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Are Lions and Tigers Substitutes or Associates? Evidence against Slot Filler Accounts of Children's Early Categorization

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Items in event-based categorical relations, or "slot fillers," have been found to be recalled better by children than items in a taxonomic relation. This has been used as evidence that children's memory is organized around script-based representations rather than taxonomic structures. Others have attributed the superior recall of slot fillers to association and typicality rather than memory structure per se. This study was designed to see if the slot filler advantage remains when association and typicality were controlled for. Forty-five 3- to 4-year-olds were tested using a cued recall procedure in which typicality and association were varied for slot filler versus taxonomic coordinate lists of items. Only children receiving the *typical + high association* slot filler list showed significantly better recall than the taxonomic coordinate list. There were no differences between the *atypical + low association* slot filler list and the taxonomic coordinate list. These results suggest that the slot filler advantage can be attributed to the more traditional mechanisms of association and typicality.

INTRODUCTION

Lucariello and Nelson (1985) have described two methods of representing categorical relations, either as slot fillers or as taxonomic categories. Slot fillers are typically substitutable within the same scripted event. Scripts are generalized representations of recurring events that specify actors, actions, links, and props (Schank & Abelson, 1977; Slackman, Hudson, & Fivush, 1986). For example, *eggs* and *cereal* are slot fillers because they are both foods that are part of the "eating breakfast" script. Notice that slot fillers are always members of the same taxonomic category (e.g., *food*). However, they are a very narrow subset of the taxonomic category defined by whatever event representation is being considered. On the other hand, a full-blown taxonomic category is not restricted to particular event participation, but can include members that do not participate in a slot filler relation. The strong claim made by Lucariello and Nelson is that young children have only these narrow slot filler classes available to them in their representation; they do not organize memory according to the wider taxonomic class.

In memory studies examining slot filler structure, it is necessary to contrast slot filler lists with non–slot filler lists. In the latter case, one must choose items that are taxonomically related but do not play the same role in an event script. Such lists have been termed "coordinates" by Blewitt and Toppino (1991). For clarity, we will refer to them as "taxonomic coordinates." Thus, *eggs* and *spaghetti* are both foods, but whereas the former can be included in the "eating breakfast" script, the latter would be included in the "eating dinner" script. In much of the previous research, coordinate lists have been termed *taxonomic,* but because the slot filler lists are also taxonomic, the more exclusive designation of *taxonomic coordinate* is less confusing.

Lucariello and Nelson (1985) have postulated that slot fillers are the first categorical relations acquired by children. In the first empirical test of slot fillers, they used the free recall paradigm and presented preschoolers with a list of nine words that were either related as (1) slot fillers (e.g., *elephant, monkey*), (2) taxonomic coordinates (e.g., *elephant, dog*), or (3) shared contextual and functional relations, but were not substitutable within the same slot (e.g., *elephant, peanuts*—where elephants eat peanuts). The latter relation was termed *complementary* by Lucariello and Nelson (1985), but has also been called *thematic* and *schematic* in other research. Children showed better free recall, more clustering, and better categorically constrained recall for the slot filler list than for the other lists. Based on these results, Lucariello and Nelson (1985) proposed that slot fillers act as precursors to later taxonomic relations.

In a more recent study, Lucariello, Kyratzis, and Nelson (1992) asked 4- and 7-year-olds to generate basic-level exemplars in response to a superordinate term. Four-year-olds primarily generated responses clustering within a single slot filler category, whereas 7-year-olds' responses crossed slot filler categories. According to Lucariello et al. (1992), when 4-year-olds were asked to name animals, if they began with *elephant,* then they would continue naming zoo animals and would not add farm animals or pets to the list. However, Blewitt (1993) points out that, although the younger children tended to stick within scripts, there were in fact examples where they crossed script boundaries, such as including *cat* and *dog* along with zoo animals. When 7-year-olds were given the same task, they generated lists such as *elephant, coyote, dog,* and *horse,* thereby demonstrating a wider class of taxonomic relations in the animal category.

In Nelson's (1982) original theory, taxonomic categories were abstracted from event-based representations, which was said to account for the prevalence of both slot filler and thematic / schematic associates in sorting and recall tasks with younger children. This theory also proposed a shift in development from event-based to taxonomic-based representations in memory. However, Blewitt and Toppino (1991) showed that, in cued recall tasks, the superiority of slot filler and thematic / schematic cues remains throughout development, from preschoolers to adults. These results demonstrate that a bias toward script-based relations is not necessarily diagnostic of the lack of taxonomic relations, because adults clearly do have taxonomies.

Although many studies have demonstrated that children have better recall for slot filler lists than for taxonomic coordinate lists, none of these studies has taken into account the traditional memory mechanisms of association and typicality. In the recall studies, word lists were child generated by asking children to name objects / animals that appeared in various scripts. For example, children might be asked to generate names of "animals you see at a zoo," "on a farm," or "at home." The most frequently mentioned responses within a script are then included in the slot filler list (e.g., *lion, tiger, elephant*). The most frequently mentioned responses across scripts are included in the taxonomic coordinate list (e.g., *lion, cow, dog*).

There are two things to notice about this method of generating word lists. First it allows only high typicality items to be included, because they are the ones most likely to be generated by children (Rosch, 1975). We do not know whether the effects also hold for low typicality items, or if there is any kind of interaction between typicality and other factors. Because typicality is crucially involved in the representation and access of categories, it is important to understand the role of this variable.

More importantly, the method of generating items produces a systematic bias with regard to the associativity of items in the two kinds of lists. The reason is that, to produce a taxonomic coordinate list, one must create a taxonomic list that contrasts with the slot filler list. Therefore, one must systematically exclude taxonomically related items that also share slot filler relations. The problem here is that, by systematically excluding items from the same script, there is a danger that one is also eliminating from the taxonomic coordinate lists sets of items that are most highly associated within a category, and systematically including those high-associate items in the slot filler lists (Blewitt & Krackow, 1992).

It seems likely that item-to-item associativity would be a critical factor in children's memory recall. For example, McCauley, Weil, and Sperber (1976) found that kindergartners and second graders named a target picture from a previously presented pair faster if the pair was highly associated. Also, Bjorklund and Jacobs (1985) found clustering of highly associated items in third and fifth graders. In a study by Goldberg, Perlmutter, and Myers (1974), 2-year-olds were presented with boxes containing two objects that were either related (e.g., a cookie and a lollipop) or unrelated (e.g., a dog and a plate). Significantly more related items were recalled by the children. It appears that items categorized as "related," in this study, could also be classed as slot fillers.

In summary, associativity would appear to be a highly significant factor in children's recall of word lists. In regard to typicality, the issues are less clear. For example, it may be that atypical items might, in some cases, be more memorable than typical items simply because they are unusual and interesting and are flagged in memory (e.g., *penguin*). Alternatively, more mundane atypical items might simply be very unfamiliar, and might not be highly memorable to children.

Siegel, Rollins, and Gutgin (1989) have suggested that typicality and association are important factors in the slot filler advantage in memory recall. To test this, they generated sets of items in which the item-to-category association (i.e., typicality) and the item-to-item association were determined based on ranking and clustering in elicitation. This was done by asking preschool children to either name exemplars of a taxonomic category (e.g., "name some animals") or of a script (e.g., "name some animals at the zoo"). Based on the order of mention of different items in this task, they generated lists that were either slot fillers or taxonomic coordinates and were either high or low in typicality or association.

A different set of children, aged 4 and 8 years, were then tested on a free recall task. Siegel et al. (1989) found significantly better recall for the slot filler list only when the items were high on measures of both association and typicality. When the values were equated for slot filler and taxonomic lists (i.e., *high typicality + low association*), there was no difference in recall between the conditions. In addition, both of these conditions produced better recall than the slot filler condition with *low typicality + low association*, although this was not tested statistically for the comparison of slot filler and taxonomic coordinate lists.

Unfortunately, the details of the items in this design are difficult to evaluate, based on the currently available reports. For example, it is not clear what criteria were used for inclusion of items in the lists, or whether there was any attempt to ensure that children knew the words on the list. This could be particularly crucial; if many children did not know the words in the slot filler *low typicality + low association* condition, then that might account for the poor results in this condition.

Also, Siegel et al. (1989) claim to have slot filler items that are high in typicality and low in association. It is difficult to imagine which items would have these characteristics because highly typical slot fillers tend to be highly associated. For example, the most typical animals in a zoo, such as elephants, tigers, monkeys, and lions, tend to be highly associated with each other. The method for collecting these items defines measures of typicality and association in terms of order of mention. That is, words that are named first in the category task (e.g., "name some animals") are defined as highly typical. Those that are named far apart or rarely together are defined as being low in association. Unfortunately, there is no independent evidence that this means of collecting items actually reflects underlying differences in association—especially if all of the items mentioned are highly associated. In addition, it is not clear that the items obtained from preschoolers are relevant for use with 8-year-olds.

In the present study, we attempted to clarify some of these issues using a different design. First, high typicality and associativity items were defined as those frequently mentioned by children in an elicitation procedure (see Blewitt & Krackow, 1992). Low typicality and associativity items were defined as those that children did not generate in the elicitation procedure (except in a single instance). We also made sure that children were familiar with the terms being used in the study. Because of these more stringent requirements, it was impossible to create slot filler items that were high in typicality and low in associativity for the reasons mentioned above.

We note that the present design does not include all possible combinations of the factors of slot filler, taxonomic coordinate, typicality, and associativity. In fact, we tested only three of the eight possibilities. For the other five combinations, it was not possible to construct a sufficiently large set of items to meet our criteria for inclusion in the study. We also note that the present design does not specifically distinguish between the roles of typicality and association in children's recall. This is because these variables are often confounded. Items that are highly associated with typical items in a category are often, themselves, high in typicality for that category.

To obtain data on memory organization, we used a cued recall task rather than a free recall task. In this procedure, the child is given a list of word pairs to remember. Afterwards, they are provided with the first word in the pair (cue) and are asked to remember the second word (target). In our design, the target item remained constant across conditions. This allowed the relation between the cue and the target to vary in terms of association, and the cue to vary in terms of how typical an example it was of the script being accessed. The use of a cued recall task in this study provided certain protective design measures not found in studies such as those of Lucariello and Nelson (1985) and Siegel et al. (1989), which had used the free recall procedure. Children in the cued recall procedure need to produce the same target words in each condition. This is important because it eliminates the possibility that some words may be more memorable across conditions due to factors other than type of categorical relation, such as length or difficulty in pronunciation (Blewitt & Krackow, 1992; Blewitt & Toppino, 1991).

If recall is guided by scripts, we would predict that slot filler cues, regardless of association and typicality values, would produce better recall of targets than cues in the taxonomic coordinate condition. If association and typicality are the central factors governing recall, we would predict that recall in the slot filler condition would be better than the taxonomic coordinate condition only when typicality and association values are high for the slot filler cues, and not when they are low.

METHOD

Participants

Forty-five children, aged 3,10 to 5,0 (M age = 53.3 months) participated in the study. These included 24 boys and 21 girls attending nursery schools in Philadelphia and southern California. They were from middle- and upper-middle-class families. An additional 38 children were dropped from the study. Twenty-eight children were unable to complete the initial training phase, eight children did not know the meaning of one of the items tested,[1] and two chil-

1. One item, *trombone*, was particularly problematic for many children. Since we could not find a substitute item, we asked participants if they knew what a trombone was prior to testing,

dren were eliminated due to distractions during testing.

Materials

There were three conditions in the present study:

Condition 1: Slot Filler: Typical/High Association (SF: Typ/HA)
Condition 2: Taxonomic Coordinate: Typical/Low Association (TC: Typ/LA)
Condition 3: Slot Filler: Atypical/Low Association (SF: Atyp/LA).

Because the conditions were tested using the same target items, the differences were therefore in the cues used to elicit the targets. For Conditions 1 and 2, we used mostly the items from Blewitt and Krackow (1992), based on elicitations from nine preschoolers. Nineteen preschoolers were further recruited to generate additional items for this study. Although these children were matched in age to the participants in the main test, they did not participate in the main study itself.

Items from Blewitt and Krackow (1992) were originally obtained using the following procedure: Children were asked to generate exemplars in a total of eight categories (animals, food, tools, clothing, vehicles, appliances, utensils, and instruments). Specifically, children were asked to generate items from two scripts within each superordinate category (*animals:* zoo and home; *food:* breakfast and lunch; *tools:* carpentry and gardening; *clothes:* morning and bedtime; *vehicles:* land and air; *appliances:* living room and kitchen; *utensils:* eating and cooking; *musical instruments:* parade and home). This allowed one of the pair of scripts to be used in the slot filler condition, and the other to be used in the taxonomic coordinate condition. Children were asked questions such as, "Can you tell me some animals you see at the zoo?" "Can you tell me some things that you ride in on the land?" If a word was generated in response to more than one script, it was discarded. For example, if *hot dog* is mentioned in both the lunch and dinner scripts, and *sandwich* is mentioned in the lunch script, then it is not clear whether *hot dog* and *sandwich* are slot fillers (mentioned in the same script) or taxonomic coordinates (mentioned in different scripts).

Condition 3 (SF: Atyp/LA) required that items be atypical, meaning that they are not strongly associated with their superordinate category label. However, we also required that children be familiar with the items and their participation in the associated scripts. Atypical items were experimenter generated by choosing peripheral members of the same slot filler categories as above that had not been mentioned by the children in the previous elicitations for Conditions 1 and 2.[2] Ten preschoolers were tested to ensure that children knew that the experimenter-generated items were actually slot fillers in the relevant scripts, even though they were atypical. We asked children if the slot filler cue was an example of an item in the script we intended to access. For example, for the cue *hippopotamus,* we asked, "Is a hippopotamus an animal you see at the zoo?" For distractors, we also asked if each of the taxonomic coordinate cues (e.g., *dog*) belonged to the script accessed for the comparison slot filler groups (e.g., "Is a dog an animal you see at the zoo?"). To be included in the list, at least 80% of the children tested must have answered the slot filler cue question correctly. This procedure produced seven usable items (*hippopotamus, chopsticks, toaster, trombone, ambulance, vest, bacon*). Because we were still short one item, five additional children were tested on a single item, *drill,* which they all knew.

On average, 94% of the children answered "yes" to the slot filler items, whereas only 22% did so for the taxonomic coordinate distractor items. In fact, most of the "errors" in the latter condition were based on two distractors that were quite plausible as "yes" responses ("Is a TV something you see in the kitchen?" "Is a sandwich something you eat for breakfast?"). If we exclude these, then the error rate drops to 5% for distractors.

To ensure low item association for Condition 3 (SF: Atyp/LA), we wanted to use cues that children would not tend to produce in a word-association task. We initially tested 13 preschoolers (eight from the previous task) in a word-association task. In this task, the experimenter said to the child, for example, "When I say *eggs,* what do you say?" or ". . . what words do you think of?" This was preceded by a short training giving examples of associates. Unfortunately, the preschoolers often responded giving other types of associates, such as functions or homonyms. Because we were not confident with the responses obtained from this initial group, we added six 5-year-olds to the pool. For these older children, we asked for only a single associate. This is because older children tend to produce too large a set of associates if

and supplied a definition if they did not. We then asked them to repeat the definition at the end of the task. If they were unable to do this, their data were not included in the analysis.

2. Trombone had been mentioned by a single child in the previous elicitations. Because trombone caused several problems in the study, we reanalyzed all of the data without the musical instrument category, and the results were almost identical.

Table 1 Mean Number of Words Recalled per Condition

Cue			
SF T/HA	SF A/LA	TC T/LA	Target
Oven	Toaster	Television	Stove
Hammer	Drill	Shovel	Screwdriver
Spoon	Chopsticks	Pan	Fork
Drum	Trombone	Piano	Horn
Car	Ambulance	Airplane	Motorcycle
Shirt	Vest	Pajamas	Pants
Elephant	Hippopotamus	Dog	Lion
Eggs	Bacon	Sandwich	Cereal
3.80 (.94)	1.93 (1.34)	1.93 (1.22)	

Note: Standard deviations are in parentheses. SF T/HA = slot filler typical/high association, SF A/LA = slot filler atypical/low association, TC T/LA = taxonomic coordinate typical/low association.

they are not limited (Pamela Blewitt, personal communication). If any of the children ever generated the chosen target in response to this task, it was changed. This was necessary in two cases. The final word lists consisted of eight word pairs in each condition (see Table 1).

Procedure

Children were tested individually in a quiet room in their nursery school. They were given the cued-recall task by a female experimenter (either the first author or research assistant). The cues were read to the children while the target was played on a portable cassette recorder using a second female voice. This was done so that the children could easily distinguish cues from targets. The lists were read at a rate of 4 s per cue-target pair. Equal numbers of children were assigned to each of the three conditions. There were three random item orders for each condition.

The children were instructed to listen carefully so that they could say the same thing that had been said on the tape recorder. For each session, the experimenter first read the complete list of eight pairs. She then repeated each cue, one at a time, waiting for the child to produce the target. Prior to testing, children were given two practice items (*boy-girl; comb-brush*) to make sure they understood the directions. If they were unable to produce the targets for these items, the instructions were repeated and they were tested again. If they still failed to produce the targets, their participation was discontinued. Unfortunately this eliminated 28 children from the study. Although large attrition rates are common in cued-recall tasks with children under about 4,6, our rates may have been higher due to our attempts to recruit more younger children. Also, we suspect that the younger children may have had problems construing the tape recorder as the second participant in the task.

RESULTS

The results of this study are presented in Table 1. A one-way ANOVA comparing the number of target items recalled across the three conditions yielded an overall main effect of condition, $F(2, 44) = 12.56$, $p < .001$. Subsequent t tests revealed that children tested on slot fillers in the Typ/HA condition recalled significantly more target words (mean = 3.80) than their counterparts in both the slot filler Atyp/LA condition (mean = 1.93), $t(1, 28) = 4.43$, $p < .001$, and those in the taxonomic coordinate Typ/LA condition (mean = 1.93), $t(1, 28) = 4.69$, $p < .001$. Because the latter two conditions had identical means, this suggests that there was only a significant slot filler advantage when bolstered by high typicality and high association of items.

These results demonstrate that superior recall of items in slot filler relations requires high typicality and associativity. When these traditional mechanisms of memory are absent, there is no advantage for slot fillers over taxonomic coordinates.

There are some possible methodological criticisms that need to be addressed before proceeding. First, it might be argued that the method for generating slot filler cues that were atypical and low in association (e.g., cue: *hippopotamus;* target: *lion*) was different than for the other conditions, and this might be the reason that the slot filler advantage disappears in this condition. The major difference is that the cue items for this condition are generated by the experimenter rather than by children. Their appropriateness as slot fillers was determined by asking children questions such as "Is a hippopotamus an animal you see at the zoo?" Questions like these require recognition rather than recall of the item as a part of the script. Cues for the other conditions were generated by children in response to script prompts such as "What are some animals you see at the zoo?" This difference is unavoidable because low typicality items, by definition, must be less closely associated to the scripted event and therefore less likely to be spontaneously produced by children.

If we were to use child-generated atypical items—as did Siegel et al., (1989)—then the method would require that we include only items that are generated by one or two children. In this situation, we would not be in a position to tell whether such items are known by the other children, or whether those items really reflect atypicality rather than some other property. For example, the number of children generating a particular item might depend on the size of the category involved, or it might depend on idiosyncratic knowledge of one or two children in the test group. We believe that our method of providing cue items not generated by children themselves, and checking for knowledge of those items, was the most practical method for developing low typicality stimuli.

It might also be noted that when Siegel et al. used child-generated atypical items, they found even stronger effects of atypicality than we did. Therefore, our method, if anything, tends to underestimate the effects of atypicality rather than boosting them. In addition, it should be remembered that the experimenter-generated items were used as cues, not as recall targets. Therefore, the fact that they were experimenter generated should not directly affect any of the recall aspects of the design.

A second possible criticism of the present design concerns the particular scripts and categories chosen for evaluation in this study. A reviewer has pointed out that two of the categories that we chose—*tools* and *appliances*—might be problematic. Lucariello et al. (1992) asked 4-year-olds, 7-year-olds, and adults to give examples of members of different categories and then performed cluster analyses based on contiguous items in the participants' lists. They noted that the *tool* and *furniture* categories did not produce many items, making category evaluation difficult and suggesting that these two categories might not be formed through script formation. Although they did not test for *appliances,* they did find that some 7-year-olds included *TV* and *stove* in the *furniture* category. Because *stove* was our target for the *toaster* slot filler cue, it might be argued that children do not include these within the same (*appliance*) category. On the other hand, we were not actually concerned whether *stove* and *toaster* were within the same superordinate category, only whether they were within the same script (i.e., "things you cook with"). Regardless, we evaluated the impact of these points by reexamining our data for the SF: Atyp / LA with *tools* and *appliances* omitted. The effect was negligible, with the recall rate changing from 23.5% to 24.7% for this condition. Therefore, neither of these categories skewed the data as a whole.

DISCUSSION

Having addressed these two methodological issues, we can argue, from our data, that the apparent slot filler advantage in children's category recall is based on traditional memory mechanisms of association and typicality. Moreover, these data militate against the proposal that children's earliest category structures are fundamentally rooted in event schemas, lacking taxonomic organization in conceptual structure. Although children's recall in the taxonomic coordinate condition was low, we suggest that this was due to the low associativity between the cue and target (typical of slot filler tasks), not because children lack the taxonomic category as a whole. Of course, taxonomic categories have to be learned, and we do not claim that all children will have all categories fully developed from the beginning. We simply question the evidence that claims that such categories emerge from script-based slot filler relations.

We are not questioning the claim that both children and adults do, in fact, use event representations of some sort. Rather, the weight of evidence currently suggests that children have several kinds of representations: taxonomic, schematic, and scripts (see Blewitt, 1993, for a review). There is growing evidence that taxonomic categories organize representations from early infancy (Bauer & Mandler, 1989) and certainly in early childhood (Markman, 1989). At the same time, studies showing early taxonomic categorization have not distinguished between slot filler relations and taxonomic-coordinate relations. Therefore, such studies do not speak to Nelson's claim that early taxonomic categories are in fact based around slot filler relations.

Current textbooks on cognitive development, such as Bjorklund (1995), and Flavell, Miller, and Miller (1993), cite the work of Lucariello, Nelson, and colleagues as evidence of script-based categories in early development. It is therefore important to be clear about the status of evidence that informs such conclusions if they are to be imprinted into the lore of the field. On the basis of the evidence from the present study, along with that of Siegel et al. (1989), it is possible to impugn previous conclusions based on data collected from recall studies suggesting that young children's categories are only organized around scripts (Lucariello & Nelson, 1985). Indirectly, we can also question the conclusions of studies using different methodologies such as hyponym production (e.g., naming animals) and word-association tasks (Lucariello et al., 1992). If typicality and associativity are the crucial variables in children's production of associated items, then these tasks are also susceptible to such conflation effects. It might be argued that Lucariello et al.(1992) eluded contamination by associative mechanisms by using a forced picture choice task. In this task, children were asked to choose which of two pictures "goes best with" an exemplar. Although this procedure avoids the possibility of specific lexical association as a factor, the task might be susceptible to associative factors at the conceptual level, which is considered to be abstract and common to lexical and pictorial representations (Potter, 1975, 1979).

On the other hand, we still need an account of category induction, and we do not know a priori whether scripts play a role in this process. One problem with scripts as a basis for representation is that they are hard to pin down. It is often very difficult to decide which script one is dealing with in the absence of any prior context. Thus, a single object could possibly fill slots in indefinitely many scripts. For example, a sweater can be an item in the *clothes put on in the morning* script, the *clothes put on to go outside* script, the *clothes to put in your drawers* script, the *clothes to wear on holidays* script, or even the *things to stuff in your shirt when imitating Santa Claus* script.

It is unclear, also, how to delimit and individuate the range of possible scripts, how to determine which particular script might get accessed given relatively impoverished context, and how to determine the permissible "grain" of a potential script. Similarly, although slot fillers are said to be defined in terms of shared function (Lucariello & Nelson, 1985), it is often difficult to decide what counts as "shared function." For example, should one include *shirt, turtleneck,* and *pants* as related slot fillers in the same *getting dressed in the morning* script, or only *shirt* and the *turtleneck,* being items of clothing worn on the upper body?

The question of whether scripts play a role in category induction hinges on whether the child's hypotheses about word meanings are constrained or if they allow any relevant information to be part of the definition of a concept. For example, in order for the script-based concept acquisition story to work, it is necessary that children entertain concepts such as *animals seen at the zoo* rather than simply *animals.* This kind of proposal falls very much in line with claims that children incorporate contexts into their early word meanings (e.g., Barrett, 1986; Bloom, 1973; Rescorla, 1980). For example, Bloom (1973) reported that, at 9 months, Allison used the term *car* to refer only to cars driving in the street as she observed them from the window. The claim then is that the context is incorporated into the meaning of the word *car* in this case, and is therefore only used in such contexts. Such incorporation of context into word meanings is clearly implicated in the idea that early taxonomies are organized around scripts.

Currently, there is a growing body of evidence that children do not entertain word meanings that include contextual information. That is, it appears that children know that categories name kinds of things, not things that appear together in the world. This is especially true when the categories are given names, and are thus constrained linguistically (Markman & Hutchinson, 1984). Languages do not seem to allow words that denote context-based meanings of the type encoded within scripts.

Accounts of context-based meanings in children's early lexicons (Barrett, 1986; Bloom, 1973) have been shown to be vanishingly rare in more systematic analyses of children's early word use. Huttenlocher and Smiley (1987) point out that such examples tend to occur in small, adult-elicited samples. When larger speech samples are examined, the kinds of examples that would convincingly demonstrate context-based meanings are strikingly absent. In addition, they argue that the criteria for attributing context-based meanings in other studies are not justified. For example, Rescorla (1980) attributed such meanings to contexts in which the referent was absent, ignoring the possibility that when a child points at a cookie jar and says "cookie," they could simply mean that they want a cookie, not that *cookie* means *cookie jar and cookie.*

In addition, Petitto (1992) shows that the lack of context-based meanings is what distinguishes words and signs from gestures in human language. For example, although deaf children produce early symbolic gestures, such gestures show strong context dependency and variability, which is absent from their sign usage in the one-sign stage. Petitto suggests that such differences represent fundamental constraints on the nature of lexical acquisition in humans.

Nelson (1988) has suggested that children's hypotheses about word meanings are relatively unconstrained and can include contextual information. Mislabelings are reined in by the social support of adults attempting to understand and guide children to the correct meanings. Nelson points out that the speech data analyzed by Huttenlocher and Smiley (1987) are based on older children than those used to argue for context-based meanings. In addition, she points out that the data are based on experimenter observations rather than parental report, which, she argues, is less susceptible to undersampling. Similarly, claims about constraints on word meaning from experimental procedures (Markman & Hutchinson, 1984) involve considerably older children and provide data that demonstrate a bias toward taxonomic labeling, not an absolute prohibition against more functionally based generalizations.

Clearly, there continues to be a debate as to whether children are little linguists who know what words do and don't do or whether they rely on context and social support to determine these parameters. Nobody believes that context is unimportant in meaning induction. The question is whether that context is included as part of the child's lexical-semantic representation or whether it merely supports the acquisition process, perhaps being retained in some form of episodic memory. The current results support the latter position.

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