Confrontation Naming and the Provision of Superordinate, Coordinate, and Other Semantic Information By Individuals With Aphasia

Pelagie M. Beeson
Audrey L. Holland
National Center for Neurogenic Communication Disorders, University of Arizona, Tucson

Laura L. Murray
Indiana University, Bloomington

Thirty-three individuals with aphasia (11 Broca's, 11 conduction, and 11 anomic) and 11 healthy control subjects were studied using a confrontation naming task. Each naming trial was followed by requests for the superordinate, other semantic information, and an in-class coordinate. All groups were as successful at giving semantic and coordinate information about items as they were at giving the basic level names for the items. Giving the superordinate category was the most difficult task for individuals with aphasia, regardless of type. These results suggest that in the face of anomia for basic level name, the provision of semantic information or an in-class coordinate is likely to be a better compensatory strategy than trying to provide the superordinate category.

Naming difficulties are the hallmark of aphasia. In the face of a lexical retrieval failure, aphasic individuals often demonstrate access to some information about the item and often are able to convey their thoughts despite the anomia. Speech-language pathologists have capitalized upon this ability by encouraging compensatory responses to naming failure, as well as semantic self-cueing techniques (Lowell, Beeson, & Holland, 1995; Marshall, Neuberger, & Phillips, 1992). The availability of information about a target word during instances of anomia has been interpreted as evidence that aphasic anomia reflects a lexical access problem, rather than a loss of semantic information (Brownell, Bihrle, & Michelow, 1986; LeDorze & Nespoulous, 1989). However, there is some evidence that semantic knowledge may be compromised, particularly in fluent aphasic individuals with poor comprehension (Goodglass & Baker, 1976; McCleary & Hirst, 1986).

LeDorze and Nespoulous (1989) examined semantic knowledge about target words using a multiple-choice format in instances of naming failure. They found that subjects with aphasia (regardless of aphasia type) were able to identify appropriate superordinate and attribute information for words that they could not produce. These findings differed from those of McCleary and Hirst (1986) and Goodglass and Baker (1976) who observed that individuals with fluent aphasia had difficulty classifying items on the basis of semantic relations, particularly function relations. Despite the observed differences regarding the status of semantic knowledge (or access to such knowledge), it is apparent that for many individuals with aphasia, considerable information remains available in instances of anomia that may be used to communicate the concept.

Brownell et al. (1986) examined spoken responses during instances of aphasic anomia for basic level names (e.g., *chair*) and subordinates (e.g., *beach chair*). They found that individuals with nonfluent aphasia and those with fluent aphasia had greater difficulty providing the subordinate name than the basic level name, even though they communicated knowledge about the subordinate attributes. Brownell et al. suggested that retrieval of subordinate names was more difficult due to a word frequency effect (basic level names being more frequent than subordinate names), as well as increased complexity of the subordinate names (e.g., two words as opposed to one).

In this study, we proposed to further examine spoken responses in the context of a confrontation naming task. We set out to explore basic level naming and, more important, to explore the ability to provide other information about objects, which might be useful in instances of anomia. We asked: What is the relative difficulty of retrieving the basic level name, the superordinate category, other semantic information, and in-class coordinates? Because previous researchers noted differences in semantic knowledge in fluent as opposed to nonfluent aphasia types, we also examined whether performance differed by aphasia type (Broca's, conduction, anomic).

Method

Participants

Thirty-three individuals with stroke-induced aphasia and 11 control subjects participated in this study. The individuals with aphasia represented three aphasia types: anomic, Broca's, and conduction aphasia,[1] based on the Western Aphasia

[1] Individuals with Wernicke's aphasia also participated in this study, but did not constitute a large enough group to be included in this analysis. It should be noted that their performance was similar to that of the conduction group, but with greater overall impairment.

Battery classification system (Kertesz, 1982). The demographic characteristics of the subjects are included in Table 1. Subjects had adequate hearing to perceive the spoken questions in the quiet testing environment. Vision was adequate to correctly recognize the pictured stimuli as evidenced by either correct naming or correct recognition of the items on 98% of all trials. All control subjects were healthy, with no significant medical history that would negatively affect their speech, language, or cognition. All subjects with aphasia had experienced a single-event stroke in the left hemisphere. They had no history of premorbid impairment of cognition, speech, or language, and (with one exception) were free of other neurological disease that would further compromise those functions. (The exception was a 36-year-old with an arteriovenous malformation and a history of subarachnoid hemorrhage at age 21. However, his language and cognition were reportedly normal until the acute onset of aphasia associated with a cerebral hemorrhage at age 34.) All but two individuals with aphasia were premorbidly right-handed.

There were no significant differences across the groups with regard to age, $F(3,40) = 2.034$, $p = .125$. Premorbid intelligence was estimated using a regression equation based on demographic characteristics (Barona, Reynolds, & Chastain, 1984). An analysis of variance revealed no significant group differences with regard to mean estimated premorbid intelligence, $F(3,40) = 2.116$, $p = .113$.

Aphasia severity and type were characterized based on testing with the Western Aphasia Battery (Kertesz, 1982). The anomic group had a significantly higher mean aphasia quotient than the Broca's and conduction groups, $F(2,30) = 15.988$, $p < .001$, Tukey post hoc $p < .05$. The time postonset of aphasia varied across the subjects, ranging from 2 months to 15 years; however, there were no significant differences across the three aphasia groups with regard to time postonset, $F(2,30) = 2.651$, $p = .087$.

Procedure

Twenty color photographs depicting specific exemplars of superordinate categories (e.g., *carrot* for *vegetable*, *piano* for *musical instrument*, *horse* for *animal*) were stimuli (see Appendix A). The superordinate categories were selected from those studied by Battig & Montague (1969), with one exception (*building*). The pictured items represented relatively prototypical exemplars of the superordinate category, in that they were ranked among the top five most frequently generated items for that category (Battig & Montague, 1969).

Four additional pictures were used for a brief training procedure to orient subjects to the task. They were shown a picture, and the examiner said, for example, "This is a puppet. It's a kind of toy." Following this orientation, pictured items were presented one at a time, and the following sequence of questions was asked:

1. What is this? (Seeking basic level name, e.g., "rose.")
2. And it's a kind of.... (Seeking superordinate, "flower.")
3. Tell me one thing about a *rose*. (Seeking semantic information other than superordinate, including attribute, function, or any other appropriate descriptive information specific to the pictured item, e.g., "Smells nice.")
4. What is another kind of *flower*? (Seeking coordinate, e.g., "daisy.")

Repetition of the questions was allowed as needed. If a subject gave more than one response, the best answer was scored, unless the subject rejected his or her correct answer in favor of another response. For example, if the subject said, "rose, no, daffodil," in response to rose, it was considered incorrect.

It should be noted that occasionally, a subject provided the superordinate category when initially asked to name the item. For example, the subject said "bird" rather than "robin." In such cases, the examiner elicited the basic level name by saying, "What kind of bird is it?"

In cases where the subject did not correctly give the basic level name for the item, a written-word recognition task was presented that included the target and two foils. If the subject failed the recognition task, the examiner identified the correct basic level name, and continued with questions for that item.

Responses were scored as correct or incorrect, with the guiding criteria for correct responses that they be understandable, meaningful responses to the question. Minor dysarthric or dyspraxic productions were scored as correct if the response was a recognizable production of the target. Nonspecific semantic information (e.g., "I have one of those at home") was not given credit. However, single-word descriptors (e.g., "juicy" for apple) were accepted as correct if judged to be appropriate descriptive information. All responses were scored by two judges, and point-to-point reliability was 95% or better. Instances of disagreement were identified and then scored by consensus of three or more judges.

An item analysis revealed that 4 of the 20 items failed to elicit the prototypical basic level name consistently. For example, *knife* had been selected as an exemplar for the category *weapon*, and even though the pictured item did not look like kitchen cutlery in our opinion, it was frequently referred to as a kind of "utensil." Such responses were independent of subject group membership. Therefore, these four problem items were eliminated, and responses to the 16 remaining items were considered for statistical analyses (see items in Appendix A).

The 16 items selected for analysis represented items that were highly prototypical of their superordinate category as indicated by the high rank on the Battig & Montague (1969) category norms (see item ranks in Appendix A). The 16 items had a mean rank of 2.06, indicating that on the average, they were about the second most commonly named exemplar for the respective categories.

TABLE 1. Demographic characteristics of subjects.

	Age		Est. IQ		AQ		TPO	
	M (range)	*SD*	*M* (range)	*SD*	*M* (range)	*SD*	*M* (range)	*SD*
Broca's *n* = 11	61 (36–79)	15.0	117 (102–125)	6.3	58.9 (40.3–76.6)	11.1	6.1 (.17–15.4)	4.9
Conduction *n* = 11	71 (55–80)	7.4	121 (115–125)	4.6	63.3 (38.4–88.6)	17.7	1.8 (.08–5.1)	1.6
Anomic *n* = 11	64 (40–74)	11.0	114 (101–125)	8.3	86.9 (76.0–92.2)	5.9	2.2 (.17–8.0)	2.7
Control *n* = 11	71 (60-87)	7.6	118 (107-126)	5.4	—	—	—	—

Note: Est. IQ = estimated IQ; AQ = aphasia quotient; TPO = mean time postonset of aphasia in years.

With regard to frequency of usage in the English language (Kucera & Francis, 1967), the basic level name and superordinate category name were not significantly different (mean frequency of occurrence per million was 34.5, SD = 33.3, and 40.7, SD = 27, respectively, t = -0.964, p = .499).

Results

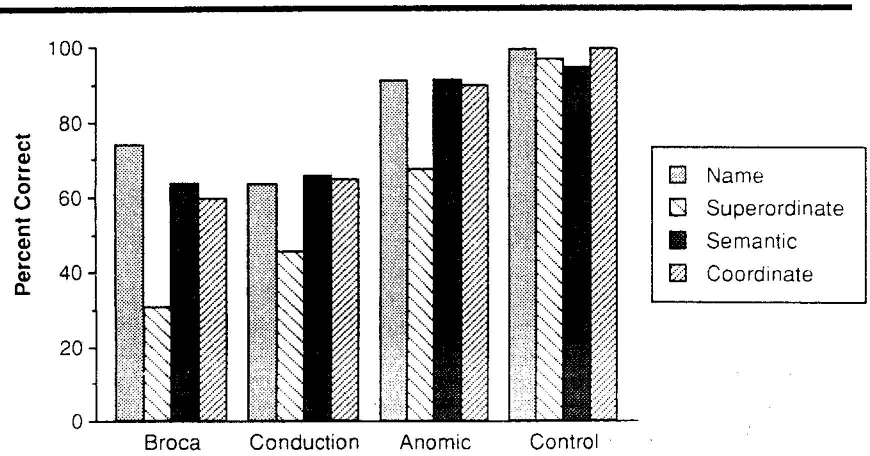
The mean performances of the three groups with aphasia and the healthy control group are reported in Table 2, and displayed graphically in Figure 1. Group performances on the four tasks (naming, superordinate, semantic information, coordinate) were analyzed using a mixed design, repeated measures analysis of variance (ANOVA), with group as the between-subjects variable and task as the within-subjects variable. There were significant main effects for group, $F(3,40) = 11.507$, $p < .001$, and task, $F(3,120) = 27.261$, $p < .001$, as well as a significant group by task interaction $F(9,12) = 4.050$, $p < .001$. Tukey HSD post-hoc comparisons were performed with the overall alpha level set at .05 to examine differences across groups and tasks.

Post-hoc analysis of the group by task interaction indicated the following significant findings: (a) on basic level naming, the conduction group performed more poorly than the anomic and control groups, and the Broca's group performed more poorly than the control group; (b) the Broca's and conduction groups performed more poorly than the control and anomic groups for semantic information and coordinates; and (c) with regard to naming the superordinate, the Broca's and conduction groups performed more poorly than the anomic and control groups, and the anomic group performed more poorly than the control group. Furthermore, all three aphasia groups performed significantly more poorly on the superordinate task than on all other tasks. In contrast, the control group's performances did not differ across the tasks. Performance of individual subjects with aphasia was consistent with the group profiles, in that 26 out of 33 subjects with aphasia performed most poorly when they were asked to provide the superordinate name.

TABLE 2. Mean number correct for basic level name, semantic information, superordinate category, and in-class coordinate out of 16 possible for subjects with Broca's, conduction, and anomic aphasia, and normal control subjects.

	Basic Level Name		Semantic		Superordinate		Coordinate	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Broca's	12	2.8	10.2	3.9	5	4.2	9.5	2.7
Conduction	10.2	5.3	10.6	4.7	7.2	5.7	10.4	5.3
Anomic	15	1.2	14.7	1.3	10.9	3.7	15	1.7
Control	16	0	15.3	1.3	15.5	.8	16	0

FIGURE 1. Mean percentage correct for basic level naming, superordinate naming, giving additional semantic information, and giving an in-class coordinate for three aphasic groups and a control group.



Discussion

The results of this study showed that regardless of aphasia severity or type, the retrieval of the superordinate category for an item was more difficult than retrieval of the basic level name, semantic information (other than superordinate), or an in-class coordinate. Even the anomic group, for whom naming was not impaired relative to normal control subjects, had difficulty with the specification of the superordinate. This impairment was not attributable to differences in the frequency of occurrence of names or superordinates, as was the case for subordinate names studied by Brownell et al. (1986).

The naming performance of the three aphasia groups was consistent with a severity effect in that the Broca's and conduction groups performed more poorly than the anomic group. It is not uncommon for confrontation naming ability to reflect overall aphasia severity (Goodglass, 1993). Likewise, the ability to provide semantic information about the items and give an in-class coordinate was consistent with overall aphasia severity.

With regard to task difficulty, there was essentially one basic level name and superordinate considered correct for each item, but there were many acceptable responses for semantic information and for the coordinate. So response specificity cannot account for the selective difficulty with superordinate category over basic level name.

The difficulty with superordinate category may simply be a manifestation of the basic level superiority effect demonstrated by Rosch, Mervis, Gray, Johnson, and Boyes-Braem (1976) wherein neurologically normal individuals identified members of a basic level category more quickly than members of superordinate or subordinate categories. The identification of superordinate relations has been conceived as a two-step process whereby class membership is first determined and then the superordinate category is abstracted (Rosch et al., 1976). In contrast, semantic information, such as attributes, as well as in-class coordinates, may be activated and readily available during the lexical retrieval process for the basic level name.

The question remains as to whether superordinate knowledge (i.e., semantics) is impaired, or whether performance reflects failure to access the lexical phonological representation. In our study, the subjects with aphasia often provided considerable information about items for which they failed to name the superordinate, suggesting that semantic specification of the items was fairly rich. In fact, the failure to give the superordinate was not associated with failure to provide the basic level name or other information about the picture. Because we did not explore superordinate knowledge using a follow-up comprehension task, we cannot determine with certainty whether or not aphasic subjects were faced with a lexical retrieval problem or a conceptual/semantic problem. However, studies of semantic knowledge in aphasia that did not require spoken responses have shown superordinate relations to be fairly well preserved (Goodglass & Baker, 1976; LeDorze & Nespoulous, 1989). Our findings are at odds with Warrington and Shallice's suggestion that superordinate information is accessed first and is more strongly represented than attribute information (Shallice, 1988; Warrington & Shallice, 1979). However, the notion of the relative preservation of superordinate information has not gone unchallenged, at least in the dementia literature (Bayles, Tomoeda, & Trossett, 1990; Rapp & Carramazza, 1993).

The findings from this study are of interest at a very practical level. If in fact superordinate names are not accessed as easily as the item name, a coordinate, or other semantic information, then search for the superordinate category is not likely to be a successful compensatory strategy during instances of anomia. Although variability is prevalent across and within aphasic individuals, it worthy of note that superordinate category is likely to be relatively difficult for individuals with aphasia. The relatively easy access to coordinate information might be considered for its compensatory value. In the event of anomia, an individual with aphasia might be encouraged to offer one or more coordinates of the target item, along with conveyance that it is not quite right. For example, for "carrot" one might say "celery, no." The listener might then deduce the superordinate category, and use that information to determine the target. One of our subjects with Broca's aphasia uses this strategy with considerable communicative success.

In summary, these findings serve to influence our expectations of individuals with aphasia in the face of anomia. Although superordinate knowledge may be well preserved, the spoken production of a superordinate is not likely to be a useful compensatory strategy.

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Contact author: Pelagie M. Beeson, PhD, National Center for Neurogenic Communication Disorders, Building 71, University of Arizona, Tucson, AZ 85721

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Appendix A

Stimulus Items

Basic Level Name	Superordinate	Basic Level Name	Superordinate	Basic Level Name	Superordinate
carrot (1)	vegetable	milk (1)	drink or beverage	knife[a] (1)	weapon
piano (1)	musical instrument	shirt (1)	clothing	cobra[a] (3)	snake
submarine (5)	ship	horse (3)	animal	sandal[a] (3)	shoe
apple (1)	fruit	chair (1)	furniture	fire station[a] (n/a)	building
robin (1)	bird	bus (2)	vehicle/transportation		
saw (2)	tool	rose (1)	flower		
spider (5)	insect	pine (3)	tree		
fork (3)	utensil	baseball (2)	sport/game		

Note. Number in parentheses is the item rank on the Battig and Montague (1969) category norms.
[a]Items that were eliminated.