CHAPTER

36

Contextual Influences on Category Concept Generation in Aphasia

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This study was part of a larger investigation that examined the access and organization of common and ad hoc categories in individuals with fluent and nonfluent aphasia. Common categories are groups of natural object concepts, such as "birds" and "fruits" that have graded structure (Rosch, 1975; Rosch and Mervis, 1975). Essentially, this indicates that all members of a category are not equally representative of the category, with some members being better examples than others. Representativeness has been based on normal subjects' ratings of how good an example a particular item is of a category. For example, "apple" consistently has been rated a better example of the category "fruit" than has "kumquat." The better examples have been identified as more typical representatives of a category. Grossman (1981) investigated fluent and nonfluent aphasic adults' sensitivity to graded structure in common categories. He observed that individuals with nonfluent aphasia were strongly anchored to the central portion of a category's referential field, primarily producing highly typical exemplars. Subjects with fluent aphasia named many out-of-category items, being relatively insensitive to category boundaries. However, they demonstrated some limits in their choice of a category's referent by producing out-of-set responses that were related to the target category.

In attempting to develop a more general theory of categorization, Barsalou (1983) investigated the structure of categories that are constructed for use in specialized contexts. These have been referred to as ad hoc categories and are considered instrumental to achieving goals. An example of an ad hoc category is "things not to eat on a diet." Ad hoc categories possess graded structures as salient as those structuring common categories. Ad hoc categories, however, are not as well established in memory as common categories because people have had more experience with common categories, establishing stronger associations to their category instances. In addition, ad hoc categories, unlike common categories, violate the correlational structure of the environment, containing category instances that share many properties with members of other categories.

Barsalou (1983) also examined the influence of context on categorization, specifically for ad hoc categories. He observed that relevant contexts prime ad hoc categories. That is, when normal individuals were presented instances of ad hoc and common categories, ad hoc category labels were as obvious as common category labels when primed by contexts indicating current goals. Context had no impact on ease of discovery of common category labels. The concepts for common categories were as available without context as with context because their instance-to-concept associations are more established in memory than those for ad hoc categories. It appears, then, that ad hoc categories are dependent on context for their realization, whereas common categories are context-independent.

The present investigation examined the influence of context on the generation of ad hoc and common category concepts in individuals with flu-

ent and nonfluent aphasia and non-brain-damaged adults. Our primary concern was whether adults with aphasia could utilize context to aid them in generating category labels, particularly for the goal-oriented ad hoc categories. We specifically examined category label accuracy, error types, and the relationship between standardized auditory comprehension level, naming scores, and experimental task performance.

METHOD

SUBJECTS

Twenty adults with brain damage who had sustained unilateral, single, left-hemisphere cerebrovascular accidents and exhibiting aphasia participated in this study. Ten neurologically intact control subjects, matched with the brain-damaged subjects on age and education level, were also examined. Brain damage was verified by neurological reports and clinical examination. Subject descriptive information is presented in Tables 36-1 and 36-2.

TASKS

All subjects with brain damage were administered portions of the Boston Diagnostic Aphasia Examination (BDAE) (Goodglass and Kaplan, 1983) and the Boston Naming Test (BNT) (Kaplan, Goodglass, and Weintraub, 1983). The subtests of the BDAE administered included oral commands, complex ideational material, repetition of words, repeating phrases, and cookie-theft picture description. The animal naming subtest from the BDAE was used as a naming screening test. A combination of several items from the reading comprehension of sentences subtest from the Western Aphasia Battery (WAB) (Kertesz, 1982) and the reading sentences and paragraphs subtest from the BDAE were used as a reading screening test. Ten of the items from the understanding sentences subtest from the Minnesota Test for Differential Diagnosis of Aphasia (MTDDA) (Schuell, 1965) were used as an auditory screening test. Individuals with aphasia who produced a minimum of three animals on the animal naming subtest and achieved at least 70 percent accuracy on both the reading and auditory screening tests were included as subjects in the study. The subjects with brain damage were assigned to fluent and nonfluent aphasic subject groups based on analysis of the BDAE Cookie Theft picture description task and a spontaneous speech sample by three speech pathologists familiar with neurogenic disorders. This resulted in 10 adults with fluent and 10 adults with nonfluent aphasia. Computation of an independent t-test between the group means on the summated BDAE subtests revealed no

TABLE 36-1. SUBJECT CHARACTERISTICS

Subjects	*Age*	*Years of education*	*Months post-CVA*	*Gender*
Normal				
1	57	10		Female
2	63	18		Male
3	67	18		Male
4	64	12		Female
5	61	12		Male
6	53	12		Female
7	57	15		Female
8	60	14		Male
9	58	12		Female
10	70	12		Male
Range	53–70	10–18		
Mean	61	13.5		
SD	5.12	2.72		
Fluent				
1	76	16	6	Male
2	66	12	15	Male
3	59	13	8	Female
4	68	14	3	Male
5	70	12	41	Male
6	72	12	36	Female
7	70	14	4	Male
8	73	14	13	Female
9	72	12	67	Male
10	53	10	2	Female
Range	53–76	10–16	2–67	
Mean	67.9	12.9	19.5	
SD	6.98	1.99	21.57	
Nonfluent				
1	59	14	94	Male
2	75	14	14	Male
3	64	9	37	Female
4	46	14	9	Male
5	71	12	51	Male
6	54	10	3	Male
7	63	12	58	Female
8	65	12	34	Male
9	63	10	58	Female
10	75	12	45	Male
Range	46–75	9–14	3–94	
Mean	63.5	11.9	40.3	
SD	9.07	1.79	27.41	

TABLE 36-2. CLINICAL TEST DATA

Subjects	*BNT* [b]	*Aphasia classification*	*BDAE* [a] *subtests*			
			Oral commands	*Complex* [c]	*Word repetition* [d]	*Repeating phrase* [e]
Fluent						
1	52	Anomic	15	12	10	15
2	28	Wernicke	15	7	10	11
3	46	Anomic	14	10	10	16
4	55	Conduction	10	5	10	12
5	23	Conduction	12	9	8	2
6	32	Conduction	10	9	8	1
7	24	Conduction	4	8	9	6
8	50	Anomic	15	12	10	15
9	51	Anomic	14	10	9	13
10	38	Anomic	15	8	9	15
Range	23–55		4–15	5–12	8–10	1–15
Mean	39.9		12.4	9	9.3	10.6
SD	12.4		3.57	2.16	.82	5.6
Nonfluent						
1	50	Broca	15	10	10	16
2	25	Mixed	14	10	9	10
3	30	Mixed	11	7	9	7

(continued)

TABLE 36–2. (continued)

Subjects	*BNT* [b]	*Aphasia classification*	*BDAE* [a] *subtests*			
			Oral commands	*Complex* [c]	*Word repetition* [d]	*Repeating phrase* [e]
Nonfluent *(continued)*						
4	7	Mixed	8	5	10	6
5	41	Broca	15	12	8	10
6	35	Broca	15	12	9	5
7	40	Broca	15	10	10	11
8	35	Broca	12	10	8	4
9	19	Broca	12	8	8	7
10	30	Mixed	12	9	8	7
Range	7–50		8–15	5–12	8–10	4–16
Mean	31.2		12.9	9.3	8.9	8.3
SD	12.16		2.33	2.16	.88	3.53

[a] Boston Diagnostic Aphasia Examination.
[b] Boston Naming Test.
[c] Complex ideational material.
[d] Repetition of words.
[e] Repeating phrases.

statistically significant difference between the fluent and nonfluent groups on auditory comprehension level ($t = .385$; $p > .35$).

MATERIALS AND PROCEDURES

Sixteen ad hoc and eight common categories were presented to each subject. The common categories were 8 of the 10 categories for which Rosch (1975) established typicality norms. The ad hoc categories were 16 categories for which Hough (1988) developed typicality norms in a pilot study with normal middle-aged adults. Category labels are presented in Table 36-3.

Context vignettes were presented to each subject for half of the categories. Each context vignette described a character engaged in a goal-directed activity and that primed the subsequent respective category. None of the vignettes contained the category label for the respective item set. For both category types, vignettes were developed using the same framework as Barsalou (1983). A sample of a vignette for the category "things to take on a picnic" is presented in Table 36-4. Practice items were one common and one ad hoc category that were not part of the experimental stimuli. The common category was "carpenter's tools," and the ad hoc category was "things that can attack something."

Four exemplars per category, consisting of two instances that were highly typical and two instances that were moderately typical, were pre-

TABLE 36-3. CATEGORY LABELS

Common	
Birds	Furniture
Sports	Weapons
Fruits	Clothing
Vehicles	Vegetables
Ad Hoc	
Things that are poisonous	Things that can be used for hitting
Things that can be leaned on	Things that can roll
Things that can be walked upon	Things that can fall on your head
Things to inventory at a store	Things to take on a camping trip
Things to sell at a garage sale	Things to take on a picnic
Things to take on a vacation	Things used to prop doors open
Things that can be folded	Things that have a smell
Things to take from one's house during a fire	Things that can float

TABLE 36-4. SAMPLE VIGNETTE

THINGS TO TAKE ON A PICNIC

Sam wanted to spend time outdoors. It was a beautiful day so he packed up some items and went to a nearby park.

sented. Category instances were chosen based on Rosch's (1975) typicality norms and pilot data for the common and ad hoc categories, respectively. On a seven-point rating scale, an instance was considered highly typical if it received a mean typicality rating between 1 and 2. Moderately typical exemplars were defined by mean ratings between 2.50 and 3.50.

Subjects were asked to perform a categorizing operation in which they provided a category label for the 24 categories, each consisting of the four category instances of an ad hoc or common category. For half of the ad hoc and half of the common categories, a context vignette preceded category exemplar presentation. Context vignettes and category instances were presented auditorily through live voice and graphically. Subjects were informed that phrases as well as single words could serve as category labels. A 2-minute time limit was provided to respond to each of the exemplar sets. If the subject did not provide a category label after 1½ minutes, the investigator encouraged the subject to think of a category name. Subjects were permitted to produce category labels either verbally or graphically. Subjects' responses were audiotaped and/or graphically recorded by the investigator. Two versions of the task were developed so that ad hoc and common categories occurred equally in both context conditions.

RESULTS

The accuracy data, in the form of percentages, were analyzed in a three-way ANOVA with one between (group — normal, fluent, nonfluent) and two within (category type — ad hoc, common; context — with, without) subject variables. The results yielded statistically significant main effects for category type ($F[1, 27] = 234.835$; $p < .001$) and context ($F[1, 27] = 136.301$; $p < .001$) and a significant category type X context interaction ($F[1, 27] = 113.373$; $p < .001$). There was no statistically significant group effect.

Newman-Keuls analyses conducted on the statistically significant category type X context interaction yielded a highly statistically significant difference between contextual conditions for the ad hoc categories but not for the contextual condition difference for the common categories. These

results are shown in Figure 36-1. Although there were statistically significant differences between category types when context was presented, there was a much greater significant discrepancy between ad hoc and common categories without the contextual influence. Contextual condition means are presented in Table 36-5.

Subject errors were categorized into six types of responses, which included related, unrelated, hierarchically-off, perseverative, no response/don't know, and self-correct. A related response was one that was not the category label but was a related category label (e.g., "things for park" for the label "things to take on a picnic"). An unrelated response was one that was an unrelated, inaccurate response. A hierarchically-off response was one that was another exemplar of the category (e.g., "frisbee" for the category label "things to take on a picnic"). A perseverative response was one that had been provided for the previous set of exemplars. A no response/don't know response was one for which subjects did not respond or indicated that they did not know the answer. Self-corrections also were evaluated.

Figure 36-1. Mean percentage of correct responses for the ad hoc and common categories as a function of contextual condition.

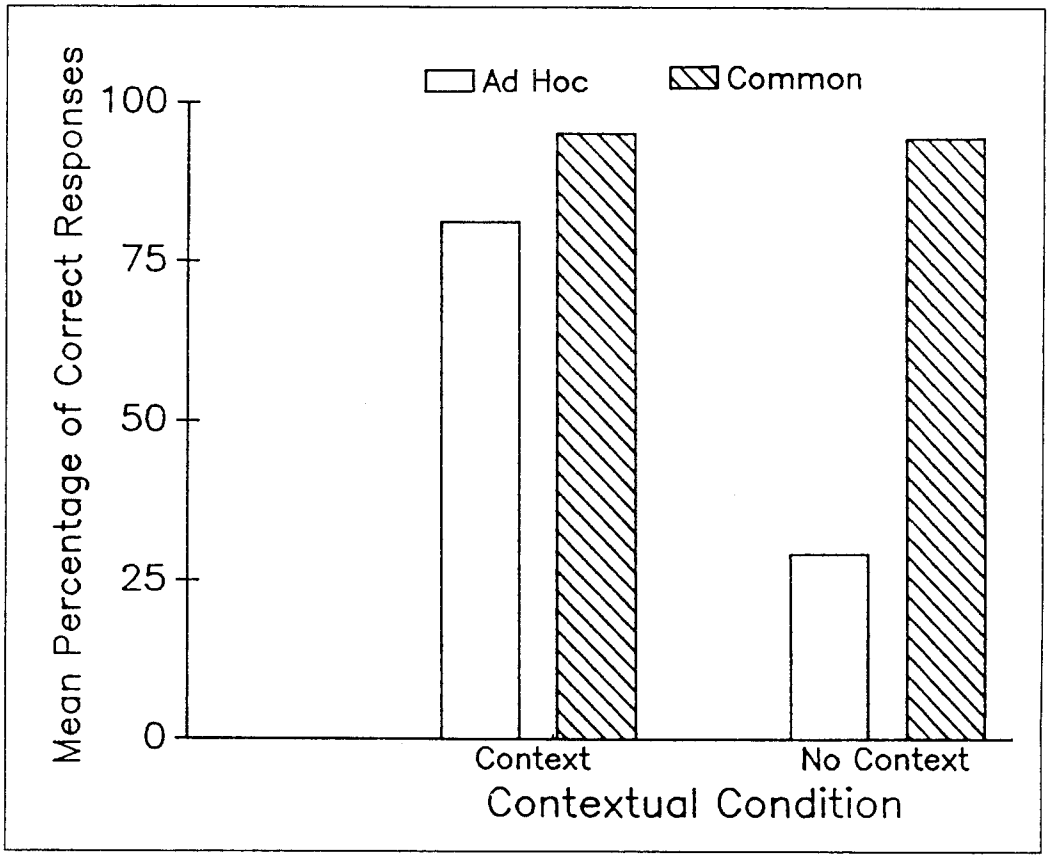

TABLE 36-5. MEAN PERCENTAGE SCORES FOR THE AD HOC AND COMMON CATEGORIES AS A FUNCTION OF CONTEXT *

	Ad Hoc	*Common*
Context	81.25 (13.03)	95.00 (12.11)
No context	29.17 (19.51)	94.17 (12.60)

* Standard deviations are in parentheses.

Error responses were analyzed in a three-way ANOVA with one between (group) and two within (category type; error type) subject variables. Statistically significant main effects for the category type ($F[1, 27] = 253.205$; $p < .001$) and error type ($F[5, 35] = 20.906$; $p < .001$) and statistically significant group X error type ($F[10, 135] = 9.194$; $p < .001$), category type X error type ($F[5, 135] = 30.128$; $p < .001$), and group X category type X error type ($F[10, 135] = 10.119$; $p < .001$) interactions were observed.

Newman-Keuls analyses conducted on the statistically significant three-way interaction revealed statistically significant differences between groups in the mean number of errors for particular error types of ad hoc categories only. The results for the ad hoc categories are shown in Figure 36-2. Statistically significant differences between all groups were found for no response/don't know, related, and unrelated error types, with normal subject producing more related and unrelated errors than both aphasic groups and nonfluent subjects producing more no response/don't know errors than the other two groups. Both groups with aphasia produced more no response/don't know errors than all other error types. Normal subjects produced more unrelated errors than all other errors and produced more related errors than any other error type aside from unrelated errors. For common categories, the only statistically significant finding was for fluent subjects, who produced more self-corrections than all other error types. Common category error results are shown in Figure 36-3.

Pearson product-moment correlations were conducted between contextual conditions for both category types, age, education, months post-onset, BNT performance, and summated BDAE auditory comprehension scores for the two aphasic groups. For the non-brain-damaged controls, correlations were conducted only between contextual conditions for both category types. The only statistically significant finding was a positive correlation between BNT scores and performance on ad hoc categories with context present for the fluent group ($r = .762$).

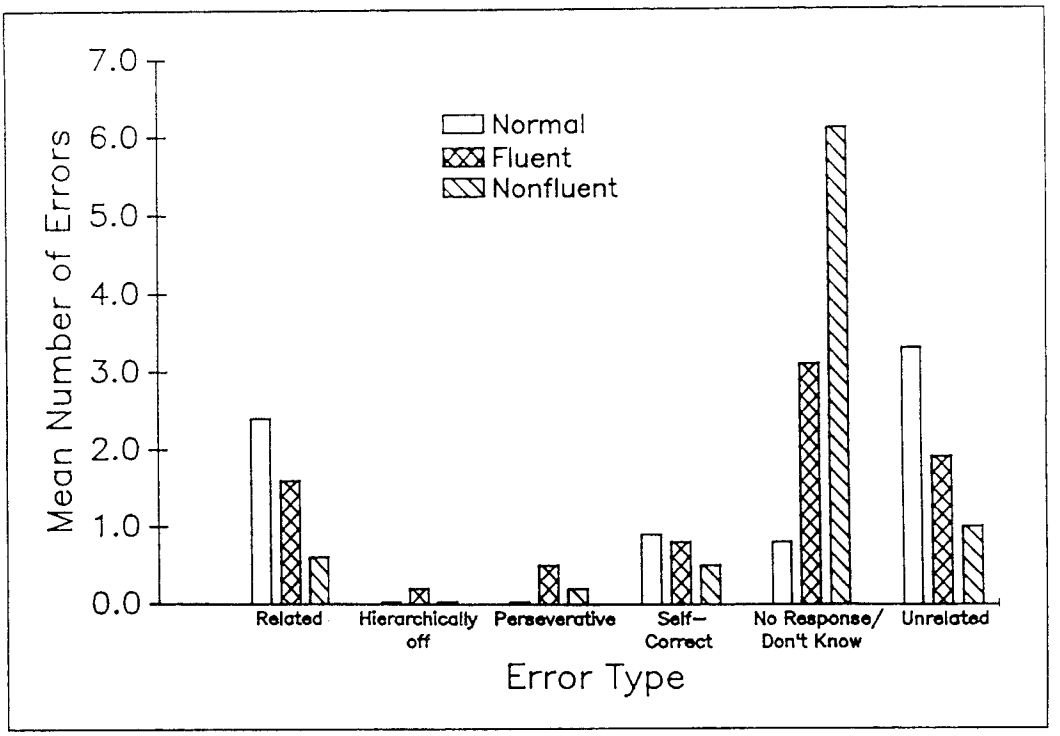

Figure 36-2. Mean number of errors for the ad hoc categories as a function of error type and group.

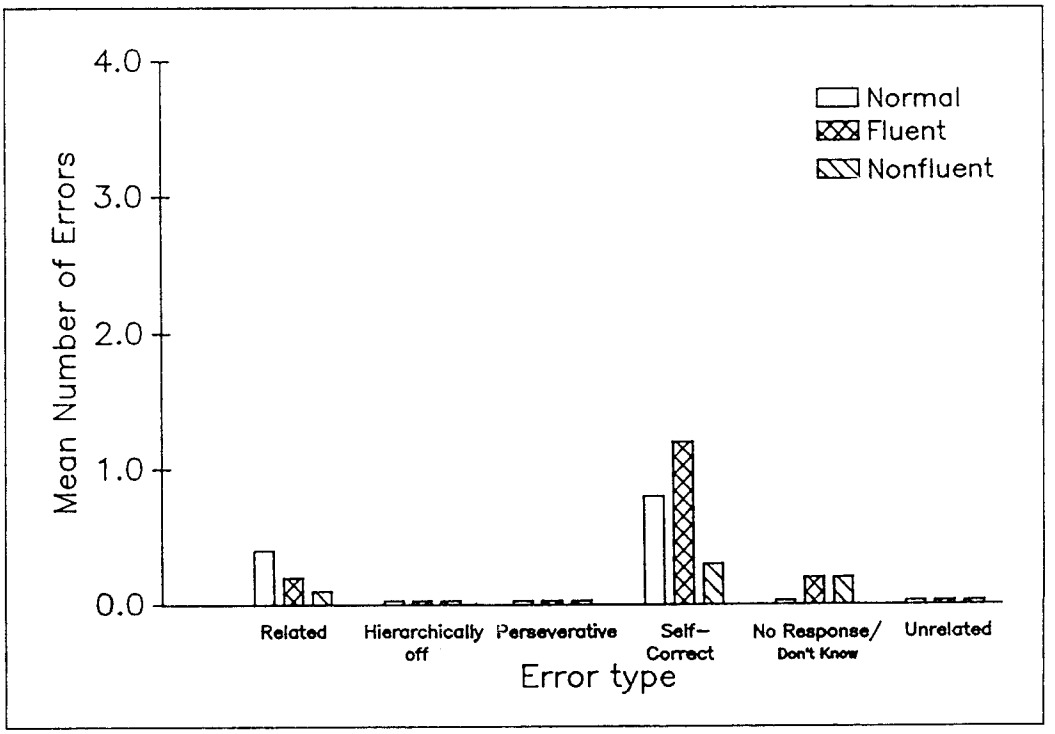

Figure 36-3. Mean number of errors for the common categories as a function of error type and group.

DISCUSSION

Our results indicate that adults with both fluent and nonfluent aphasia are able to utilize context effectively to prime category labels, particularly for categories that depend on an explicit context for their realization. Both normal and aphasic individuals showed a statistically significant increase in performance for ad hoc categories when context was introduced. For the fluent subjects, this performance was directly related to individuals' standardized naming abilities. As Barsalou (1983) had observed, the presence of context had no impact on category label generation for the common categories. Although common categories are not goal-derived, people are more familiar with these natural object concepts.

In regard to error production, performance for common categories was similar in all groups. For ad hoc categories, subjects with aphasia appeared to have more difficulty generating category labels than did normal subjects, in that they produced more no response/don't know errors. Normal subjects, on the other hand, generated more labels, producing more related and unrelated responses than both aphasic groups.

Individuals with fluent and nonfluent aphasia were similar to normal adults in their ability to see the relationship between category instances that reflect functional goals when context was present. This suggests that category structure and the ability to relate exemplars and goals within a contextual environment are intact for both types of aphasic adults. An individual's awareness of ad hoc categories appears to be based on previous experience and/or knowledge, with category construction extending what is already known. Ad hoc category utilization may involve a broad search of memory to generate a goal, since these categories have been found to violate the correlational structure of the environment (Barsalou, 1983). Chapey (1981) had indicated that adults with aphasia often have difficulty in communicative contexts requiring convergence on one correct response. Therefore, facilitation of categories, such as ad hoc, that are dependent on explicit context for their realization may be fruitful with linguistically impaired individuals because their construction does not require an individual to focus on a narrow response. Moreover, ad hoc categories are more functional than common categories in that they rely on previous experience and knowledge to accomplish the goals of daily living.

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DISCUSSION

Q = question; A = answer; C = comments.

C. This is not directly related to some of the data here, but it has to do with divergence, which I think you are looking at.

A. Yes, in sort of a way. It's an attempt at trying to get back to the efficacy of some of the issues Chapey had discussed in the 70s.

Q. I wonder if this has any application at all? It happens that I've had some patients to whom I've shown contextual pictures, and they can describe very well the things that are going on in those pictures. Then, you say to them, "Well, tell me what this brings to mind about your past or about other things, anything that might even be associated with it." They simply cannot do that task. You try to spend time with it and try to get that going. I wonder if maybe you are doing some of this with your ad hoc categories and if you would like to comment on this.

A. I definitely think you are tapping this knowledge with your ad hoc categories. For example, in the category "things to take on a picnic," aphasic subjects seem to retain that basic knowledge and experience when you give them the contextual information. The nonfluent subjects are not necessarily responding "things to take on a picnic," but they are saying "picnic" and are smiling because you have definitely triggered something off for them. Then ask the subjects, out of the situation, "Tell me some things to take on a picnic" a half an hour later, and the subjects are unable to respond to the request.

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