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WORD ACQUISITION: THE EFFECT OF PERCEPTUAL AND FUNCTIONAL STIMULUS ATTRIBUTES

Ву

Maria Della Corte

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ABSTRACT

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The purpose of this study was twofold: 1) to examine whether children's early word meaning is based on perceptual features, as stated in Clark's Semantic Feature Hypothesis, or on functional characteristics, as stated in Nelson's Functional Core Hypothesis; to clarify the equivocal results obtained in earlier investigations of these theories. Children, whose mean age was twenty-six months, were asked to play with one object from three categories of unfamiliar objects. The objects within each category were similar to each other either in shape or function. Children were asked to play with each object twice. Based on their order of selection, the objects' salience was assessed. Initial selections presumably based on shape provided a measure of perceptual salience. Functional salience was assessed by the order of selection after becoming acquainted with the object's function. The two sets of rank orders were used to examine whether the objects' perceptual and functional salience influenced name learning and/or the basis upon which the names were generalized to similar objects. After playing with the objects, the children were asked to learn nonsense names for them. The children then were shown

the remaining objects in each category, and were asked whether the names could be extended to any of these objects. Responses were categorized according to object characteristics which children used as the basis of generalization.

The results indicated that saliency was not an influencing variable for name learning or for the basis of generalization. One category name was learned better than the others and females learned all names better than males. Moreover, behavioral indicators of anxiety revealed that children who were less anxious learned the names better. Two sets of objects were generalized more often on the basis of perceptual characteristics for some children and on the basis of functional characteristics for others. This investigation shows that name learning and generalization are not independent of type of object. Although the results tend to favor Clark's position, some aspects of Nelson's theory have not been tested adequately.

To Joe
who makes it all
worthwhile

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CHAPTER I

INTRODUCTION

This study was designed to investigate predictions from two different theories of the development of word meaning in early language acquisition. One theory is Clark's Semantic Feature Hypothesis which states that perceptual characteristics are the basis of meaning. The other theory is Nelson's Functional Core Hypothesis which states that functional characteristics of objects are the basis of meaning. Several studies have been conducted with the aim of obtaining evidence to support either one of these positions. However, these earlier studies have produced conflicting results. Methodological problems and differences in stimuli and procedures make comparisons and generalizations across these studies difficult. The present investigation was an attempt to determine the reasons for the conflicting results of several previous studies as well as resolve some of the methodological problems.

In her Semantic Feature Hypothesis (1973), Clark assumes that the meaning of words can be broken down into smaller components called features. Clark contends that the first semantic features are likely to be derived from perceptual input. When children first use a word, its meaning is based on only one or two general features. Consequently, when a child uses a word, the word will encompass a broader range of referents than an adult's use would. For example, the meaning for "dog" might be based on the feature, "four leggedness". Hence, cats,

horses, cows, etc., might all be called "dog". These inappropriate uses of words have been termed overextensions. Clark obtained evidence for her hypothesis from the nineteenth century diary studies (cited in Clark, 1973). An examination of the overextensions revealed that they were based on shape, movement, size, taste, texture, and sound, with shape being used most often.

There are several problems with Clark's hypothesis, some of which have been recognized by other investigators (Barrett, 1978; Nelson, 1974; Reich, 1976; Thomson and Chapman, 1977). First, it does not account for underextensions which are specific, contextually bound uses of words. For example, one child used "shoe" only for his mother's shoes in the closet and no others (Reich, 1976). If children always started with general features and later added more specific ones, as Clark states, then underextensions would not occur. Second, the basis upon which the overextension was made was inferred by Clark. Not only is it possible that different adults might infer different bases of similarity about a given child's overextensions, but any or all of them might differ from that actually intended by the child. Third, overextensions may not be the most appropriate data base for investigating the development of word meaning. If word meaning proceeded in the manner proposed by Clark, all early words should be overextended. However, Gruendel (1977) and Rescorla (1980) found that less than twenty percent and thirty-four percent, respectively, of the words used by the children were overextensions. Nelson, Rescorla, Gruendel, and Benedict (1978) suggest that children may be commenting on perceived similarities when they overextended words. They are not able to state explicitly "it looks like a "because they are

not yet able to construct sentences. Therefore, if a child calls a slice of grapefruit "moon", he/she may be commenting on the fact that it looks like a moon but may simply not have the productive vocabulary to state it explicitly. Furthermore, Clark's theory does not account for the discrepancy which exists between comprehension and production, i.e., words that are overextended in production are not always overextended in comprehension (Gruendel, 1977; Thomson and Chapman, 1976).

Nelson (1974) criticizes traditional models of concept formation because they are based on the assumption that the child learns meaning from encounters with language rather than from encounters with the physical and social world. In her Functional Core Hypothesis, Nelson argues that as a result of the child's interaction with an object in certain contexts, he/she discovers its function. It is on the basis of this function that a concept is formed. For example, the child's concept of ball might consist of the relations, "it bounces", "rolls under the couch", "Mommy throws it", etc. Hence, a concept is a dynamic set of functions and relationships. According to Nelson, a concept begins to develop on the basis of a single instance and never starts out as a vague, undifferentiated whole. The functional basis for meaning is consistent with the Piagetian notion that objects are not identified in isolation but within a system of possible relationships. Things are considered to be similar if they can be acted on in the same way. Vygotsky (1962) reports that if a child is asked to explain a word, he/she will tell what the object can do or what can be done with it. Werner and Kaplan (1963) also contend that it is through internalized affective-sensory-motor patterns that a child comes to know objects and reflect on them. Nelson argues that a label is used after the

child recognizes that a word consistently is used by others in the context of the already formed concept. To identify new instances of the concept, the child might utilize perceptual characteristics as well as functional ones, especially if the function is not readily apparent. Therefore, concept formation is based on functional characteristics but concept identification can be based on perceptual characteristics. Viewed in these terms, evidence differentiating the two theories would be difficult to obtain. Nelson also suggests that the functional core may vary from child to child since it is based on a child's particular experience with the object. This, in addition to the fact that the process occurs before a label is attached to the concept, makes the hypothesis a very difficult one to test experimentally. Some support for Nelson's hypothesis has been found in observational studies (Gruendel, 1977; Rescorla, 1980) but once again, these involve overextensions and adult inference for the basis of generalization.

In summary, Clark's hypothesis states that early word acquisition begins with a child learning a label for an object. The meaning for that label is based on the object's perceptual characteristics. In contrast, Nelson argues that a child develops a concept on the basis of an object's function while perceptual characteristics are used to identify new instances of the concept.

Investigating the basis of early word meaning is complicated by the fact that, in reality, perceptual and functional characteristics are usually correlated. Anglin (1979) found that overextensions occurred for perceptually similar objects but found it difficult to separate form and function. Recognizing this problem, Gentner (1978) used novel objects in which form and function could be separated. The

stimuli consisted of the following: a) a jiggy - a box with a face whose eyes and nose moved up and down when a lever was pulled; b) a zimbo - a gumball machine containing jellybeans that were dispensed from the machine by moving a lever; c) a hybrid object which looked like the jiggy but produced jellybeans like the zimbo. Subjects ranging in age from 2½ years to adulthood were shown the objects. allowed to manipulate them and were told their names. They were then shown the hybrid. After manipulating it, they were asked what it should be called. Younger children and adults used the name based on form (jiqqy) while the middle age group (9-15 years) used the name based on function (zimbo). Gentner presented this as evidence against Nelson's theory, although that type of age related response pattern is not predicted by either theory. It could be argued that the concept might have been learned on the basis of function and that the testing situation concerned identification of an object, in which case form would be an important factor. However, this does not explain why the older children's identifications still were based on function. It is interesting to note that informal observations revealed that the young children learned the name of the zimbo faster and displayed more interest in it. One methodological problem with Gentner's study is that the objects were not counterbalanced. Furthermore, even though both toys had novel names, the gumball machine was probably familiar to the children and this may have affected the results.

In contrast to Gentner's results, Casby (1979) found that individuals did not generalize on the basis of form, regardless of age. He used wind-up toys covered with papier maché each of which was given a nonsense name. Subjects ranging in age from two years to adulthood

were presented with an object which performed a certain action and were told its name. Two additional objects were presented. One object was similar in form to the target object but performed no action while the other object was different in form but performed the same action. The subjects' task was to match the target object. Casby obtained a significantly greater number of responses based on action for all age groups. Since objects that performed actions could be considered more "salient," an additional group of children (7 years) participated in an experiment in which the shared-form object also performed an action but one that was different from the target object. The results were the same, i.e., they matched the object according to the action of the target, regardless of form. It is conceivable, however, that not all age groups would have responded in the same manner.

Using still another approach, Tomikawa and Dodd (1980) presented preschoolers (2 to 4 years) with a sorting task involving nine wooden toys of various geometric shapes and functions (e.g., rectangular toy with an open-close hinge). Following the demonstration of each object's function, the children were allowed to manipulate the toy themselves. The test situation consisted of the presentation of two of the toys which were different in form and function. After each was demonstrated by the experimenter and manipulated by the children, each toy was placed on opposite ends of a cookie sheet. Two additional objects, which were either similar in form or function to the ones on the cookie sheet, were presented in the same manner. The child was then told to find the same toy and place it at the appropriate end of the cookie sheet. The results indicated that the children made more perceptual

than functional groupings. Since cartoon decals had been attached to the toys, Tomikawa and Dodd suggested that the results may have been biased perceptually. However, a second experiment in which the decals were removed yielded the same results. Recognizing that a sorting task may be indirectly related to the acquisition of word meaning. the authors performed another experiment in which the toys were given nonsense names and made characters in a story. The training trials consisted of the children listening to a story about the wooden toys during which their functions were demonstrated. Two conditions were used. In the perceptual condition, toys which looked alike had the same name and in the functional condition, toys which functioned alike had the same name. The children's task during the test trials was to point to the correct toy after being given its nonsense name. Criterion was considered to have been met when the children could correctly name all three toys in a set in six test trials or less. More children in the perceptual condition met criterion than in the functional condition. There were also significantly more errors made in the functional condition. In a final experiment, Tomikawa and Dodd investigated whether familiar objects would elicit the same type of responses. Artificial and real fruit were used in the same sorting task as the earlier experiments. The children were given pieces of the real fruit to eat and were shown that the artificial fruit could not be eaten. Grouping according to whether the fruit was real or artificial would indicate a functional base while grouping according to the type of fruit (apples, oranges, etc.) would indicate a perceptual base. Once again, the children sorted the objects on a perceptual basis.

The results appear to support Clark's position but there are some methodological problems with the study. First, the authors may have intended that the objects be comparable in functional and perceptual saliency but that was never verified objectively from the children's point of view. Furthermore, the term saliency is not defined. Second, it appears that the same experimenter was used in all the experiments. If she was not blind to the hypotheses, this could have biased the results. Third, the children's ages ranged from 2 to 4 years. Since it is not clear whether all ages were equally represented in each of the conditions, the results could have been influenced by a particular age group. Fourth, although the toys' functions were demonstrated during the third experiment, the children did not handle the toys themselves as was true of the previous two experiments. Fifth, the authors state that instructions for the experiment involving the real and artificial fruit were the same as the first two experiments, i.e., "Find the same toy. Put them together." Assuming that "fruit" was substituted for "toy," the groupings for the fruit could have been influenced to a greater extent by these instructions than the nonsense objects. Children's experience with fruit may have determined which kinds of fruit are the "same." Furthermore, the artificial fruit did not have a function in the same sense as the nonsense objects. Children were shown what the nonsense objects could do whereas they had to be shown what the artificial fruit could not do (could not be eaten).

The above studies may have obtained conflicting results as a consequence of the variation in the stimuli which were used. The role of the object's salience in the word acquisition process has

been commented on by many investigators (e.g., Anglin, 1979; Bowerman, 1978; Casby, 1979; Nelson, 1973; Tomikawa and Dodd, 1980). However, what is meant by the term, saliency, is often left to one's imagination. In her report of children's early vocabulary, Nelson (1973) provides some elucidation through her observations that salient objects seemed to be those which serve the child's basic needs, such as food, and those which move or change. Since each study used different objects, the role of saliency could not be assessed. It is possible that the conflicting results were due partly to variations in the saliency of the objects across studies. For example, a hinge (Tomikawa and Dodd, 1980) might have been less salient than a mechanical toy that moved on its own (Casby, 1979), resulting in the child's attributing names on different bases. Greenberg and Kuczaj (1982) argue that one reason previous investigations have failed to resolve the form-function controversy is due to the lack of a measurement equating the distance between the saliencies of particular forms and functions.

Another difference among the stimuli is their designated function. Some require manipulation by the child (Gentner, 1978; Tomikawa and Dodd, 1980) while others seemed to function autonomously (Casby, 1979). In reality, an object's function may or may not be an action (e.g., the function of a chair is to be sat on; the chair performs no action on its own). Consequently, variation in conspicuousness of function may influence the child's response. Finally, in the studies mentioned, the children were constrained to respond on either a perceptual or functional basis.

In the present investigation, saliency was operationally defined as children's demonstrated preferences for the objects as indexed by

their order of selection. Each stimulus type received both a perceptual and functional saliency rank. Perceptual saliency ranks were derived from children's initial selections which were based on the object's appearance. After the children had the opportunity to play with the objects, functional saliency ranks were determined by their second round of object selections. These ranks were used to determine whether perceptual or functional saliency influence both the acquisition of object names and the way in which children generalize to new instances of an object category. Furthermore, the present study was conducted in a less structured fashion in order to provide the child with the opportunity to respond in a variety of ways.

The purpose of the present investigation was to examine the role of saliency in name learning and generalization. If children learned and/or generalized names based on perceptually or functionally salient characteristics, then neither Clark's nor Nelson's theories adequately explain these processes. Moreover, if the stimulus objects differ in saliency, then the inconsistent results obtained to date might be due to the differences in object saliency. Therefore, the following hypotheses were tested:

- 1. Objects from previous studies vary in terms of their perceptual and functional saliency as indexed by the children's order of selection.
- 2. Perceptual and functional saliency of objects will influence the acquisition of names.
- 3. Perceptual and functional saliency of objects will influence the basis for generalizing to new instances of an object category.

CHAPTER II

METHOD

The experiment can be divided into three phases. In the first phase, the degree of saliency for nonsense objects was assessed by the child's selection of the objects before and after interacting with them. In the second phase, the child was asked to learn nonsense names for some of the objects. The third phase was an examination of the basis upon which the child generalizes to similar objects varying in form and function.

Subjects and Experimenters

Twenty males and twenty-one females, ranging in age from 23 to 31 months with a mean of 25.66 and a standard deviation of 1.78, participated in the study. Twenty-one of the subjects were first born children and twenty were second born. The families were middle class and lived in the East Lansing, Okemos, Haslett, and Meridian township areas. Potential subject names were obtained from birth records and were solicited through letters sent to their homes. Three of the subjects were solicited from the university day care center. Five additional children (3 from homes, 2 from the day care center) either started the experiment and refused to continue or refused to start at all. They were excluded from the study.

One principal experimenter interacted with the children while observations were made by two other individuals who were blind to the

questions being investigated. The observers were provided with a checklist on which they recorded the children's responses.

Setting and Materials

The experiment took place either at the day care center (for the three children who attended) or at the child's home (for the remaining thirty-eight). The mother was present in most instances and both mother and father were present in three instances. Parents were allowed to observe but not interact with their child during the procedures.

Three types of objects, modeled after those used in the studies of Gentner, 1978; Casby, 1979; and Tomikawa and Dodd, 1980, were used. The objects from these studies were chosen because they provide variation in perceptual and functional characteristics and enabled comparisons to be made across studies. Gentner's stimuli (Type A) have noticeable perceptual properties and require manipulation by the child before their function is realized. Casby's stimuli (Type B) have geometric-like shapes and move in interesting ways seemingly on their own. Tomikawa and Dodd's stimuli (Type C) consisted of geometric shapes and have rather obscure functions.

The toys used in the present investigation are described below:

Type A:

1) A white box with a pink and blue dog-like face on the (marble front. The dog's ears and mouth moved up and down via a lever. 2) A white box with a stationary pink and blue dog-like face mounted on the front. Marbles, contained inside the box and not visible, were dispensed through a hole via a lever. 3) A white box with a blue airplane shape mounted on the front. The airplane moved up and down via a lever. The box also had a transparent bowl

on top containing different colored, medium sized marbles, but the marbles remained in the bowl. 4) A white box with a stationary, blue airplane mounted on the front. There also was a transparent bowl on top containing different colored, medium sized marbles which were dispensed through a hole via a lever.

The dimensions of the four boxes were each 10" x 8" x 8".

Type B:
(windup toys)

1) A wind-up toy that walked, covered with a white papier maché cylinder. 2) A wind-up toy that hopped, covered with a white papier maché cylinder. 3) A wind-up toy that walked, covered with a white papier maché cone. 4) A wind-up toy that hopped, covered with a white papier maché cone.

The wind-up toys were 2½" tall.

Type C: (hinge/ magnet toys) 1) A three inch, red, square piece of wood with an open-close hinge. 2) A three inch, red, square piece of wood with a magnet glued to one side. A 10" x 4" piece of metal was presented with this object. 3) A red, three inch diameter circle made of wood with an open-close hinge. 4) A red, three inch diameter circle made of wood with a magnet glued to one side.

The same piece of metal was presented with this object.

Anxiety scale. It is conceivable that during the generalization task (see Procedure, Phase 3 for details) some children might not respond at all. Although a lack of response could be caused by any one of a variety of factors, it was not possible to examine all possible causes. Since the children were faced with three strangers in an

unfamiliar situation, anxiety seemed a likely reason for response inhibition. Anxiety was operationally defined as those behavioral indicators designated by the Preschool Observation Scale of Anxiety (Glennon and Weisz, 1978). This particular scale was chosen since it appears to be the only one available designed for preschoolers. Glennon and Weisz assessed the validity of the instrument by comparing the scores with teachers' and parents' inventory ratings of children's anxiety. Significant positive correlations were obtained. Moreover, children's scores on the scale were high in a session expected to provoke high anxiety (mother absent) than in a session expected to provoke minimal anxiety (mother present). Interrater reliability also produced a significant correlation coefficient, .78, for total scores. The scale consists of thirty items and the total score is calculated by the number of 30 second intervals in which any of the behaviors occurred. The method of computing anxiety scores for the purpose of the present experiment was modified since it was not feasible to divide the session into 30 second intervals. Furthermore, expressions of anxiety were not critical to the central aims of the study. The anxiety score for each subject was derived from the total number of different anxiety indicators recorded by both observers. Each indicator was counted only once. (See Appendix for scale items.)

Procedure

Four observers, three females and one male, were trained to record the children's toy selection, play time, anxiety indicators, and verbalizations. Two observers were present during twenty-seven of the forty-one experimental sessions. One observer was present at the remaining fourteen sessions. It was not possible to have two observers

present at all sessions due to scheduling difficulties. Although interrater reliability for the anxiety scale was only .55, the correlations for the measures most relevant to the study ranged from .87 to 1.00 (see Results), therefore, only one observer was deemed sufficient for the remaining sessions. Reliability for order of selection and play time was high initially so little formal training was necessary with regard to these variables. The observers received practice recording the responses with pilot subjects. Moreover, discussions with the author prior to the present investigation clarified procedures for possible ambiguous responses. The anxiety scale was memorized by the observers and any instances of anxiety were recorded on the same sheet as the other responses.

The experimenter and the two observers played with the child until he/she seemed comfortable with them (e.g., played with the experimenters, verbalized, expressed interest in looking at the toys, etc.). Also during this time, the investigators, the mother, and the child played a game in which the child pointed to each person named in response to a song that proceeded as follows: "Where, oh where, oh where is (person's name)?" The reason for this game was to familiarize the child with this song since it was going to be used to assess comprehension of the object names later in the experiment, and in addition, to confirm that the child understood that he/she was expected to point to objects in response to their name. However, some children disliked this game and, therefore, it was not used with them. (Unfortunately, the exact number is not known since this took place before the observers began recording responses.) For children who would not respond to the song, the experimenter simply named the people in the room and asked the child

to point to them. All the children demonstrated they could point to a person or object when asked.

<u>Phase 1</u>. The purpose of this phase was to obtain two measures of saliency, one perceptual and one functional, as indexed by the child's order of selection of the objects. The length of time the children played with each object was also recorded.

After the familiarization procedures were completed, the child was taken out of the room and the experimenters set up the objects. When the child reentered the room, all objects were hidden except for three, one from each object type (see setting and materials for description). Since it was not feasible to expose the child to all possible combinations across types, each child was shown one set which consisted of three objects, one from each type, randomly selected. The placement of objects in a set was randomly assigned for each subject in order to eliminate position effects. If the child did not spontaneously begin playing with one of the toys the experimenter asked the child which toy he/she would like to play with first. The selection and the length of time (up to a maximum of two minutes) the child played with the toy was recorded by the observers. Based on the assumption that the children's initial round of choices represented the objects' perceptual salience, a child's first, second, and third selections were assigned perceptual saliency ranks 1, 2, and 3. Once children had played with the objects, their choices should be influenced by the saliency of what the objects do, so the rankings of functional saliency were determined by asking the child to indicate which toy he/she would like to play with again. The child was allowed to play with the toy that was selected and the procedure was repeated for the two remaining toys. The toys were then ranked 1, 2, and 3 for a second time.

Phase 2. In this phase, the child was asked to learn nonsense
names for the three objects with which he/she had been playing. The
experimenter named each object as follows: "This is called a_____.
See, the _____looks like this and does this. This is a _____."
The names of the three objects were counterbalanced resulting in six
sets of names. The order of presentation of the sets was determined
randomly for each child. Comprehension of the names was assessed by
asking the child to point to the object when given its name. The song
("Where, oh where," etc.) described earlier was used only with three
children since most children seemed to become bored with it. The
children were asked simply, "Where's the _____? Can you point to it?"
If the child made an incorrect response, the experimenter said, "No,
this one is the _____ " and then proceeded to ask for the next name.
When the child made a correct response, he/she was praised (e.g.,
"Very good, that's right.").

Phase 3. In this phase the child was asked to select similar objects to the ones that were named but that varied perceptually or functionally. The three remaining objects from one of the object types was shown to the child. (The order of presentation of types and objects within types was distributed randomly across subjects.) Each was demonstrated by the experimenter and given to the child to play with. The experimenter then asked the child "Are there any ______ here? Can you find any _____? Can you point? There were several possible responses which the child could make. He/she could select a toy that was similar in function, in form, one that was dissimilar in both respects, or any combination of these. For example, if the child was presented with a square hinge, he/she could select a round

hinge (function) or a square magnet (form) or a round magnet (no similarity). The child also could select both a square magnet and a round hinge (form and function) which might imply that the child recognized the two separate similarities. However, the child might select no toy in which case at least two inferences might be made, i.e., there was an inhibition of response for some reason (e.g., anxiety) or the child did not recognize either of the similarities. In order to distinguish between these two responses, behavioral indicators of anxiety were recorded throughout the experiment. If the child picked all three objects or any combination of objects that included the object which was dissimilar to the object that was named, several interpretations might be proposed, one being that the child simply did not understand the task. Therefore, the child's responses were classified in one of six categories: a) perceptually similar; b) functionally similar; c) perceptually and functionally similar; d) no similarity; e) verbal response specifying no similar toy; and f) no response.

Mean Length of Utterance (MLU). In order to determine whether the children's stage of language development was related to performance on any of the tasks, MLU was calculated for each child. When the procedures described above were completed, the child was allowed to play with any of the toys. During this time, the observers recorded the child's verbalizations until fifty utterances were obtained. Thirty-two of the forty-one children were used in this analysis since a minimum of fifty utterances could not be obtained for the remaining children due to lack of spontaneous as well as prompted utterances.

MLU was defined as the mean number of morphemes per utterance. The rules specified in Dale (1976) for designating morphemes were followed.

CHAPTER III

RESULTS

Interrater reliability was assessed for order of selection of objects, time played with objects, comprehension of object names, classification of responses for generalizing to new instances of a category, anxiety indicators, and Mean Length of Utterance (MLU). There was 100 percent agreement for the order in which the children selected the objects during the first and second play periods. Pearson correlation coefficients for the length of time the children played with the toys were .99 for the first play period and .98 for the second. The average time recorded by the two observers was used in the data analyses. The interrater reliability for comprehension of object names and MLU as measured by Pearsonian correlation was .98 and .87, respectively. Once again, the average score was used in the analyses. The reliability for responses concerned with generalizing to new instances of a category was obtained by percentage agreement. The agreement was 89 percent for the marble toys (M), 96 percent for the wind-up toys (Wp), and 93 percent for the hinge/ magnet toys (H/M). When the observers disagreed, the classification of the response was determined by a coin toss. The interrater reliability, as measured by Pearsonian correlation, for the number of anxiety indicators observed was .55. With respect to type of indicator, percentage agreement between observers for each session also was calculated. Agreement ranged from 0 to 100 percent with a mean

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of 49 percent. Possible reasons for the low reliability are: a) it was difficult for the observers to record the anxiety indicators along with several other responses; b) since the children tended to move around a lot, both observers did not always have an equally good vantage point to view the children's behavior (e.g., if the child turned his/her face, only one observer may have been able to see a grimace that was made). Consequently, the anxiety score used in the analyses was the total number of different anxiety indicators recorded by both observers.

The analyses concerned with the hypotheses being tested will be discussed first.

The objects vary in terms of their perceptual and functional saliency as indexed by the order in which they were selected. This hypothesis was supported by the data which indicate that the objects differed in terms of the children's preferences for them. A Friedman two-way analysis of variance performed on the order in which the children selected the objects during the first play period (perceptual saliency) was significant ($x_r^2 = 35.17$, 2, p < .001). The same analysis performed on the order of selection during the second play period (functional saliency) also was significant ($x_r^2 = 26.39$, 2, p < .001). Table 1 presents the frequencies with which each of the object types were selected for each play period. The marble toys were selected first most often, and these also were the toys the children most frequently wished to play with when given the opportunity to play with any toy they chose. However, the order of selection during the first play period did not differ from that of the second play period as indicated by the McNemar test for significance of changes (M: $x^2 = 2.58$, 1,

Table 1
Frequencies for the Order of Selection for Each Type of Object
During the First and Second Play Period

-	First	t Play Peri	od	Second Play Period Rank Order					
		Rank Orde	er						
Object	1	2	3	1	2	3			
Marble	32	6	3	26	10	5			
Wind-Up	8	20	13	13	18	8			
Hinge/Magnet	1	15	25	2	11	26			

p > .05; Wp: $x^2 = 2.28$, 1, p > .05; H/M: $x^2 = .34$, 1, p > .05), which would indicate that becoming acquainted with the toys' function did not affect the children's initial selection. Perhaps they inferred the function before they actually saw what the toy did, or perhaps, interesting perceptual characteristics are highly correlated with interesting functional ones, at least in these stimuli.

H2. Perceptual and functional saliency will influence the acquisition of object names. This hypothesis was not supported. To determine whether saliency influenced how well the children learned the names, the rank orders were divided into two groups, high rank versus low rank. The high rank group consisted of those subjects who selected an object first. The low rank group consisted of those subjects who selected the object second or third. A t-test was then performed on these two groups in order to compare how well each group learned the object names. Very few children selected the hinge and magnet toys first (one subject during the first play period and two during the second); therefore, the high rank group for these toys consisted of those subjects who selected them second while the low rank group consisted of those subjects who selected them third.

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A significance difference between children at different selection ranks was obtained (t=2.72, 39, p < .01) for the marble toys during the first play period. Those who selected the toy first learned the name for that toy better than those who selected it second or third. This would suggest that perceptual saliency was important for learning the name for this toy. On the other hand, comparison of the high and low ranks for the wind-up toys indicated that those children who selected the toy second or third during the second play period learned the name for the toy better (t=-2.0, 39, p < .05). The reason for these results are unclear. If functional saliency was a factor, one would expect that children who selected the wind-up toy first during the second play period would have learned the name better, rather than those who selected it second or third. No significant differences were found for the hinges and magnets.

H3. Perceptual and functional saliency will influence the basis for generalizing to new instances of an object category. Before discussing the data pertaining to this hypothesis, some preliminary information is required. Table 2 shows the frequency with which the children responded in each of the categories. As indicated, the responses differed depending on the type of object. With regard to perceptual and functional similarity, the marble toys and the hinges and magnets were generalized most often on a perceptual basis while the wind-up toys were generalized on a perceptual basis by some children and a functional basis by others. To examine these differences, the Cochran Q test for matched samples was used to compare the frequency of responses in the perceptual similarity category and the functional similarity category across objects. Responses based on perceptual

Table 2

Frequency of Responses in Each of the Categories of Generalization to Similar Objects: Perceptual Similarity (P), Functional Similarity (F), Verbal "No" Response (N), Both Perceptual and Functional Similarity (P & F), Neither Perceptual Nor Functional Similarity (NS),

No Response (NR)

0bject	Response Category						
	P	F	N	P&F	NS	NR	
Marble	17	3	5	0	7	9	
Wind-Up	14	11	2	1	6	7	
Hinge/Magnet	13	4	10	0	7	7	

similarity did not differ significantly across objects (Q = 1.13, 2, p > .05). However, responses based on functional similarity did differ significantly (Q = 6.71, 2, p < .05), with children responding on the basis of functional similarity more frequently for the wind-up toy than the other two toys. Although the index of saliency used in this investigation would indicate that the wind-up toy was not the most functionally salient toy, this analysis suggests that, in some way, the function of the wind-up toy influenced children's responses to a greater extent than the function of the other two toys.

To test whether the frequencies of each response for each object type were random or differed in some systematic way, a chi square goodness of fit test was performed. Response frequencies in each of the categories (perceptual similarity, functional similarity, perceptual and functional similarity, no similarity, verbal response specifying no similar toy, and no response) were compared with an expected frequency. Three separate tests were performed, one for each object type. A significant difference was found for the marble toys ($x^2 = 25.3$, 5, p < .001),

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for the wind-up toys ($x^2 = 17.51$, 5, p < .01), and for the hinges and magnets ($x^2 = 15.04$, 5, p < .02), indicating that the distribution of responses was not random.

Considering just the responses based on perceptual similarity and functional similarity, since these were the responses of primary interest, a significantly greater number of responses based on perceptual similarity were made for the marble toys ($x^2 = 9.8$, 1, p < .01), and for the hinges and magnets ($x^2 = 4.76$, 1, p < .05). No significant difference was found for the wind-up toys ($x^2 = .36$, 1, p > .05). These analyses indicate that although the basis of generalization depended on the type of toy, generalization was more often based on perceptual than functional similarity for two of the object types.

The main reason for including the anxiety scale was for the purpose of differentiating between children who did not respond at all and those who gave a verbal "no" response. However, when behavioral anxiety indicators for these two groups were compared, there was no difference (M: t = -2.03, 12, p > .05; Wp: t = -.14, 7, p > .05; H/M: t = -.69, 15, p > .05).

In order to determine whether the saliency rankings (order of selection) influenced the basis for generalizing to new instances of an object category, the chi square goodness of fit test was performed on the frequency in each response category in relation to the order in which the toy was selected. For example, eighteen children selected the marble toy based on perceptual similarity during the first play period. Of these eighteen, fifteen children had selected the toy first, three had selected it second, and none had selected it third. These three frequencies were compared using the chi square test in which the actual

frequencies are compared with an expected frequency. In this example, the expected frequency was six. Table 3 presents actual frequencies and chi-squares for each response category. (The response category which was defined as the selection of two toys, one based on perceptual similarity and one based on functional similarity, was eliminated from the analysis since it occurred only once.) The marble toys and the hinges and magnets produced significant differences for perceptual similarity (M: $x^2 = 18.19$, 2, p < .001; H/M: $x^2 = 6.62$, 2, p < .05). This indicates that the marble toys were generalized most often on the basis of perception when they were selected first. However, the hinges and magnets also were generalized on the basis of perception but unlike the marble toys, this occurred when they were selected second and third. Since it was assumed that selecting a toy second or third during the first play period indicated that the toy was less perceptually salient than one selected first, it would appear that perceptual saliency did not affect the basis of generalization. Significant differences also were found for other response categories during the first play period and for several response categories during the second play period (Table 3), but most could not be related to perceptual or functional saliency (order of selection). Therefore, the third hypothesis was not supported.

Summarizing thus far, it seems that the objects differed in terms of the children's preferences for them. However, the order of selection during the first play period assumed to be an indication of perceptual saliency, and the order of selection during the second play period assumed to be an indication of functional saliency were the same. Whatever attracted the children to the toys did so right from the

Table 3

Actual Frequencies and Chi Squares for Type of Responses When Children Were Asked to Generalize to Similar Objects in Relation to the Order in Which Each Object Type Was Selected During the First and Second Play Periods

Object_	Response	First	Play Pe	riod		Seco	nd Play	Period		
		Frequencies		Frequencies						
		Order	of Sel	ection		Order of Selection				
		1	2	3	x ²	1	2	3	x ²	
	Р	15	3	0	18.19****	11	5	1	8.51**	
	F	2	1	0	1.50	3	0	0	3.33	
M	N	5	0	0	9.98***	4	0	1	5.19	
	NS	5	0	1	6.15*	5	0	1	6.15*	
	NR	5	2	2	1.99	3	4	2	0.66	
	Р	4	5	5	0.14	5	8	1	5.27	
	F	1	5	5	2.86	5	4	2	1.27	
Wp	N	0	1	1	0.99	1	1	0	0.99	
	NS	1	3	2	1.00	0	5	1	7.00*	
	NR	1	6	0	8.87**	1	2	4	2.01	
·····	Р	0	6	7	6.62*	0	4	9	9.40***	
	F	0	1	3	3.51	1	1	2	0.50	
H/M	N	0	4	6	5.60	0	3	7	7.40*	
	NS	0	2	5	5.44	0	3	4	3.72	
	NR	1	2	4	2.01	1	2	4	2.01	

^{*} p < .05

^{**} p < .02

^{***} p < .01

^{****} p < .001
P: perceptual similarity; F: functional similarity; N: verbal "no" response; NS: neither perceptual nor functional similarity; NR: no response.

start and for the most part, this did not change after playing with the toy. The orders in which the toys were selected were associated with learning the names for the toys, but this association differed depending on the type of toy. Furthermore, the basis of generalization differed as a result of type of toy, but not as a result of the order in which the toys were selected.

Post-hoc Analyses

Several other questions of interest can be addressed from these data.

Object names. Did the children learn the names for certain objects better than others? Children were asked to point to the correct toy when given its name. This was done six times for each toy.

Therefore, a perfect score for all three toys would be eighteen. Table 4 shows the means and standard deviations for the number of correct responses for each type of object. A two-way ANOVA involving repeated measures was performed on the accuracy of learning the names for the three types of objects. Sex was a between groups factor and type of object was a within subject factor. Significant main effects were

Table 4

Means and Standard Deviations for the Number of Correct Names
Learned for Each Type of Object for Males and Females

	Marble		Wind-Up		Hinge/	Magnet
Sex	X	S	X	S	Σ.	S
M	2.13	1.67	4.03	1.41	1.93	1.05
F	3.45	1.16	4.57	1.54	3.07	1.96
Total	2.80	1.75	4.30	1.48	2.51	1.67

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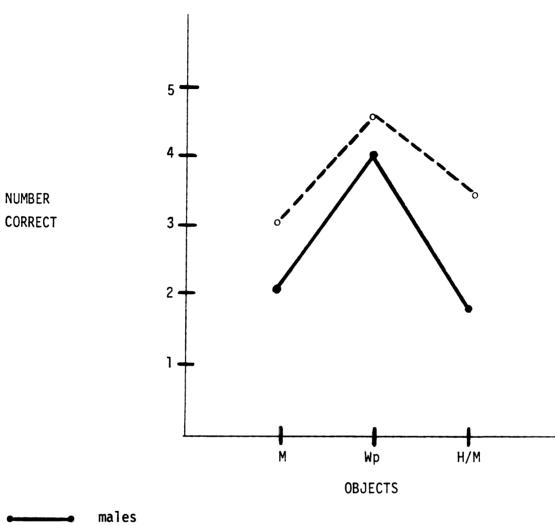
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obtained for sex of subject and type of object, F(1, 39) = 8.39, p < .006; F(2, 78) = 20.84, p < .000. There was no significant interaction. As shown in Figure 1, the name for the wind-up toy was learned the best and females performed better overall.

The names for each of the types of toys were not randomly assigned for each subject, and therefore, the name is confounded with the type of toy. One possible explanation for better performance for the wind-up toy is that the nonsense name for this toy had a high association value with a real name, and consequently, was easier to learn. All the nonsense names used were considered to have low association value according to Hilgard (1951). However, the association explanation cannot be dismissed completely since the associative norms were obtained for adults and may not be applicable for children. The possibility of phonological biases can be discounted since Leonard, Schwartz, Folger, Newhoff, and Wilcox (1979) found that subjects showed the same tendency to imitate a nonsense word that contained phonemes that were not produced spontaneously as those that contained phonemes that were produced spontaneously. Moreover, the nonsense words in the present study that produced the most correct responses, wug (/waq/), contained phonemes that are often produced later in development than the nonsense words that produced fewer correct responses, mep $(/m\epsilon\rho/)$, and zib $(/z \pm b/)$. In a follow-up study intended to determine whether learning the name for the wind-up toy was due to the name itself or some aspect of the toy, the names were randomly assigned (Della Corte, in progress).

Since age was found to be correlated with the accuracy of learning the names (r = .38, 39, p < .02), an ANCOVA was performed using age as



males

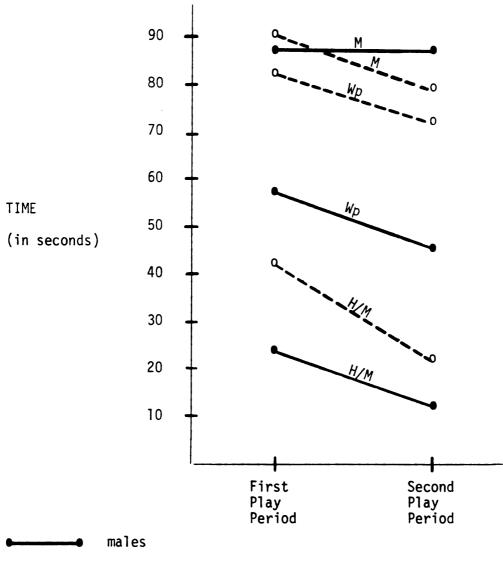
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Figure 1. Mean Number of Correct Name Responses for Each Object for Males and Females

the covariate. Males and females still differed on how well they learned the names even when age was taken into account, F(1, 39) = 6.06, p < .02.

<u>Play time</u>. Since the order in which the children selected the objects did not influence name learning or generalization, the length of time the children played with the objects was examined with respect to these variables. Using a 2 (sex) x 3 (type of object) x 2 (play period) ANOVA, significant main effects were found for sex of subject, F(1, 39) = 6.15, p < .03, type of object, F(2, 78) = 36.93, p < .000, and play period, F(1, 39) = 5.17, p < .03. No significant interactions were found. Females played with the objects longer, and children played with the marble toys the longest, the wind-up toys next, and the hinges and magnets least (Figure 2). Means and standard deviations are presented in Table 5. Children played with the objects longer during the first play period. This reduction in play time may have been due to a novelty effect.

When length of play time was examined depending on the order in which the object was selected, a simple one-way ANOVA revealed significant differences for all three types of objects (M: F (2, 78) = 7.05, p < .01; Wp: F (2, 78) = 5.46, p < .01; H/M: F (2, 78) = 5.33, p < .01) during the second play period. For the marble toy, paired comparisons using the Duncan test showed significant differences in play time between those children who selected this toy first and those who selected it second, with the children who selected the toy first playing with it for a longer period of time. Similarly, those children who selected the marble toy first played with it significantly longer than those who selected it third. Unexpectedly, the children who selected the marble



females

Mean Play Time (In Seconds) During First and Second Play Periods for Each Type of Object for Males and Females. Figure 2.

Means and Standard Deviations for Length of Play Time (in Seconds) During the First and Second Play Periods for Males and Females for Each Type of Toy Table 5

Second Play Period	Wp H/M	S X S	.13 24.28 27.72 86.51 41.54 43.73 43.47 13.41 13.70	.03 41.69 31.96 77.21 43.84 69.74 42.65 20.76 31.44	.64 33.20 30.88 81.75 42.46 57.05 44.50 17.17 24.44
Second	Σ	X s X	5.51 41.54 43.	7.21 43.84 69.	.75 42.46 57
	H/M	χ	4.28 27.72 86	77 96.18 69.1	3.20 30.88 81
First Play Period	Μp	X s	55.45 40.13 24	37	40
	Σ	X s	86.55 45.94	86.52 36.40 83.48	86.54 40.80 69.80
Sex			Σ	Ľ.	-

toy third played with it longer than those who selected it second. The reason for this may be due to the fact that sometimes the lever on this toy was difficult for the children to press, and consequently, they would discontinue trying to make the toy work. Eventually, the children were able to press the lever and when this was accomplished they enjoyed playing with the toy. Perhaps these children were the ones to select the toy last during the first play period. However, when they finally were able to operate the toy, they played with it for a greater period of time. Unfortunately, the observation concerning the children's difficulty in operating the toy was not systematically recorded. Therefore, this explanation must be viewed as speculation since it cannot be confirmed at this time.

Paired comparisons for the wind-up toy revealed that children who selected this toy first played with it significantly longer than those who selected it third, and those who selected it second played with it significantly longer than those who selected it third. Unlike the marble toy, no significant differences were found between children who selected the wind-up toy first and those who selected it second. For the hinges and magnets, a significant difference was found between children who selected these first and those who selected them third with the former playing significantly longer. There also was a significant difference between children who selected the hinges and magnets first and those who selected them second with those who selected them first playing with them longer. No significant differences were found for children who selected the hinges and magnets second and those who selected them third.

To examine whether the length of time that children played with a particular toy had any effect on how well they learned the name for that toy, a 2 (sex) x 3 (type of object) ANCOVA was performed with play time as a covariate. Play time had no effect on how well the children learned the names for the objects.

To investigate whether the length of play time affected the basis of generalization, the play time of children who generalized on the basis of perceptual similarity was compared with those who generalized on the basis of functional similarity. Only the marble toy produced significant differences for both the first play period (t = -2.88, 18, p < .01), and the second play period (t = -4.56, 18, p < .001). The children who played with this toy longer tended to generalize on the basis of function. These results must be viewed with caution since the number of children comprising the group who generalized on the basis of function was very small while the group who generalized on the basis of perception was large. Play time may have an effect on generalization whereas the order in which the toy was selected did not.

Anxiety. Anxiety scores as measured by the total number of anxiety indicators recorded by both observers ranged from 0 to 9 with a mean of 3.83 and a standard deviation of 2.52. To examine whether anxiety was related to children's performance in learning the object names, the anxiety scores were correlated with how well they learned the object names. A Pearson correlation coefficient was significant (r = -.36, 39, p < .05). Children who were less anxious learned the names better.

To explore whether anxiety had any effect on the responses children made during the third phase (generalizing to new instances of an object category) of the experiment, their responses were grouped

according to how "responsive" they were, i.e., to what extent did they comply with the investigator's request to select an object. Since anxiety can have a disorganizing effect on behavior, children who did not make a selection may have been more anxious than children who did. To investigate this possibility, children who made some kind of selection response regardless of whether the object chosen was similar to the one that was named were considered most responsive and given a score of 1. Those who verbally replied there was no object that was similar were given a score of 2. Those who gave no response at all were considered least responsive and were given a score of 3. When these scores were correlated with the anxiety scores for each type of object, the marble and wind-up toys produced significant correlation coefficients of .38 (p < .02) and .41 (p < .01), respectively, indicating that the children who were more anxious were the least responsive. Similarly, a single factor ANOVA comparing the three responsiveness groups on anxiety also revealed significant differences for the same two object types (M: F(2, 78) = 3.49, p < .05; Wp: F(2, 78) = 3.98, p < .05). Paired comparisons using the Duncan test showed that for the marble toy, children who gave no response displayed significantly more anxiety than children who gave some kind of response. Children who gave no response also were significantly more anxious than the children who verbally replied that no object was similar. No significant difference in anxiety was found for children who verbally responded that no object was similar and the children who made some kind of selection. For the wind-up toy, children who verbally responded that no object was similar were significantly more anxious than children who made some kind of selection. Children who made no response were significantly more

anxious than children who made a selection. No significant difference was found between children who made no response and children who verbally responded that no object was similar. The reasons for the differences between the marble and wind-up toys are not clear, but once again, the children's responses differed depending on the type of object.

Sex differences. There was no sex difference for the order in which the objects were selected for either the first play period (M: t = 1.81, 38, p > .05; Wp: t = -1.87, 38, p > .05; H/M: t = .58, 38, p > .05), or for the second play period (M: t = -.22, 38, p > .05; Wp: t = -.43, 38, p > .05; H/M: t = .81, 38, p > .05). However, there was a difference in the length of time males and females played with the toys as measured by a 2 (sex) x 3 (type of object) ANOVA, F (1, 39) = 6.15, p < .02) with females playing with the wind-up and hinge/magnet toys longer than the males. Females also learned the names for the toys better (t = -2.82, 38, p < .01). Since females were more accurate in learning the names and played with the toys longer, Pearson correlation coefficients were computed between number of correct responses and play time for each type of object for the first play period (M: r = .39, 19, p > .05; Wp: r = -.35, 19, p > .05; H/M: r = .09, 19, p > .05), and the second play period (M: r = .22, 19, p > .05; Wp: r = -.30, 19, p > .05; H/M: r = -.24, 19, p > .05). Although none were significant, it is interesting to note that for females during the second play period, there was a positive correlation coefficient between time and correct naming responses for the marble toy (r = .39), but there was a negative correlation for the wind-up toy (r = -.35). For males, just the opposite was the case (M: r = -.32; Wp: r = .36). Fisher's Z transformation revealed the correlation coefficients for males versus females for marble toys did

not differ significantly from one another (t=1.63, 39, p>.05), but for the wind-up toys, they did differ significantly from one another (t=2.04, 39, p<.05). It would appear that children react differently to the wind-up toy depending on sex, although the cause is undetermined at present.

With regard to other variables, no sex differences were found for generalizing to new instances of an object category, anxiety scores, or MLU.

<u>Birth order</u>. Since there were almost equal numbers of first and second born children in the sample, they were compared on the various dependent variables to determine whether birth order was an influencing factor. No differences were found for the order in which the objects were selected, the length of time the children played with the objects, accuracy of learning the object names, basis of generalization, or MLU.

Mean Length of Utterance (MLU). The mean and standard deviation for MLU was 2.37 and .63, respectively. Children ranged from 1.34 to 4.19. MLU was computed for each subject in order to examine whether this variable was related to the accuracy with which children learned the object names. A Pearson correlation coefficient was not significant (r = .19, 30, p > .05). It should be noted that MLU was difficult to obtain since many of the children were silent most of the time, and often their speech was difficult to understand. The obtained MLU for each subject probably does not reflect accurately the children's language development since much of their speech was in response to questions which tend to elicit one word responses.

Summary. The objects differed in terms of the children's preferences for them, but the index used to measure saliency (order of selection) had little effect on the accuracy of learning the names or the basis of generalization. On the other hand, play time was related to generalization and differed between males and females. Sex differences also were found for name learning. Females learned the names better than males. Furthermore, all children learned the name for the wind-up toy better than the other two toys. Finally, the children's anxiety may have interfered with their performance on some of the tasks.

CHAPTER IV

DISCUSSION

The idea that differences in object saliency might explain the conflicting results of previous studies which have investigated the basis of early word meaning was not clearly supported. When measured by the order in which children selected the toys, saliency was not an influencing variable. Either the index used to measure salience was inadequate or the conflicting results of earlier studies are due to other factors. Although play time did not have an effect on how well the children learned the different object names, there was some indication that it influenced the basis of generalization (functional) for one of the object types (marble toy).

The children generalized the marble toys and the hinges and magnets on the basis of perceptual characteristics which is consistent with studies using similar objects (Gentner, 1978; Tomikawa and Dodd, 1980). The results for the wind-up toys were not totally consistent with Casby's (1979) findings. Some children in the present investigation generalized on the basis of perceptual characteristics and others generalized on the basis of functional characteristics, whereas children in Casby's study generalized on the basis of functional characteristics. This discrepancy may be due to the fact that some toys in Casby's study had no action while others did. As stated earlier, this was corrected in a follow-up study in which all the toys were given actions, and children persisted in generalizing on

the basis of function. However, the children were seven years of age, and hence, older than the children in the present investigation. At present, it would seem that the type of object involved makes a difference in how children will generalize to similar objects. There may not be one, overriding basis for generalization.

Unlike previous, similar investigations, the present investigation showed that females learned the object names better than males. However, no sex differences were found for the basis of generalization.

The children in this study preferred playing with some of the objects more than others, but their preferences had only a slight influence on how well they learned the names for the objects, and no influence on how they generalized to new instances, However, the objects did elicit different responses. The children learned the name for the wind-up toy better and generalized the name for it on the basis of function more often than the other two toys. The fact that the name for the wind-up toy was learned the best is consistent with Nelson's (1973) findings that children acquire words for things that move before they acquire words for static objects. The explanation typically given for this is that dynamic objects are more "salient," but when salience is operationally defined as the order in which the objects are selected, the wind-up toy is not the most salient. Ross, Nelson, Wetstone, and Tanouye (Note 1) also found that object attractiveness was not related to receptive name learning for novel objects. In their study, object attractiveness was measured by "the number of five second intervals during which children contacted the object type." Children in the Ross et al. study learned the names

better for the objects with which they performed more specific interactions; i.e., behaviors that were related to the particular properties of the object (stretching out a slinky) as opposed to undifferentiated behaviors (mouthing, banging, etc. the object). Their results differ from the present study in that the object whose name the children learned the best (wind-up toy) was a toy with which they tended to interact the least. Most children just watched the toy walk or hop because they were unable to wind it up themselves.

Although one of the purposes of the experiment was to obtain an estimate of both perceptual and functional saliency, some uncertainty exists as to whether the index used (order of selection) adequately reflected these two aspects of saliency since the two sets of rank orders were not significantly different from one another. One possible explanation is that the two sets of orders did indeed reflect the two aspects of saliency, but the perceptual and functional characteristics were strongly correlated, i.e., the same toys were high or low in both perceptual and functional salience. Therefore, the order of selection did not change. Another is that the children inferred the objects' function even before they interacted with them and thus, the first set of rank orders was not based solely on perceptual characteristics. This possibility is illustrated by the children's spontaneous comments. When presented with the marble toy in which marbles were visible but no marbles were released, many of the children said it was broken. This comment was made even before they had seen the toy that did dispense marbles. The same comments were made in reference to the magnets that looked like the hinges but did not open. It appears that the children had expectations of what the objects should do just by looking at them.

This is consistent with Nelson's (1974) view that perceptual characteristics are used to predict the object's function, and with Rosch and Mervis' (1975) argument that perceptual and functional characteristics are difficult to separate since, in reality, they are strongly correlated.

The reason for females' better performance on name learning is not clear. Although Nelson (1973) found that girls develop vocabulary more rapidly than boys, experimental tests of comprehension between the ages of two and four years have not found strong sex differences (Dale, 1976). Since MLU did not differ between boys and girls in the present investigation, girls' better performance on name learning cannot be attributed to a more advanced stage of language production. However, it is possible that the female subjects in this particular investigation were more advanced in comprehension than the male subjects. An alternative interpretation is that the female subjects payed closer attention to the task resulting in more correct responses. Another intriguing difference between males and females was the opposite sign correlation coefficients between play time and accuracy of learning the name for the wind-up toy. For females, a greater number of correct responses was negatively correlated with play time whereas for males, there was a positive correlation. The reason for the shorter play time for females is not clear. Seven of the children did express fear of the wind-up toy and six of these were females, although the binomial test was not significant. Furthermore, if more of the female subjects were indeed afraid of the toy, but did not express this explicitly, one would expect the play time to be shorter during the first play period when the toy was first encountered. However, the significant difference between males and females was obtained during the second play period.

Moreover, the shorter play time did not hamper the acquisition of names by the female subjects. It would seem that the amount of time spent playing with an object is not crucial for acquiring its name.

The names for the marble toy and hinge/magnet toys were generalized most frequently on the basis of perceptual characteristics. In contrast, the wind-up toy differs from the other two toys in that its shape is less well defined by the papier maché covering, perhaps resulting in some children noticing the action more readily than the shape. Another possibility for the greater number of responses based on function is that when the objects were being demonstrated during the phase of the experiment in which children were asked to select new instances of the object category, it was possible to have all the wind-up toys moving at the same time, whereas the other toys could only be demonstrated singly even though they were all present for the children to see. Perhaps it was difficult for some of the children to remember which toy performed which function. This may have led them to generalize on the basis of shape since this was the most obvious. On the other hand, they did not have to remember the function of the wind-up toy since the toys were moving right in front of them. Despite this, some children still generalized on the basis of shape with respect to the wind-up toy. This may be due to individual differences in cognitive ability but that cannot be ascertained from the available data.

Other investigators have obtained similar findings with regard to classification of objects. Bowerman (1978) pointed out that children do not necessarily classify objects on the basis of one single principle. In her study of overextensions, Rescorla (1980) also found that children

overextended words on several bases. If children do not always generalize on the basis of one feature, then it would be useful to specify the circumstances under which certain features are used. Saliency, as defined in the present investigation, did not seem to be an influencing factor.

On the basis of children's responses when asked to generalize to new instances of an object category, the results are consistent with Clark's theory which states that perceptual characteristics are the basis of word acquisition. Both the marble and hinge/magnet toys were generalized mostly on the basis of a perceptual characteristic (shape). On the other hand, the wind-up toy was generalized on the basis of a perceptual characteristic (shape) and on the basis of function. However, the function of the wind-up toy was the action it performed. Action or movement can also be considered a perceptual characteristic. When viewed this way, even the name for the wind-up toy was generalized on the basis of perceptual characteristics, albeit two different ones, shape and action. Moreover, defining an object's function is not as simple as it appears at first, especially since a child's notion of an object's function may not always coincide with that of the experimenter. For example, one child opened the hinge and used it like a gun. Another child did not want to watch the wind-up toy move but rather wanted to put it into the marble toy.

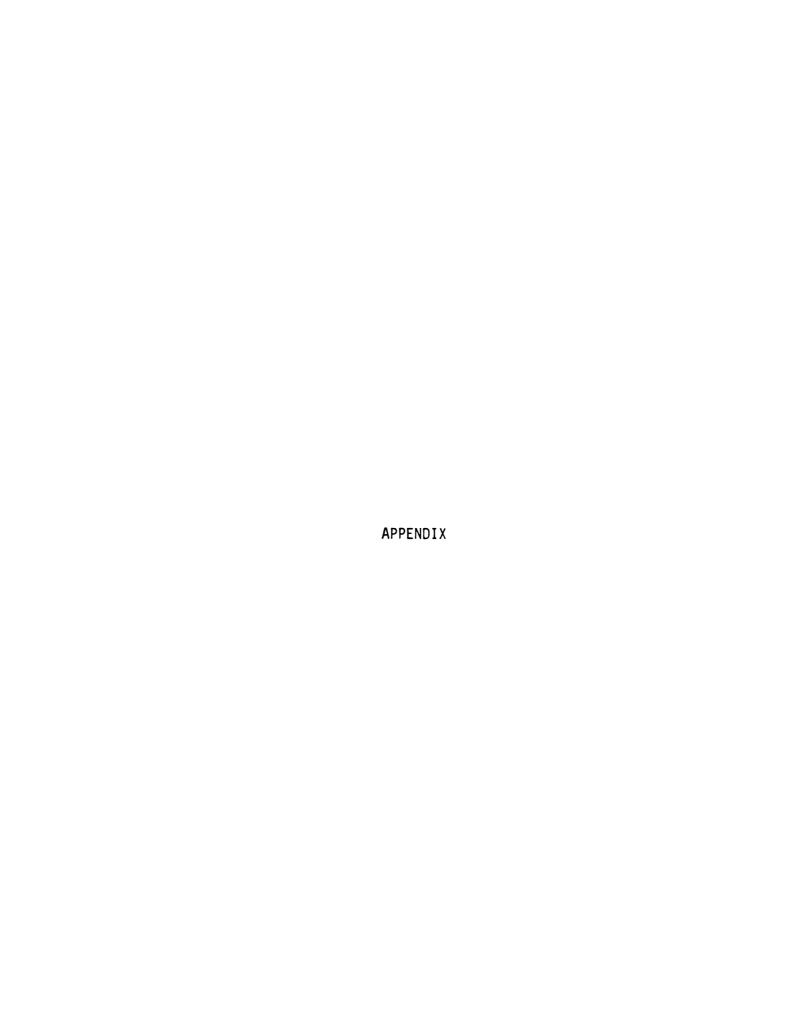
Nelson argues that children will identify new instances of a concept by perceptual characteristics especially when the function is not apparent. In the present experiment, the objects' functions were demonstrated for the children but they still generalized the names based on perceptual characteristics. However, one might argue that children

have already formed a concept when they are being asked to generalize to new instances. When children are identifying concepts, predictions on the basis of Nelson's theory are the same as that of Clark's theory. The present study also showed that comprehension of the names varied depending on the object, however, the reason for these results are still unclear.

The finding that behavioral expressions of anxiety were related to comprehension of object names indicates that the children's responses were not a result solely of the task at hand, at least in the context of an unfamiliar, experimental situation. Consequently, it may be unwise to assume that personality variables do not influence performance on cognitive tasks.

Since the children responded differently to the various types of objects, the characteristics of objects used in future investigations of the basis of word meaning should not be ignored. Although the present investigation was an attempt to obtain separate measures of perceptual and functional salience, it is not certain this was accomplished since perceptual and functional salience may have been correlated in the same objects. In the future, it would be necessary to construct objects which are alternatively high in one measure of salience and low in the other. Furthermore, it will be necessary to specify what is meant by function. Another aspect of this study which needs to be explored further is the reason for children's better performance in learning the name for the wind-up toy. A current investigation (Della Corte, in progress) in which the names for the toys were randomly assigned may help to clarify the issue. The role of anxiety also

should be considered in future investigations. Perhaps children who are the least anxious will more accurately reflect the processes involved in early word acquisition. As Ross and her colleagues indicate, the process of word acquisition seems to be much more complex than previously had been recognized.



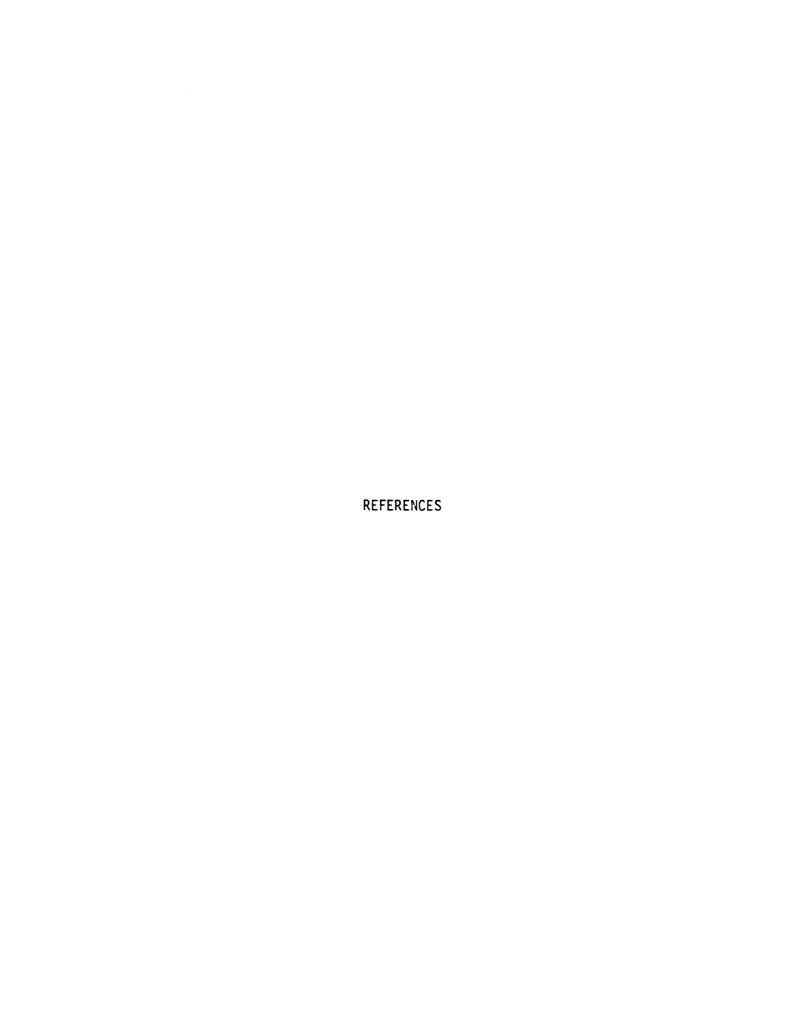
APPENDIX

Preschool Observation Scale of Anxiety

- Physical complaint: Child says he or she has a headache, stomachache, or has to go to the bathroom.
- 2. Desire to leave: Child says he or she wants to leave the testing room or makes excuses about why he or she must leave; desire or "need" to leave must be explicit.
- 3. Expression of fear or worry: Child complains about being afraid of or worried about something; must use the word "afraid," "scared," "worried," or a synonym.
- 4. Cry: Tears should be visible.
- 5. Scream.
- 6. Whine or whimper.
- 7. Trembling voice.
- 8. Stutter.
- Whisper: Child speaks softly, without vocal cords; should not be a playful whisper.
- 10. Silence to one question in the interval.
- 11. Silence to more than one question in the interval.
- 12. Nail-biting: Child actually bites his or her nails in the testing room.
- 13. Lip-licking: Tongue should be visible.
- 14. Fingers touching mouth area: Not counted if bites nails while touching mouth.
- 15. Sucking or chewing object: Not fingernails.

- 16. Lip contortions.
- 17. Trembling lip.
- 18. Gratuitous hand movement at ear area.
- 19. Gratuitous hand movement at top of head.
- 20. Gratuitous hand movement at an object separate from body or at a part of clothing separate from body.
- 21. Gratuitous hand movement at some part of body (not ear, hair, mouth, or genitals).
- 22. Gratuitous hand movement.
- 23. Gratuitous leg movement.
- 24. Gratuitous foot movement: Below ankles, distinguish from foot merely moving along with leg.
- 25. Trunk contortions (e.g., arching back).
- 26. Rigid posture: Part of body is held unusually stiff or motionless for the entire 30-sec interval.
- 27. Masturbation: Touches genital area.
- 28. Fearful facial expression.
- 29. Distraction: Must be indicated by a verbal reminder by the examiner to the child to pay attention.
- 30. Avoidance of eye contact: Examiner should be having clear trouble making eye contact with child.

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