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ABSTRACT

Children may be able to gain partial information about the meaning of a word from clues, such as how it is used in a sentence and what words it is contrasted with. This strategy, known as "fast mapping," may provide a very useful first step in language learning. One question which arises from studies of fast mapping is whether fast mapping is available to children across various semantic domains, such as shape, texture, and color. A total of 50 children (with a mean age of 3 years, 8 months) participated in the first study, and 33 children (with a mean age of 2 years, 9 months) participated in the second. Children were introduced to a novel color, shape, or texture term by contrasting the new term with a well-known word from that domain. They were then tested for both their ability to produce and comprehend the new term and whether they knew the semantic domain the word referred to. The data show that children can gain some information about the meaning of a word from a brief encounter. In contrast to rather slow and difficult hypothesis-testing mechanisms, fast mapping may allow the child to rapidly obtain information from the situation. By considering only a few hypotheses, the child can then quickly focus in on the correct meaning. (Author/RH)

Word Learning in Children

An Examination of Fast Mapping

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Running head: Fast Mapping

Abstract

Children may be able to gain at least partial information about the meaning of a word from clues such as how it is used in a sentence, what words it is contrasted with, as well as other factors. This strategy, known as "fast mapping," (Carey and Bartlett, 1978) may allow the child to form a quick and rough hypothesis as to the meaning of a word and thus provide a very useful first step in language learning. One quest[illegible] hich arises from previous work on fast mapping is whether this strategy is available to children across various semantic domains. In the present studies, we examined the domains of shape, texture and color. Fifty children with a mean age of 3,8 participated in the first study and thirty-three children with a mean age of 2,9 participated in the second study. Children were introduced to a novel color, shape, or texture term by contrasting the new term with a well-known word from that domain. They were then tested for their ability to produce and comprehend the new term and for whether they knew what semantic domain the word referred to. In general, the data show that children are able to gain some information about the meaning of a word from just a brief encounter. In contrast to rather slow and difficult hypothesis-testing mechanisms, fast mapping may allow the child to rapidly obtain information from the situation. By considering only a few hypotheses, the child can then quickly focus in on the correct meaning.

One way of acquiring new word meanings may be through the use of general hypothesis-testing mechanisms. For example, from a positive exemplar of the concept *dog*, a child would formulate a tentative hypothesis about the meaning of the word "dog." New instances of dogs that are consistent with the hypothesis would support it while instances that are inconsistent would require that the hypothesis be revised. Eventually the child abstracts a concept of "dog" which consists of all of the attributes which the instances have in common. This explanation describes a time-consuming process that would strain a young child's information-processing capacities since it demands that the child be able to recall exemplars and correctly incorporate positive and negative instances into the hypothesis.

Another problem for this kind of model is that in many experimental studies of concept learning, young children are slow and inflexible in forming concepts as compared to older children and adults (e.g., Kendler & Kendler, 1962). Yet, as Nelson (1974) points out, in these studies the concept domain is often well defined and limited, the components are well specified, and the child receives feedback, unlike the more variable conditions the child confronts in everyday learning. How do children manage to form so many natural language concepts, then, when the conditions in the natural learning environment are much less hospitable?

One answer to this question is that children may use the linguistic and non-linguistic context in which a new word occurs to help figure out its meaning. This process of "fast mapping," (Carey, 1978) occurs when the child encounters the word in a specific context and rapidly learns information such as the fact that the new word is a word, along with some basic syntactic and semantic properties. To take an example from Carey and Bartlett (1978), when children hear "Bring me the beige one, not the blue one," they might realize that *beige* is an English word and that it refers to a property of an object. They may also realize that *beige* is a color word and also know which color it names. Thus by contrasting a novel term with a well-known term one can provide an enormous amount of information about the meaning of the new term -- syntactic and lexical cues that *beige* is a color word as well as contextual cues as to which specific color it names.

To accomplish this type of learning, however, children must make a number of assumptions about the linguistic and communicative context. One assumption that children may use in constraining the possible meanings of words is that they are mutually exclusive (Markman, 1984). Markman has argued that this assumption of mutual exclusivity reduces redundancy and helps to eliminate hypotheses and successively constrain the meanings of terms. As an example, suppose that a child has words for book and square. After hearing "Bring me the beige book, not the blue one" in the fast mapping situation, the child can eliminate book, square, and blue for the meaning of *beige* and begin to examine the object for some other property which the label could refer to.

Another closely related assumption which children may use in acquiring language is that words contrast in meaning. This assumption is derived from the Principle of Contrast (Clark, 1983, in press) which states that every two forms contrast in meaning. For instance, suppose that a child knows *blue* and knows that *beige* is a color word but does not know what color it denotes. By the Principle of Contrast, the child will think that *beige* denotes a color other than "blue." Thus, the Principle of Contrast helps to constrain the meaning of a new word by contrasting it with the meanings of familiar words.

In a study by Carey and Bartlett (1978), the reorganization of the color lexicon in three and four year olds was monitored as each child learned a new color name, *chromium,* chosen for the color olive. The new word was introduced to the children in a natural, casual context with no explicit teaching, since the goal was to explore the limits of the children's ability to learn words they encountered in day-to-day environments. The word was introduced using a tray which was painted olive and an identically shaped tray painted blue. In a natural classroom context, each child was individually told. "Bring me the chromium tray, not the blue one, the chromium one." One week after the introducing event, the children were given sorting, production, comprehension, and hyponym tasks in order to assess the development of the mapping between the new word and the concept.

At least half of the children learned something about the word *chromium* or the naming of the color "olive" from just this single experience with the word. What makes this finding more impressive is that they were able to demonstrate this knowledge one week later in a context different from the original introducing event. Under such circumstances, it is surprising that such young children were able to show evidence of learning at all.

One question that arises from this work, however, is whether fast mapping is available to children across domains other than color. Since Carey and Bartlett examined only color, in fact only one color, the generality of fast mapping cannot be determined from their data. To begin to determine how general this ability may be, the present work examines the phenomenon of fast mapping in three lexical domains: color, shape and texture. In addition, Carey and Bartlett (1978) encountered problems in their initial study with respect to the salience of their training item which promoted effective guessing. In their comprehension task where children were asked to show the experimenter a *chromium* one, 35% of the control subjects picked olive. This was not statistically different from the number of experimental subjects who were able to correctly identify olive. Thus, even though the control subjects had no previous exposure to the word, many were able to guess correctly. Despite subsequent attempts to control for this by including another nonfocal color, maroon, among the distractors, olive was still salient as an odd color. In order to avoid this problem in the current work, we randomly selected items from a pool of stimuli for each domain so that each child would hear a different color, shape, or texture word in the introducing event.

Another difference between our study and Carey and Bartlett's was in the time delay between exposure to the word and testing. Carey and Bartlett were interested in pushing the child's capacity to learn new word meanings to the limit and thus introduced a one week delay between the introducing event and the assessment tasks. Indeed, this approach might be close to the limits of the children's ability since half of them did not learn anything. We hoped to have a more sensitive test of the children's ability, so each child's knowledge of the word was assessed in the same session as when the word was introduced.

A final difference between Carey and Bartlett's study and ours was in one of the measures of word learning that was used: the hyponym task. The hyponym task assesses whether the child has some knowledge of the domain to which the new word belongs (i.e., does the child know that the new color word is a color word?) and can make proper contrasts within the domain. In Carey and Bartlett's hyponym task, children were asked if various words were colors. Questions were of the following type: "Is purple a color? Is cold a color? Is noisy a color? Is chr ...ium a color?" A child had to answer all of the questions correctly in order to be credited with knowing that *chromium* is a color word. This task proved to be very difficult for the children. Only four out of nineteen children were able to produce the pattern required in order to show knowledge of *chromium*. The method employed in this study was designed to be easier for the child to answer and to be a more sensitive measure with which to uncover the child's knowledge of the word's meaning. To answer correctly for this hyponym measure, children must provide a proper contrast for the new word. For example, children might hear: "See this? It isn't chartreuse because it's ________." If children answer with a color term, one may infer that they interpreted the new word to refer to a color.

In summary, in addition to investigating the generality of fast mapping, we attempted to get more sensitive measures of children's word learning by shortening the time interval and by simplifying the hyponym task.

STUDY 1

Methods

Subjects. Fifty children ranging in age from 3;0 to 4,8 with a mean age of 3,8 participated in the study. Children were randomly assigned to one of three conditions with the constraint that the conditions be balanced for sex and for which preschool the children attended. There were 17 children in the color condition, 18 children in the shape condition, and 15 children in the texture condition.

*Materials.*Children were to be taught a novel color, shape, or texture term. For each of these three domains the word to be taught to a given child was selected from a pool of unfamiliar words. Adult word frequency norms were used (Kucera and Francis, 1970) to select the items. Words with frequency scores less then 10, which would be unfamiliar for many adults, were considered to be unfamiliar for children. After a target word was selected from this pool, some of the remaining words from that domain served as distractors for some of the tasks. Examples of unfamiliar color, shape, and texture words are "bice," "trapezoid," and "fibrous," respectively. A complete list of the unfamiliar terms is presented in Table 1. The method of introducing the new term is to contrast it with a well-known word from that

Insert Table 1 about here

domain. A pool of familiar terms to serve as the contrasting words was chosen by examining vocabulary lists and various word frequency norms for children. For both the shape and texture domains, only four words appeared to be familiar to children at these ages. For the color items, eight terms with the highest relative frequency were chosen. A list of the familiar words for each of the three domains is presented in Table 2.

Insert Table 2 about here

Each item in the unfamiliar stimulus pool was used at least once as a target item, with the items selected randomly across children. For some of the tasks (comprehension and production tasks) the target was presented along with other unfamiliar instances from that domain to ensure that children were not simply responding to any stimulus which was unfamiliar. In these cases, because some of the familiar and unfamiliar items were similiar to one another and thus potentially confusable (e.g., maroon and purple), the distractor sets were constructed so as to avoid as many perceptual confusions as possible. This approach was used since the basic question addressed by this task was whether children can acquire knowledge of the meaning of a word rather than how well they can discriminate among similiar colors, shapes, or textures.

*Procedure.*Each child was individually tested by the same experimenter in a separate room in their schools. Each child was asked to help the experimenter by retrieving one of two items which had been placed on a chair in a corner of the room. For example, in the color condition, one child might hear. "Oh, there's something that you could do to help me. Do you see those two books on the chair in the corner? Could you bring me the chartreuse one, not the red one, the chartreuse one." Another child would hear "Could you bring me the bice one, not the blue one, the bice one." The same procedure was used to introduce children to new shape and texture words. Small paper books with plain covers in the various colors were used to teach the color words to the children. The shape terms were introduced to the children using objects which the experimenter called "trays." These "trays" were various shapes cut out of heavy cardboard which were then covered by a plastic laminating material to make the shapes look similiar to wooden trays. The texture words were presented using small boxes which were coated with various materials.

Approximately 10 to 15 minutes after the introducing event, the children received the production, hyponym, and comprehension tasks, in that order. The tasks were run in a fixed order to control how much exposure the children received to the new word and to other words in the domain before testing. Since the experimenter mentioned the new word itself in the comprehension task, and mentioned other relevant words in the hyponym task, this order was used.

The production task probed whether or not the child could name the new color, shape, or texture. As an example of the instructions given in the shape condition, the experimenter would say. "Now I'm going to ask you some questions about these trays on the table. See this tray? What is it?" Prompts such as "What does it look like?" were also used if needed.

The hyponym task was designed to assess whether the child has some knowledge of the domain to which the new word belongs. In other words, do the children realize that "bice" is a color term, that "trapezoid" is a shape term, and that "fibrous" is a texture term? To illustrate with the texture condition, this test involved the following procedure. the experimenter presented a box with a texture assumed to be familiar to the child, for example, "soft" and said: "See this box? It's not fibrous because it's ________." If the child answered with a texture term, one may infer that the child interpreted the new word to refer to a texture.

Following the hyponym task, the children participated in a comprehension task requiring them to identify the target color, shape, or texture from a group of distractors. Each child saw an array of objects (including some new objects) representing three unfamiliar and three familiar domain terms and the target term. For this task a child in the color condition would hear: "Can you show me a blue one? Can you show me a chartreuse one?" This was repeated for each term represented in the array.

After these three measures were completed, each child responded to a brief vocabulary assessment corresponding to the experimental condition for that particular child. For example, in the color condition, the experimenter presented colors on small index cards and said. "On these cards are different colors. I'm going to show you these cards one at a time and ask you to tell me the names of the colors. Okay?" The vocabulary assessment for children who were taught color words consisted of eleven familiar colors. black, blue, brown, gray, green, orange, pink, purple, red, white, and yellow. Children who were taught shape terms were asked about for terms in the vocabulary assessment. rectangle, round, square, and triangle. The texture vocabulary assessment contained four familiar texture words. fuzzy, rough, smooth, and soft.

All children were praised for the performance and received stickers for participating in the experiment.

Results

The basic question that this study sought to address is whether children can acquire knowledge of the meaning of a word from a brief exposure to the word and whether the strategy of fast mapping is as effective for shape and texture as for color.

Comprehension Measures. For this measure, children were asked to identify items from an array containing a target item, three unfamiliar and three familiar items. Since a total of four items in the array are from the pool of unfamiliar items for a domain, chance performance is 25%. As shown in Table 3, all children, with the exception of girls in the texture condition, were responding at well above chance

Insert Table 3 about here

levels. Overall, children comprehended more of the color and shape words than the texture words. This was be due to the poor performance of the girls who were taught texture terms. In general, girls comprehended more of the color and shape words than boys, but fewer of the texture words, as shown shown by a 2-way ANOVA with condition (color, shape, and texture) and sex as between-subject variables, $F(2, 44) = 7.66$, $p < .005$. Subsequent examination of the individual responses of the girls who were taught texture words showed no discernible pattern or strategy that the girls may have adopted.

Hyponym Measures. The hyponym task measures whether the child knows which domain the new word belongs to and can make proper contrasts within that domain. That is, does the child know that "chartreuse" is a color term, "parallelogram" is a shape term, etc. To answer correctly, the child must provide a proper contrast for the new word, e.g., one child might hear: "See this box? It's not fibrous because it's ________." We accepted answers which matched the domain of the stimulus object, if not the object exactly, (e.g., "fuzzy" would be accepted as a correct answer for a "soft" object). The data are presented in Table 3. As can be seen, all children always picked a contrasting color for the color condition and a contrasting shape for the shape condition, while children who were taught texture terms experienced more difficulty in producing a contrasting texture word, $F(2, 44) = 6.34$, $p < .005$. Nevertheless, 72% of the children in the texture condition were able to respond correctly on the hyponym question.

Production Measures. In this task, three words from a pool of familiar words for a domain were included in the test array in part to determine how familiar children were with each domain. Children had no trouble labeling the three familiar shapes (round, square, and triangle), getting an average of 2.78 correct, or colors, getting an average of 2.94 correct. They were much less likely to correctly label the texture terms, however, getting only .79 out of three correct, $F(2, 44) = 104.53$, $p < .001$.

Children who were taught a new term for a shape were better able to produce that word (mean = 44%) compared to children who were taught a new color (mean = 5%) or texture term (mean = 6%), $F(2, 44) = 6.18$, $p < .005$. Follow-up Newman-Keuls tests indicated that these differences among children who were taught words in different lexical domains were significant. The alpha level was set at .05 for this and all subsequent post-hoc analyses. In addition to the children who could correctly produce the new term, eight other subjects showed some evidence that the target item had acquired a new meaning even though they answered incorrectly. Several of these subjects answered "I don't know yet" or "I forgot" which may indicate that they distinguished the target item from the other items in the array. Using a more lenient approach, these answers were interpreted as demonstrating that some degree of learning had occurred. Again, children who were taught a shape term demonstrated more knowledge of that word in this task (72%) than children who were taught a new color (23%) or texture (6%) term, $F(2, 44) = 9.16$, $p < .001$.

Three words from a pool of unfamiliar words for each domain served as additional distractors in the test array. All children had difficulty naming the unfamiliar color and texture items, thus confirming that the words were unfamiliar to the children. However, when the children attempted to guess, their guess was always within the appropriate domain. All of the unfamiliar items were new to the children in the shape condition except for two children who demonstrated consistent knowledge of the word "rectangle."

Examining the results from the production, comprehension and hyponym tasks, several trends are apparent. For children who were taught shape words, there is good evidence that the children are able to rapidly learn the new information. This is reflected in the high percentage of children who respond correctly to the three tasks. Overall, 44% of the children were able to produce the new shape term they have been exposed to. Eighty-three percent of the children in the shape condition demonstrated some receptive knowledge; 100% of the children responded correctly on the hyponym task. Only five percent of the children in the color condition were able to correctly produce the new word, but 69% were correct in the comprehension task and 100% were able to pick a contrasting color for the new color word. Children exposed to a new texture term were generally less likely to produce or comprehend the new word or to pick a contrasting texture for the new texture term. The percentage of correct responses were 6%, 28%, and 72% for the production, comprehension, and hyponym tasks respectively. A puzzling feature is that the girls drop to 0% correct on the comprehension measure.

Overall, the data from the three lexical domains of color, shape, and texture provide evidence of learning via a fast mapping method. Even for texture, where children did most poorly, 72% of the children at least knew that the new term referred to a texture.

We also examined individual patterns in children's responses to the target items in the production, comprehension and hyponym tasks. As shown in Table 4, nine children answered correctly on

Insert Table 4 about here

all three tasks. Eight of these nine children were in the shape condition. For these children who showed perfect patterns of responses, there was no apparent relationship to age. For the girls, the ages ranged from 3;2 to 4,5 which spans the entire age range. For the boys, the ages ranged from 3;9 to 4;2, all close to the mean male age.

Twenty-two children answered two of the three questions correctly, usually failing the production task but passing the comprehension and hyponym tasks. Sixteen children answered only one question correctly (usually the hyponym task) with half of these children being those who were taught new texture terms. Of the fifty children tested, only three subjects exhibited no evidence of learning. All three of these children were in the texture condition and each used a clear pattern when describing the stimulus items in the production task. These children responded to all items using a pair of texture terms which were opposite in meaning, i.e., "soft/hard," "soft/not soft," or "soft/rough").

Vocabulary Assessment. The color vocabulary assessment consisted of eleven items; both the shape and texture vocabulary assessment contained four items. In general, the children knew most of the color and shape words included in the assessments, but knew fewer texture terms, $F(2, 44) = 15.18$, $p < .001$ (see Table 5 for a summary of the data). Boys demonstrated more knowledge of shape terms

Insert Table 5 about here

than girls, whereas girls demonstrated more knowledge of texture terms than boys. The result of the texture vocabulary assessment is particularly puzzling since boys performed much better than girls on the comprehension measure in the experiment proper.

There is a low but significant correlation between the proportion correct on the vocabulary assessments and both the age of the children ($r(48) = .31$, $p < .05$) and the number correct on the three assessment tasks ($r(48) = .45$, $p < .05$). Thus prior familiarity with words in a particular lexical domain may influence somewhat fast mapping ability. Children knew most of the color and shape words included in the vocabulary assessments and learned more about words from these two domains than from the texture domain where they knew fewer texture words to begin with. It is possible that texture terms may not yet be structured into a domain for many of these children. In order to use fast mapping effectively, children may need to recognize the domain as a domain rather than just individual instances. Ten of the fifteen children who were taught texture terms knew only two of the four texture words included in the vocabulary assessment, and four children knew only one texture word ("soft").

STUDY 2

The results of the first study show that fast mapping can be used by four year old children to narrow down the meaning of a word and can be used by children across various semantic domains. This second study begins to address the question as to when the strategy of fast mapping becomes available to children by replicating the first study with younger children.

Methods

The materials and procedures used with this younger group of children were identical to those described in Study 1.

Subjects. Thirty-three children ranging in age from 2;2 to 3;2 with a mean age of 2;9 participated in the study. Children were randomly assigned to one of three conditions with the constraint that the conditions be balanced for sex. There were 11 children in the color condition, 12 children in the shape condition, and 10 children in the texture condition.

Results

Comprehension Measures. The comprehension task probed whether the child was able to identify the new color, shape, or texture from an array containing familiar and unfamiliar distractors. As seen in Table 6, children in all groups could identify the appropriate referent at well above chance levels (chance

Insert Table 6 about here

performance here is 25%). Overall, there is no significant difference in children's comprehension among the three conditions, $F(2,27) = 1.52$, $p > .05$.

Hyponym Measures. The hyponym task was designed to assess whether the child has some knowledge of the domain to which the new word belongs and can make proper contrasts within the domain. Answers which matched the domain of the referent, if not the referent itself, were accepted as correct answers. As can be seen in Table 6, children always picked a contrasting shape for the shape condition, while children who were taught color and texture terms experienced more difficulty in producing appropriate contrasts, $F(2, 27) = 8.78$, $p < .01$. Over 70% of the children who were taught color words were able to provide proper contrasts, while only 30% of the children who were taught texture words were able to do so.

Production Measures. The production task probed whether or not the child could name the new color, shape, or texture when the target was presented with three familiar and three unfamiliar distractors. Children had no difficulty labeling the three familiar shapes, getting an average of 2.92 correct. They were less likely to correctly label the color terms, with an average of 1.82 correct, or the texture terms, getting only .60 out of three correct, $F(2, 27) = 27.61$, $p < .001$.

Children who were taught a new shape term were better able to produce that word (mean = 42%) compared to children who were taught a new color (mean = 0%) or texture term (mean = 10%), $F(2, 27) = 4.06$, $p < .05$.

All the children had difficulty naming the unfamiliar colors, shapes, and textures, thus confirming that the terms were unfamiliar to the children. Many children tried to guess what the unfamiliar items might be called and most of these guesses were in the appropriate domain. Five children, however, did not use labels which identified the correct domain. Three children who were taught a texture term used color terms to describe the items and two children who were taught a color term used shape terms to describe the items. All children who were taught a new shape term were able to correctly identify the domain.

As in the group data for the older children, several trends are apparent in the production, comprehension and hyponym task results. For children who were introduced to a new shape word, there is again good evidence that the children are able to quickly learn the new information. Overall, 42% of the children were able to produce the new shape term. Eighty-three percent showed some receptive knowledge and 100% provided proper shape contrasts. None of the children in the color group were able to produce the new color term, 54% were correct in comprehension and 74% were able to provide appropriate color contrasts. In general, the performance of children learning texture terms was poorer relative to children learning novel color or shape terms. The percentage of correct responses were 10%, 50% and 30% for the production, comprehension, and hyponym tasks respectively.

As before, we examined individual patterns in children's responses to the targets in the production, comprehension, and hyponym tasks. As shown in Table 7, six children answered correctly on

Insert Table 7 about here

all three tasks. Five of these children were in the shape condition. Ten children answered two of the three questions correctly, usually failing the production task but passing the comprehension and hyponym tasks. Twelve children answered only one question correctly. Only five of the thirty-three children tested showed no evidence of learning and four of these five children had been taught a new texture term.

Vocabulary Assessment. In general, the children knew most of the color and shape words included in the assessments, but knew fewer texture terms, $F(2, 27) = 18.48$, $p < .001$ (see Table 8 for summary of

Insert Table 8 about here

data). As for the older children, there was a small but significant correlation between proportion correct on the vocabulary assessments and the number correct from the production, comprehension, and hyponym tasks, $r(31) = .51$, $p < .05$, again suggesting that prior familiarity with words in a particular lexical domain may influence fast mapping ability.

Discussion

In the investigation of fast mapping by Carey and Bartlett (1978), the color olive, chosen to be the target word, was very salient as an odd color and many children who had no previous exposure to the word were able to correctly guess when asked to point to the "chromium" one. In order to avoid this in the present studies, target items were randomly selected from a pool of stimuli formed for each domain, so that each child was exposed to different items in the introducing event. The findings of the present work confirm that fast mapping generalizes across items and across several semantic domains.

Also, as discussed previously, the hyponym task used by Carey and Bartlett (1978) was difficult for the children. The present studies used a different hyponym task which required the child to provide a proper contrast for the new word. Using this measure we found that children were quite good at identifying the domain of the new word. For this contrast children saw an example of an object similar to that used in the introducing event. For example, if a child were taught the word "burgundy" using a burgundy-colored paper book, the hyponym task would involve showing the child another book, perhaps a green book, and saying: "See this book? It's not burgundy because it's _______." The similar context, then, may have helped the child decide on the relevant contrast. Thus, a hyponym task in which the context differed from the original might provide a purer measure of word knowledge. Other work, not reported here, includes a hyponym task similar to this. In that study, if a child was taught the word "chartreuse" using a chartreuse-colored book, the hyponym task would involve showing the child a triangle covered with dark brown sandpaper and saying: "See this? It's not chartreuse because it's ------." Results from this modified hyponym task show good performance similar to performance on the hyponym task used in the two studies discussed here (the percentage of children who were able to supply proper contrasts was 91%, 56%, and 75% for the shape, color and texture conditions respectively).

Children who were taught shape words learned more about the new words than children who were taught other words. This superiority of shape is shown clearly in the production data and also in the comprehension and hyponym data, although to a lesser extent. This result is consistent with several other findings. Dockrell (1981), in a study of word learning in young children, found shape to be more strongly favored than color. Other evidence about children's use of shape comes from overextension data on children's early word meanings, where shape is found to be the most common basis for overextension (Clark, 1977). In the present work it is also possible that the superiority of shape could be due to a difference in linguistic form class in the introducing event. The same syntatic framework, "Bring me the x one, not the y one," was used for all three domains, including shape. For the shape terms, children heard. "Bring me the hexagon one, not the triangle one." It may be, however, that the children interpreted the shape terms as category labels for objects rather than as property terms since "triangle" and other familiar shape terms are, in fact nouns. Several recent studies have shown the special status that category labels have for young children. When someone points to an unfamiliar object and provides a new label, children often assume that the new word is a category label for the object (Markman & Hutchinson, 1984, Soja, Carey & Spelke, 1985).

In addition to these possible explanations for the superiority of shape, differences in the structure of the domains may be affecting the fast mapping strategy. Landau and Gleitman (1985) have suggested that adjectives which encode absolute constrast may be less natural as lexical items, and therefore harder for children to acquire, than adjectives which encode relative contrast. Although this may in part account for the difficulty children encountered in learning new texture and color terms, it cannot explain why children are able to learn new shape words so readily, since shape terms also encode absolute contrast.

Another way in which these domains can be distinguished is that the domain of shape is discrete as compared to the domain of color, which is a perceptual continuum. Texture might also be viewed as being continuous (perhap including several different continua) from rough to smooth or from hard to soft. This discrete- continuous distinction could also be seen as a distinction between mutually exclusive and incompatible terms versus terms which are not always mutually exclusive and that show a fuzzy incompatibility (cf. Miller & Johnson-Laird, 1976). The first type is what Miller and Johnson-Laird term "contrastive," that is, terms of this kind are incompatible so that one and only one word in the set can apply to any given particular. For example, an octagon can not be acceptably labeled as a circle.

However, some terms are of the other type -- they are not always mutually exclusive. For example, since colors lie on a perceptual continuum, it is often difficult to isolate the particular range of the continuum which a term denotes. Thus, it is not altogether incorrect to give "turquoise" the label "blue." It is possible that children may be sensitive to differences of this type. For example, in these studies, as in other work (see Dockrell, 1981), children readily overextend known color terms to name a newly encountered color, whereas this did not occur with shapes. Children appeared to be quite comfortable using focal color terms to label non-focal colors but rarely used basic shape terms to label new, unusual shapes.

It is also important to note that the results from both studies suggested that prior familiarity with words in a domain may affect fast mapping. It may be that once children have firmly established a domain, as the children in these studies have for the domains of color and shape, that the assumptions of mutual exclusivity and contrast may be operating more effectively to help the children to analyze the object, eliminate hypotheses, and discover what property the new label refers to. If a domain has not been firmly established, as may be the case for texture, contrastive information may be less useful or perhaps useless if the child does not consider the contrast to be within a domain.

There may be a relationship between the findings from these studies and an observation by Newport (1982). Newport cites examples from the domains of syntax, closed-class morphology, phonology and lexical semantics in support of the view that language learners move from organizing units in an unrelated and independent fashion to organizing them in more rule-governed systems. By performing contrastive analyses across language items, children are able to organize their early individual and relatively unanalyzed units into a paradigmatic system. The parallel to the phenomenon of fast mapping is that when presented with a new word, children act as if it must contrast with words they already know in the same domain. Working with such basic conceptual similarities, the different units can be readily organized into semantic fields which serve to promote the rapid vocabulary growth seen in child language learners.

In conclusion, even though differences exist among the lexical domains tested in the present studies, the basic finding was that children were able to learn something about a new word from each of the domains studied. From only a brief exposure, children can draw rough conclusions about the meaning of a word and thus quickly limit the number of hypotheses to be considered. This partial and perhaps fragile entry can then help guide further hypotheses about the word's meaning without excessive demands on the storage, hypothesis-testing and evaluation capacties of young children.

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Table 1

Unfamiliar Stimulus Items

Color	*Shape*	*Texture*
amaranth*	hexagon	coarse
beige	octagon	fibrous
bice*	oval	fleecy
burgundy	parallelogram	granular
chartreuse	pentagon	nubbly
maroon	rectangle	woven
turquoise	trapezoid	

Note. * indicates that items were renamed. The colors peach and olive were given the color names amaranth and bice respectively because children may be familiar with the foods peach and olive.

Table 2

Familiar Stimulus Items

Color	*Shape*	*Texture*
black	round	fuzzy
blue	square	rough
brown	triangle	smooth
green		soft
orange		
red		
white		
yellow		

Table 3

Percentage of Correct Responses to Target Item by Children

Group	n	Task		
		Production	Comprehension	Hyponym
Color				
males	8	0%	50%	100%
females	9	11.11%	88.89%	100%
totals	17	5.55%	69.44%	100%
Shape				
males	9	33.33%	66.67%	100%
females	9	55.56%	100%	100%
totals	18	44.44%	83.33%	100%
Texture				
males	7	0%	57.14%	57.14%
females	8	12.5%	0%	87.5%
totals	15	6.25%	28.57%	72.32%

Table 4

Patterns in Individual Responses on Target Items

Number Correct	Response Pattern (to Prod., Comp., Hyp.)	Color	Shape	Texture	Total (n = 50)
3	Y - Y - Y	1	8	0	9 (18%)
2	N - Y - Y	11	7	3	21
	Y - N - Y	0	0	1	1 (44%)
1	N - N - Y	5	3	7	15
	N - Y - N	0	0	1	1 (32%)
0	N - N - N	0	0	3	3 (6%)

Table 5

Proportion of Items Correct on Vocabulary Assessments

Group	n	Proportion correct
Color		
males	8	.88
females	9	.95
Shape		
males	9	.92
females	9	.72
Texture		
males	7	.36
females	8	.56

Table 6

Percentage of Correct Responses to Target Item by Children

Group	n	Task		
		Production	Comprehension	Hyponym
Color				
males	5	0%	40%	80%
females	6	0%	67%	67%
totals	11	0%	53.50%	73.50%
Shape				
males	6	50%	83%	100%
females	6	33%	83%	100%
totals	12	41.50%	83%	100%
Texture				
males	5	0%	60%	20%
females	5	20%	40%	40%
totals	10	10%	50%	30%

Table 7

Patterns in Individual Responses on Target Items

Number Correct	Response Pattern (to Prod., Comp., Hyp.)	Color	Shape	Texture	Total (n = 33)
3	Y - Y - Y	0	5	1	6 (18%)
2	N - Y - Y	4	5	1	10 (30%)
1	N - N - Y	4	2	1	7 (21%)
	N - Y - N	2	0	3	5 (15%)
0	N - N - N	1	0	4	5 (15%)

Table 8

Proportion of Items Correct on Vocabulary Assessments

Group	n	Proportion correct
Color		
males	5	.67
females	6	.59
Shape		
males	6	.67
females	6	.92
Texture		
males	5	.25
females	5	.15