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CHILD AND ADULT VERB CATEGORIES*

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Studies of the acquisition of word meaning and the semantic features involved have been mostly confined to noun categories and polar adjectives. Investigation of the semantic categories underlying verb forms has implications not only for theories of child language acquisition but also for theories of semantic structure in general.

Experimental evidence is provided that tends to confirm the prototype analysis of semantic category acquisition, extending it to verbs of separation (cut, peel, tear, etc.). It is suggested that the process of acquisition includes arriving at the appropriate "weighting" of relevant semantic components.

The investigation of word meaning in language acquisition studies has relied on adult assessment of the extension of a child's semantic category relative to the corresponding adult category. The prevailing assumption of such assessment is that the meaning of a word can be specified by certain conventions of usage represented as features or attributes (Clark, 1973). In the process of specifying the semantic features comprising various semantic categories, investigators have discovered that the semantic features reflect a general set of non-linguistic cues. It is apparently on this general set of cues that children rely in classifying so-called real world phenomena into particular linguistic categories.

The discussion of semantic features as they relate to the acquisition of word meaning has been frequently confined to the study of noun categories, although recently polar adjectives have also received considerable attention. The study of the acquisition of verb categories, on the other hand, has received but recent attention. Taking note of this limitation, an investigation of the semantic categories underlying verb forms may have significant implications, not only for theories of child language acquisition, but also for providing a more complete analysis of the structure of semantic categories, in general.

Providing a more complete analysis of the semantic categories of natural language, however, need not be the major motivation for investigating semantic verb categories. In recent linguistic theory verb forms have assumed a pivotal role in the structural analysis of sentence meaning. In the underlying structural notation of McCawley (1970) and Lakoff (1972), verbs define the major structural units of meaning. Fillmore (1968) has perhaps emphasized the structural

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significance of verbs to an even greater extent. In Fillmore's (1968) analysis of the simple sentence, a verb is a structural unit which governs the possible semantic relationships that may be expressed by nouns in that same sentence. Chafe (1970) presents an analysis somewhat parallel to that of Fillmore (1968), though with more detailed attention to the states, processes and actions encoded by verbs.

The pivotal function of the verb in the analysis of meaning in recent linguistic theory suggests that more extensive study of verb categories is warranted on structural grounds. A question remains however: What non-linguistic cues might children use in arriving at the semantic features of a verb category, hence, at the meaning of a verb? With regard to the often studied noun categories, certain cues have been found to be of primary importance to children. Initially discussed in the work of Clark (1973), these cues include the shape, size, sound, movement and texture of an object. Clark (1976) has more recently added a dimension of universality to these noun cues by demonstrating their function in the classifier systems of various non-related languages.

The non-linguistic cues underlying noun categories provide little insight into the functional features underlying verb category acquisition. The limited data available concerning verb category features are derived primarily from developmental psycholinguistic studies. Two general categories of verbs have been studied in this regard; the acquisition of causitive verbs (Bowerman, 1974) and the acquisition of verbs of transfer (Gentner, 1975).

Acquisition of Verb Categories:

Bowerman (1974) analyzed the acquisition of causative verbs. In her spontaneous speech data, Bowerman (1974) discovered errors such as I'm singing him said by a child pulling a string attached to a toy doll. These errors first appeared one week after periphrastic causative constructions like make it flat had appeared. It was noted by Bowerman (1974) that many causative verbs in English such as open partake of two causative constructions: The single lexical construction open and the periphrastic causative construction cause to open. Based on the order of emergence of the periphrastic constructions relative to the causative errors, Bowerman (1974) postulated that the children's errors resulted from overgeneralization of the two-part structural pattern exemplified by open. Furthermore, she concluded from the cases of apparent overgeneralization that the feature CAUSE had become an element of the child's semantic category.

Gentner (1975) provides further data covering the acquisition of verb categories. Her studies relied on an analysis of verbs of transfer (such as give, take and pay) in which underlying semantic categories were identified on the bases of general and specific features. Gentner claimed the meaning of the words give and take could be represented by the general relational features DO, CAUSE and TRANSFER while the words pay and trade could be represented by these three general

relational features in addition to the specific feature OBLIGATION. By examining children's use of the verbs of transfer in an experimental format, Gentner (1975) found that the words with the most general features, give and take, were acquired before those with the more specific feature. The common underlying structural relation posited for the four verbs was strengthened by Gentner's (1975) finding that the youngest children understood the words with the more specific feature, pay and trade, as if they meant give and take.

Semantic Features Underlying Verbs of Separation:

The studies by Bowerman (1974) and Gentner (1975) provided some initial data concerning the child's acquisition of the verbs of his language. The data are limited in that they are confined to a relatively small subset of possible verb categories; namely, causative verbs and verbs of transfer. Data from more verb categories are needed if we are to explain the process of verb acquisition in first language learners. One such category involves verbs of separation such as open, break, tear, etc. While there are no developmental data concerning the relevant features utilized in categorizing such verbs, on logical grounds alone one might assume that cues which function in determining the semantic features of such verb categories may be the instrument, object and action encoded by those verbs. One might expect, therefore, that the non-linguistic instrument, object and action associated with a separation event like cutting may act as cues in assigning particular real world events to the verb category cut.

The major problem in providing research data regarding cues which function in determining semantic features of verbs has been the lack of an efficient experimental paradigm. One procedure which might be applicable to the study of verb categories is advocated by Miller (1967). Miller evaluated traditional procedures such as substitution, scaling and word association that might be used in assessing the semantic structure of the adult lexicon. Though the traditional procedures had been of value in the past, Miller (1967) advocated a new procedure: classification. The central assumption of the classification procedure which Miller (1967) noted is that as the similarity between two phenomenon increases, the likelihood that these phenomenon will be classified into one category also increases.

An experimental investigation of children's semantic categories along the lines suggested by Miller (1967) can be found in Rosch and Mervis (1975). Rosch and Mervis (1975) investigated the sorting behavior of young children at a level of category abstraction referred to as the basic object level. Basic objects reduce the infinite differences among real world stimuli to cognitively useful proportions by capturing those features which occur in highly correlated clusters. In the triplet animal, dog and German Shepherd, dog captures the level of the basic object.

Traditional sorting studies in contrast to Rosch and Mervis (1975) appeared to demonstrate that young children did not group objects of the same kind together. Thus the semantic knowledge of children apparently could not be assessed by way of a classification task. In

the traditional sorting studies, as Rosch and Mervis (1975) argue however, children were required to sort at a superordinate level, that is, they were required to group dog and cat together by means of the superordinate category animal. A more primitive sorting strategy, according to Rosch and Mervis (1975), would require access only to the level of the basic object where dog-1 and dog-2 are grouped together by means of the basic category dog.

Rosch and Mervis (1975) tested the sorting behavior of children and adults at the basic object level. They used an oddity problem format consisting of a triad of colored photographs of objects. Four categories of vehicles and four categories of animals were used in triadic combinations which required sorting at either a basic or superordinate level of abstraction. The results were overwhelming. Children as young as 3 years were able to group together objects which required access only to the basic object level. Those triadic sort combinations which required access to a superordinate level of abstraction showed improvement with subject age, as the traditional studies suggested.

The study by Rosch and Mervis (1975) marks theoretical and methodological factors which deserve consideration in an attempt to assess semantic categories by means of a classification task. The necessity that sorting tasks with children not require access to superordinate levels of abstraction, would appear to be a crucial theoretical factor. The results of Rosch and Mervis (1975) clearly point to this factor. A methodological factor of significance would appear to be the use of both adult and child subjects in assessing semantic category development. Such a range of subjects prevents the imposition of an a priori evaluation metric by which children's semantic categories are judged. A final methodological factor of potential value used by Rosch and Mervis (1975) would appear to be the use of photographs as experimental stimuli.

The study described in the following section will attempt to observe each of the above factors. It will attempt to explore the classification strategies of adults and children with regard to categorization of verbs of separation. In so doing, it will also attempt to assess the potential value of the non-linguistic cues, instrument, object and action in defining semantic cues utilized in categorizing verbs of separation.

METHOD

Subjects:

The subjects consisted of 20 children and 10 adults. The children were divided into two groups, 10 nursery school children and 10 first grade children. The nursery school children at the time of testing were between 4.4 and 5.2 years of age and the first grade children were between 6.5 and 7.6 years. All of the children in the study were learning English as their first language. For all of the adult subjects,

English was also their first language. Adult subjects were between the ages of 19 and 30 years and either were attending college or were college graduates.

Verbal Stimuli:

The verbal stimuli consisted of 5 English verbs. Each verb described a category of events involving some manner of object separation. The 5 verbal stimuli were cut, tear, open, peel and break.

Visual Stimuli:

The visual stimuli were 33 3 x 5 colored photographs. Each photograph depicted an event involving instances of those variables postulated to play a role in the categorization of verbs of separation: instrument, object and action. Instances of those variables used in the photographs are listed in Table 1. No two photographs depicted the same instances of each variable.

Object	Action	Instrument
apple	cutting	knife
paper	peeling	scissor
orange	tearing	hand
banana	breaking	hammer
egg	opening	opener
pop can	stabbing	hatchet
board	chopping	
cracker	pounding	
bottle		
carrot		
flower pot		
log		
cloth		
kleenex		
envelope		
box		
nail		

Table 1.

Not every possible combination of the variables listed in Table I was used in the experimental task. For instance, cutting an apple with a hand was not used since such a combination of variables appeared to be physically impossible to depict in a convincing manner. Some unusual combinations of the variables which could be depicted in a convincing manner were used however. The photographs depicting a scissor cutting a banana or a hatchet breaking an egg were two such instances.

As suggested by Table I, certain photographs depicted events not identified by the experimental verbal stimuli. In this class of photographs, one or more of the postulated variables was used in an event that would not be identified in adult usage by one of the verbs corresponding to the 5 verbal stimuli. For instance, one photograph depicted stabbing a piece of wood with a knife and another pounding a nail with a hammer. Such photographs when inappropriately categorized could possibly allow the identification of variables (cues) that subjects consider central to a category.

Procedure:

The entire set of 33 visual stimuli were paired with each verbal stimulus by means of a sorting task. The sorting task was administered to each subject individually. In each sort, a subject picked out, from the 33 visual stimuli, those stimuli which he viewed as representative of one of the five verb names (verbal stimuli). The visual stimuli picked out were placed by the subject in a small box. Children used as subjects were pre-trained to sort in this fashion in a match to sample task in which they were required to place "all trucks" in the box. Adults were simply told to put all visual examples of the target verb in the box.

The same set of direction statements were given to all subjects. Furthermore, the direction statement assumed a parallel form for each sort: "Put in the box pictures that show X ing / that show X ing something." The X in the direction statement corresponding to each sort was replaced by 1 of the 5 verbal stimuli. The direction statement was presented immediately before a sort was initiated. Throughout a given sort the relevant direction statement was repeated at random intervals in order to keep the verbal stimuli readily available to subjects, especially the younger subjects.

After a direction statement was presented, the visual stimuli were placed within an arm's length of the subject. For the two youngest groups of subjects, the set of 33 visual stimuli were presented in groups of 3, chosen at random. This procedure was followed in order to ensure subject attention to the details of each visual stimulus. For adult subjects, the set of visual stimuli were presented in groups of 8, again chosen at random. When a sort was completed, the identification number corresponding to each visual stimulus in the box was recorded by the experimenter. The visual stimuli were shuffled after every sort.

To ensure task reliability, all subjects performed one of the sorts twice. Upon completion of the 5 verbal stimuli sorts, subjects sorted the 33 visual stimuli on the basis of one of the 5 verbal stimuli given to them again. Pilot testing with children and adults established that a sort differential greater than one visual stimulus between the original sort and the reliability sort indicated that a subject was not attending to the sorting task. The combined set of visual stimuli from the original and reliability sort, when it abided by the reliability criterion, were counted as representative of the verbal stimuli of the sort. All study subjects observed the reliability criteria. In summary, a total of 6 sorts were performed by each subject, 5 study sorts and 1 reliability sort.

RESULTS AND DISCUSSION

The experiment described in the previous section attempted to assess adult and child verb classification strategies. More specifically it attempted to explore the possible value of certain preselected cues in defining the semantic categories underlying English verbs of separation. The response pattern derived from the experimental stimuli appears to imply that the verb classification strategies of adult and child subjects were non-identical. Moreover, evaluation of the response pattern obtained suggests that the cues (variables) manipulated in the experimental stimuli may function to define in part the verb categories investigated.

The cues depicted in each visual stimulus were translated into a four digit code to be used as the basis for data analysis. The object depicted in a given visual stimulus corresponded to the first two digits of the code. The experimenter's subjective judgment of the action depicted in a visual stimulus corresponded to the third digit. The fourth digit corresponded to the instrument used in performing the action. No two visual stimuli were translated into an equivalent series of digits. Table 2 presents the code corresponding to each of the 33 visual stimuli, as well as the respective object, action, and instrument depicted.

Each of the visual stimuli classified by an experimental subject's sort was translated into code form. The sort data, in code form, were then punched on computer cards. The total set of sort data, 150 sorts (5 verbal stimuli x 10 subjects x 3 age groups), were submitted to a BMDP/KSL01A analysis program and a BMDP3M clustering analysis program at the University of Kansas. Only the percentage and frequency figures obtained from the BMDP/KSL01A program are discussed below due to their informative and reproducible output. The percentage and frequency figures, a direct reflection of the experimental subject's sorting behavior, differed from chance at the .05 level of confidence.

Table 3 presents the total percentage response of each age group to each visual stimulus. Five apparently distinct response patterns can be identified in Table 3. In the dominant response pattern, the adult group classified over half of the visual stimuli under only one verb category. By comparison, the two child groups classified the

		Object	Action	Instrument
1.	0111	Apple	Cut	Knife
2.	0121	Apple	Peel	Knife
3.	0212	Paper	Cut	Scissors
4.	0311	Orange	Cut	Knife
5.	0321	Orange	Peel	Knife
6.	0412	Banana	Cut	Scissors
7.	0411	Banana	Cut	Knife
8.	0423	Banana	Peel	Hand
9.	0323	Orange	Peel	Hand
10.	0233	Paper	Tear	Hand
11.	0544	Egg	Break	Hammer
12.	0543	Egg	Break	Hand
13.	0655	Pop can	Open	Opener
14.	0761	Board	Stab	Knife
15.	0211	Paper	Cut	Knife
16.	0843	Cracker	Break	Hand
17.	0762	Board	Stab	Scissors
18.	0942	Bottle	Break	Scissors
19.	0546	Egg	Break	Hatchet
20.	0941	Bottle	Break	Knife
21.	1043	Carrot	Break	Hand
22.	1146	Flower Pot	Break	Hatchet
23.	1276	Log	Chop	Hatchet
24.	1333	Cloth	Tear	Hand
25.	1433	Kleenex	Tear	Hand
26.	0541	Egg	Break	Knife
27.	1011	Carrot	Cut	Knife
28.	0223	Paper Pad	Peel	Hand
29.	1312	Cloth	Cut	Scissors
30.	1784	Nail	Pound	Hammer
31.	1551	Envelope	Open	Knife
32.	0953	Bottle	Open	Hand
33.	1653	Box	Open	Hand

Table 2. The four digit identification code and the experimental variables depicted in each visual stimulus.

same stimuli under two or more verb categories. The stimuli observing the first pattern include 1, 3, 4, 6, 7, 10, 13, 14, 16, 18, 20, 22, 23, 24, 25, 27 and 29.

A second response pattern in Table 3 deviates slightly from the first. The adult group in this second pattern classified certain visual stimuli under one category at a percentage rate between 78 and 91 percent. The child groups, in general, classified the same stimuli under two or more verb categories. Such a response pattern by the child groups is very similar to the first pattern discussed. The second pattern includes stimuli 2, 5, 8, 9, 21, and 28.

	CUT			TEAR			OPEN			PEEL			BREAK		
	P	F	A	P	F	A	P	F	A	P	F	A	P	F	A
1. 0111	71	53	100	0	0	0	29	32	0	0	5	0	0	11	0
2. 0121	42	40	9	5	5	0	11	5	0	42	45	91	0	5	0
3. 0212	90	77	100	0	0	0	0	15	0	0	0	0	10	8	0
4. 0311	63	53	100	0	0	0	25	29	0	6	6	0	6	12	0
5. 0321	36	44	9	9	0	0	14	0	0	36	50	91	5	6	0
6. 0412	53	73	100	5	0	0	16	7	0	16	7	0	11	13	0
7. 0411	62	71	100	0	0	0	31	14	0	0	0	0	8	14	0
8. 0423	0	0	0	28	25	0	32	29	17	40	42	83	0	4	0
9. 0323	0	4	0	28	33	9	28	26	0	40	33	91	4	3	0
10. 0233	11	8	0	50	77	100	22	0	0	0	0	0	17	15	0
11. 0544	18	14	0	6	0	0	35	36	31	0	0	0	41	50	69
12. 0543	8	0	0	27	26	0	31	39	54	0	0	0	35	35	46
13. 0655	27	23	0	0	8	0	73	69	100	0	0	0	0	0	0
14. 0761	50	60	100	0	0	0	20	20	0	0	0	0	30	20	0
15. 0211	82	64	67	9	0	33	9	7	0	0	7	0	0	21	0
16. 0843	20	6	0	33	44	0	13	11	0	0	0	0	33	39	100
17. 0762	40	33	0	0	33	0	30	0	0	0	0	0	30	33	0
18. 0942	27	19	0	0	0	0	27	19	0	0	0	0	47	63	100
19. 0546	20	32	7	0	0	0	33	32	29	0	0	0	39	59	100
21. 1043	10	6	0	27	38	11	27	19	0	0	0	0	36	38	89
22. 1146	13	23	0	0	0	0	20	8	0	0	0	0	67	69	100
23. 1276	15	27	100	8	0	0	15	27	0	0	0	0	62	33	0
24. 1333	0	8	0	64	77	100	14	0	0	7	0	0	14	15	0
25. 1433	12	8	0	53	69	100	6	0	0	12	8	0	18	15	0
26. 0541	50	43	38	0	0	0	28	22	23	0	0	0	22	35	38
27. 1011	63	59	100	0	0	0	19	24	0	0	0	0	19	18	0
28. 0223	8	0	11	54	23	78	31	38	0	8	31	11	0	8	0
29. 1312	69	83	100	0	0	0	15	8	0	0	0	0	15	8	0
30. 1784	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0
31. 1551	50	56	29	7	5	18	43	33	53	0	6	0	0	0	0
32. 0953	0	0	0	0	9	0	100	91	100	0	0	0	0	0	0
33. 1653	0	0	0	0	25	0	100	75	100	0	0	0	0	0	0

Table 3. For each age group, the percentage of sort response to each visual stimulus (P=preschool, F = first grade, A = adult).

Still, a third response pattern identified in Table 3 reveals a somewhat more distributed classification by each age group. Marking this third pattern is each age group's classification of identical visual stimuli under two or more verb categories. The stimuli numbered 11, 12, 15, 26 and 31 observe pattern three.

Two weaker, in the sense of stimuli affected, response patterns can be observed in Table 3. One pattern contrasts sharply with the first two patterns noted above. In this contrasting pattern, the two child groups classified experimental stimuli under one verb category while the adult group failed completely to classify the same stimuli under any verb

category. The stimuli numbered 17 and 30 reflect what is response pattern four. A fifth and final response pattern in Table 3 is the near classification of stimuli 32 and 33. The three age groups agreed in classifying these two stimuli primarily under one verb category.

The five general response patterns manifested in Table 3 make it apparent that the classification strategies used by the adult and child groups do not, for the most part, agree. The subjects appear to agree in response patterns 3 and 5, but fail to agree in response patterns 1, 2, and 4.

A point to be noted about response pattern 3 is that three of the stimuli making up this pattern, 11, 12, and 26, depict what the experimenter identified as a breaking event involving an egg and either a knife or hand instrument. That the response pattern to these three stimuli was distributed among several categories suggests that the features defining any one of the five experimental verb categories, for both the adult and child groups, was not of a sufficient structure to classify the events depicted. These stimuli may thus represent events on the boundary of several of the experimental verb categories. Further confirmation of their boundary status is the informal observation that the sort time, relative to other stimuli, required by adult subjects for these three stimuli was prolonged. The sort time required for stimuli 15 also seemed to be prolonged relative to most other stimuli. Post experiment discussion with subjects revealed that the action-instrument relation in stimuli 15 was unclear. Either the hand or knife depicted could have been the instrument of the action.

The near agreement by all subject groups in response pattern 5 should also be mentioned. What is of interest in this pattern is the fact that the action depicted in the stimuli is an opening action. Later discussion will point to the unique feature composition of the category open.

The classification strategies of the preschool and first grade subjects in response patterns 1, 2, and 4 can be combined into one group due to their overall similarity when contrasted to the adult group. Since the semantic categories reflected by the classification responses appear to be distinct for the two age groups, adult and child, one might consider the features comprising the adult and child semantic categories to be distinct. That is, the child categories may lack a semantic feature(s) available in the adult categories.

There exists a plausible alternative to the just mentioned feature-lacking hypothesis. One might suppose that the features comprising the categories of the adult and child groups were nearly identical. The classification differences between the two groups might then be accounted for by differences in the internal structure of the category features. That is, it may be the case that in certain of the categories features were weighted differentially by the children and adults.

The response frequency figures of the three subject groups to the three variables manipulated in the experimental visual stimuli point to the weighted feature alternative. Table 4 presents the

frequency, in number of subject sorts, with which the action variable was classified under one of the five verb categories. In its general outline, Table 4 reveals near identical sorts, except for the category break (recall response pattern 3), for action-category pairs of the same name. For instance, the total number of sorts in which visual stimuli depicting a cutting action were classified under the category cut was nearly equivalent for the three age groups. Based on the near equivalence figures for each action-category pair, the features comprising the categories of the adult and child group would not appear to differ substantially. Hence, the feature-lacking hypothesis is considerably weakened.

The child group, nonetheless, demonstrated a strong tendency already observed in Table 3 to classify visual stimuli into more than one verb category. Stimuli depicting a peeling action, for instance, were not only classified under the category peel, but under the categories cut, tear and open as well. (Adult subjects, in contrast, classified the peeling action primarily under the category peel.) In the manner of the peeling action, certain cutting actions were classified under the categories open and break, certain breaking actions were classified under cut, tear and open and certain opening actions were classified under the category cut. The fact that the number of apparent miscategorizations by the child group is consistently a subset, rather than an equivalent set, of the number of categorizations under the action-category pairs appears to strengthen further the weighted feature alternative. How might the apparent miscategorizations be accounted for however?

A response tendency in Table 4 hints that the feature instrument may have been accorded a disproportionate weight in the categories upon which the classification strategies of the child group were based. Notice the response pattern to those stimuli which depicted a stabbing action. The preschool group classified the visual stimuli depicting stabbing primarily under the category cut, but also under the categories open and break. It may be recalled that the visual stimuli depicting the stabbing action were included in order to detect features that might be considered central to a category. In this case, the foil stimuli appear to have detected the feature instrument. Though Table 4 is suggestive, an overall view of the classification of the instrument variable may prove of more value in accounting for the apparent miscategorizations.

Table 5 presents the frequency with which sorts identified by the various instrument variables occurred under each of the five verb categories. Comparison of the adult and child response patterns in Table 5 suggests that the feature Instrument may have been weighted disproportionately in some child categories. Visual stimuli with the instrument knife, apparently irrespective of action, were placed under the category cut in at least 30 or more sorts by each child group relative to the adult group. In a similar fashion, visual stimuli depicting the instrument hand were placed under the categories tear and open almost twice as often by children as by adults. Relying on the above findings, it would appear that among the features comprising

	CUT			TEAR			OPEN			PEEL			BREAK		
	P	F	A	P	F	A	P	F	A	P	F	A	P	F	A
Cutting	75	79	77	3	0	4	21	22	0	4	4	0	10	16	0
Peeling	17	17	3	24	19	8	24	20	2	37	42	41	2	5	0
Tearing	4	3	0	27	29	30	7	0	0	3	1	0	8	6	0
Breaking	34	30	6	20	20	1	43	37	18	0	0	0	64	72	73
Opening	10	13	5	1	6	3	32	34	38	0	1	0	0	0	0
Stabbing	9	4	1	0	1	0	5	1	0	0	0	0	6	2	0
Chopping	2	4	3	1	0	0	2	4	0	0	2	0	8	5	0
Pounding	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0

Table 4. For each age group, the frequency with which visual stimuli depicting the experimental action variables were classified under the 5 verb categories (P = preschool, F = first grade, A = adult).

	CUT			TEAR			OPEN			PEEL			BREAK		
	P	F	A	P	F	A	P	F	A	P	F	A	P	F	A
Knife	90	91	60	6	2	7	38	34	12	17	22	20	20	33	13
Scissor	36	35	30	2	1	0	12	7	0	3	1	0	15	15	10
Hand	12	6	1	66	71	39	60	52	28	24	25	21	31	30	22
Hammer	3	2	0	1	0	0	6	5	4	0	0	0	8	7	9
Opener	3	3	0	0	1	0	8	9	10	0	0	0	0	0	0
Hatchet	7	13	4	1	0	0	10	11	4	0	2	0	25	21	19

Table 5. For each age group, the frequency with which visual stimuli depicting the experimental instrument variables were classified under the 5 verb categories (P = preschool, F = first grade, A = adult).

the category cut, children may weigh the instrument feature knife more heavily than do adults. Similarly, the instrument feature hand may be disproportionately weighted in the child categories tear and open. Neither of the categories peel or break reveals a parallel tendency, although the frequency figures for the three instruments, knife, scissor, and hand under the category break are higher for the child group than for the adult group.

Though the feature instrument appears to be disproportionately weighted in some of the categories of the child group, there is still a puzzle. In Table 5 the frequency figures corresponding to knife, scissors and possibly hatchet are not accounted for when the weighted instrument feature for the category open is assumed to be hand. How might these frequency figures for instrument features other than hand be accounted for?

Table 6 presents the frequency with which stimuli depicting the 17 object variables occurred under each of the verb categories. Since the category open is of most immediate interest, consider the response pattern under open in Table 6. It is apparent in Table 6 that the child group responded consistently to several objects in combination with an opening action where adults failed to respond, or nearly failed. For instance, the objects apple, paper, orange, carrot and to a lesser extent board received no adult response but consistent child response. The object banana appears to show a similar pattern despite two adult responses.

Visual stimuli containing the above named objects in combination with the instruments knife, scissor and hatchet were inspected in an attempt to identify a common feature. One salient feature did appear. In each visual stimulus inspected, the action of the instrument revealed a part of the object that was otherwise not visible. It may therefore be the feature "revealing what is hidden" which is weighted heavily in the category open of the child group. Two disproportionately weighted features may thus account for the apparent miscategorizations by the child group involving the category open. Perhaps also it was the two heavily weighted features in the child category open that account for response pattern five wherein the child and adult groups nearly agreed in their classification strategy.

Throughout the preceding discussion of experimental results, it was tentatively supposed that the features comprising a semantic category were in some sense weighted. In general outline, this tentative supposition reflects a perspective of semantic category structure which has gained steady acceptance in the field of first language development in recent years. Such acceptance has been gained at the expense of the traditional perspective of semantic category structure. A semantic category, according to the traditional perspective, is defined by a conjunction of features such that each defining feature of the category occurs in each exemplar of the category.

The traditional perspective on category structure has been applied to semantic category acquisition by Clark (1973). As outlined by Clark (1973), when adult and child semantic categories differ, as they do in the acquisition of word meaning, it is primarily due to the

	CUT			TEAR			OPEN			PEEL			BREAK		
	P	F	A	P	F	A	P	F	A	P	F	A	P	F	A
Apple	18	18	11	2	1	0	6	7	0	8	10	10	0	3	0
Paper	21	20	19	17	13	21	9	8	0	1	5	1	4	7	0
Orange	18	18	11	9	9	1	14	12	0	19	19	20	3	4	0
Banana	18	21	20	8	6	0	15	10	2	13	11	10	3	5	0
Egg	17	18	6	8	6	0	24	25	18	0	0	0	27	30	39
Can	3	3	0	0	1	0	8	9	10	0	0	0	0	0	0
Board	9	4	1	0	1	0	5	1	0	0	0	0	6	2	0
Cracker	3	1	0	5	8	0	2	2	0	0	0	0	5	7	8
Bottle	10	7	0	1	1	0	18	16	10	0	0	0	14	20	8
Carrot	12	11	10	6	6	1	9	7	0	0	0	0	11	9	8
Pot	2	3	0	0	0	0	3	1	0	0	0	0	10	9	10
Wood	2	4	3	1	0	0	2	4	0	0	2	0	8	2	0
Cloth	9	11	9	9	10	10	4	1	0	1	1	0	4	1	0
Kleenex	2	1	0	9	9	10	1	0	0	2	1	0	3	1	0
Envelope	7	10	5	1	1	3	6	6	9	0	1	0	0	1	0
Box	0	0	0	0	3	0	8	9	9	0	0	0	0	0	0
Nail	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0

Table 6. For each age group, the frequency with which visual stimuli depicting the experimental object variables were classified under the 5 verb categories (P = preschool, F = first grade, A = adult).

lack of a particular feature or features in the child's category. In the preceding discussion of the experimental results, the rejected hypothesis considered to account for the response pattern of Table 3 and 4 implied the traditional perspective on category structure.

A more recent perspective on category structure, sometimes termed prototype analysis, is directly opposed to the equal distribution of features within a category. In this recent perspective the structure of a semantic category consists of a core set of features supplemented by additional non-core features. As for the specification of a core set of features, it is argued that they are derived from a best example of the category.

The prototype perspective has been applied to semantic category acquisition by Bowerman (1977). Semantic category development from this perspective does not consist of the acquisition of semantic features; rather, it would appear to consist of determining the proper weight to be accorded the semantic features comprising a category. When applied to the findings of the present study, the prototype analysis suggests that part of the process of acquiring the meaning of verbs of separation is arriving at an acceptable weight for at least the features Action, End State (effect of action on object) and Instrument. Though this interpretation is highly tentative, the experimental findings upon which it is based suggest that investigation of the verbs of separation by way of a classification procedure can prove to be fruitful.

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