a count noun (e.g., “a DAXY” in the CN condition). In a third version of the script, no novel word was used (NW condition). See the appendix for the full text.

E1 then slowly moved the original toy to the other end of the stage (92 cm away) while attracting children’s attention by saying, “Look here!” (see Figure 1, Step C). A second identical-looking toy was then placed in the position where the original toy had been first located (see Figure 1, Step D), and E1 attracted children’s attention to it by saying, “Look here! Look here!” At this point, E1 removed her hand from the stage and uttered three test prompts using the novel label that had been used earlier (i.e., “Look at DAXY! Where is DAXY? Look at DAXY!” in the PN condition; “Look at a DAXY! Where is a DAXY? Look at a DAXY!” in the CN condition) and saying, “Look! Look! Look!” in the NW condition. E1 waited 5 sec between each prompt. E2 then turned the stage lights off to mark the end of the first
A. Two identical-looking stuffed animals are placed on a puppet stage and then removed.

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

C. This animal is slowly moved to the other side of the stage.

D. The other identical-looking animal is placed where the first one was originally located.

**FIGURE 1** Procedure used in Experiments 1 and 2.

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 original or second object following at least two of the three prompts. The novel words were “DAXY,” “ZAVY,” “BLICKY,” and “FEPPY”; each was paired consistently with one kind of animal. The order of presentation of the animals was counterbalanced, as was the side (left or right) of the original toy’s initial location on the stage.

**Coding.** We coded the videotapes to obtain two dependent measures from each of the four trials: proportion of first looks to the original object and proportion of looking time at the original object.

**First look.** We defined first look as the proportion of prompts on a trial after which the infant looked first at the original (labeled) rather than the second
To obtain this number, a trained coder viewed the videotape from each trial and recorded the object (original or second) at which infants looked on hearing the noun phrase of each test prompt in the PN and CN conditions. In the NW condition, she recorded infants’ looking behavior on hearing the word “Look!” because there was no noun phrase in this prompt.

To assess the reliability of this measure, we enlisted a second coder, unaware of condition, to recode all the videotapes. For a randomly selected half of the infants in each condition, this coder worked from the original analog VHS tapes; for the other half of the infants, she worked from digitized versions of the analog tapes (created using the video editing program Final Cut Pro 3). To recode from the analog tapes, the coder watched them with the sound off while a listener, wearing headphones but not looking at the screen, monitored the corresponding audio. On hearing the noun phrase in each test prompt (PN and CN conditions) or on hearing the word “Look!” in each test prompt (NW condition), the listener said “Now.” The coder noted the first object at which the infant looked after this point. To recode from the digitized tapes, we first placed a visual marker on the video files at the end of the noun phrase of each test prompt (PN and CN conditions) or at the end of the word “Look!” of each test prompt (NW condition). The coder then advanced each file with the sound off to the points where the markers appeared. From these points, she played the file forward, frame by frame as necessary, and noted the first object at which the infant looked. We calculated interrater agreement by dividing the number of trials on which the two coders agreed by the total number of trials and found it to be 84% overall (83% for the analog recoding, 85% for the digital recoding). Trials on which the coders disagreed were reviewed by both coders, and disagreements were resolved through discussion.

**Looking time.** We defined looking time as the proportion of total trial time spent looking at the original object divided by the sum of the time spent looking at the original object and the time spent looking at the second object. To obtain the two numbers that contributed to this measure, a trained coder unaware of condition viewed the silent analog videotape from each trial twice. To tell the coder when to begin timing a trial, another researcher first viewed the tapes and noted the VCR counter readings on hearing the noun phrase in the first test prompt (PN and CN conditions) or on hearing the word “Look!” in the first test prompt (NW condition). The coder began coding at those readings. Coding ended when the stage lights were turned off at the end of the trial (i.e., approximately 15 sec later). On one viewing, the coder used a stopwatch to record the length of time the infant spent looking at the original object; on the other viewing, she recorded the length of time spent looking at the second object. As a reliability check, we then enlisted a second unaware coder to do the same for all infants. Both pairs of codings (i.e., the two codings of time spent looking at the original object and the two codings of time spent looking at second object) fell within 1 sec of each other on 98% of trials. For
these trials, we averaged the two coders’ times and used the means in subsequent analyses. On the remaining trials, the coders viewed the tapes again and rerecorded the looking times until the differences between their times fell to within 1 sec before we computed the means.

Results and Discussion

Recall that our main predictions concerned the first look measure. We expected that infants would look first at the original object (a) more often in the PN than in the CN condition and (b) equally often in the CN and NW conditions. Recall that we also expected that infants would show a baseline tendency to look first at the second object across conditions. We also had analogous but weaker expectations about the looking time measure: that infants would look (a) longer at the original object in the PN than in the CN condition, (b) equally long at the original object in the CN and NW conditions, and (c) longer at the second object across conditions.

To begin, a one-way analysis of variance (ANOVA) showed no significant difference between the mean number of trials completed by infants in the PN condition ($M = 3.75, SD = 0.46$), the CN condition ($M = 3.75, SD = 0.46$), and the NW condition ($M = 3.63, SD = 0.74$).

**First look.** We then carried out a $3 \times 2$ ANOVA on the first look data, with condition (PN, CN, and NW) and gender (male and female) as between-participants factors (see Figure 2, left). We included gender as a factor in our analysis because some previous studies have found gender effects, with girls showing an earlier differentiation of proper names from count nouns than boys (e.g., Hall et al.,

![Figure 2](image-url)
2001; Katz et al., 1974; Macnamara, 1982). This analysis yielded a significant main effect of condition, $F(2, 18) = 4.33, p < .05$, and no other significant effects. Consistent with our first prediction, Newman–Keuls multiple comparisons showed that the mean proportion of first looks to the original object in the PN condition was significantly higher than that in the CN condition, $q(18) = 3.77, p < .05$. In support of our second prediction, there was no difference between the mean proportion of first looks to the original object in the CN condition and the NW condition, $q(18) = 0.38, p > .05$. In addition, the mean proportion of first looks to the original object was significantly greater in the PN condition than in the NW condition, $q(18) = 3.40, p < .05$.

We also examined the consistency of each infant’s first look behavior across the four trials. We classified participants as being consistent first lookers at the original object if they looked first at the original object following more than 0.50 of the prompts (out of 12 possible prompts). Five infants fell into this category in the PN condition, whereas only 1 infant in the CN condition and 0 in the NW condition were consistent first lookers at the original object. This finding also supports our first two predictions: More infants in the PN condition than in the CN condition looked first at the original object consistently and almost equal numbers of infants in the CN condition and NW condition looked first at the original object consistently. In fact, a chi-square test revealed the number to be significantly higher in the PN condition than in the combined CN and NW conditions, $\chi^2(1, N = 24) = 6.25, p < .05$, with Yates’ correction applied.

To address our third prediction about a baseline preference for looking first at the second object, we conducted one-tailed single-sample $t$ tests, comparing to chance the proportion of first looks to the original object in each condition. For the purposes of these analyses, we defined chance as 0.50 because on each trial infants were coded as looking at one of two objects. We used one-tailed tests because we predicted that infants would tend not to look first at the original object due to an expected baseline preference for the second object. As predicted, infants looked first at the original object significantly less often than chance both in the NW condition, $t(7) = -2.69, p < .05$, and in the CN condition, $t(7) = -3.04, p < .05$. These findings suggest that infants did have a baseline preference for looking first at the second object. In the PN condition, however, infants looked first at the original object only as often as would be expected by chance, $t(7) = .64, p > .05$, suggesting that the use of the proper name tended to draw their attention away from the preferred second object and back to the original object.

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2 We also analyzed the first look data to search for effects of the order of the test prompt. We conducted an ANOVA on the first look data from all three conditions, with prompt order (first, second, third) as a within-participants factor. The result was not significant in this or any subsequent experiment.
**Looking time.** We also conducted a $3 \times 2$ ANOVA on the looking time data, with condition (PN, CN, and NW) and gender (male and female) as between-participants factors (see Figure 2, right). This analysis yielded no significant effects. The mean proportion of looking time to the original object was no different in the PN condition than it was in the CN condition. There was also no difference between the mean proportion of looking time to the original object in the CN condition and the NW condition.

In addition, infants showed no baseline preference for looking at the second object based on this measure. We again performed one-tailed single-sample $t$ tests to compare the proportion of looking time to the original object in each condition to chance (0.50). Infants looked at the original object as often as would be expected by chance in the NW condition, $t(7) = -0.75, p > .05$, the PN condition, $t(7) = -0.64, p > .05$, and the CN condition, $t(7) = -0.76, p > .05$.

In sum, the results of Experiment 1 indicate that 20-month-olds have begun to master distinct form–meaning connections involving proper names and count nouns. They were significantly more likely to look first at an original (labeled) object rather than its identical-looking (unlabeled) mate in response to a word modeled as a proper name than in reaction to a word given as a count noun (or in response to no word). Infants thus seemed often to restrict a proper name to an original object, appropriate for proper names; but they appeared more likely to generalize a count noun from an original object to another object from the same object category, appropriate for count nouns.

In contrast to their first look behavior, infants’ looking time behavior did not differ across the three conditions. This discrepancy was not unexpected. As we noted in the introduction, the first look measure is more analogous to the reaching and pointing measures used in past studies of the acquisition of proper names and count nouns, and it is on this measure that we observed the predicted condition differences. In contrast, the looking time measure takes into account looking across an entire trial, which lasted a total of 15 sec. Given that the two objects looked identical, it is understandable how infants might have made a first look to the original object most often in the PN condition and yet still showed an equivalent overall amount of looking to the two objects across conditions.

In addition, 20-month-olds showed a predicted baseline tendency to look first at the second object in all but the PN condition, suggesting that the second object tended to attract infants’ attention. However, we observed no baseline preference for looking at the second object in the looking time data. Again we suspect that this discrepancy between measures reflects the difference between the immediacy of the first look measure and the extended nature of the looking time measure. Regardless, our finding of a baseline preference in the first look data but not in the looking time data suggests that this preference was not highly potent in 20-month-olds’ looking behavior.
Previous research using this task has failed to find evidence of knowledge of links from proper names and count nouns to their appropriate meanings in 20-month-olds, when the dependent measure was children’s pointing or reaching (Hall et al., 2001). Our findings suggest that past failures may have reflected infants’ difficulty in making an active choice in this task. However, the discrepancy between the findings based on search measures and those based on looking measures suggests the need for some caution in advancing claims about 20-month-olds’ understanding of form–meaning links involving proper names and count nouns. Moreover, the data from Experiment 1 indicate that an appreciation of these specific connections is only nascent at this age. The difference between the performance in the PN and CN conditions was significant but the proportion of first looks to the original object in the PN condition fell only at chance. Nevertheless, the positive evidence we obtained with 20-month-olds in Experiment 1 led us to wonder whether we could find any evidence of an appropriate differentiation between these two word categories at 16 months of age. In Experiment 2, we thus tested 16-month-old infants on the same task used in Experiment 1.

EXPERIMENT 2

Method

Participants. Twenty-four infants (12 girls and 12 boys), ranging in age from 14 to 18 months ($M = 15.6$ months), participated in this study. All had been exposed to English as their first language. Equal numbers were assigned to the CN condition ($M = 15.7$ months, $SD = 0.9$ months), the PN condition ($M = 15.8$ months, $SD = 1.1$ months), and the NW condition ($M = 15.3$ months, $SD = 0.8$ months). An additional 3 infants were tested but excluded because they failed to complete the task. Participants were recruited as in Experiment 1. None had taken part in that study.

Stimuli, apparatus, and procedure. The stimuli, apparatus, and procedure were the same as in Experiment 1.

Coding. We followed the same procedure as in Experiment 1 in coding the videotapes.

First look. The interrater agreement was 87% overall (87% for the analog recoding, 87% for the digital recoding).

Looking time. The difference between the two coders’ times was less than 1 sec on 97% of trials.
Results and Discussion

Our predictions were the same as in Experiment 1. To begin, a one-way ANOVA showed no significant difference between the mean number of trials completed by the infants in the PN condition ($M = 3.38$, $SD = 0.74$), the CN condition ($M = 3.75$, $SD = 0.71$), and the NW condition ($M = 3.75$, $SD = 0.46$).

First look. As in Experiment 1, we then conducted a $3 \times 2$ ANOVA on the first look data, with condition (PN, CN, and NW) and gender (male and female) as between-participants factors (see Figure 3, left). This analysis yielded no significant effects. There was no difference between the mean proportion of first looks to the original object in the PN condition and in the CN condition. There was also no difference between the mean proportion of first looks to the original object in the CN condition and in the NW condition. In addition, the mean proportion of first looks to the original object was similar in the PN condition and in the NW condition.

We next classified participants as being consistent first lookers at the original object if they looked first at the original object following more than 0.50 of the prompts (out of a possible 12 prompts). There was no difference between the resulting numbers in the PN condition ($N = 1$), in the CN condition ($N = 1$), and in the NW condition ($N = 1$). Unlike Experiment 1, a chi-square test revealed that the number was no different in the PN condition than in the combined CN and NW conditions. Again, then, we obtained no support for our prediction that infants would look first at the original object more often in the PN condition than in the CN or NW condition.

Recall our third prediction that infants would show a baseline preference for looking first at the second (unlabeled) object. We performed one-tailed sin-
Single-sample *t* tests to compare to chance the proportion of first looks to the original object in each condition, chance again being defined as 0.50. The results revealed that infants looked first at the original object significantly less often than would be expected by chance in all three conditions: in the NW condition, \( t(7) = -3.84, p < .005 \); in the PN condition, \( t(7) = -3.51, p < .01 \); and in the CN condition, \( t(7) = -2.35, p < .05 \). These results suggest that, like the 20-month-olds in Experiment 1, 16-month-olds also had a baseline preference for looking first at the second object. However, the use of the proper name did not lead 16-month-olds to overcome this preference, as it did for the 20-month-olds.

**Looking time.** We also conducted a 3 × 2 ANOVA using the looking time data, with condition (PN, CN, and NW) and gender (male and female) as between-participants factors (see Figure 3, right). This analysis also returned no significant effects. The mean proportion of looking time to the original object was no different in the PN condition than that in the CN condition. Moreover, there was no difference between the mean proportion of looking time to the original object in the CN condition and the NW condition.

Sixteen-month-olds also showed a baseline preference for looking longer at the second (unlabeled) object. We performed one-tailed single-sample *t* tests to compare the proportion of looking time to the original object in each condition to chance (0.50). Infants looked at the original object significantly less often than would be expected by chance in all three conditions: in the NW condition, \( t(7) = -4.57, p < .003 \); in the PN condition, \( t(7) = -13.02, p < .0001 \); and in the CN condition, \( t(7) = -4.97, p < .002 \).

In sum, the findings from Experiment 2 offer no evidence that 16-month-old infants have mastered distinct form–meaning connections for proper names and count nouns. Unlike 20-month-olds, they were no more likely to look first at an original (labeled) object than at its identical-looking (unlabeled) mate in reaction to a proper name than in response to a count noun (or to no word). This result suggests that 16-month-olds restricted a proper name to an original object no more often than they restricted a count noun. Sixteen-month-olds’ looking time to the original object also did not differ across the three conditions. Although this looking time result is consistent with the result from the first look data, we think that the first look finding is more noteworthy, for reasons discussed in Experiment 1. Taken together with the results of Experiment 1, these findings suggest that distinct links from proper names and count nouns to their appropriate meanings first emerge between 16 and 20 months of age.

One notable difference between Experiments 1 and 2 concerned the baseline preference for the second (unlabeled) object. In terms of both the first look measure and the looking time measure, all groups of 16-month-olds preferred the second object, suggesting a robust preference effect. However, 20-month-olds revealed this effect only on the first look measure, suggesting a weaker preference.
This difference between age groups raises the possibility that 16-month-olds failed to show an appreciation of the difference between the two lexical categories because they were unable to overcome a strong baseline preference. In other words, the design of Experiment 2 may have prevented them from showing their understanding.

One way to test whether a strong baseline preference for looking at the second object could account for the null results of Experiment 2 is to modify the methodology. In Experiments 3 and 4, we thus altered the procedure from Experiments 1 and 2 by presenting a bright fixation card midway between the two objects after presenting the second object but before giving the test prompts. The purpose of using the card was to attract the child’s attention to the center of the stage after the second object was introduced, thereby drawing the gaze away from the second object and removing the preference for that object. In Experiment 3, we began by testing 20-month-olds to determine not only whether we could eliminate the baseline preference at this older age but also whether we could uncover an actual preference for looking first at the original (labeled) object in the PN condition. Recall that in Experiment 1, 20-month-olds looked first at the original object in the PN condition more often than in the CN or NW conditions, but only at chance levels. In Experiment 4, we then tested 16-month-olds on the modified task.

In Experiments 3 and 4, we also altered the wording of the test prompts used in the NW condition to equate the length of the prompts across conditions. Rather than use the bare words, “Look! Look! Look!”, we now used sentences structured similarly to the ones used in the other conditions, namely “Where is one? Look at one! Where is one?” Making this change enabled us to measure infants’ looking behavior from a more consistent point (i.e., after the noun phrase) across conditions.

**EXPERIMENT 3**

**Method**

*Participants.* Twenty-four infants (12 girls and 12 boys), ranging in age from 18 to 22 months ($M = 20.6$ months), participated in this study. All had been exposed to English as their first language. Equal numbers were assigned to the CN condition ($M = 20.6$ months, $SD = 1.0$ months), the PN condition ($M = 20.8$ months, $SD = 1.3$ months), and the NW condition ($M = 20.5$ months, $SD = 1.9$ months). An additional 10 infants were tested but were excluded because they failed to complete the task ($N = 6$) or because of experimenter error ($N = 4$). Participants were recruited as in Experiment 1. None had taken part in either previous study.

*Stimuli.* These were the same as in Experiment 1, with the addition of a square fixation card (16 cm by 16 cm), with an orange center and outer squares of
bright yellow, blue, white, and red. The card had a handle attached to the back that enabled it to be manipulated.

**Apparatus.** This was the same as in Experiment 1.

**Procedure.** This was the same as in Experiment 1, with two differences. See Figure 4. First, immediately after introducing the second object but before uttering the first test prompt, the experimenter introduced a fixation card halfway between the two objects on the stage. She called out, “Look here! Look here!” , tilting the card 45 degrees to the left and right twice, and then withdrew the card (see Figure 4, Step D, and Figure 4, Step E). Second, in the NW condition, the test prompts

A. Two identical-looking stuffed animals are placed on a puppet stage and then removed.

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

C. This animal is slowly moved to the other side of the stage.

D. The other identical-looking animal is placed where the first one was originally located an fixation card is placed in the middle of the stage.

E. The distracter card is removed.

**FIGURE 4** Procedure used in Experiments 3 and 4.
were changed to better match the sentence structure of the prompts in the other two conditions. After withdrawing the fixation card, the experimenter asked the infant: “Where is one? Look at one! Where is one?”

**Coding.** We followed the same procedure as in Experiment 1 in coding the videotapes, except that in the NW condition, we now measured looking behaviors after the noun phrase “one” rather than after the word “Look!”

**First look.** The interrater agreement was 85% overall (84% for the analog recoding, 87% for the digital recoding).

**Looking time.** The difference between the two coders’ times was less than 1 sec on 96% of trials.

**Results and Discussion**

Our predictions were the same as in Experiment 1, except that we no longer expected a baseline preference for looking at the second (unlabeled) object.

To begin, a one-way ANOVA indicated no difference between the mean number of completed trials in the PN condition \( (M = 3.87, SD = .34) \), the CN condition \( (M = 3.75, SD = .47) \), and the NW condition \( (M = 4.0, SD = 0) \).

**First look.** As in previous experiments, we carried out a \( 3 \times 2 \) ANOVA on the first look data, with condition (PN, CN, and NW) and gender (male and female) as between-participants factors (see Figure 5, left). This analysis yielded a significant main effect of condition, \( F(2, 18) = 4.55, p < .05 \), and no other significant effects. Consistent with our first prediction, Newman–Keuls multiple comparisons showed that the mean proportion of first looks to the original object was significantly higher in the PN condition than in the CN condition, \( q(18) = 4.20, p < .05 \). In support of our second prediction, there was no difference between the mean proportion of first looks to the original object in the CN condition and the NW condition, \( q(18) = 0.99, p > .05 \). In addition, the mean proportion of first looks to the original object was significantly greater in the PN condition than in the NW condition \( (M = .48, SD = .08) \), \( q(18) = 3.21, p < .05 \).

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3We chose the wording “Where is one?” for several reasons. To begin, we wanted to use a test question that matched the sentence frame used in the CN and PN conditions, so we wanted it to begin with the words “Where is ____?” We also wanted to avoid “it” to complete the sentence, because the object was described using the pronoun “he” during the teaching phase, and so switching to “it” would have sounded odd. Finally, we wanted to avoid “he” to complete the sentence, because we had already used “he” in the initial part of the trial, and we felt that we did not want to be evaluating infants’ interpretation of the pronoun “he” in a NW condition.
We next classified participants as being consistent first lookers at the original object if they looked first at the original object following more than 0.50 of the prompts (out of a possible 12 prompts). Six infants fell into this category in the PN condition, whereas only 2 infants in the CN condition and 1 in the NW condition were consistent first lookers at the original object. This result provides further support for our first two predictions: More infants in the PN condition than in the CN condition looked first at the original object consistently and almost equal numbers of infants in the CN condition and NW condition looked first at the original object consistently. Indeed, a chi-square test found that the number was significantly higher in the PN condition than in the combined CN and NW conditions, $\chi^2(1, N = 24) = 5.00, p < .05$, with Yates’ correction applied.

With our modified procedure, we also eliminated 20-month-olds’ baseline preference for looking first at the second object. We performed two-tailed single-sample $t$ tests to compare the proportion of first looks to the original object in each condition to chance, chance again being defined as 0.50. Infants looked first at the original object as often as would be expected by chance in the NW condition, $t(7) = –0.75, p > .05$, and in the CN condition, $t(7) = –1.14, p > .05$. And in the PN condition, infants actually looked at the original (labeled) object first significantly more often than would be expected by chance, $t(7) = 3.07, p < .05$.

**Looking time.** We also performed a $3 \times 2$ ANOVA on the looking time data, with condition (PN, CN, and NW) and gender (male and female) as between-participants factors (see Figure 5, right). This analysis yielded no signifi-
cant effects. There was no difference between the mean proportion of looking time to the original object in the PN condition and the CN condition. Moreover, there was no difference between the mean proportion of looking time to the original object in the CN condition and the NW condition.

There was also no evidence of a baseline preference for the second object in the looking time data. We performed two-tailed single-sample \( t \) tests to compare the proportion of first looks to the original object in each condition to chance (0.50). Infants looked at the original object as often as would be expected by chance in the NW condition, \( t(7) = 0, p = 1 \), the CN condition, \( t(7) = -1.30, p > .05 \), and the PN condition, \( t(7) = -0.73, p > .05 \).

In sum, the results of Experiment 3 offer corroborating evidence that 20-month-olds have begun to acquire distinct form–meaning connections involving proper names and count nouns. As in Experiment 1, they were significantly more likely to look first at an original (labeled) object rather than its identical-looking (unlabeled) mate in response to a word modeled as a proper name than in reaction to a word given as a count noun (or in response to no word). Infants thus seemed often to limit a proper name to an originally labeled object, appropriate for proper names, but they appeared more likely to extend a count noun from an original object to another object from the same object category, appropriate for count nouns. As in Experiment 1, 20-month-olds’ mean looking time at the original object did not differ across the three conditions. This result is again at odds with the first look findings but the discrepancy was not unexpected, for reasons discussed in Experiment 1.

In addition, the use of a central fixation card in Experiment 3 appears to have eliminated the preference for looking at the second object. We found no such preference in either the first look data or the looking time data. In fact, 20-month-olds in this experiment actually showed a preference for looking first at the original (labeled) object in the PN condition. The results of Experiment 3 thus provide even stronger evidence than those from Experiment 1 that 20-month-olds have acquired an appreciation of the link between proper names and individual objects.

One final result that deserves mention concerns the change we made to the wording of the test prompts and, consequently, to the timing of looking behavior in the NW condition. In Experiment 3, the NW condition results patterned with those in the PN and CN conditions in the same way that they did in Experiment 1. Thus it appears that 20-month-olds’ performance in the NW condition of Experiment 1 cannot be explained by the differential sentence structure and timing of looks.

The positive evidence we obtained with 20-month-olds using our modified methodology led us to wonder whether we could find any evidence of an appropri-
ate differentiation between proper names and count nouns at 16 months of age. In Experiment 4, we thus tested 16-month-old infants on our modified task.

EXPERIMENT 4

Method

Participants. Twenty-four infants (12 girls and 12 boys), ranging in age from 14 to 18 months ($M = 15.9$ months), participated in this study. All had been exposed to English as their first language. Equal numbers were assigned to the CN condition ($M = 16.5$ months, $SD = 1.4$ months), the PN condition ($M = 15.8$ months, $SD = 1.4$ months), and the NW condition ($M = 15.6$ months, $SD = 0.9$ months). An additional 7 infants were tested but were excluded because they failed to complete the task ($N = 4$) or because of experimenter error ($N = 3$). Participants were recruited as in Experiment 1. None had taken part in any previous experiment.

Stimuli, apparatus, and procedure. The stimuli, apparatus, and procedure were the same as in Experiment 3.

Coding. We followed the same procedure as in Experiment 3 in coding the videotapes.

First look. The interrater agreement was 87% overall (84% for the analog recording, 90% for the digital recording).

Looking time. The difference between the two coders’ times was less than 1 sec on 96% of trials.

Results and Discussion

Our predictions were the same as in Experiment 3. To begin, a one-way ANOVA indicated no difference between the mean number of completed trials in the PN condition, the CN condition, and the NW condition.

First look. We then performed a $3 \times 2$ ANOVA on the first look data, with condition (PN, CN, and NW) and gender (male and female) as between-participants factors (see Figure 6, left). This analysis yielded no significant effects. There was no difference between the mean proportion of first looks to the original object in the PN condition and in the CN condition. And there was no difference
between the mean proportion of first looks to the original object in the CN condition and in the NW condition.

We next classified participants as being consistent first lookers at the original object if they looked first at the original object following more than 0.50 of the prompts (out of a possible 12 prompts). There was little difference between the number of infants who looked consistently at the original object in the PN condition (N = 3), the CN condition (N = 3), and the NW condition (N = 4). Unlike Experiment 3, a chi-square test revealed that the number was no different in the PN condition than in the combined CN and NW conditions. Again, then, there was no evidence that infants looked first at the original object more often in the PN condition than in the CN or NW conditions.

As predicted, we also observed no baseline preference for looking first at the second object. We performed two-tailed single-sample $t$ tests to compare the proportion of first looks to the original object in each condition to chance, chance again being defined as 0.50. Infants looked first at the original object as often as would be expected by chance in all three conditions: the NW condition, $t(7) = –.49, p > .05$, the PN condition, $t(7) = –1.07, p > .05$, and the CN condition, $t(7) = .30, p > .05$.

Looking time. We also carried out a 3 × 2 ANOVA on the looking time data, with condition (PN, CN, and NW) and gender (male and female) as between-participants factors (see Figure 6, right). This analysis again revealed no significant effects. There was no significant difference between the mean proportion of looking time to the original object in the PN condition and in the CN condition. And there was no difference between the mean proportion of looking time to the original object in the CN condition and in the NW condition.

Again, as predicted, infants had no baseline preference for looking longer at the second object. We performed two-tailed single-sample $t$ tests to compare the proportion of first looks to the original object in each condition to chance (0.50). In-
fants looked at the original object to a degree expected by chance in all three conditions: the NW condition, \( t(7) = -1.88, p > .05 \); the PN condition, \( t(7) = -1.09, p > .05 \); and the CN condition, \( t(7) = -1.28, p > .05 \).

In sum, the results of Experiment 4 are consistent with those from Experiment 2 in offering no evidence that 16-month-old infants have acquired distinct form–meaning connections for proper names and count nouns. Unlike 20-month-olds in Experiments 1 and 3, 16-month-olds were no more likely to look first at an original (labeled) object than at its identical-looking (unlabeled) mate in reaction to a proper name than in response to a count noun or no word. Sixteen-month-olds thus appeared to restrict a proper name to an original object as often as they restricted a count noun. Sixteen-month-olds’ looking time at the original object also did not differ among the three conditions. Although this looking time result is consistent with the result based on the first look measure, we again suspect that the first look data are more noteworthy, for reasons discussed in Experiment 1. Taken together with the results of the previous experiments, the findings suggest that distinct links from proper names and count nouns to their appropriate meanings first emerge between 16 and 20 months of age.

The modified procedure of Experiment 4 succeeded in eliminating the preference for the second object observed in both the first look and looking time data of Experiment 2. Yet despite this success, 16-month-olds still did not look first more often at the original object in the PN condition than in the CN or NW conditions. We therefore suggest that 16-month-olds’ failure to show evidence of differentiating between proper names and count nouns was not due to the baseline preference observed in Experiment 2. It is also of note that we found the same pattern of results across conditions in Experiment 4 that we found in Experiment 2, despite changing the wording of the test prompts and the timing of the looking behavior in the NW condition. This fact indicates that the results of the NW condition in Experiment 2 were not due to these factors.

**GENERAL DISCUSSION**

These four experiments provide evidence that at 20 months, but not at 16 months, infants have established distinct links between proper names and count nouns and their appropriate meanings. Twenty-month-olds had a significantly greater tendency to look first at an original (labeled) stuffed animal, rather than its identical-looking (unlabeled) mate, if they were prompted by a request involving a proper name than if they were prompted by one involving a count noun or no word. The findings extend recent work by Hall et al. (2001) in which 23- and 24-month-olds, but not 20-month-olds, showed evidence of knowing these distinct links, when the dependent measure was the tendency to make an active object choice. Earlier results, also using object choice measures, had sug-
gested that these links were known by girls as young as 17 months (Gelman & Taylor, 1984; Katz et al. 1974; Macnamara, 1982). However, that early research involved pairs of objects that contrasted in terms of salient properties (such as hair or fur color) and thus suffered interpretative problems. Because we used pairs of animals that looked identical, it is unlikely that infants who looked first at our original object did so because this object had any distinctive physical properties. Rather, it is more likely that they did so because they intended to look at that particular individual. Our research thus suggests without the ambiguity of earlier work that between 16 and 20 months infants become more likely to map a proper name than a count noun to an individual object. The results are also consistent with the possibility that between 16 and 20 months infants become more likely to map a count noun than a proper name to an object category, because they appeared more willing to generalize a count noun from an original object to another identical-looking object from the same object category. However, the exact scope of children’s interpretation of count nouns in these experiments is difficult to determine without further research to specify the range of objects to which infants would be willing to generalize these words.

In Experiments 1 and 3, 20-month-olds looked first at an original (labeled) object significantly more often in reaction to a proper name than in response to a count noun or no word. In Experiment 1, this tendency to look first at the original object in the PN condition was only at chance levels but it was significantly greater than chance in Experiment 3. The latter result offers especially clear evidence that 20-month-olds have some appreciation that proper names map to individual objects. In contrast, in both Experiments 2 and 4, 16-month-olds looked first at the original (labeled) object equally often, regardless of hearing a proper name, a count noun, or no word. In Experiment 2, all three means were lower than chance, but in Experiment 4 they were all at chance. The agreement between the results of the two experiments, despite the baseline difference, suggests strongly that 16-month-olds lack an appreciation of the links between novel proper names and count nouns and their appropriate types of meanings.

In both Experiments 1 and 3, we observed a difference between the results obtained from the first look data and those from the overall looking time data. In both experiments, only the results from the first look data offered evidence that 20-month-olds distinguished appropriately between proper names and count nouns. As discussed in the introduction, we expected a priori that the looking time measure would not discriminate among conditions as well as the first look measure. Our reasoning was that the first look measure assessed infants’ behavior in direct response to the test prompts, and so it was analogous to the measures used in previous research showing sensitivity to the distinction between proper names and count nouns (i.e., reaching or pointing; see Gelman & Taylor, 1984; Hall et al., 2001; Macnamara, 1982). In contrast, the looking time measure assessed behavior over the entire 15-sec trial. Because the two toys always looked identical, we sus-
pected that infants might look at them both equally across the extended trials in all conditions, even if their first look behavior differed across conditions.

Our results are generally consistent with those of Waxman and her colleagues, who have explored the origins and evolution of form–meaning connections, focusing on adjectives and count nouns. Using manual habituation tasks and preference for novelty and word extension as the dependent measures, those researchers have found evidence that (a) infants initially link both adjectives and count nouns to a wide range of commonalities among objects, (b) the link from count nouns specifically to object categories is established by 14 months, and (c) the link from adjectives specifically to object properties is fragile at 14 months (evident only when the property is color) and is firmly established later, by 21 or 24 months (e.g., Booth & Waxman, 2003; Waxman, 1999; Waxman & Booth, 2001; Waxman & Markow, 1995, 1998). Using our looking task, we also found evidence of a progression from a general link common to both proper names and count nouns at 16 months to distinct and appropriate connections for proper names and count nouns at 20 months. Moreover, our results with 16-month-olds are consistent with the possibility that the link between count nouns and object categories is established first, because our 16-month-olds’ looking behavior suggested an object category interpretation (i.e., they had a tendency to generalize rather than restrict the word, whether it was a count noun or a proper name). However, our methodology involving pairs of identical objects does not allow us to exclude the possibility that infants in our studies still lack the appropriate link between count nouns and object categories (but see evidence from, e.g., Waxman & Booth, 2001).

Our findings also bear on the question of how infants acquire form–meaning links in the lexicon. According to Waxman and her colleagues (1998, 2004), infants learn these links via a mechanism that initially leads them to notice commonalities among sets of objects that are labeled with a given word. For infants, words first serve as invitations to form categories (Waxman & Markow, 1995), highlighting various types of commonalities (e.g., category-based or property-based) among sets of labeled objects. With experience, infants begin to notice the distinctive grammatical properties of some of these words and at the same time start to notice correlations between certain sets of words and certain types of commonality among objects. For example, they start to recognize that some words (count nouns) label category-based commonalities, whereas others (adjectives) label property-based commonalities (like color or texture). As a result, infants gradually acquire links between specific lexical classes (count nouns, adjectives) and specific types of meaning (object category, object property). In this process, the connection between count nouns and object categories is acquired first, because count nouns

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4This claim is based on separate analyses of the results of Experiments 1 and 2 and Experiments 3 and 4. We analyzed the results of our experiments with 16- and 20-month-olds separately because the studies were conducted independently at different times and with different experimenters.
are especially salient in the linguistic input or because object categories are particularly salient in the world (Waxman, 2004).

Our results suggest that during the second year infants also acquire a link between proper names and individual objects. However, establishing this connection requires a different ability than the one used to acquire form–meaning connections for count nouns and adjectives. To learn the link for proper names, infants must have the ability to interpret a novel word as applying not to a commonality shared by a set of objects (e.g., object category or object property) but rather to an individual object itself. Without this ability, infants would not be able learn the meanings of proper names. Yet if infants have the ability to interpret a word for an object as labeling either some commonality shared with other objects or the individual object itself, how do they determine when to treat it as a term for the individual object? Hall (1999) argued that several cues might foster the interpretation of a novel word as a label for an individual object, including hearing the word used for an animating object (such as a person or a pet) and hearing the word restricted to only one such object. For example, there is strong evidence that children as young as 2 years acquire proper names more readily for people, dolls, and stuffed animals than for artifacts (e.g., Gelman & Taylor, 1984; Hall, 1994; Hall, Veltkamp, & Turkel, in press; Katz et al., 1974). Children as young as 2½ years also appear more likely to interpret a novel word as a proper name if it is restricted to only one object than if it is extended to two different objects (Hall, 1996; Hall & Bélanger, 2005; see also Markman & Jaswal, 2004). Further research is still needed to determine whether such cues lead infants initially to interpret a novel word as a term for an individual object rather than as a label for a commonality shared by a set of objects.

Recall that Tincoff and Jusczyk (1999) found evidence that 6-month-old infants interpret words such as “mommy” and “daddy” as applying to their own parents. How do those results bear on our claims? Tincoff and Jusczyk concluded that their findings indicate that infants start to connect sound patterns with meanings at 6 months of age. But do their results imply that 6-month-olds have forged a form–meaning link between proper names and individual objects at this age, even prior to learning the link between count nouns and object categories? We do not think so (nor do Tincoff and Jusczyk advance such a claim). One reason is that the evidence from Tincoff and Jusczyk does not establish clearly that 6-month-olds interpreted the words as labeling individual objects per se. Like earlier research on proper name learning (e.g., Gelman & Taylor, 1984; Katz et al., 1974; Macnamara, 1982), their work does not allow us to rule out the possibility that infants were construing the words as labeling properties or restricted categories. Tincoff and Jusczyk showed that 6-month-olds did not map “mommy” indiscriminately to all women or “daddy” indiscriminately to all men, but they did not establish unambiguously that infants restrict “mommy” to their mother as an individual or “daddy” to their father as an individual (as opposed to mapping it to a property of either individual or to a restricted category including either individual). Another reason for
being cautious about the interpretation of Tincoff and Jusczyk’s findings is that “mommy” and “daddy” are themselves ambiguous words, used both as proper names (e.g., “Mommy wants a hug”) and as count nouns (e.g., “Your mommy wants a hug”). Moreover, Tincoff and Jusczyk’s evidence comes from infants’ interpretation of words presented without sentence context and does not reveal that infants have learned any linguistic properties of the lexical category proper name that could be used to interpret novel proper names in context. For these reasons, we think it remains an open question whether 6-month-olds represent words like “mommy” and “daddy” as labeling individual objects per se, and we believe it is premature to suggest that they have acquired a form–meaning link between proper names and individual objects.

In sum, these findings enrich our understanding of the course of lexicon construction during the second year. The results suggest that distinct and appropriate form–meaning links for proper names and count nouns are established by 20 months of age, and the findings are consistent with the proposal that the connection between count nouns and object categories is formed prior to the link between proper names and individual objects. In this regard, the findings are in line with results from Waxman suggesting that the count noun–object category linkage is a primary acquisition, established by 14 months and several months prior to the adjective–object property connection. Our findings also indicate that, before their second birthdays, infants have available to them as potential word meanings not only object categories and object properties (as suggested by Waxman’s work) but also individual objects. Further work is needed to determine the precise sequence of children’s acquisition of the links for count nouns, adjectives, and proper names, perhaps by assessing knowledge of these different links within a single study. Additional research is also now required to refine proposals about the process through which children come to acquire specific form–meaning connections for these and other open-class words in the lexicon.

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REFERENCES


**APPENDIX**

Script for PN condition: “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.” At the end of the trial, infants were asked, “Where is DAXY? Look at DAXY! Where is DAXY?”

Script for CN condition: “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?”

Script for NW condition: “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, E1 said, “Look! Look! Look!” [Experiments 1 and 2] or “Where is one? Look at one! Where is one?” [Experiments 3 and 4]