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Young Two-Year-Olds' Tendency to Map Novel Verbs onto Novel Actions

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Children tend to select novel objects over familiar ones as the likely referents of novel nouns. This finding is of central importance to several accounts of early word learning. In the current studies, 2-year-olds were shown pairs of videotaped actions, one familiar and one novel, and were asked to select the referents of novel verbs. For actions that did not involve objects, children tended to select the novel action over the familiar one in each of four experiments. For example, they chose the woman who was turning in circles while leaning backwards as ''the one who is glarving'' more often than the woman who was running. For actions involving objects, novel actions (e.g., shuffling balls) were chosen more often than familiar ones (e.g., kicking balls) in only two of the four experiments. An object-name-blocking mechanism was proposed to account for this last result. The preference for novel actions was also found to be strengthened by preexposing both actions from a test pair, but to be unaffected by preexposing just the novel actions.

Children's word learning is guided by a variety of lexical principles, which are expectations about how unfamiliar words are likely to be used (Hall, Waxman, & Hurwitz, 1993; Golinkoff, Mervis, & Hirsh-Pasek, 1994; Jones & Smith, 1993; Markman, 1992; Merriman, Marazita, & Jarvis, 1995). According to the Object Kind principle (Hall et al., 1993), for example, an unfamiliar word that occurs in a sentence frame such as ''This is a _____'' is likely to be a name for a kind of object rather than a name for something else. Theorists have differed primarily in terms of the principles they have

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proposed and the claims they have made about how these principles interact over the course of development.

Several principles may be used in solving a common problem in language comprehension, namely, that of identifying the referent of a novel word when speaker cues to reference are inadequate. Consider a person who hears, ''There's a thermostat over there,'' but cannot tell from the speaker's gaze or gesture what *thermostat* designates. Two classes of lexical principles can be applied to this problem. Structural bootstrapping principles (Behrend, 1995; Gleitman, 1990; Naigles, Fowler, & Helm, 1995) specify semantic information that is likely to be true of a new word based on the linguistic structure in which it occurs. The Object Kind principle is an example. Because the slot in the sentence frame, ''There's a _____ over there,'' is most often filled by an object name, the child should tend to interpret *thermostat* as a name for an object.

The second type of principle, which is the focus of this article, specifies semantic information based on the familiarity of the potential referents of the novel word. According to the Mutual Exclusivity principle (Markman & Wachtel, 1988; Merriman & Bowman, 1989), for example, words tend not to have referents in common and, therefore, novel words tend not to designate aspects of the world that can already be labeled. The joint implication of this and the Object Kind principle is that an unfamiliar kind of object should be judged to be the most likely referent of the word that occurs in the slot in ''There's a _____ over there.''

Children who are at least 2 years old behave in accordance with this last prediction; they tend to select an unfamiliar object over a familiar, nameable one as the likely referent of a novel count noun (see Merriman, Marazita, & Jarvis, 1995, for a review). For example, when shown a ball and a protractor and asked, ''Which one is a zav?'' preschoolers strongly prefer the protractor. Those in a no word control group, who are merely asked to choose between the two objects, do not. This name mapping tendency has been called the disambiguation effect (Merriman & Bowman, 1989) because it indicates that names that occur in ambiguous contexts tend to be interpreted in a consistent manner.

Alternative principles have been advanced to explain this effect. For example, children might not be surprised at hearing a new name for something they can already name; rather, they might be surprised at not being told a new name for an interesting unfamiliar kind of object. Children are motivated to fill gaps in their lexicons (Clark, 1987) and they may expect them to be filled by novel names (Merriman & Bowman, 1989; Golinkoff et al., 1994, describe a very similar expectation, which they call the Novel-Names-for-Nameless-Categories principle.) Another alternative is the Feeling of Novelty principle (Merriman et al., 1993), which is the expectation that a novel word will designate something that feels new. (How new something feels depends on whether it can be named, but also on other factors.)

One weakness of the research on these familiarity-based principles, other than the little progress that has been made in disentangling them, is the exclusive focus on object name learning. The main goal of the current set of studies was to examine whether young 2-year-olds show an action word disambiguation effect, that is, whether they tend to map a novel verb onto an as-yet-unnameable action rather than onto one that they can already name, and if so, what factors influence this tendency.

Action verb Mutual Exclusivity. Our view of how the Mutual Exclusivity principle is to be applied to action verbs is based on Jackendoff's (1983, 1990) theory of cognitive semantics. Jackendoff proposes that when a verb phrase specifies an action, the reference of the phrase is essentially the nonverbal answer to the question, ''What is the actor doing?'' So the verb phrase in ''The boy is chasing the dog'' refers to the speaker's phenomenal experience of the boy's movement in pursuing the dog. For Jackendoff, the sense of any linguistic expression is the information, or concepts, that it conveys, and its reference is the phenomenal experience, or percept, which this information is about. Two verb phrases can have the same reference, but different senses if they convey different information about the same percept. For example, ''chasing the dog'' and ''running'' can both refer to what the boy who is chasing the dog is doing. Each expression characterizes the boy's action differently, that is, conveys different information about it. Thus, the intention to catch is part of the sense of ''chase,'' but not part of its reference; otherwise, ''running'' and ''chasing the dog'' could not be said to refer to the same action.

Jackendoff (1983, 1990) also draws a distinction between actions and events. The latter are essentially the nonverbal answer to the question, ''What is happening?'' and are the referents of whole sentences, rather than just verb phrases. So, ''The boy is chasing the dog'' refers to the speaker's perceptual experience of an event. An important implication of this view for our purposes is that sentences can have the same reference, while the verb phrases within them need not. For example, ''The boy is chasing the dog,'' and ''The dog is fleeing from the boy,'' can refer to the same event, but ''chasing the dog'' refers to what the boy is doing and ''fleeing from the boy'' refers to what the dog is doing. A second implication is that the perceptual experience of an event is separable from the perceptual experience(s) of the action(s) that occur within the event.

Two action verb phrases violate Mutual Exclusivity only if they refer to the same action performed by the same actor. So, ''chasing the dog'' and ''running'' violate Mutual Exclusivity when predicated of the same boy. Likewise, ''chasing the dog'' and ''fleeing the boy'' would only violate Mutual Exclusivity if they were predicated of a third actor who was chasing a dog and fleeing from a boy at the same time.

Actions can be decomposed into actions. The action specified by ''throwing a pitch,'' for example, contains several actions that can be described as

''moving the arms,'' ''winding up,'' ''pushing off the mound with one leg,'' and ''releasing the ball.'' None of the last four verb phrases listed can be said to have the same reference as ''throwing a pitch'' even when predicated of someone who is throwing a pitch. Although he has not addressed action decomposition per se, Jackendoff (1991) has proposed that perception of actions and events has the same fundamental structure as the perception of objects (e.g., parts, boundaries, a singular-plural distinction, a mass-count distinction). Therefore, we propose that verb phrases that describe actions that are contained in another action refer to parts of the latter action. Since the name for a part of an object does not have the same reference as the name for the object itself (Markman & Wachtel, 1988), verb phrases that refer to parts of an action do not have the same reference as the verb phrase that refers to the whole action.

To extend this analysis to actions that are completely simultaneous, the region of the actor's body that is involved in each action has to be considered. The question, ''What is he doing?'', has at least two acceptable answers when asked about someone who is walking and chewing gum at the same time, namely, ''Walking,'' and ''Chewing gum.'' These two verb phrases would not have the same reference in this case, however, because the actions involve nonoverlapping regions of the body. One piece of evidence for our position, which is the same kind of evidence that Jackendoff (1983) cites in support of his general approach, is the permissibility of sentences that assign an actor's actions to his body parts: ''He is walking with his legs and chewing gum with his mouth,'' ''His legs are doing the walking and his mouth is doing the chewing,'' or ''Walking involves moving the legs and chewing gum involves moving the mouth.'' Thus, two verb phrases that are intended to describe ''what someone is doing'' do not have the same reference if they denote movements that involve non-overlapping parts of the actor's body. By this test, ''running'' and ''chasing the dog'' can have the same reference since the two phrases denote movements that involve the same parts of the actor's body. The following pairs could also have the same reference: ''entering X'' and ''going into X''; ''bumping into X'' and ''hitting X'' (as with a car); and even ''building a house'' and ''ruining those pieces of wood.''

Four-year-olds' mapping of novel action verbs. In the only published investigation of action word disambiguation, Merriman et al. (1993, Study 1) observed 4-year-olds to map novel verbs onto actions that they could not already name about twice as often as onto familiar ones. Although this mapping rate exceeded chance and that of a no word control group, it was much lower than that which 4-year-olds showed for object names in a follow-up study. Moreover, previous assessments of this age group's object name disambiguation obtained mapping rates similar to those of the follow-up study (e.g., Au & Glusman, 1990).

A second difference between the two studies reported by Merriman et al. (1993) was that stimulus preexposure undermined the disambiguation effect

for actions, but not for objects. When children had viewed the unfamiliar, but not the familiar types of actions several times at the start of the experiment, they selected the unfamiliar ones on the verb mapping test on an average of only .55 of the trials; when neither type of action had been previewed, the corresponding figure was .77.

Because preexposure had only a small impact on the selections of the no word control group and because its effect on the word group was restricted to children whose productive verb vocabularies fell below the group mean, Merriman et al. (1993) were led to propose the Feeling of Novelty principle. The 4-year-olds who knew relatively fewer verbs were hypothesized to have a strong expectation that novel verbs would designate actions that feel new. Because preexposure reduced the impression of novelty that an as-yet-unnameable action evoked, these children tended to select non-preexposed familiar actions over them as the likely referents of novel verbs. (See Merriman et al., 1993, for some reasons why preexposure to unfamiliar types of objects has little impact on any 4-year-olds' object name mapping.)

The children with the larger vocabularies were hypothesized to be guided by Mutual Exclusivity, rather than Feeling of Novelty, and thus were unaffected by action preexposure. Moreover, their expectation that words would not have exemplars in common was hypothesized to be weaker for action than for object words because violations of the expectation occur more frequently in their experience with action than with object words. As Maratsos and Deak (1995) have argued, a basic level of mutually exclusive shape-based object categories dominates children's object naming, but there is no analogous basic level of action categories. Any list of candidates for basic verbs must include ones that refer to the same actions, but characterize them differently. For example, the act of wiping off a counter could be called *cleaning*, *washing*, *wiping*, or *rubbing*. Note that this example passes the region-of-the-body test for common reference developed in the last section. None of these verbs seems more basic than the others. There may be basic verbs, but they do not form a level, that is, a contrastive set of mutually incompatible terms (for further evidence and argument, see Gentner, 1982, Huttenlocher & Lui, 1979, and Merriman, Marazita, & Jarvis, 1995).

EXPERIMENT 1

The procedures used by Merriman et al. (1993, Study 1) to measure the action word disambiguation effect were administered to 23- to 26-month-olds. In the Novel Word group, children were asked to decide whether a familiar or an unfamiliar action was the referent of a novel verb. The No Word group viewed the same pairs of actions as the Novel Word group, but was merely asked by the experimenter to select ''one that I want.'' For half the trials, the unfamiliar action was preexposed and for the remainder it was not; none of the familiar actions were preexposed. In addition, half the pairs of actions were self-focused, that is, ones in which the actor's movement had

no effect on any object other than himself or herself (e.g., a man walking versus repeatedly moving his knees together and apart), and the other half were object-focused (e.g., a man picking up a spoon versus making it catapult across the room by striking down on it). For a discussion of this causative distinction, see Shibatani (1976) and Talmy (1976). The 4-year-olds in Merriman et al.'s (1993) study showed comparable disambiguation effects for the two types of actions.

In previous studies with objects, young 2-year-olds have shown a much weaker disambiguation effect than 4-year-olds. Excluding those studies in which children were corrected for selecting familiar objects (Mervis & Bertrand, 1994; Vincent-Smith, Bricker, & Bricker, 1974), and excluding trials in which cues that opposed the effect were introduced (e.g., ones in which the novel word sounded similar to the name for the familiar choice object), young 2-year-olds' average rate of selecting an unfamiliar over a familiar object is only .67 (Hutchinson, 1986; Merriman & Bowman, 1989, Study 1; Merriman & Marazita, in press, Study 1; Merriman & Schuster, 1991).

Two-year-olds' object name disambiguation has also been found to be undermined by preexposing the unfamiliar test objects (Merriman & Bowman, 1989, Study 1 & 2; Merriman & Schuster, 1991). For example, in Merriman and Schuster's study, toddlers were shown pictures of six unfamiliar things for approximately 5 min., during which time they had to answer various questions about them (e.g., Is it pretty or yucky?) On the subsequent disambiguation test, they chose these objects over familiar ones that had not been preexposed on only .43 of the trials. In contrast, on trials in which neither the unfamiliar nor familiar object had been preexposed, the unfamiliar was chosen on .68 of the trials. Because it had a similar effect on the selections of the No Word control group, preexposure was hypothesized to simply cause 2-year-olds to attend to or prefer an object less and thus select it less often on those disambiguation trials in which they guessed or chose impulsively. Had preexposure been found to have a greater impact on the Novel Word than on the No Word group, as was the case in Merriman et al.'s (1993) study of 4-year-olds' verb mapping, then the Feeling of Novelty principle would have been implicated. That is, it could have been concluded that at least some children were guided by the expectation that novel names would map onto referents that feel new.

Golinkoff, Hirsh-Pasek, Mervis, Frawley, and Parillo (1995) have recently proposed that an expanded version of the Novel-Names-for-Nameless-Categories principle is operative by the end of the second year of life. Not only are as-yet-unnamed objects expected to be called by novel nouns, but so are as-yet-unnamed actions to be called by novel verbs. Support for their proposal is weak, however. They cite work reported in a conference paper (Golinkoff, Diznoff, Yasik, & Hirsh-Pasek, 1992) as showing that by age 2 $\frac{1}{2}$, children can use structural cues to distinguish novel nouns from novel verbs. They also describe in a few sentences an experiment (Golinkoff, Jacquet, & Hirsh-

Pasek, 1993) in which children who were almost 3 years old showed a strong tendency to choose drawings of unfamiliar actions over drawings of familiar ones as the referents of novel actions. Clearly, data on action verb disambiguation by children who are younger than those in these studies are needed to evaluate their hypothesis.

The current study also addressed the relation between the disambiguation effect and 2-year-olds' tendency to acknowledge that a novel word is unfamiliar (e.g., to say ''No'' when asked, ''Do you know what glarving is?''). A consistent positive correlation has been found between these two measures in 4-year-olds (Merriman & Bowman, 1989; Merriman & Schuster, 1991; Merriman et al., 1993; Marazita & Merriman, 1994), which has been interpreted as evidence that a process of monitoring stimulus familiarity promotes mapping novel words onto unfamiliar rather than familiar kinds of entities. In contrast to 4-year-olds, few 24-month-olds tend to acknowledge the unfamiliarity of novel nouns and those who do are not more likely than their peers to map such nouns onto unnameable rather than nameable objects (Merriman & Bowman, 1989; Merriman & Schuster, 1991; Merriman & Marazita, 1994). There is evidence, however, that those who do acknowledge the unfamiliarity of these nouns have superior phonological comparison skill (Merriman & Schuster, 1991; Merriman & Marazita, 1994)—a reflection of the fact that judging a word to be unfamiliar involves deciding that it does not sound enough like any known word.

Method

Subjects. Thirty-two 2-year-olds (M = 2-0, range = 1-11 to 2-2), who were located through published birth records and recruited through a mailing with follow-up phone calls, participated. The vast majority were from middle class homes. Eight boys and eight girls were assigned to each of two conditions, Novel Word and No Word. One child was replaced for refusing to comply with disambiguation test instructions.

Materials. The twelve pairs of videotapes from Merriman et al.'s (1993) first experiment were used (see Table 1). Each tape was approximately 10 s long and showed a man or woman performing a simple action. Any sound that the action made or that accompanied it could be heard on the tape. The pairs were equated with respect to actor, location, patient (if one was involved), and duration of action. The pairs differed in action familiarity, with one intended to be an action that 2-year-olds could name and the other not. Six pairs portrayed object-focused actions, and six portrayed self-focused ones.

Two preexposure films and two pairs of disambiguation films were created by splicing together the action tapes in various ways. The preexposure films were constructed by randomly dividing the unfamiliar actions into two sets of six, each consisting of three self- and three object-focused actions. Each pair of disambiguation films was made in such a way that when the films were shown simultaneously on separate screens the pairs of unfamiliar and

TABLE 1
The Familiar–Unfamiliar Action Paris Used in Experiment 1

Familiar action	Unfamiliar action
	Self-focused
Man runs back and forth twice	Man whirls forearm in horizontal plane in front of him
Man cries	Man wiggles lips repeatedly
Man sleeps lying down	Man moves legs together and apart repeatedly
Man sits down once	Man repeatedly puffs up one cheek then the other
Woman sings	Woman crosses legs once
Woman jumps up and down repeatedly	Woman leans back while turning in circle twice
	Object-focused
Man washes door with rag	Man repeatedly turns scraper over against door
Man kicks three balls one at a time	Man repeatedly shuffles three balls around on palm
Man picks up spoon once	Man hits down on end of spoon making it catapult off chair
Man opens door once	Man repeatedly rolls fingers on door
Woman drinks orange juice from glass	Woman repeatedly bobs fist in glass of orange juice
Woman cuts paper with scissors	Woman makes several holes in paper with hole puncher

familiar actions listed in Table 1 appeared. The order of the pairs was random. All independent variables (action familiarity, self- versus object-focus, whether a tape had occurred in a particular preexposure film) were counterbalanced with right-left screen position. One pair of disambiguation films displayed the actions in the reverse order in which they appeared in the other pair. In every film, a blank blue field appeared for two seconds between each action.

Procedure. Each child sat across from two color monitors which rested atop two adjacent VCRs on a table in a lab room. The experimenter sat on the floor next to the child and used a remote control to operate each VCR. Once the child was judged to feel comfortable with the experimenter, three tasks were administered—preexposure; disambiguation; and naming. For the first task, the child was told to watch one of the preexposure films as it was presented three times on one of the VCRs. This experience was intended to reduce the token novelty of half of the unfamiliar actions that would be presented in the disambiguation test. Within each gender × condition cell,

half the children viewed one of the preexposure films and half viewed the other.

Instructions for the disambiguation task varied according to condition. The Novel Word group was told, ''I'm going to show you two videos. On one of these TVs you'll see a man jeggering (or whatever the test word was). Now watch this one.'' One of the actions from a pair in Table 1 was presented on the left monitor. ''Now watch this one.'' The other action of the pair was presented on the right monitor. ''Now I'm going to show you both at the same time.'' The two actions were presented simultaneously. As the films came on, the child was asked, ''Can you point to the one of the man jeggering?'' If the actions were object-focused, the request mentioned the patient (e.g., ''Can you point to the one of the man jeggering the door?'') This procedure is similar to one that Golinkoff, Hirsh-Pasek, Cauley, and Gordon (1987) developed except that novel verbs were used rather than familiar ones and children's pointing gestures were recorded rather than their visual fixations. The experimenter hit the pause button whenever the blank blue field that separated one action on a film from the next appeared, and after telling the subject what was coming next, released the pause button.

The format of the remaining eleven trials was the same except that different action pairs and nonce verbs were used and each trial began with the child being asked whether he or she was familiar with the verb-to-be-tested (e.g., ''Do you know what cardling is?'' Pause for child response. ''On one of these TVs you'll see a man cardling . . .'') The verbs were *jegger, cardle, zav, glower, bruck, sart, moog, biff, spain, neen, clow,* and *firsh.*

The No Word group viewed the films in the same manner, but were not asked to identify the referents of unfamiliar verbs nor to say whether they knew these verbs. During the phase in which two actions were viewed simultaneously, they were told, ''I want you to pick one of these. Which one do you think it is?'' This condition was included to assess children's preference for one kind of film over another. In both the Novel and No Word conditions, the experimenter accepted whatever selection the child made by saying ''OK'' or ''Good.''

The naming task was only given to the Novel Word group. Each child was told, ''I was just playing a game with you before. All of those names I asked you about were just pretend names. Now I want to know if you can think of any real names for what the man and the lady were doing.'' All actions from the disambiguation test were presented one at a time and the child was asked to name each one.

Results and Discussion

Disambiguation: dependence on action type. As in Merriman et al.'s (1993) study, performance on the naming task was used to eliminate on a child-by-child basis those disambiguation trials that had not truly pitted a nameable action against an unnameable one. Any trial that contained either an unfamiliar

TABLE 2
Proportion of Trials in Which the Unfamiliar Action Was Selected in Experiment 1

	Type of action pair by whether unfamiliar action preexposed			
	Self-focused		Object-focused	
Condition	Preexposed	Not preexposed	Preexposed	Not preexposed
Novel word	.69* (.32)	.68* (.38)	.35 (.39)	.37 (.44)
No word	.36 (.24)	.55 (.28)	.61 (.24)	.45 (.23)

Note. None of the familiar actions were preexposed. Standard deviations are in parentheses.
* Proportion is significantly different from change ($p < .05$, two-tailed).

action that the child subsequently named by a specific verb or a familiar action that he or she failed to name was dropped from the calculation of his or her score. The data from three children in the Novel Word condition were completely excluded because they failed to label every or nearly every ''familiar'' action in the posttest. For the remaining participants, an average of 4.6 of the 12 trials was eliminated. Most trials were eliminated because the familiar action was not named.

Because no significant effects of gender or of any interactions involving gender were obtained in a preliminary analysis of variance, groups were collapsed over this variable. A 2 (Condition: Novel Word vs No Word) $\times$ 2 (Preexposure of the Unfamiliar Action: Yes vs No) $\times$ 2 (Action Focus: Self vs Object) mixed analysis of variance, in which the last two factors were repeated measures, of the proportion of disambiguation trials in which an unfamiliar action was selected yielded two significant effects, namely, action focus, $F(1,27) = 4.26$, $p < .05$, and condition $\times$ action focus, $F(1,27) = 12.06$, $p < .002$. The relevant cell means are presented in Table 2.

The children showed a disambiguation effect for self-focused actions, but not for object-focused ones. That is, they tended to map a novel verb onto an unnameable rather than a nameable action only when the actions were self-focused. Children in the Novel Word group selected self-focused actions that they could not already label over ones that they could on .69 of the trials, a rate significantly greater than both chance and that of the No Word controls (.45). They selected unnameable object-focused actions on only .36 of the trials, a rate not significantly different from chance or that of the No Word controls (.54).

The 4-year-olds in Merriman et al.'s (1993) first experiment, who were tested with these very same stimuli and procedures, showed comparable disambiguation effects for both self- and object-focused actions. Their average rates of selecting unnameable over nameable actions were .67 and .65 for the two types of pairs, respectively.

The null effect of preexposure is noteworthy in light of the strong impact that this experience has been found to have on both 2-year-olds' noun mapping (Merriman & Bowman, 1989; Merriman & Schuster, 1991) and 4-year-olds' verb mapping (Merriman et al., 1993). However, there is one similarity between how preexposure affects 2-year-olds' verb and noun mapping: in both cases, there is no difference between the reactions of the Novel and No Word conditions to preexposure. Thus, the impact of preexposure on their decisions is not linguistically mediated; they do not appear to use the Feeling of Novelty principle.

The reason preexposure to unfamiliar objects makes toddlers less likely to select them over familiar ones, but preexposure to unfamiliar actions does not affect their action selections may have to do with the greater difficulty of encoding actions. Some 2-year-olds may not have enough processing resources to both encode the pair of actions in the disambiguation test and carry out the other processes that lead to selecting the unnameable one (e.g., noting the mismatch between the test verb and the name for the familiar action). The preexposed unfamiliar actions may have been easier to encode when reencountered on the disambiguation test than the unfamiliar actions that were encountered for the first time on this test. This encoding benefit may have promoted disambiguation by freeing up resources for processes such as noting the mismatch between the test verb and the name for the familiar action. This disambiguation-enhancing consequence may have offset the usual disambiguation-attenuating consequence of preexposure, which is reduced preference for the preexposed stimulus. This processing load reduction argument will be examined further in Experiment 4.

Acknowledging verb unfamiliarity. Before every disambiguation trial except the first, children in the Novel Word condition were asked whether they knew the test verb (e.g., ''Do you know what glarving is?''). Responses such as saying, ''No,'' shaking the head, or asking, ''What?'' were scored as denials. Responses such as saying, ''Yes,'' nodding, or giving a familiar verb (e.g., ''Throwing'') were scored as affirmations. Responses such as not saying or doing anything, repeating part of the question, or saying something irrelevant were scored as other. The children's rates of denial, affirmation, and other response, counting the three subjects excluded from the first analysis, were .26, .55, and .19, respectively. The corresponding rates for the 4-year-olds in Merriman et al.'s (1993) Study 1 were .55, .45, and .00, respectively. An age-related increase in the tendency to deny knowing a novel word has also been found in studies of object names (Merriman & Bowman, 1989, Studies 1 & 2; Merriman & Schuster, 1991).

In previous studies of 2-year-olds' object name disambiguation (the three just cited and three reported in Merriman & Marazita, 1994), their rate of denial has been lower (average = .12, range = .06 to .20) and their rate of other response, higher (average = .49, range = .28 to .67) than in the current study. Note that over 90% of other responses in these studies are non-re-

sponses. It is not clear to what extent the better performance in the current study is due to sample differences, to our procedure somehow making the toddlers more comfortable and thus more verbally responsive to requests, or to toddlers actually being better able to judge that novel verbs are unfamiliar than that novel objects are.

As has been found in the object name studies, 2-year-olds' denial rate was not correlated with their general rate of mapping a novel word onto an unnameable stimulus, $r(11) = .20$, $p > .10$. However, a significant correlation was obtained for self-focused actions, $r(11) = .59$, $p < .05$, but not for object-focused ones, $r(11) = -.23$, $p > .10$. Moreover, their denial rate was strongly correlated with the difference between the two mapping rates, $r(11) = .71$, $p < .01$.

The sound match and object name blocking hypotheses. There are two plausible explanations for both this last finding and for the disambiguation effect's restriction to self-focused actions. According to the sound match hypothesis, the disambiguation effect for object-focused actions is undermined by the perceived similarity in sound between the test verb phrases and children's own verbal encodings of the familiar object-focused actions. Both Merriman and Schuster (1991) and Merriman and Marazita (1994) have documented a sound match effect of this type in 2-year-olds' novel noun mapping. When asked to select ''the japple,'' for example, the youngsters showed the disambiguation effect when the nameable object was a car, but not when it was an apple. Moreover, those who denied knowing the test word showed the greatest tendency to map this word onto the familiar object with the similar-sounding name, presumably because they were more attuned than their peers to sound relations between words.

The test phrase for the object-focused actions always included a direct object, and children's encoding of the familiar object-focused action most likely included the same direct object. For example, when shown a man opening a door versus a man rolling his fingers on it and asked, ''Can you point the man glarving the door,'' the children most likely encoded the familiar action as ''opening the door.'' The occurrence of the same final elements (e.g., ''-ing the door'') in both the test phrase and the encoding of the familiar action may have prompted some to map the verb onto this action. In contrast, the test phrase for the self-focused actions was intransitive, and thus contained no direct object (e.g., ''Can you point to the man jeggering?'') and so lacked potential common sound elements with the children's encoding of the familiar self-focused actions (e.g., ''running'').

An alternative explanation is the object name blocking hypothesis, which also emphasizes the child's act of comparing the test phrase to his or her own verbal encodings of the choice actions. Children's verbal encoding of object-focused actions may have been dominated by the name for the affected object, making it difficult for them to note the mismatch between the test verb and the verb they knew for the familiar action or to note that no mis-

matching verb had been generated for the unfamiliar action. For example, a child might encode opening the door as ''opening the door'' and rolling fingers on the door as simply ''door.'' Because ''door'' occupies the salient recency position in both verbal encodings, the children may have had difficulty deciding which one was a better match to the test verb phrase, ''firshing the door.'' No such problems occurred with self-focused actions because these involve no objects. For example, a child who encoded running as ''running'' and generated no verbal code for arm whirling might have found it relatively easy to decide which one was the referent of ''jeggering.''

For this hypothesis to account for the pattern of correlations between admission of verb unfamiliarity and disambiguation, it must be assumed that the children who are more attuned to phonological relations experience more interference from the names they generate for the patients of object-focused actions than the other 2-year-olds do.

EXPERIMENT 2

The sound match and object name blocking hypotheses were disentangled by separating action type from verb phrase type. Children in the Novel Word–Direct Object condition were asked to pick out the man ''VERB-ing the NOUN'' from pairs of object-focused actions (e.g., ''clowing the nail'' from a man pounding a nail versus turning a scraper's corner on top of a nail) and pairs of self-focused actions (e.g., ''baving his eyes'' from a man opening and closing his eyes versus crossing and uncrossing them.) The self-focused pairs were such that both actions involved the same body part, which made it possible to use the body part's name as the direct object in the test phrase. Children in the Novel Word–No Direct Object condition were shown the same pairs of actions, but were simply asked to point to the man ''VERB-ing'' (e.g., ''clowing'' or ''baving.'')

If the sound match hypothesis is correct, children should show a weaker disambiguation effect in the direct object than in the no direct object condition and the effect should be as strong for one type of action as for the other. If the object name blocking hypothesis is correct, the effect should not depend on the syntax of the test phrases, but should be stronger for self- than for object-focused actions. If children's verbal encodings of the object-focused actions in a test pair are dominated by the name of the affected object, their judgment of which encoding better fits a test phrase should be impaired even when the test phrase is intransitive. For example, if their encoding of a man rolling his fingers on a door is ''door,'' they should tend to construe the phonological mismatch between this encoding and the intransitive test phrase, ''baving,'' as evidence that the test phrase should not be mapped onto this action.

Two other methodological changes were made. In Experiment 1 some of the unnameable actions were preexposed; in the current study, children viewed every nameable and unnameable action that appeared in the disambiguation

test beforehand. Familiarizing the children with the actions might well allow them to encode the actions more easily during the test, which might in turn make it easier for them to carry out all the processes necessary for showing a reliable disambiguation effect (i.e., processes such as retrieving a name for the familiar action in the test pair, comparing it to the test verb, etc.)

The second change was to intersperse four familiar verb trials among the disambiguation trials. The familiar trials involved asking the child to select the referent of a familiar verb from a pair of familiar actions. Two such trials were presented at the beginning of the test as a warm-up and the other two were presented periodically so as to maintain the child's sense of being able to answer the questions.

Method

Subjects. Forty-eight 2-year-olds (M = 2-1, range = 2-0 to 2-2) were recruited in the same fashion as in the first study. Eight boys and eight girls were assigned to each of three conditions, Novel Word–Direct Object, Novel Word–No Direct Object, and No Word. Eight children were replaced for refusing to choose in the disambiguation test.

Materials. Twelve pairs of videotapes were developed. Each tape was approximately 10 s long and showed a man performing a simple action. All pairs were equated with respect to actor, location, and patient (if one was involved). Four were pairs of familiar actions, two self-focused (walking versus running and crying versus scratching) and two object-focused (throwing a ball versus rolling it and pulling a wagon versus riding it). Each of the remaining pairs consisted of an action that was judged to be familiar to 2-year-olds and one that was judged to be unfamiliar. Half of these pairs portrayed object-focused actions, and half portrayed self-focused ones (see Table 3).

One preexposure film and two pairs of disambiguation films were constructed. The preexposure film was a random ordering of the tapes of all 24 actions. Each pair of disambiguation films was made in such a way that when the films were shown simultaneously the familiar action pairs described in the previous paragraph and the unfamiliar–familiar action pairs listed in Table 3 appeared. The first two were familiar action pairs, the next two were unfamiliar–familiar, then another familiar, then two more unfamiliar–familiar, then the final familiar, and then the remaining four unfamiliar–familiar. Even though both pairs of disambiguation films had this ordering, the particular pairs that occurred in a particular position in one film occurred in the reversed position in the other. For example, the last familiar action pair in one film was the first in the other film. Every action appeared as often on the right as on the left screen.

Procedure. The procedure was the same as that of Experiment 1, with four exceptions. First, the preexposure film was presented once, rather than three times. Second, on the trials in which children viewed a familiar action pair,

TABLE 3
The Familiar-Unfamiliar Action Pairs Used in Experiment 2

Familiar action	Unfamiliar action
	Self-focused
Washes hand with rag	Traces along hand with pizza cutter
Combs hair	Repeatedly grasps parts of hair with ice tongs
Waves arm	Whirls forearm in horizontal plane in front of him
Repeatedly opens and closes eyes	Repeatedly crosses and uncrosses eyes
	Object-focused
Cuts paper with scissors	Makes several holes in paper with hole puncher
Kicks three balls one at a time	Repeatedly shuffles three balls around on palm
Picks up spoon once	Hits down on end of spoon making it catapult off chair
Pounds nail with hammer repeatedly	Turns scraper over and over on top of nail

those in the Novel Word conditions were asked to find the referent of a familiar verb (e.g., ''Can you point to the one of the man riding the wagon?''). Half the children received the verb for one of the actions in a pair and half received the other verb. For self-focused familiar actions, the test verb phrase was intransitive; for object-focused ones, it was transitive. The actions from the familiar pairs were not included in the naming posttest.

Third, and most importantly, there were two Novel Word conditions rather than one. Those in the Novel Word–Direct Object condition heard transitive verb phrases for both types of unfamiliar–familiar pairs, self-focused (e.g., ''Can you point to the one of the man sarting his arm?'' regarding the man waving versus whirling his arm) and object-focused (e.g., ''Can you point to the one of the man firshing the paper?'' regarding the man cutting versus punching holes in paper). For the self-focused pairs, the name of the body part involved in the action served as direct object of the verb phrase. The children in the Novel Word–No Direct Object condition heard intransitive verb phrases for all unfamiliar–familiar pairs (e.g., ''Can you point to the one of man sarting/firshing?'') Also, those in the Direct Object condition heard transitive phrases to introduce each trial (e.g., ''On one of these TVs you'll see a man sarting his arm.''), whereas those in the No Direct Object condition heard intransitive phrases here (e.g., ''On one of these TVs you'll see a man sarting.''). The novel words used were *firsh, sart, cardle, spain, gruck, zav, clow,* and *bave.*

Fourth, on every disambiguation trial, after hearing the sentence that intro-

duced the trial, the children were asked whether they knew the verb to be tested (e.g., ''Do you know what sarting is?''). This question was asked concerning both familiar and unfamiliar verbs.

Results and Discussion

Disambiguation: more support for the object name blocking than the sound match hypothesis. One unexpected result was that children behaved much more shyly than in the first experiment; most were quite reluctant to talk. The changes in the preexposure experience were probably the cause. Whereas six unfamiliar actions had been presented three times each in the preexposure phase of Experiment 1, eight unfamiliar and twelve familiar actions were presented once in the current study. The greater number of actions and the lack of any opportunity to view them more than once may have overwhelmed the children. One sign of the subjects' greater difficulty is that a larger proportion of them had to be replaced for refusal to map the novel verbs (8 out of 48) than had to be in Experiment 1 (1 out of 32).

Although most were willing to respond when asked to point, they tended not to give verbal responses to questions that required them. Nine children in the Direct Object condition and seven in No Direct Object condition failed to name any of the actions in the posttest, and some of the others named only a few. Because of the inadequacy of the posttest results, these were not used to eliminate specific disambiguation trials for individual children. At least those who did produce names in the posttest were more likely to do so for familiar actions (average = 5.31) than for unfamiliar ones (2.12), $t(15) = 7.77$, $p < .001$.

Groups were collapsed over gender for the same reasons as in Experiment 1. A 3 (Condition: Novel Word − Direct Object vs Novel Word − No Direct Object vs No Word) × 2 (Action Focus) mixed analysis of variance of the proportion of disambiguation trials in which the unfamiliar action was chosen over the familiar one yielded main effects of condition, $F(2,45) = 6.32$, $p < .005$, and action focus, $F(1,45) = 4.74$, $p < .05$. In contrast to the results of Experiment 1, the interaction was not significant, $F(2,45) < 1.0$. The relevant cell means are listed in Table 4.

By the sound match hypothesis, the disambiguation effect should have been greater in the Novel Word−No Direct Object than in the Novel Word−Direct Object condition. A nonsignificant difference in the opposite direction was found, however. The rates of unfamiliar action selection in the two conditions were .55 and .63, respectively. This result is more compatible with the object name blocking hypothesis, according to which the two conditions should be similar.

The effect of action focus on disambiguation, which also bears on the two hypotheses, was not clearcut. As in Experiment 1, rates of unfamiliar action selection were significantly greater than chance for self-focused actions (.67), but not for object-focused ones (.51), and these two rates were significantly different from each other. These results are consistent with the object name

TABLE 4
Proportion of Trials in Which the Unfamiliar Action Was Selected in Experiment 2

Condition	Type of action pair	
	Self-focused	Object-focused
Novel word		
Direct object	.71* (.25)	.56 (.28)
No direct object	.68* (.24)	.47 (.26)
No word	.49 (.22)	.42 (.24)

Note. Standard deviations are in parentheses.
* Proportion is significantly different from chance ($p < .05$, two-tailed).

blocking hypothesis. However, the No Word control group showed a nonsignificant trend in the same direction (.49 vs .42), and as already noted, the condition × action focus interaction was not significant. One cannot rule out the possibility that the main effect of action focus is just a manifestation of nonlinguistic preferences, that is, of 2-year-olds' just preferring the particular unfamiliar self-focused actions used in the current study more than the particular unfamiliar object-focused ones used.

Acknowledging verb unfamiliarity. When children in the Novel Word conditions were asked whether they knew the unfamiliar test verbs, their rates of denial, affirmation, and other response were .19, .26, and .55, respectively. The affirmation rate was lower, $t(46) = 2.32$, $p < .05$, and the other response rate higher, $t(46) = 3.32$, $p < .01$, than in the first experiment. Neither finding is surprising in view of the other indications that children in the current study were less verbally responsive than those in Experiment 1.

The tendency to acknowledge the unfamiliarity of novel verbs was not related to tendency to map these verbs onto unfamiliar actions. The correlation between children's denial rates and their unfamiliar action selection rates in the disambiguation test were .10 and .05 in the Direct Object and No Direct Object conditions, respectively, $p > .10$. When correlations were computed for self- and object-focused actions separately, only one was significant, namely, that for object-focused actions in the Direct Object condition, $r(15) = .55$, $p < .05$; the others ranged from .01 to .12. There is no obvious explanation for the lone significant correlation. The pattern is strikingly different from that obtained in Experiment 1, the one consistent with both the sound match and object name blocking hypotheses; that is, the one in which the correlation was significantly positive for self-focused actions and nonsignificantly negative for object-focused ones.

It would be unwise to reject the object name blocking hypothesis on the basis of the null correlational results. The measures involved were very noisy estimates of individual tendencies. The preexposure experience may have

overwhelmed and consequently silenced some children who might otherwise have denied knowing the novel verbs. Also, because disambiguation rates were not posttest-corrected, they were undoubtedly noisier than the rates used in the correlational analyses of Experiment 1.

EXPERIMENT 3

The current study sought to improve the method of testing young 2-year-olds' novel verb mapping, to address a third explanation for the action pair type effect of the first two experiments, and to further test the object name blocking hypothesis.

The preexposure phase was dropped and the naming test was administered before, rather than after, the disambiguation test. The second of these changes made it possible to use each child's naming performance to determine the particular pairs presented to him or her in the disambiguation test. Each such pair consisted of a familiar action that the child had named and an unfamiliar one that he or she had not named in the pretest.

The new explanation attributes the action pair type effect to the lesser perceptual discriminability of the object-focused than the self-focused pairs. The object-focused pairs had both the actor and patient in common, whereas the self-focused ones shared only the actor. For example, in the object-focused pair that consisted of a man opening a door versus rolling his fingers on it, the man was the common actor and the door the common patient. In contrast, the actions in the self-focused pair that consisted of a man running versus whirling his arm had only the man in common. The patients of the object-focused pairs not only constituted shared elements in the settings of the actions, but also shared constraints on the actions themselves. That is, a particular object such as a door can only be acted on in certain ways and will only respond in certain ways to actions on it, whereas much more variability is possible in the dynamic course of a patient-less action. Young children were hypothesized to find it more difficult to perceive the difference between familiar and unfamiliar actions on the same patient than between familiar and unfamiliar self-focused actions and consequently to only show a disambiguation effect with self-focused pairs.

This discriminability hypothesis was tested by comparing the magnitude of the disambiguation effect for three kinds of action pairs: self-focused; object-focused with different patients; and object-focused with the same patients. If the discriminability hypothesis is valid, the effect should be weaker in the last condition than in the other two, which should not differ from each other. If the object-name-blocking hypothesis is valid, commonality of patients should not matter; the effect should be strongest in the self-focused condition and should not differ in the two object-focused conditions.

Method

Subjects. Sixty 2-year-olds (M = 2-3, range = 2-1 to 2-5) were recruited in the same fashion as in the first study. Ten boys and ten girls were assigned

to each of three conditions, Self-Focused Action; Object-Focused-Action–Different Patient; Object-Focused Action–Same Patient. Ten children were replaced, eight for not naming any actions in the pretest and two for refusing to make choices in the disambiguation test.

Materials. Forty-eight tapes were made, each approximately 10 s long and showing a man performing a simple action. (See Table 5). Half were self-focused actions and half were object-focused ones. Within each subset, half were familiar and the rest were unfamiliar. Some tapes had been used in the previous experiments.

Four pretest films were created by splicing together the tapes in various ways. Two films were shown to children in the Self-Focused Action condition. Each film presented two familiar object-focused actions, six familiar self-focused ones, and six unfamiliar self-focused ones. The films began with the object-focused actions, which were used to introduce the naming task, then proceeded to the other actions in an order that was random except that the same type of action never occurred more than twice in succession. The same order was used in both films. The order of the last twelve actions was reversed for half the children in the condition.

The other two films were shown to children in both Object-Focused Action conditions. These were structured similarly to the ones shown to those in the Self-Focused Action condition except that object-focused actions were replaced with self-focused ones and vice versa. That is, each began with two familiar self-focused actions, then proceeded to twelve object-focused ones.

Procedure. The laboratory situation was the same as in the first two experiments except that the VCRs were moved to an adjoining room. A second experimenter operated the VCRs as he watched the child and the other experimenter through a one-way mirror.

The experiment involved three phases, namely, pretest, filler task, and disambiguation test. The pretest began with the experimenter telling the child, ''Hey! Do you want to watch some videos? Let's look and see what's on these T.V.'s. There's going to be a man in these videos doing some things. I want you to help me figure out what he is doing.'' The first action of one of the pretest films was presented on the left monitor and the experimenter named it (e.g., ''Look what the man is doing to the orange juice! He is drinking the orange juice!'') This procedure was repeated with the first action of the other pretest film on the right monitor. The experimenter then administered a second pair of practice trials in the same fashion (i.e., first one on the left, then the other on the right.) The remaining actions in the pretest films were then presented in this alternating manner. As each action came on, the child was asked to name what the man was doing. The experimenter accepted all child responses by saying ''OK'' or ''Good.''

Although the results of Experiment 2 made us suspect that 2-year-olds might be overwhelmed by the number of actions presented in the pretest, a pilot study showed that this was not the case. A crucial difference may have

TABLE 5
The Familiar-Unfamiliar Action Pairs Used in Experiment 3

Familiar action	Unfamiliar action
	Self-focused
Kicks leg repeatedly	Crosses and uncrosses eyes repeatedly
Jumps up and down	With hand on shoulder moves elbow in a quarter circle in the horizontal plane
Cries	Traces hand with pizza cutter
Combs hair	With hands in prayer position moves touching fingertips up and down together
Coughs repeatedly	Moves knees together and apart
Sits down once	Whirls forearm in horizontal plane in front of him
Washes hand with rag	Leans back while turning in a circle
Walks across room	Repeatedly puffs up one cheek then the other
Opens and closes eyes repeatedly	Repeatedly crosses and uncrosses legs while sitting
Sings	Moves eyebrows up and down simultaneously
Waves	Moves one leg than the other in a circle while standing
Scratches head	Repeatedly grasps parts of hair with ice tongs
	Object-focused
Washes dish with rag	Spins dish
Kicks three balls one at a time	Repeatedly shuffles three balls around on palm
Throws a ball	Holds ball between fingertips and moves it up and down
Cuts paper with scissors	Makes holes in paper with hole puncher
Rides wagon	Moves handle of wagon back and forth between floor to wagon bed
Drinks orange juice from a glass	Moves glass of orange juice in tight circle creating whirlpool
Opens door	Repeatedly rolls fingers on door
Ties shoe	Repeatedly hits shoe with both knees while holding it between them
Pushes toy truck across table	Repeatedly tips toy truck up then lets fall
Pounds nail with hammer	Turns scraper over and over on top repeatedly of nail
Repeatedly hits pillow with fist	Holds pilow by corners and rotates it around a horizontal axis
Rocks stuffed animal	With hand on own shoulder repeatedly touches stuffed animals with elbow

Note. The first eight self-focused and first eight object-focused pairs listed were also used in Experiment 4.

been that subjects were asked to name each action in the current pretest, but were asked to simply view them in the preexposure phase of Experiment 2. Children may have been encouraged in the current study by their perceived ability to respond to the experimenter's requests for names.

In the filler task, the experimenter showed the child fifteen pictures of familiar objects (e.g., bottle, phone) and asked him or her to name each one. This task took approximately three minutes. During this time, the second experimenter used notes of the child's pretest performance to assemble pairs of tapes to be presented to him or her in the disambiguation test. The first two pairs, which were of familiar actions and were used for practice, were the same for all the children and identical to the practice pairs given in the pretest. The remaining pairs were created by selecting a tape of a familiar action that the child had correctly named and a tape of an unfamiliar action that he or she had not named at all. Six such pairs were created, except where the child had not named six or more familiar actions. In these cases, the number of pairs was equal to the number of familiar actions that the child had named. A random number sequence was used to determine the ordering of the pairs, with a different sequence used for each child.

The first experimenter introduced the disambiguation test by saying, ''I'm going to show you two videos. One will be on this TV (pointing to the left monitor) and one will be on this TV (pointing to the right monitor).'' For children in the Self-Focused Action condition, the instructions for the first practice trial were, ''On one of these you'll see a man drinking orange juice. Do you know what drinking is?'' The pair of familiar actions was presented, first one on the left monitor (drinking orange juice), then the other on the right (throwing a ball). As an action came on, the experimenter said, ''Look what he is doing.'' The actions were then replayed simultaneously as the experimenter said, ''Can you point to the one of the man drinking?'' The structure of the second practice trial (cutting paper versus tying a shoe) was the same except that the correct answer was on the right side. The test trials followed. These differed from the practice trials in that the actions were self-focused and novel verbs were presented (e.g., ''On one of these you'll see a man firshing. Do you know what firshing is? . . . Can you point to the one of the man firshing?'') The novel verbs were *firsh, sart, gruck, zav, spain, looch, krag,* and *clow.*

The procedure followed in the two Object-Focused Action conditions was identical to that of the Self-Focused Action condition, except for two differences. First, instead of presenting object-focused actions in the practice trials and self-focused ones in the test trials, self-focused actions were presented in the practice trials and object-focused ones were shown in the test trials. Second, an additional constraint was placed on the procedure for constructing disambiguation test pairs. In the Same Patient condition, the patient of the familiar action in a pair had to be the same as the patient of the unfamiliar one, and in the Different Patient condition, it was not allowed to be the same.

TABLE 6
Proportion of Trials in Which the Unfamiliar Action Was Selected in Experiments 3 and 4

Experiment	Condition	Action pair preexposure	
		Preexposed	Not preexposed
3	Self-focused	.63* (.25)	—
	Object-focused: same patient	.59 (.24)	—
	Object-Focused: different patient	.66* (.24)	—
4	Self-focused	.66* (.29)	.39 (.42)
	Object-focused: same patient	.70* (.20)	.59 (.33)

Note. Standard deviations are in parentheses.
* Proportion is significantly different from chance ($p < .05$, two-tailed).

For example, only the Same Patient condition could be tested on a pair that consisted of a man kicking balls versus shuffling balls around on his palm. Test verbs were used in intransitive phrases in all conditions.

Results and Discussion

Disambiguation: support for neither the discriminability nor the object name blocking hypothesis. The average number of disambiguation test trials that children received was 4.6 (range = 2 to 6). The three conditions did not differ significantly in the number of such trials (range = 4.4 to 4.7). Groups were collapsed over gender for the same reasons as in Experiment 1.

The three conditions showed disambiguation effects of comparable size. The average rates of unfamiliar action selection are listed in Table 6. (Note that because all actions were presented in the pretest, they were considered preexposed; preexposure was not manipulated in the current study, but was in Experiment 4). A one-way analysis of variance of the proportion of trials in which the unfamiliar action was selected yielded a nonsignificant effect of condition, $F(2,57) < 1$, $p > .10$. The unfamiliar action was chosen on an average of .63, .59, and .66 trials in the Self-Focused, Object-Focused–Same Patient, and Object-Focused–Different Patient conditions, respectively.

The rates of unfamiliar action selection were greater than chance in the Self-Focused ($t(19) = 2.32$, $p < .05$) and Object-Focused–Different Patient ($t(19) = 2.98$, $p < .05$) conditions, but not in the Object-Focused–Same Patient condition ($t(19) = 1.70$, $p = .11$). Thus, unlike the first two experiments, a significant disambiguation effect was obtained for object-focused actions, though only in one of two conditions.

These results do not support the hypothesis that the lesser perceived difference between actions on a common patient than between patient-less actions is the cause of the action pair type effect in Experiments 1 and 2. If this discriminability hypothesis had been valid, then the disambiguation effect for

object-focused actions should have been significantly greater in the Different Patient than in the Same Patient condition. Although there was a small trend in this direction and rates of selecting unfamiliar actions were only greater than chance in the Different Patient condition, the hypothesis is contradicted by the near identity of the rates in the Self-Focused and Object-Focused–Same Patient conditions. This nonreplication of the action pair type effect of the first two experiments is also inconsistent with the object-name-blocking hypothesis.

Acknowledging verb unfamiliarity. When asked whether novel verbs were familiar, children in the three conditions showed very similar patterns of response. Their average rates of denial, affirmation, and other response were .12 (range over the three groups = .08 to .16), .43 (range = .39 to .49), and .45 (range = .39 to .52), respectively. This pattern is quite similar to that which this age group has shown for novel object names. The average rates from six experiments with young 2-year-olds (Merriman & Bowman, 1989, Studies 1 & 2; Merriman & Schuster, 1991; Merriman & Marazita, 1994, 3 studies) are .12, .39, and .44, respectively. Four-year-olds' response patterns for action names have also been found to resemble their patterns for object names (Merriman et al., 1993).

One reason why the higher rate of denial and lower rate of non-response of Experiment 1 were not replicated may be the change to giving practice trials involving familiar names. Some children, who answered, ''Yes,'' when asked whether they knew the familiar names, may have come to expect that the other names they would be asked about would be familiar and so were surprised when asked about a novel name and therefore failed to respond. Others, who failed to respond when asked about familiar names because they thought they were being asked for definitions, may have maintained this interpretation of the questions when unfamiliar verbs were introduced. Support for these conjectures can be found in the novel noun studies. In those in which familiar name practice trials were given (Merriman & Bowman, 1989, Experiment 2; Merriman & Marazita, 1994, three studies), the average non-response rate was .51 and the denial rate, .10; in contrast, in the two studies in which such practice trials were not given, the average non-response rate was .35 and the denial rate, .16. The difference between non-response rates is significant, $t(138) = 2.07$, $p < .05$, but that between denial rates is not, $t(138) < 1$.

Correlations between denial rates and rates of unfamiliar action selection in the disambiguation test were .33, −.40, and −.20 in the Self-Focused, Object-Focused–Different Patient, and Object-Focused–Same Patient conditions, respectively. Although none of these values surpasses the .05 alpha level, which is .43 for $df = 19$, the difference between the Self- and Object-Focused conditions is similar to that which was observed in Experiment 1. In fact, the difference between the correlation for the Self-Focused condition and that for the combined Object-Focused conditions ($r(39) = -.29$) is sig-

nificant, $Z = 2.18$, $p < .03$. This effect is compatible with the object name blocking hypothesis.

If the disambiguation performance of just the few children who denied knowing the test verbs is considered, a difference comparable to the action pair type effect of Experiment 1 and 2 is found. For these subgroups, the average rate of selecting unnameable self-focused actions was .83, whereas that of selecting unnameable object-focused actions was .53. Thus, in the current study, the object name blocking hypothesis appears to hold only for these children, the ones who have been shown in other studies (Merriman & Schuster, 1991; Merriman & Marazita, 1994) to be especially sensitive to phonological relations between novel and known words.

If the disambiguation performance of just the remaining children is considered, the average rates of selection of unnameable actions were .61, .62, and .76 in the Self-Focused, Object-Focused–Same Patient, and Object-Focused–Different Patient conditions, respectively. The difference between the two object-focused conditions is significant by a one-tailed test, $t(27) = 1.84$, $p < .05$. Thus, although the discriminability explanation for the action pair type effect of the first two experiments was not supported, the verb mapping of children who do not acknowledge the unfamiliarity of novel verbs may be affected by action discriminability. When actions share a patient, these children may tend to focus on the action rather than the patient, making the actions as discriminable as self-focused ones. When actions involve different patients, however, they may take note of both action and patient, making the whole events more discriminable than either those involving actions on a common patient or actions on the self. It must be assumed that, unlike the other children, this group's encodings of object-focused actions are not dominated by verbal codes of the patient names; that is, that they do not behave according to the object name blocking hypothesis.

Two explanations. The non-effect of action pair type in the last experiment can be accommodated by restricting the object name blocking mechanism to situations in which a mixture of self- and object-focused action trials are presented. Action pair type was a within-subject variable in Experiments 1 and 2, but not 3. Young 2-year-olds may find the objects in object-focused actions to be more salient when such actions are contrasted with ones that involve no objects. Conversely, when shown only pairs of object-focused actions, they may tend to tune out the objects and focus on the pattern of movements that differentiate the events within each pair. Thus, children were either less likely to generate names for the patients of object-focused actions or, if they did generate them, were less likely to dwell on them when only actions of this type were presented. This revised explanation shall be referred to as contrastive object name blocking.

The correlations between rates of disambiguation and of admission of verb unfamiliarity in Experiment 3 suggest that a small subgroup of toddlers—those who are most sensitive to phonological relations between novel and

known words—may have experienced object name blocking when tested on films that contained only one type of action pair. Thus, the contrastive object name blocking hypothesis is best construed as a relative claim, namely, that more children will experience interference from the names they generate for the patients of object-focused actions when such actions are mixed with self-focused ones than when they are not. Also, recall that in Experiment 1, admission of verb unfamiliarity was very strongly related to the difference between the disambiguation rate for self-focused actions and the one for object-focused actions ($r(11) = .71$). This suggests that the more phonologically attuned children, who are the only ones to show object name blocking when tested on a single type of action, show the strongest object name blocking when tested on both self- and object-focused actions.

An alternative explanation is a processing load account which assumes that (1) more processing resources are required to encode object- than self-focused actions, (2) more are required to encode non-preexposed than preexposed actions, and (3) only the encoding of non-preexposed object-focused actions taxes 2-year-olds' processing resources to such a degree that their disambiguation tendencies decline. A strong action type effect was only found in Experiment 1, which is also the only study not to have preexposed all the test actions; only half of the unnameable actions were preexposed in that study.

EXPERIMENT 4

The goal of this study was to distinguish between the contrastive object name blocking and processing load explanations by comparing young 2-year-olds' disambiguation effect for pairs of preexposed and non-preexposed actions. Half the test pairs consisted of actions that the children had previewed three times and the other test pairs consisted of ones that they had not previewed at all. Exposure to an action was assumed to reduce the attentional resources required to encode the action when it was encountered at a later time. Children were tested with films containing either only self-focused or only object-focused ones.

According to the contrastive object name blocking hypothesis, the disambiguation effect ought to be as strong for object-focused actions for self-focused ones because the tests contained only one of these types of actions. According to the processing load explanation, preexposure ought to have a stronger impact on the disambiguation effect for object- than for self-focused actions. That is, the effect should be stronger for preexposed than for non-preexposed pairs of object-focused actions, but should be equivalent for these two kinds of self-focused action pairs.

The tacit assumption of the contrastive object name blocking hypothesis is that self- and object-focused actions do not differ with respect to processing load. Some support for this assumption can be found in the results of Experiment 1. Children's verb mapping tendencies for both self- and object-focused actions were unaffected by preexposure to the unfamiliar actions in the test

pairs. This finding was surprising in light of the strong negative impact that preexposure to unfamiliar objects tends to have on 2-year-olds' noun disambiguation (Merriman et al., in press). The source of this discrepancy between the action and object results was suggested to be the greater processing resources required to encode actions. The reduction in processing load that resulted from having had a chance to preview the unfamiliar actions may have offset any negative effect of preexposure on children's preference for a stimulus. If this explanation is correct, then the fact that preexposure had similar effects on self- and object-focused actions suggests that these two types of actions do not differ in the amount of processing resources required to encode them.

Method

Subjects. Thirty-two 2-year-olds (M = 2-2, range = 2-2 to 2-4) were recruited in the same fashion as in the first study. Eight boys and eight girls were assigned to each of two conditions, Self-Focused and Object-Focused–Same Patient. Seven children were replaced for refusing to make choices in the disambiguation test and one was replaced for failing to name actions in the posttest.

Materials. The videotapes of the first eight self-focused action pairs and first eight object-focused pairs listed in Table 5 were used. Four preexposure films were created by combining these tapes in various ways. One presented four unfamiliar and four familiar self-focused actions and the other presented the remaining self-focused actions. Children in the Self-Focused condition viewed one of these films. The third film presented four unfamiliar and four familiar object-focused actions and the fourth presented the remaining object-focused actions. One of these films was shown to children in the Object-Focused condition. In every film, each action tape was shown three times in an order that was random except all eight actions occurred once before any was repeated and all occurred twice before any appeared for the third time.

Four pairs of disambiguation test films were constructed, two for each condition. One for the Self-Focused condition presented two practice pairs of familiar object-focused actions (i.e., drinking orange juice vs tying a shoe and cutting paper vs throwing balls), then eight test pairs that each consisted of an unfamiliar and a familiar self-focused action. Table 5 indicates how the actions were paired. The other began with the same practice pairs, but then presented the eight test pairs in the reverse order. A similar scheme was used to create the pairs for the Object-Focused condition except that object-focused films replaced self-focused ones and vice versa. The first practice pair consisted of singing versus combing hair and the second, of jumping up and down versus waving.

Procedure. The equipment was arranged in the same manner as in Experiment 3, but the order of tasks was like that of Experiment 1, namely, preexposure, disambiguation, and naming. For the first task, the child was told to

watch one of the preexposure films as it was presented on one of the VCRs. Within each gender × condition cell, half the children viewed one of the preexposure films and half viewed the other film for that condition. In the disambiguation task, the Self-Focused and Object-Focused–Same Patient conditions received the same instructions as these groups received in Experiment 3, including the instructions for the practice trials. Within each group, half received test trials in the reverse order of the other, and the right-left positions of the actions in each pair were counterbalanced. In the final task, all actions from the disambiguation test were presented one at a time and the child was asked to name each one.

Results and Discussion

Disambiguation: more support for the contrastive object name blocking than for the processing load hypothesis. Children's performance on the naming posttest was used to eliminate disambiguation trials that did not truly pit an unnameable versus a nameable action. The average number of trials eliminated was 2.72 (range = 0 to 6).

A 2(Condition) × 2(Preexposure) mixed analysis of variance of the proportion of trials in which unnameable actions were selected yielded only a single significant effect, namely, preexposure, $F(1,30) = 7.47$, $p < .02$. Children tended to select unnameable actions at a rate significantly above chance when both actions in a test pair had been preexposed (.68), but not when both were viewed for the first time during test (.49). (See Table 6.) Although this result suggests that some young 2-year-olds' processing resources were taxed beyond their limits when the verb mapping task required encoding two nonpreexposed actions, it does not support the processing load explanation for the variation in the disambiguation effect over the first three experiments. By this explanation, more resources were assumed to be needed to encode object-focused than self-focused actions, and so preexposure should have had a greater impact on the disambiguation effect for object-focused than for self-focused actions. This last prediction was not confirmed; in fact, the trend was in the opposite direction.

The results are compatible with the contrastive object name blocking hypothesis, according to which self- and object-focused actions make comparable demands on processing resources and only differ in the size of their respective disambiguation effects when both are presented in the same test.

Acknowledging verb unfamiliarity. The responses of the two conditions to the questions about the familiarity of the test verbs were not significantly different. The average rates of denial of familiarity, affirmation of it, and other response were .16, .33, and .52, respectively. This pattern is comparable to the one obtained in both Experiment 3 and the studies of this age group's tendency to acknowledge the unfamiliarity of novel nouns (Merriman & Bowman, 1989, Studies 1 & 2; Merriman & Schuster, 1991; Merriman & Marazita, 1994, 3 studies).

Denial rates were not correlated with rates of disambiguating either preexposed or nonpreexposed self-focused actions ($r(15) = -.04$ and $-.30$, respectively, both $p > .10$) or object-focused actions ($r(15) = -.30$ and .25). In contrast to the results of Experiments 1 and 3, correlations for object-focused actions were not significantly different from those for self-focused ones. This result suggests that even the toddlers who were most sensitive to phonological relations between words did not experience object name blocking in the current study. This conclusion is bolstered by the nonsignificantly greater disambiguation effect evident with object- than with self-focused actions in the current study—a reversal of the trends of the first three experiments, where object name blocking was hypothesized to occur (albeit only in a subgroup in Experiment 3). A salient difference between the current study and the only other one in which a single type of action pair was presented (Experiment 3) is the preexposure manipulation, but it is not obvious why preexposure to half the test pairs rather than to all of them prevented the more phonologically-attuned subjects from experiencing object name blocking.

GENERAL DISCUSSION

The experiments provide basic information regarding young 2-year-olds' tendency to use action novelty as a cue to verb reference as well as their tendency to acknowledge the unfamiliarity of novel verbs. First, and most importantly, a modest disambiguation effect was evident. This age group favors unfamiliar over familiar types of actions as the likely referents of novel verbs. Second, this effect was more robust for self- than for object-focused actions. Third, the effect was strengthened by preexposing both actions in the test pairs, but unaffected by preexposing only the unfamiliar actions. Fourth, toddlers' tendency to acknowledge the unfamiliarity of novel words is as weak for verbs as it is for nouns.

Dependence on action type. If performance on the non-preexposed actions of Experiment 4 is discounted on the grounds that encoding these required more processing resources than some children had available, then the disambiguation effect for self-focused actions appears to be consistent over the four experiments (i.e., the average rates of selection of the unnameable actions ranged from .63 to .68). In contrast, performance on object-focused actions varied considerably. In the first experiment, unnameable actions of this type were selected at a rate close to both chance and that of a no word control group. In Experiment 2, their rate of selection did not exceed chance, but was greater than that of the control group. In the final two experiments, their rate was comparable to that for unnameable self-focused actions.

Several explanations were examined. According to the sound match hypothesis, the subjects in Experiment 1 were lured to select nameable object-focused actions because they perceived substantial sound similarity between their own verbal encodings of such actions (e.g., ''kicking the balls'') and

the test phrases (e.g., ''sarting the balls''). This explanation was rejected, however, because the results of Experiment 2 did not confirm an implication of it, namely, that the disambiguation effect would be evident with intransitive, but not with transitive test phrases.

According to the discriminability hypothesis, difficulty in perceiving the difference between two actions on the same object prevented the children from consistently mapping a novel verb onto the action that they could not already name. This hypothesis was rejected based on the equivalence of the disambiguation effect for self-focused actions and actions on the same object in Experiment 3.

A third explanation posited a greater processing resource requirement for encoding object-focused actions than for encoding self-focused ones. If this explanation had been correct, preexposure to the actions presented in the disambiguation test trials should have had a greater positive impact on the disambiguation effect for object-focused actions than for self-focused ones. The results of Experiment 4 did not uphold this prediction.

The object name blocking hypothesis fared the best, although the results of Experiment 3 compelled us to restrict the blocking mechanism primarily to situations in which a mixture of self- and object-focused action pairs are presented. Toddlers are assumed to find the objects in object-focused action pairs to be especially salient when these events are contrasted with ones that involve no object patients. Thus, only when a test contains both types of action pairs do children tend to dwell on the names for the object patients, which interferes both with their detecting the mismatch between the test verb and the familiar action's verb and their realizing that no verb can be retrieved for the unfamiliar action. This proposed name blocking mechanism is consistent with the disambiguation effect for self-focused actions exceeding that for object-focused actions in Experiments 1 and 2, but not 3 and 4. Tests contained a mix of the two types of action pairs in the first two, but not the last two experiments.

The correlations obtained between rates of acknowledging test verb unfamiliarity and rates of selecting unnameable self- and object-focused actions in the disambiguation tests in Experiments 1 and 3 suggest that those toddlers who are more sensitive than their peers to phonological relations between words are more likely to experience object name blocking, and may even experience it when tests consist of only object-focused action pairs. However, because the correlational patterns in the other two experiments were essentially null, this claim should be considered only as one that merits further research. Future studies should examine whether more direct measures of toddlers' phonological sensitivity, such as tests of rhyme detection, are predictive of degree of object name blocking in the disambiguation test.

The contrastive name blocking hypothesis itself also deserves further scrutiny. One implication worth testing is that any context that directs children's attention away from the objects and toward the actions in the object-focused pairs will enhance the disambiguation effect for these pairs.

Effects of preexposure. The results of preexposure manipulations of Experiments 1 and 4 indirectly support the claim that greater processing resources are required to encode a pair of unfamiliar and familiar actions than to encode an analogous pair of objects. First, whereas preexposure to unfamiliar objects tends to erase or even reverse the noun disambiguation effect (see Merriman, 1991), preexposure to unfamiliar actions had no impact on the verb disambiguation effect in Experiment 1. The reduction in processing load that resulted from having had a chance to preview the unfamiliar actions may have offset the negative effect of preexposure on children's preference for these actions. In contrast, if most children have sufficient resources to encode two non-preexposed objects in a disambiguation test pair, then preexposure to the unfamiliar member of the pair would only have the negative effect on their preference for this stimulus.

Second, preexposure to the two actions in a disambiguation test pair enhanced the disambiguation effect in Experiment 4. This finding supports the claims that some toddlers lack sufficient processing resources to produce a disambiguation effect for non-preexposed actions and that fewer resources are required to encode preexposed than novel stimuli.

Experiments in which young 2-year-olds' disambiguation of object and action words are assessed under equivalent conditions—experiments like those Merriman et al. (1993) conducted with 4-year-olds—are needed before greater stock can be placed in our conclusion that action encoding is more demanding than object encoding of toddlers' processing resources.

Relative strength of toddlers' lexical principles for action and object words. When the impact of processing resource limitations and of a hypothesized object name blocking mechanism are minimized by preexposing both members of the test pairs and by using films that contain only one type of action pair, as in Experiments 3 and 4, young 2-year-olds' disambiguation effect for action words is comparable in strength to the one they have shown for object words (Hutchinson, 1986; Merriman & Bowman, 1989, Study 1; Merriman & Marazita, 1994, Study 1; Merriman & Schuster, 1991). Under optimal conditions, they tend to select the unnameable entity approximately twice as often as the nameable one as the likely referent of a novel word.

This equivalence suggests that the lexical principles that underlie toddlers' disambiguation are no stronger for object than for action words. For example, if disambiguation is primarily determined by the default expectation that word extensions will not overlap (Markman, 1989), then this expectation in young 2-year-olds is equally strong for the two types of names. This last proposal contrasts with Merriman et al.'s (1993) conclusion that 4-year-olds have a greater Mutual Exclusivity expectation for object than for action words and the contrast implies that experiences after the second birthday, such as hearing many more instances of action word than object word overlap in default situations, cause this differential expectation to develop.

Two caveats are in order, however. Toddlers' disambiguation effect for

object and action words has yet to be evaluated in a single experiment. Second, the relative causal roles of various lexical principles in the disambiguation effects of either 2- or 4-year-olds for either object or action words are not yet known. For example, it is possible that 2-year-olds' Lexical Gap Filling expectation is weaker than their Mutual Exclusivity expectation for object names, but the reverse is true for action names, and that the combined strength of these two lexical principles determines how consistently a novel word is mapped onto an entity that cannot already be named rather than onto one that can. An important project will be to assess young 2-year-olds' object and action word disambiguation effects under comparable conditions and determine the relative roles played by various lexical principles in each effect.

Why English-speaking toddlers know many more nouns than verbs. Our results have some relevance to a current theoretical controversy in lexical development, namely, the explanation of children's tendency to acquire nouns more rapidly than verbs in English. According to Gentner (1982), the reason is that animals and things, which are the referents of early nouns, are easier to segment from ''. . . the ongoing stream of perceptual-cognitive information about the world around . . .'' (p. 303) than are other kinds of entities, including actions. In contrast, Gopnik and Choi (1995) attribute the effect to linguistically-specific factors: the greater salience of nouns than verbs in English input (e.g., nouns are more likely to occur alone or at the ends of utterances) and the greater probability in English that an object will be denoted by a noun than that an action will be denoted by a verb. They note that nouns do not enjoy either of these advantages in Korean, and that toddlers learning this language acquire verbs more quickly and object names less quickly than their English-learning counterparts (see Au, Dapretto, & Song, 1994, however, for evidence that young Korean children still learn nouns faster than verbs.)

Our results provide some indirect support for both positions. The discrepancy between the preexposure effects of the current study and those reported for 2-year-olds' object name disambiguation were reconciled by hypothesizing that the encoding of unfamiliar actions requires more processing resources than the encoding of unfamiliar objects. This hypothesis fits with Gentner's segmentation proposal. On the other hand, the salient position of object names in children's verbal encoding of object-focused actions may well have been the reason that no disambiguation effect was found for these kinds of actions in the first two experiments.

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