

Children's Avoidance of Lexical Overlap: A Pragmatic Account

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Children tend to choose an unfamiliar object rather than a familiar one when asked to find the referent of a novel name. This response has been taken as evidence for the operation of certain lexical constraints in children's inferences of word meanings. The present studies test an alternative—pragmatic—explanation of this phenomenon among 3-year-olds. In Study 1 children responded to a request for the referent of a novel label in the same way that they responded to a request for the referent of a novel fact. Study 2 intimated that children assume that labels are common knowledge among members of the same language community. Study 3 demonstrated that shared knowledge between a speaker and listener plays a decisive role in how children interpret a speaker's request. The findings suggest that 3-year-olds' avoidance of lexical overlap is not unique to naming and may derive from children's sensitivity to speakers' communicative intentions.

How do children learn the meaning of words so efficiently given the complexity of the contexts in which most new words are encountered? One prevailing answer to this question is that children's inferences about word meanings are guided by a set of internal lexical constraints, biases, or principles that allow children to bypass consideration of most of the logically plausible meanings of a word (Golinkoff, Mervis, & Hirsh-Pasek, 1994; Markman, 1989; Waxman, 1990). For instance, it is argued that children believe that words denote whole objects, that labels refer to categories of objects rather than to individual objects, and that every object has only one name. A second line of thinking points out that young children are knowledgeable about various communication practices and are sensitive to a number of pragmatic cues present in the discourse context that indicate a speaker's communicative intent (L. Bloom, 1998). For instance, young children attend to the direction of a speaker's eye gaze to establish the referent of the speaker's utterance (Baldwin, 1993), they are sensitive to a speaker's affective and behavioral expressions as indicative of whether his or her communicative intent was accomplished (Tomasello,

Strossberg, & Akhtar, 1996), and they assume that speakers tend to name things that are new to the discourse context (Akhtar, Carpenter, & Tomasello, 1996).

Currently, it is generally accepted in the field of word learning that children solve the induction problem posited above by relying on multiple cues (see, e.g., Hollich, Hirsh-Pasek, & Golinkoff, 2000). Included among these cues are lexical constraints and sociopragmatic cues, as well as syntactic cues (Hall & Graham, 1999), conceptual knowledge (P. Bloom, 2000), and general mechanisms of memory and attention (Samuelson & Smith, 1998). According to this "multiple cues" view, lexical constraints and pragmatics are not explanations for word-learning phenomena but rather are complementary factors interacting differently throughout development and across contexts. One notable exception to this notion that the factors are complementary is phenomena having to do with the mutual exclusivity bias. As noted by Woodward and Markman (1998) in a recent review of the literature, it is an empirical question whether mutual exclusivity is a purely lexical constraint or whether it reduces to pragmatic principles.

This question is most evident in the alternative explanations of a simple naming phenomenon commonly found in 3-year-olds: the avoidance of lexical overlap. Specifically, when children are presented with two objects, one familiar and one novel, and are asked for the referent of a novel name, children tend to choose the novel object. In one of the first empirical tests of this phenomenon, Markman and Wachtel (1988) showed 3-year-olds a familiar object (e.g., a cup) and an object that children did not have a name for (e.g., tongs). The experimenter then asked the children, "Show me a *dax* [a novel name]." Children chose the object without a name (e.g., the tongs) approximately 80% of the time (see also Merriman & Bowman, 1989, and Mervis & Bertrand, 1994, for comparable results).

Markman and Wachtel (1988) explained these findings by arguing that children adhered to a mutual exclusivity bias. That is, children assumed that an object could not have more than one label. Given that they already had a label for one of the objects

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(e.g., the cup), they eliminated that object as the possible referent of the novel label and inferred that the other object—the one for which they did not have a name—must be the referent of the novel label (see also Merriman & Bowman, 1989). Golinkoff and her colleagues (1994) explained this naming response by claiming that children were following a novel-name nameless-category principle. The principle led children to select the nameless object as the referent of the novel label. Although these explanations are different in many respects (see Mervis & Bertrand, 1994, for an analysis), both stipulate that children rely on lexical-specific constraints or principles.

A third plausible explanation for this naming response—the pragmatic explanation evaluated in Woodward and Markman's (1998) review—is best captured by E. V. Clark's (1987) principle of contrast.¹ The principle states that any two linguistic forms must contrast in meaning because it is likely that they stem from two different underlying intentions. Thus, in contexts analogous to Markman and Wachtel's (1988) task, children will most likely infer that *cup* and *dax* refer to different objects (E. V. Clark, 1990, p. 423; see also Gathercole, 1989, for a similar argument). More explicitly, children's reasoning in Markman and Wachtel's task may be portrayed as follows: "If the experimenter had wanted me to pick the cup, she would have asked me to show her the cup. Given that she asked me for a *dax*, I inferred that she must have wanted me to give her the other object [the tongs]."

This line of reasoning is consonant with the general literature on pragmatics. For instance, Grice (1975) would explain the naming response described above in terms of his communicative maxims and principle of cooperation. Specifically, listeners assume that a speaker has a specific communicative intent underlying his or her utterance and that in order to make this intent as transparent as possible, the speaker will formulate an unambiguous and informative utterance. The interpretation of the experimenter's request that best satisfies these assumptions is that *dax* refers to the novel object. In a more parsimonious account, Sperber and Wilson (1986) proposed that a single principle—relevance—can account for how listeners infer a speaker's communicative intent. In their view, the child in the present context settles for the interpretation of the utterance that produces sufficient cognitive effect to make the utterance worthy of the child's attention but without requiring unnecessary effort.

Drawing on these theories, the present studies test the pragmatic explanation of children's avoidance of lexical overlap described above. Whereas E. V. Clark's (1987) principle of contrast is primarily about words, a more general pragmatic account of communication suggests that children have this expectation about contrasting intentions whenever they hear contrasting referential acts. Moreover, a pragmatic account makes clear that this expectation about contrasting intentions only holds when it is evident to the child that the speaker knows both contrasting forms.

Study 1 was designed to test whether 3-year-olds infer the referential intent underlying general referential acts in the same way that they infer the intent underlying an act of naming. For that purpose, in Study 1 we compared (a) children's responses in a labeling task similar to the task in Markman and Wachtel's (1988) original study with (b) children's responses in a structurally identical task in which labels were replaced with facts about objects. In Study 2 we attempted to assess the role of mutual knowledge in children's inferences about naming by asking whether children's

avoidance of lexical overlap indeed depends on the fact that the child and the questioner share knowledge about the name of one of the objects. To achieve this, in Study 2 we examined children's inferences in a situation in which the questioner did not hear the novel label attributed by an experimenter to one of the objects. Study 3 provided a more rigorous test of the role of mutual knowledge in children's inferences about a speaker's communicative intent. In Study 3, children were again provided with facts about objects rather than labels, but the extent to which the questioner was aware of these facts was manipulated.

In general, in these studies we attempted to bring new empirical evidence to bear on the debate noted by Woodward and Markman (1998) concerning whether it is necessary to postulate a mutual exclusivity bias to account for 3-year-olds' avoidance of lexical overlap or whether instead children's general cognitive abilities and their understanding of communication can explain this phenomenon. It is important to emphasize, however, that the present studies focus on one specific naming phenomenon with 3-year-old children. They do not attempt to rule out the possibility that lexical constraints are responsible for other naming phenomena or might even interact throughout development with pragmatic knowledge to explain children's avoidance of lexical overlap.

Study 1

The primary motivation for postulating constraints in the acquisition of word meanings was to explain the impressive capacity of young children to learn words as rapidly and as efficiently as they do. Consequently, most principles and assumptions proposed to guide children's inferences of the meaning of words are claimed to be specific to word learning (Golinkoff, Hirsh-Pasek, Bailey, & Wenger, 1992; Markman, 1989; Merriman & Bowman, 1989; but see Markman, 1992, for a discussion of the domain-specific nature of these biases). In contrast to this basic postulate of the constraints account, the pragmatic account described earlier implies that the inferential process children go through when determining the meaning of a word is no different than the process they go through when interpreting other kinds of referential acts. The task of the listener—in this case a child—is to infer, from the utterance itself and the context in which it is heard, the speaker's intended meaning (Grice, 1975; Sperber & Wilson, 1986)—that is, what the speaker meant to communicate.

These alternative accounts make quite distinct predictions about the generality of children's responses in Markman and Wachtel's (1988) task. According to a lexical-constraints account, children's choice of an object without a name in response to a novel label was caused by their honoring a principle specific to word learning (the mutual exclusivity bias or the novel-name nameless-category principle) and therefore should occur only in word-learning contexts. According to a pragmatic account, these responses are due to general assumptions about communication and therefore should also arise in discourse contexts other than word learning. In

¹ As Woodward and Markman (1998) pointed out, there is an additional pragmatic account of the phenomenon that has been proposed by Merriman and Bowman (1989). Specifically, children might have a tendency to fill lexical gaps. It is important to note that this account differs greatly from the one being presented here, and as will become clear, the present studies in effect also serve as a test of the lexical-gap account.

Study 1 we tested these alternative hypotheses by comparing (a) children's responses in a condition in which the experimenter applied labels to objects with (b) children's responses in a condition in which the experimenter applied facts to objects.

The label condition was similar to the condition in Markman and Wachtel's (1988) Study 1 except that both objects were novel to the child. Children were exposed to two unfamiliar objects, they were taught a novel name for one of the objects (e.g., *mef*), and they were then asked to choose the referent of a second novel name (e.g., "Can you give me the *wug*?"). Children in the fact condition were exposed to two unfamiliar objects but were taught a fact about one of the objects (e.g., "My uncle gave this to me"), and then they were asked to choose the referent of a second fact (e.g., "Can you give me the one my cat likes to play with?").

The alternative predictions were straightforward. If children are guided by a mutual exclusivity bias or a novel-name nameless-category principle, then in the label condition they should pick the object for which they do not have a name, but in the fact condition they should pick at random. After all, children have no principle that tells them that an object can only have one fact associated with it, and there is no logical reason to think that the object that the experimenter got from her uncle, for instance, could not also be one that my cat likes. Alternatively, if children rely on pragmatic cues, then they should respond similarly in the fact and in the label conditions, choosing the object without a fact or a label in response to the experimenter's request.

Method

Participants

Thirty-two 3-year-old children ($M = 3.6$ years, range = 3.1–4.1 years), 16 boys and 16 girls, participated in the study. Children were recruited from local preschools and were tested in a quiet room at their school. Most children were Caucasian American, from middle-class families. Parental consent was obtained for each child prior to his or her participation in the study.

Materials

Twelve novel objects were used in the study. The objects were roughly equal in size, made of either plastic or rubber, and came in a variety of colors. The set of 12 objects consisted of a Popsicle holder, a dumpling press, a pink shade for a car window, a plastic knife holder, the top part of a baster, an odd-shaped drain filter, a device for serving canned pet food, a rubber toilet-drain piece, an odd-shaped soap rest, a plastic piece used for windshield wipers, an odd-shaped bag hanger, and a plastic cup holder. The criteria for selection were that objects be interesting to children, easy to manipulate, visually distinct from one another, and that children did not have names for them.

In the experimental conditions, each child was presented with six pairs of objects, for a total of 12 objects across six trials. To determine the pairs of objects to be used in the experimental conditions, we tested a group of sixteen 3-year-olds in a preference task. In this task, children were shown pairs of objects and were simply asked to choose one (e.g., "Can you give me one of them?"). Children saw a variety of pairs, considered to be equally salient. The pairs of objects used in all three subsequent studies consisted of objects that were chosen by children in the preference task approximately 50% of the time. In other words, in the absence of any information (e.g., labels or facts) about the objects in the pairs, children showed no preference for any of the objects in any of the pairs used in the

experiments. None of the children who participated in the preference task were tested in the subsequent studies.

The pairings and order of appearance of the objects varied across children within conditions. Children in the two experimental conditions were shown the same pairs of objects.

Design

The study included two between-subjects conditions: *label* and *fact*. Sixteen children participated in each condition. The two conditions consisted of six trials per child, with each trial including two phases: (a) an information phase, in which the experimenter introduced a novel label or fact for one of the objects (Object A) and made a generic comment about the second object (Object B) and (b) a question phase, in which the experimenter asked children to retrieve the referent of a different novel label or fact.

Procedure

Children were tested individually in a quiet room at their preschool. A puppet (named Percy) was introduced to the children and played an active role throughout the course of the task. After a brief introduction period with the experimenter and the puppet, children were told that they were going to be shown some new things and asked some simple questions about them.

Label condition-information phase. The experimenter placed the first pair of novel objects in front of the child, picked up Object A (e.g., a Popsicle holder), and said, "Look at this one, it's a *zev*. See, it's a *zev*. This is a *zev*." The object was then set back down in front of the child. Next the experimenter picked up Object B (e.g., a dumpling press) and said, "Oh, look at this one, it's neat. Isn't it cool? This is nice." The object was set back down and the experimenter commented on both objects, "Aren't they neat? Let's play with them." The child was encouraged to play freely with the objects for about 1 min.

Label condition-question phase. Following the play period, both objects were set down in their original locations. The experimenter then asked the child to select one of the objects by asking for the referent of a different novel label, "Can you give Percy the *jop*?" If the child was reluctant to choose an object, the question was repeated until one of the objects was selected and given to the puppet. The experimenter thanked the child for the object, put both objects away, and announced that they were ready to look at some new things.

The same two-phase procedure was repeated for a total of six trials per child.

Novel labels. The labels were novel consonant-vowel-consonant strings that were easy to comprehend and produce by young children. The labels were *bem*, *bip*, *dax*, *gup*, *jop*, *kiv*, *lof*, *mef*, *tig*, *wug*, *zev*, and *zot*. The 12 labels were randomly assigned to the 12 novel objects for each child. Labels were also randomly paired together for each trial, with the constraint that labels with similar-sounding phonemes (e.g., *bem* and *bip*, or *lof* and *mef*) never occur in the same trial. This was done in order to minimize the chance of children's confusing the two labels.

Fact condition-information phase. The experimenter placed the first pair of novel objects in front of the child, picked up Object A, and said, "Oh, look at this one, my sister gave this to me. See, my sister gave this to me. My sister gave me this." The object was then set back down in front of the child. Next the experimenter picked up Object B and said, "Now look at this one, it's neat. Isn't it cool? This is nice." The object was set back down, and the experimenter commented on both objects, "Aren't they neat? Let's play with them." The child was encouraged to play freely with the objects for about 1 min.

Fact condition-question phase. Following the play period, both objects were set down in their original locations. The experimenter then asked the child to select one of the two objects by asking for the referent of a different novel fact, "Can you give Percy the one my dog likes to play

with?" If the child was reluctant to choose an object, the question was repeated until one of the objects was selected and given to the puppet. The experimenter thanked the child for the object, put both objects away, and announced that they were ready to look at some new things.

The same two-phase procedure was repeated for six trials per child.

Novel facts. The facts consisted of arbitrary pieces of information about each object that children could not have known were associated with any particular object and that could refer equally well to any of the 12 objects. The 12 facts were as follows: "This is from Mexico," "This is from California," "My uncle gave this to me," "My sister gave this to me," "I got this yesterday," "I got this last week," "I got this for Christmas," "I got this for my birthday," "My cat likes to play with this," "My dog likes to play with this," "I keep this in the garage," and "I keep this in the bedroom." The 12 facts were randomly assigned to the 12 novel objects. Facts were randomly paired across the six trials, with the constraint that incompatible facts (i.e., facts that could not logically refer to the same object, such as "My uncle gave this to me" and "My sister gave this to me") never occur on the same trial.²

In both conditions, the assignment of labels or facts to particular objects (i.e., which object was chosen as A and which as B) was random. The order of introduction of Object A (the object for which children were told a label or a fact) and Object B (the object that did not receive a label or a fact but instead received a generic statement) was counterbalanced, such that in three of the six trials, the experimenter provided a label or fact for the first object presented to the child (as illustrated previously in the description of the procedure); in the other three trials, the experimenter provided a label or a fact for the second object. In addition, the left-right placement of Objects A and B with respect to the child was counterbalanced across trials for each child.

Results and Discussion

The primary question of interest was whether children's responses on the standard labeling task were due to some internal constraint specific to word learning. If this were the case, children in the label condition should choose the unlabeled object in response to the experimenter's question, but children in the fact condition should select among the two objects at random. In contrast, if children's responses were not due to lexical constraints but rather to considerations regarding referential acts more generally, then they should respond to labels and facts in a similar way. The dependent measure used to address this question was the number of trials, out of six, in which children selected the object for which they had not been told a label or a fact (Object B). Because there were six trials, 3 times was considered chance responding. Results are displayed in Table 1.

Children in the label condition chose Object B, on average, 4.9 (out of 6) times (82%, $SD = 1$), which was significantly greater than predicted by chance, $t(15) = 7.77, p < .001$. This replicated Markman and Wachtel's (1988) earlier findings except that we used two novel objects and labels instead of one novel and one familiar. The critical finding of the study, however, was that children in the fact condition selected Object B an average of 4.4 times (73%, $SD = 1.1$), also significantly more than would be expected by chance, $t(15) = 5.26, p < .001$. A 2×2 analysis of variance (ANOVA), with condition (label, fact) and gender (female, male) as between-subjects variables, found no difference between children's performance in the label and fact conditions and no effect of gender nor an interaction ($ps > .05$).

To gain a clearer picture of children's individual patterns of response across all six trials, we conducted a chi-square analysis on the number of children in each condition who selected Object

Table 1
Mean Number of Object B Choices by Study and Condition

Study and condition	Object B choices	
	<i>M</i>	<i>SD</i>
Study 1		
Label	4.9*	1.0
Fact	4.4*	1.1
Study 2		
Label	4.7*	1.3
Study 3		
No knowledge	3.0	1.2
Explicit knowledge	3.9*	1.0

Note. Chance = 3.0.

* $p < .05$.

B on the majority of the trials (4 or more times; see Table 2). A comparison of children's response patterns in the label and fact conditions found no difference between the two groups ($p > .05$). Fourteen of the 16 children in the label condition chose Object B on four or more trials, and 14 of the 16 children in the fact condition chose Object B on four or more trials.

These null effects of condition challenge the claim that children's tendency to avoid lexical overlap is due to constraints specific to word learning, such as the novel-name nameless-category principle (Golinkoff et al., 1994) or the mutual exclusivity bias (Woodward & Markman, 1998). In fact, these findings also challenge the notion that children have a specific tendency to fill lexical gaps (Merriman & Bowman, 1989). Instead, the results indicate that the tendency to interpret a novel piece of information as referring to an object that does not yet have a piece of information associated with it is a more general tendency that is not specific to naming.

Recently some attention has been given to the importance of focusing on a child's initial response on cognitive tasks (Evey & Merriman, 1998). The argument is that the first trial is the most sensitive measure of children's responses on a given task because it is unaffected by any potential feedback children might get during the task. Evey and Merriman used this kind of argument to support their conclusion that young children's tendency to map novel nouns onto unfamiliar objects on the first trial in their studies results from children's adherence to lexical principles. We found that all children in both conditions chose Object B on the first trial (see Table 3). More specifically, all 16 children in the fact condition chose the object without a fact the first time the experimenter

² A second group of sixteen 3-year-olds ($M = 3.6$ years) was tested in a condition in which the facts used by the experimenter were incompatible. That is, the facts could not logically apply to the same object (e.g., "My uncle gave this to me" and "My sister gave this to me"). Children in this condition chose Object B in response to the experimenter's request an average of 4.1 times, which was significantly above chance, $t(15) = 4.39, p < .001$, and no different from what children in the fact condition of Study 1 did. This result might be taken to suggest that the attribution of different facts per se, and not the compatibility of the facts, is what influenced children's inferences. Further studies are needed to examine this possibility more directly.

Table 2
Number of Children Choosing Object B Four or More Times out of the Six Trials

Condition	Study 1		Study 2	Study 3	
	Label	Fact	Label	No knowledge	Explicit knowledge
≥4	14	14	14	5	12
<4	2	2	2	11	4

asked them to retrieve the referent of a novel fact. Recall that in the preference task, children showed no preference for any of the objects in any of the experimental pairs. This finding provides additional support for the conclusion that this type of response is not due to constraints specific to word learning.

The finding concerning children's responses on the first trial also rules out an alternative explanation of our main results. It could be argued that children have biases specific to word learning and that in the context of the task, they generalized these biases to learning new facts. However, if that had been the case, we would have expected children in the fact condition to start off randomly choosing the objects and then learning to choose them mutually exclusively. The finding that all children in the fact condition started off choosing the objects mutually exclusively contradicts this generalization/learning account. These findings do not rule out the possibility, however, that such a generalization from words to facts occurred prior to the task. Although it is logically possible, it seems highly implausible that 3-year-olds have a bias to accept only one fact about each object they encounter in the world.

One plausible interpretation of the present findings is that, as in the labeling context, children's reasoning in the fact condition can be portrayed in the following way: "The experimenter has just told me that one of the objects was given to her by her uncle. We now both know this. Thus, if she wanted me to give her the object that her uncle gave her, she would have asked for the object that her uncle gave her. Given that she asked me for something else, I inferred that she must have wanted me to give her something else." That is, children's inferences about which object a fact or a label referred to were driven by considerations of a speaker's communicative intent. The principle guiding these inferences—an extension of E. V. Clark's (1987) principle of contrast—is simple: If a speaker says two different things, regardless of whether it is two labels or two facts, she or he probably has two different referential intentions in mind.

However, the findings are also consistent with another explanation—namely, children might have some kind of one-to-one mapping constraint that leads them to assume that an object can have only one piece of information, be it a label or a fact, associated with it. Flavell (1988) argued that young children may have difficulty representing a single object in multiple ways. Markman (1992) discussed the possibility that such a general cognitive constraint on multiple representations might give rise to a mutual exclusivity bias in word learning. In Study 2, we attempted to contrast the pragmatic account with a one-to-one mapping constraint account.

Study 2

According to the pragmatic account, a crucial step in the child's inferential process is the assumption that the speaker asking the child for a second fact or label has knowledge of the first fact or label attributed to one of the objects (see H. H. Clark & Marshall, 1981, for a general discussion of this issue). In Study 1 this assumption was appropriate because the same speaker provided children with the initial fact or label and then asked for the referent of a second fact or label. For instance, in the label condition of Study 1, the child and the experimenter knew that one of the objects was referred to by the name *mef*—the experimenter explicitly called it that. According to the pragmatic account, children went on to infer that if the experimenter had wanted the child to pick the *mef*, she would have simply asked the child for the *mef*. The fact that she did not do so led the child to infer that she did not want the child to pick the *mef* but instead intended that the child pick the other object—the one without a label.

A possibility that arises from this account is that if a second speaker, who does not hear the experimenter call one of the objects *mef*, asks the child for the referent of a second label, the child might not be able to infer that speaker's communicative intent. After all, this second speaker's request would have to be evaluated on the basis of that speaker's knowledge, not on the child's own knowledge or on the knowledge the child shares with the experimenter. Given that the second speaker does not hear the first label, the child might infer that the speaker does not know what any of the objects are called and thus conclude that the speaker's request for an object associated with a different label has no clear-cut intended referent. In other words, the speaker's communicative intent is not as pragmatically transparent as it was in Study 1. In Study 2 we created such a scenario.

In this study, a puppet, who the child is told does not know the experimenter and has not heard the experimenter label one of the objects, asks the child to pick the referent of a second novel label. According to a pragmatic account, if—and only if—children assume that the puppet does not know the first label, then they should select the objects randomly. According to a one-to-one mapping constraint account, children's inferences are governed by internal constraints, independent of the discourse context. In other words, it does not matter who does the questioning and how much knowledge the person has of the discourse context. In either case, children will tend to accept only one label per object. Given that the crucial distinction between the two accounts has to do with whether children believed that the puppet did not know the label used by the experimenter, children were questioned about their beliefs regarding this at the end of the procedure.

Table 3
Number of Children Choosing Object A or B on the First Trial

Condition	Study 1		Study 2	Study 3	
	Label	Fact	Label	No knowledge	Explicit knowledge
Object A	0	0	2	7	5
Object B	16	16	14	9	11

Method

Participants

Sixteen 3-year-old children ($M = 3.9$ years, range = 3.4–4.2 years), 6 girls and 10 boys, participated in the study. Children were recruited from local preschools and were tested in a quiet room at their school. Children were mostly Caucasian American, from middle-class families. Parental consent was obtained for each child prior to participation in the study. None of the children had participated in Study 1.

Materials

The same 12 novel objects from Study 1 were used in Study 2. In addition, either the same puppet from Study 1 (Percy) or a different puppet (Curious George) and a “puppet house” with windows and a door that closed were present throughout the duration of Study 2.

Design

The study consisted of one label condition. As in Study 1, there were six trials per child, each consisting of an information phase, in which the experimenter applied a label to one of the two objects (Object A), and a question phase, in which a puppet asked children to select the referent of a second novel label.

Procedure

Information phase. Before the first pair of novel objects was shown to the child, an introduction scenario between the experimenter and Percy the puppet took place. Percy was deftly manipulated by a highly trained experimenter, who also spoke for Percy in a slightly different tone of voice. As the child and experimenter sat together at a table, the door to Percy’s house opened and the puppet emerged from inside, exclaiming to the experimenter and child, “Hi there! Who are you, and what are you doing here?” The experimenter replied, “I’m [name] and this is my friend [child’s name]. We are here to look at some things I brought. Who are you?” Percy responded, “I’m Percy, and this is my house! I’ll let the two of you play now. I’m going to take a nap. Don’t worry about talking loudly because I can’t hear anything that goes on outside when I’m in my house.” Percy went back inside his house and closed the door. The experimenter then called out, “Percy! Percy!” but there was no response, and she said, “Oh, I forgot that Percy can’t hear us when he’s in his house. Let me knock on the door to get him to come out.” The experimenter knocked on the door of the house, and when Percy emerged, she asked, “Hi Percy, did you want to play with us?” To which Percy responded, “No, I’m kind of tired and want to rest. Have fun! It was nice to meet you, but now I’m going back inside my house.” The experimenter said good-bye to Percy and then turned to the child and said, “Let’s look at the neat things I brought with me, ok?” The purpose of this introduction was to establish to the child that (a) the experimenter and Percy did not know each other and (b) while in his house, Percy could not hear the conversation between the experimenter and the child.

The experimenter placed the first pair of objects in front of the child, picked up Object A (the object receiving a label), and said, “Look at this one, it’s a zev. See, it’s a zev. This is a zev.” The object was then set back down in front of the child. Next the experimenter picked up Object B (the object receiving a generic comment) and said, “Now, look at this one, it’s neat. Isn’t it cool? This is nice.” The object was set back down, and the experimenter commented on both objects, “Aren’t they neat? Let’s play with them.” The child was encouraged to play freely with the objects for 1 min.

Question phase. While the child was distracted by playing with the objects, Percy emerged from his house and the experimenter announced, “Hey Percy, you came out, huh?” Percy then asked the child to retrieve the

referent of a new novel label, “Can you give me the jop?” If the child was reluctant to choose an object, the question was repeated until one of the objects was selected and given to the puppet. Following the child’s response, Percy excused himself and returned to his house. The experimenter then put both objects away and announced that they were ready to look at some new things. The same procedure was repeated for a total of six trials per child. It is important to note that Percy was never present when the experimenter introduced the novel label to the child, and he always came out of his house to ask the child for the referent of a different label.

Following the third trial, the experimenter casually reminded the child that Percy could not hear anything from inside his house by commenting, “Percy asks some funny questions, huh?! Oh, don’t worry, remember he can’t hear us when he’s in his house.” After the last trial, the experimenter asked children, “Do you think Percy knew the names of the toys we played with?” Children’s responses to this question were recorded. These responses were used to evaluate whether children indeed assumed that Percy did not know the names of the objects. As pointed out earlier, the pragmatic account predicted that children would choose randomly between the objects only if they thought Percy did not know the name of one of the objects.

Novel labels. The same 12 labels used in Study 1 were used in this study. The labels were randomly assigned to objects, and the order of presentation of the objects (Object A first or Object B first) was counter-balanced within and across children.

Results and Discussion

As in Study 1, the dependent measure used in the analyses was the number of trials, out of six, in which children selected the object for which they had not been told a label (Object B). Because there were six trials, 3 times out of 6 was considered chance responding. The results are displayed in Table 1.

Children in Study 2 selected Object B, on average, 4.7 times (78%, $SD = 1.3$), which was significantly greater than expected by chance, $t(15) = 5.38, p < .001$. As in Study 1, this tendency was already evident on the first trial, in which 14 of the 16 children chose Object B (binomial $p = .004$; see Table 3). As in the label condition of Study 1, 14 of the 16 children tested in Study 2 chose Object B 4 or more times out of the six trials (see Table 2). In sum, children consistently selected Object B in response to a second speaker’s request for the referent of a different label, despite the fact that the speaker was not present when the first label was applied. In principle, this result, combined with the results of Study 1, supports the notion that children have a one-to-one mapping constraint that gives rise to a mutual exclusivity bias in naming (Markman, 1992). That is, independently of speakers’ knowledge states, children accept only one label per object.

However, one finding from Study 2 seems to caution against drawing this conclusion. Specifically, only 3 of the 16 children tested replied “no” when asked by the experimenter at the end of the task whether Percy knew the labels she used (binomial $p = .02$). Ten of the 16 children said Percy knew the labels, and 3 answered “don’t know” or gave no response. Thus, for some reason most of the children believed that Percy knew that one of the objects was called *zev*—the name the experimenter used. This was a crucial issue, because also according to the pragmatic account, if children believed that Percy knew the experimenter’s labels, they were expected to choose the object without a label in response to Percy’s request for a different label. Specifically, children would reason that if Percy wanted them to show him Object A, he could have asked for the *zev*. Given that he asked for a *jop*, children inferred that he wanted them to choose Object B.

One reason why children might have thought that Percy knew the labels that the experimenter used has to do with E. V. Clark's (1990) principle of conventionality. Specifically, children might believe that names are conventions, known by all members of a linguistic community. Because Percy was an English speaker, children might have assumed that he knew what a zev was, even though he did not hear the experimenter use that label. We return to this point in the General Discussion section. It is apparent, however, that Study 2 did not provide an adequate assessment of the importance of mutual knowledge in children's inferences, nor did it provide a definitive test between the pragmatic and the one-to-one mapping accounts. We addressed these issues more directly in Study 3 by using arbitrary facts about objects instead of labels.

Study 3

Children in Study 3 were tested in a procedure similar to that of Study 2. The main difference between the studies was that instead of being presented with and asked about labels for objects, children in Study 3 were presented with and asked about facts for objects. By using facts instead of labels, we hoped to avoid children's assuming that the information provided by the experimenter was common knowledge. To further avoid this assumption by children, the experimenter presented facts that always had some unique and personal relationship to her so that someone who did not know her or who did not hear her express the fact should not know the fact.

Children in Study 3 were tested in one of two conditions. In the critical condition (the no-knowledge condition), a puppet who did not know the experimenter and who did not hear the experimenter tell the child a fact for one of the objects asked the child to pick the referent of a different fact. This condition was analogous to that of Study 2. In a different condition (the explicit-knowledge condition), the puppet was always present when the experimenter told the child a fact for one of the objects and clearly expressed his knowledge of that fact.

The pragmatic account predicts that in the no-knowledge condition, children should have no way to establish the communicative intent of the speaker. That is, in contrast to children in Study 2, children in this condition should have no reason to suspect that the puppet knows the fact that the experimenter just told them, and thus they will have no basis on which to infer which object the puppet intends for them to choose. If children try to establish the puppet's referential intent, they should be led to guess randomly between the objects. Children in the explicit-knowledge condition, however, should be able to establish the referential intent of the speaker, just as they did in Study 1. In the explicit-knowledge condition, children should pick Object B in response to the puppet's request for a fact different from the one the puppet knows the experimenter attributed to Object A.

In contrast, according to a one-to-one mapping constraint account, the knowledge states of the speakers should not influence children's inferences. The constraint is an internal one that limits the child's capacity to represent an object in more than one way. The prediction is that just as in the fact condition of Study 1, children in both conditions of Study 3 should select the object that the experimenter had not provided a fact for in response to the puppet's request.

Method

Participants

Thirty-two 3-year-old children ($M = 3.6$ years, range = 3.0–4.0 years), 20 girls and 12 boys, participated in the study. Children were recruited from local preschools and were tested in a quiet room at their school. Children were mostly Caucasian American, from middle-class families. Parental consent was obtained for each child prior to participation in the study. None of the children had participated in the previous studies.

Materials

The same 12 novel objects from Studies 1 and 2 were used in Study 3. In addition, the puppet (Percy) and the puppet house used in Study 2 were used in Study 3.

Design

The study consisted of two fact conditions: no knowledge and explicit knowledge. Sixteen children participated in each condition. The two conditions consisted of six trials per child, with each trial including two phases: (a) an information phase, in which the experimenter told children a fact about one of the objects (Object A) and made a generic comment about the other object (Object B), and (b) a question phase, in which a puppet asked children to identify the referent of a different fact. The main difference between the two conditions was whether the puppet was present or absent during the information phase.

Procedure

No knowledge-information phase. Before the first two novel objects were shown to the child, an introductory interaction between the experimenter and Percy, identical to the one used in Study 2, took place. The interaction clarified for the child that Percy did not know the experimenter and that he could not hear anything that went on outside his house while he was inside. At the end of the interaction, Percy excused himself and went into his house. The experimenter then showed the child the first pair of objects.

The experimenter placed the first pair of objects in front of the child, picked up Object A (the object receiving a fact), and said, "Oh, look at this one, my uncle gave this to me. See, my uncle gave this to me. My uncle gave me this." The object was then set back down in front of the child. Next the experimenter picked up Object B (the object receiving a generic comment) and said, "Now, look at this one, it's neat. Isn't it cool? This is nice." The object was set back down, and the experimenter commented on both objects, "Aren't they neat? Let's play with them." The child was encouraged to play freely with the objects for 1 min.

No knowledge-question phase. While the child was distracted by playing with the objects, Percy emerged from his house, and the experimenter announced, "Hey Percy, you came out, huh?" Percy then asked the child the experimental question, using a new novel fact: "Can you give me the one that goes inside a fish tank?" If the child was reluctant to choose an object, the question was repeated until one of the objects was selected and given to the puppet. Following the child's response, Percy excused himself and returned to his house. The experimenter then put both objects away and announced that they were ready to look at some new things. The same procedure was repeated for a total of six trials per child. To be clear about the procedure, we made sure that Percy was never present when the experimenter introduced the novel fact to the child, and he always came out of his house to ask the child for the referent of a different fact.

Following the third trial, the experimenter casually reminded the child that Percy could not hear anything from inside his house by commenting, "Percy asks some funny questions, huh?! Oh, don't worry, remember he can't hear us when he's in his house." After the last trial, the experimenter

tested the child to see if he or she understood that Percy could not hear them from inside his house by saying, "Oh, before you go back to your class, why don't you say good-bye to Percy. Can Percy hear you when he's in his house?" The child's response to this question was recorded.

Explicit knowledge-information phase. Before the first two novel objects were shown to the child, an introduction scenario between the experimenter and Percy the puppet took place. In contrast to the no-knowledge condition, in this condition the experimenter recognized Percy as he came out of his house. They greeted each other, and the experimenter introduced the child to Percy. The crucial difference between this condition and the previous one was that Percy did not go back into his house but instead sat by the door, observing the interaction between the child and the experimenter.

The procedure was the same as the one followed in the no-knowledge condition except for one important difference at the end of the information phase. The experimenter placed the first pair of objects in front of the child, picked up Object A (the object receiving a fact), and said, "Oh, look at this one, my uncle gave this to me. See, my uncle gave this to me" (i.e., in this condition the experimenter mentioned the fact only two times, instead of three, as in the no-knowledge condition). The object was then set down in front of the child. Next the experimenter picked up Object B (the object receiving a generic comment) and said, "Now, look at this one, it's neat. Isn't it cool? This is nice." The object was set down, and the experimenter commented on both objects, "Aren't they neat? Let's play with them." At this point, Percy picked up Object A and paraphrased what the experimenter had told the child about that object. For instance, while looking at the object and the experimenter, Percy announced, "Oh, so this is the one your uncle gave you, huh?" This was done to clearly convey to the child that Percy knew that fact. The child was then encouraged to play freely with the objects for 1 min. Note that the children in this condition heard the novel fact three times, which is the same number of times that children in the no-knowledge condition heard the fact.

Explicit knowledge-question phase. At the end of the play period with a pair of objects, Percy asked the child the experimental question, using a new novel fact: "Can you give me the one that goes inside a fish tank?" If the child was reluctant to choose an object, the question was repeated until one of the objects was selected and given to the puppet. Following the child's response, the experimenter put both objects away and announced that they were ready to look at some new things. The same procedure was repeated for a total of six trials per child. Percy was always present when the experimenter introduced the novel fact to the child, always paraphrased the fact that the experimenter had provided for Object A, and always asked the child for the referent of a different fact. It is important to note that the time lag between hearing the first fact and being questioned about a different fact was kept constant across the two conditions.

Novel facts. The facts consisted of an unfamiliar, arbitrary piece of information about each object. The two facts presented on each trial were always semantically compatible (i.e., they could logically refer to the same object, e.g., "This goes inside a fish tank" and "I got this for my birthday"). One additional restriction of Study 3 was that the fact initially presented to children in the information phase of the study was always something personally related to the experimenter. In other words, the fact consisted of information that someone who did not know the experimenter, or who did not hear her express it, would have no way of knowing (e.g., that one of the objects was given to the experimenter for her birthday). This was done in order to discourage children in the no-knowledge condition from assuming that Percy knew the facts. The 12 facts were the same in both conditions. They were as follows: "My uncle gave this to me," "I keep this in the kitchen," "I bought this yesterday," "This came in a special box," "My cat likes to play with this," "I got this for my birthday," "This goes inside a fish tank," "This is from Mexico," "This is from California," "You can get this at the grocery store," "Lots of people have this in their house," and "This costs a lot of money." The facts were randomly assigned to objects, and the

order of presentation of the objects (Object A first or Object B first) was counterbalanced for each child.

Results and Discussion

The main measure used in the analyses was the number of trials, out of six, in which children selected the object for which they had not been given a fact (Object B). Because there were six trials, 3 times was considered chance responding. The pragmatic account predicts an effect of condition, with children in the no-knowledge condition choosing randomly between Objects A and B, and children in the explicit-knowledge condition choosing Object B significantly more than would be expected by chance. The one-to-one mapping constraint account predicts no effect of condition, with children in both conditions picking Object B significantly more than expected by chance. The results provide support for the pragmatic account (see Table 1).

Children in the explicit-knowledge condition picked Object B an average of 3.9 (out of 6) times (65%, $SD = 1.0$), which was significantly more than expected by chance, $t(15) = 3.42$, $p < .005$. Children in the no-knowledge condition, however, chose Object B an average of 3.0 (out of 6) times (50%, $SD = 1.2$), which evidently was no different from chance. An ANOVA with condition (no knowledge, explicit knowledge) as a between-subjects variable rendered a significant main effect of condition, $F(1, 30) = 5.14$, $p < .05$. This difference in children's responses across the two conditions supports the notion that children drew different inferences about Percy's referential intent on the basis of whether he shared knowledge with the child about the fact associated with Object A. In the explicit-knowledge condition, children assumed that Percy knew the fact associated with Object A. Therefore, when he asked for the referent of a different fact, children inferred that he intended for them to pick the object that did not have a fact associated with it. In the no-knowledge condition, however, Percy did not share knowledge with the child about the fact associated with Object A. Consequently, his request could not have been elaborated with that piece of knowledge in mind. In that situation, Percy's communicative intent was not transparent to the children, and thus all they could do was guess what his intent might have been. If children had some kind of one-to-one mapping constraint, we would have expected children in the no-knowledge condition to be as likely as children in the explicit-knowledge condition to reject the application of two facts to the same object.

To obtain a better idea of children's individual response patterns in the no-knowledge and explicit-knowledge conditions, we conducted a chi-square analysis of the number of children in each condition who selected Object B on the majority of the trials (4 or more times; see Table 2). Only 5 children out of the 16 in the no-knowledge condition chose Object B 4 or more times. In contrast, 12 of the 16 children in the explicit-knowledge condition did so, $\chi^2(1, N = 32) = 6.15$, $p < .05$. A consideration of individual response patterns is particularly informative for the no-knowledge condition because, given the indeterminacy of the questioner's intentions, children might have developed a rule or strategy for choosing one way versus another. The preceding analysis shows that this was not the case. Most of the children remained inconsistent in their responding throughout the six trials. This is very different from the pattern observed in the explicit-

knowledge condition, in which the speaker who asked the question shared knowledge of the given facts with the child. In that case, the majority of children were consistent in their responding, selecting the object for which they had not been told a fact on four or more trials. The difference in response patterns suggests that children in both conditions were not operating on the basis of an a priori rule but rather were using knowledge of the particular communicative environment in which the interaction occurred.

Regarding this last point, data on children's choice on the first item were also revealing (see Table 3). Nine of the 16 children in the no-knowledge condition chose Object B on the first trial, compared with 11 of the 16 children in the explicit-knowledge condition who did so ($p > .5$). In fact, neither of the groups chose Object B on the first trial more than would be expected by chance ($ps > .2$). It seems that the scenario with two speakers talking about facts rather than labels posed some inferential challenge to the children, perhaps because it involved evaluating the speakers' knowledge state (see Keysar, Barr, & Balin's, 1998, perspective adjustment model of the use of mutual knowledge in comprehension for a compatible account). The finding of a difference between the two conditions in the number of children who consistently chose Object B suggests that children solved this challenge differently depending on the communicative context to which they were exposed.

Following the last trial, each child in the no-knowledge condition was asked whether Percy could hear the experimenter and child's conversation from inside his house. It was important to ascertain that children understood and believed that Percy could not hear while inside his house, as this was the basis for determining whether the child and questioner shared mutual knowledge. Fifteen of the 16 children tested in this condition reported that Percy could not hear from inside his house, and one child neglected to respond.

It is interesting to note that despite being involved in the more elaborate scenario presented in the explicit-knowledge condition, children in this condition responded similarly to the children in the fact condition of Study 1. In other words, it mattered little to children whether the same or two different speakers introduced one fact and then requested a different fact. This finding further suggests that it was not the case that children in the no-knowledge condition responded randomly simply because they were confused by the more elaborate scenario. It seems that the crucial factor was the presence or absence of mutual knowledge between the questioner and the child.

The no-knowledge condition is also informative about how children in the fact condition of Study 1 responded. It could be argued that children in Study 1 interpreted our presumably compatible facts as incompatible. If so, their avoidance of overlap could have resulted from a desire to avoid logical contradiction rather than from pragmatic considerations. The finding that children in the no-knowledge condition often accepted two facts—similar to those used in Study 1—for the same object reinforces the pragmatic interpretation of the findings in Study 1. It could also be argued that children's avoidance of overlap of facts in Study 1 resulted from differential habituation to the two objects. Specifically, the provision of a fact for Object A might have caused children to attend to it more than to Object B during the play period, thus becoming more habituated to it. When then asked for the referent of a novel fact, children would have switched their

attention to Object B because it was relatively more novel. The findings in the no-knowledge condition of Study 3 are inconsistent with this interpretation.

General Discussion

The goal of the present investigation was to test a pragmatic explanation for a naming response commonly made by 3-year-old children. The response is a simple one: When presented with two objects, one for which children know a name and another for which they do not know a name, children tend to pick the unfamiliar object as the referent of a novel name. The present findings revealed that children not only avoid accepting two labels as referring to a single object but they also avoid accepting two facts as referring to a single object. The findings further revealed that a key component of this inferential process is children's attention to a speaker's knowledge about the discourse context. Children seemed to rely on their assessment of the speaker's knowledge when inferring his or her referential intent. These findings have implications for a number of related issues that are discussed in turn.

What Is Special About Word Learning?

A basic but important conclusion that can be drawn from the present findings is that children's tendency to apply novel pieces of referential information to unfamiliar objects is not unique to words. Children in Study 1 applied a novel fact to an object for which they did not already know a fact significantly more than would be expected by chance, and not significantly less than they applied a novel label to an object for which they did not know a label. Furthermore, in this study, children manifested this tendency to assign facts to unfamiliar objects on the very first trial. These findings counter the notion that children's avoidance of lexical overlap results from lexical-specific constraints, and they support the notion that it is due to assumptions about referential acts more broadly.

Markman and Wachtel (1988) argued that children pick the object for which they do not know the name in response to a novel label because they assume that the familiar object cannot have two names. That is, a mutual exclusivity bias leads children to avoid lexical overlap (see also Merriman & Bowman, 1989). This view was recently restated, in contraposition to a pragmatic explanation akin to the one being put forth here (Woodward & Markman, 1998). Golinkoff et al. (1994) explained this type of response by arguing that children have a novel-name nameless-category principle. In other words, children follow a principle that leads them to apply novel names to objects for which they do not yet have names. Although these accounts differ in terms of the precise details of the mechanisms, they agree that the mechanisms are to a large extent specific to the acquisition of words. Therefore, a strict interpretation of these accounts does not stipulate that children should resist applying two facts to an object. Markman (1992) did acknowledge the possibility that mutual exclusivity is not specific to word learning and might not even be specific to language acquisition. Nonetheless, most of the empirical studies have exclusively targeted word learning, in effect presupposing the specificity of the mechanisms. The present findings intimate that the question of specificity should be addressed empirically rather

than dealt with a priori (see Markson & Bloom, 1997, for evidence that the capacity to fast map is not specific to word learning, and P. Bloom, 2000, for a cognitive account of the whole-object constraint).

Interestingly, the present findings lend indirect support to the idea that in some respects, word learning *is* special. In particular, in Study 2 we found that even if a speaker was not present when a label was introduced to the child by the experimenter, children seemed to react to that speaker's later request for a different label as if the speaker knew the label provided by the experimenter. In that study, a puppet that was in his house throughout the information phase of the experiment came out after the experimenter had labeled one of the objects, and the puppet asked children for the referent of a second label. Children did not hesitate to give the puppet the unlabeled object in response to his request. In fact, children did so beginning on the very first trial, and when asked at the end of the task if the puppet knew the object names the experimenter had used, most children answered affirmatively. This overall pattern of children's responses was similar to that found in Study 1, when the experimenter was the one providing and asking for the labels, but it differed from the pattern found in the no-knowledge condition of Study 3, when facts were substituted for labels.

One possible account for children's expectation that labels are common knowledge is captured by E. V. Clark's (1987) principle of conventionality. According to this principle, young children might assume that there are forms in a language that are commonly used by speakers to express certain meanings. As E. V. Clark (1990) clarified, even though conventionality is specific to word learning, it is nonetheless a pragmatic assumption about the use of words. In the present scenario, children might have assumed that *mef* was a conventional form that referred to Object A, and thus when the puppet asked for a *wug*, children inferred that he did not have Object A in mind.

Some indirect evidence for this argument comes from studies conducted by Au and Glusman (1990). In their Study 1, 4-year-olds were exposed to four objects: two exemplars of one category and two exemplars of a different category. An experimenter taught children a novel name (e.g., *mido*) for one of the objects, tested children's comprehension of that name, and then left the room. A second experimenter entered and asked children to show the referents of a different novel name (e.g., *theri*). Almost all children chose the two exemplars of the category not named by the first experimenter in response to the second experimenter's request. The authors concluded that children assume that labels pick out mutually exclusive categories. What the findings further seem to imply, however, is that children assumed that the second experimenter shared knowledge with the first experimenter that the first two objects were named *midos*. That is, children honored a principle of conventionality.

In a second set of studies, Au and Glusman (1990) made a slight alteration in their procedure. Once again an experimenter taught children an "English" label for one of the objects and then left the room. A second experimenter then came in and asked children to pick the referents of a "Spanish" novel label. Both bilingual and monolingual children picked the objects randomly in response to the second experimenter's request. Au and Glusman concluded that children suspend mutual exclusivity across languages. On a pragmatic account, the reason for this change in response pattern

is that children suspended the notion of conventionality, which is by definition language-specific.

In general, the present findings must be interpreted within the limits of the phenomenon under investigation. The studies targeted children's avoidance of lexical overlap and attempted to provide an alternative explanation for its existence in 3-year-olds. The present findings have little to say about the possibility that other naming phenomena are best explained by constraints specific to word learning (e.g., as Kleinknecht, Behrend, & Scofield, 1999, and Waxman & Booth, 2000, claimed to be the case for the taxonomic bias or the principle of categorical scope). Moreover, the present findings do not rule out the possibility that a mutual exclusivity bias or a novel-name nameless-category principle might be plausible explanations for other word-learning phenomena (e.g., for what Merriman & Bowman, 1989, defined as the rejection and correction effects of mutual exclusivity) or may operate in younger children (see, e.g., Liittschwager & Markman, 1994). It is also important to note that we are not claiming that pragmatic considerations are solely responsible for this phenomenon. There is some evidence that syntactic cues (Hall & Graham, 1999; Merriman, Marazita, & Jarvis, 1993) and conceptual knowledge (Merriman & Schuster, 1991) affect children's avoidance of overlap.

In fact, the present findings cannot even rule out the possibility that a mutual exclusivity bias or a novel-name nameless-category principle underlies children's avoidance of lexical overlap. That is, it could be argued that children rely on lexical constraints when inferring the referents of labels and rely on pragmatic reasoning when inferring the referents of facts. Consistent with this possibility is the statistically nonsignificant trend found in these studies for a stronger avoidance of overlap for labels compared with facts (see Table 1). The pragmatic explanation for this trend again recruits E. V. Clark's principle of conventionality (1987). Specifically, it is possible that adherence to such a principle gave children an overall edge when inferring the referents of labels compared with facts, because children could presuppose that the labels were known to the speaker. The finding that children avoided overlap on the first trial of Study 2 (with labels) but did not do so on the first trial of Study 3 (with facts) suggests that the labeling inference might indeed have been a principled one. Further studies with more powerful tests are needed to establish whether children's inferences about labels are indeed significantly different from their inferences about facts and what might underlie such a difference, if one is to be found.

At this point, what may be ascertained based on the present findings is that a pragmatic account can explain children's avoidance of lexical overlap, and parsimony would dictate that this more general account might replace the more specific and redundant constraints account. The results suggest that even if an assumption of conventionality is special to word learning, the mechanism guiding children's inferences about a speaker's referential act is the same whether the speaker asks for a label or a fact. Children assume that speakers will use the mutually known form to refer to a certain object, and when they do not, children infer that the speaker meant to refer to a different object. The difference between the two cases is that although children presuppose mutual knowledge (on the basis of conventionality) in the case of labels, they need clear evidence to suppose mutual knowledge in the case of

facts (e.g., the explicit-knowledge condition of Study 3). The next section elaborates on this inferential process.

Inferring a Speaker's Referential Intent

The results of the present studies indicate that children do not have an a priori constraint about how many referential facts or labels can apply to a single object but rather are sensitive to cues in the discourse context concerning what a speaker is trying to communicate. The prevalent cue in the present tasks was the state of knowledge of the speaker who was requesting a second fact or label. The argument is that children expect speakers to use mutually known forms to refer to objects in order to facilitate understanding. Thus, if there is a mutually known form but the questioner uses a different one—as in both conditions of Study 1, the explicit-knowledge condition of Study 3, and seemingly the label condition of Study 2—children infer that the questioner intended to refer to the other object. If there is not a mutually known form and the questioner uses a different form from the one the child knows—as in the no-knowledge condition of Study 3—children cannot unambiguously infer the questioner's intent and resort to guessing what it might be.

Our interpretation of children's guessing behavior is that it was the pragmatically appropriate thing to do. Given the puppet's lack of knowledge of the discourse context, children could not have a definitive hypothesis about his reasons for formulating the request in the way that he did. As Sperber and Wilson (1986) would argue, the puppet's fact could apply to either object, and thus the two interpretations carried comparable cognitive effects; they were equally relevant (D. Sperber, personal communication, July 8, 1999).

It is important to point out that even though the pragmatic account describes the many inferential steps children go through when determining the meaning of a speaker's utterance, the claim is not that children actually go through these inferential steps every time they hear a request. Rather, the argument is that with experience participating in and listening to communicative interactions, children learn how people speak to each other (see Shatz, 1994, for a detailed analysis of this developmental process). In particular, children realize that there are conventional and natural ways of expressing certain ideas and that when people say two different things, they probably have two different ideas in mind. In other words, both the principle of conventionality and the principle of contrast are learned by children, but once learned they are applied without too much additional reasoning. Children, however, also have to learn to suspend these principles when aspects of the discourse context do not warrant their application.

Especially within the pragmatic account presented here, children's acquisition of communicative skills is linked to their developing understanding of mind. Of particular importance to this account is children's ability to assess the knowledge state and intentions of others. Recent findings suggest that even 2-year-olds evidence signs of understanding these two aspects of the mind, particularly in the context of interpersonal communication (Baldwin & Moses, 1994; O'Neill, 1996). As the literature on theory of mind reveals, however, there is substantial development in this area between 2 and 4 years of age (Lewis & Mitchell, 1994). Thus, the older the child, the more capable he or she is of assessing someone else's state of knowledge and intentions. It would be

worthwhile to extend some of the current studies with 3-year-olds to younger and older children in order to examine the connection between theory of mind and communication. The prediction would be that the older the child, the more capable the child should be of inferring the intent of a speaker on the basis of mutual knowledge, and in turn the more likely the child would be to disambiguate a speaker's referential intent. In this regard, it is interesting to note that a few studies have indeed found an increase with age in children's avoidance of lexical overlap (Davidson, Jergovic, Imami, & Theodos, 1997; Merriman & Bowman, 1989; Merriman & Schuster, 1991).

Conclusion

The studies reported here reveal that the inferential process 3-year-olds go through when disambiguating the referents of facts is similar to the process they go through when disambiguating the referents of labels. Basically, if a speaker says two different things, children assume the speaker probably intends to refer to two different things. More specifically, the studies show that the presumed presence or absence of mutual knowledge between a child and a speaker who asks the child for the referent of a label or fact was crucial to the child's inferential process. When children assumed the existence of mutual knowledge, they were able to draw unambiguous inferences about a speaker's referential intent. When children did not believe there to be mutual knowledge between a speaker and listener, they resorted to guessing what a speaker's referential intent might be. We have elaborated on the implications of these findings to conceptualizations of how children infer the meaning of words and the role of lexical constraints in this process. In general, the current studies introduce new avenues for investigating children's knowledge of communication and its relationship to their developing theory of mind.

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