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Effects of Noun Type on Naming Performance of Right Hemisphere–Damaged and Non–Brain-Damaged Adults

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Communication impairments associated with right hemisphere damage (RHD) are most typically demonstrated at the level of connected discourse. However, some RHD patients may have problems with naming, single-word comprehension, and word definition tasks. Most studies of RHD subjects' confrontation naming skills have reported that the subjects are impaired relative to non–brain-damaged (NBD) controls (Cappa, Papagno, & Vallar, 1990; Diggs & Basili, 1987; Gainotti, Caltagironi, & Miceli, 1983; Joanette, Lecours, Lepage, & Lamoureaux, 1983). Gainotti et al. (1983) concluded that RHD subjects' naming errors were possibly related to a "true lexical–semantic" impairment (p. 162).

The stimuli used in studies of naming by RHD patients have been drawings depicting single objects, and the number of stimuli has ranged from 20 (Diggs & Basili, 1987) to 32 (Cappa et al., 1990). With the exception of Gainotti et al. (1983), investigators have not analyzed error types on these tests, possibly because of the restricted number and type of stimuli used.

The present study was designed to investigate the nature of RHD errors on a confrontation naming task that included both single and collective nouns. We assumed that producing superordinate category names for collective nouns takes more effort than naming single objects. Unlike naming single nouns, collective-noun naming requires that one first deduce the relationships among members of a group and then retrieve the name. We hypothesized that the extra effort required to produce the superordinate category for collective nouns might make

collective-noun naming more difficult than single-noun naming for both RHD and NBD subjects. In addition, we hypothesized that RHD subjects would be more impaired in collective-noun naming than NBD controls. This last hypothesis was based on reports that RHD subjects may be impaired in apprehending relationships among pictured items (Mackisack, Myers, & Duffy, 1987; Myers, 1991).

We expected that the analysis of errors on single-noun and collective-noun naming tasks would shed light on whether RHD subjects' errors reflect lexical retrieval problems similar to those encountered in aphasia, reflect the general effects of brain damage on any cognitive task, or reflect impairments more specific to right hemisphere damage, such as visuoperceptual confusion or problems in generating inferences.

METHOD

The subjects were 24 adults with right hemisphere damage and 30 adult volunteers with no history of neurological impairment. NBD subjects ranged in age from 66 to 88 years (M = 78, SD = 5.85) and had a mean education level of 14 years (SD = 3.00, range = 8–21). RHD subjects ranged in age from 41 to 85 years (M = 65, SD = 12.73) and had a mean education level of 13 years (SD = 3.81, range = 8–21). Each RHD subject had sustained a single cerebrovascular accident limited to the right cerebral hemisphere, as determined by computerized tomographic (CT) scan. RHD subjects were tested at least 1 month postonset of their brain damage. All subjects were right-handed.

The RHD subjects were divided into two groups based on the severity of their neglect as measured by their composite scores on line bisection, copy drawing, and line cancellation tasks. There were 14 subjects in the low-neglect group (RHD/LN) and 10 in the high-neglect group (RHD/HN).

The stimuli consisted of 96 black-and-white line drawings of objects from the 100-item *Expressive One-Word Picture Vocabulary Test–Revised* (Gardner, 1990). Items on the test are ordered from least to most difficult, based on the performance of children. Each stimulus plate depicted either a single or a collective noun. The one verb and three plural nouns on the test were administered, but not included in the analysis.

Single-noun drawings consisted of a single object or animal, such as corn or tiger. Collective-noun drawings consisted of three to six objects or animals that belonged to a superordinate category, such as vegetables. Collective nouns were further divided into picturable and

nonpicturable items (see Appendix A for definitions of noun types). Picturable items were those whose category names were picturable or readily evoked a visual image, such as reptiles or fruit. Nonpicturable items were those for which the superordinate category could not be as easily pictured, such as communication or transportation.

The assignment of pictures to noun types was validated by the judgments of three speech pathologists. There were 67 single nouns, 20 picturable collective nouns, and 9 nonpicturable collective nouns. Nouns of each type occurred randomly throughout the test.

Subjects sat facing the examiner across a table. Stimulus plates were presented one at a time, and subjects were instructed to "name the picture." Cues were not offered and there were no time limits.

RESULTS

Table 1 shows the average naming accuracy of the three groups for single and collective nouns. No subject in any group had a perfect score on either single or collective nouns. The NBD group was the most accurate and the RHD/HN group was the least accurate across all three types of nouns. Average accuracy on the 67 single nouns was 90% for the NBD group, 85% for the RHD/LN group, and 76% for the RHD/HN group.

As predicted, single-noun naming was more accurate than collective noun naming for all three groups. The average accuracy score for the 20 picturable collective nouns fell to 84%, 66%, and 46% for the

Table 1. Mean Naming Scores of Non–Brain-Damaged and Right Hemisphere–Damaged Subjects on Singular and Collective Nouns

Noun Type	*Group*	*Mean*	SD	*Accuracy (%)*
Single (67)	NBD	60.4	2.67	90
	RHD/LN	56.7	7.15	85
	RHD/HN	50.9	12.86	76
Picturable collective (20)	NBD	16.7	2.16	84
	RHD/LN	12.9	6.04	66
	RHD/HN	10.1	5.57	46
Nonpicturable collective (9)	NBD	5.6	1.77	62
	RHD/LN	3.8	2.52	42
	RHD/HN	1.5	1.84	18

Note: NBD = non–brain-damaged; RHD/LN = right hemisphere–damaged low neglect; RHD/HN = right hemisphere–damaged high neglect.

NBD, RHD/LN, and RHD/HN groups, respectively. The nine nonpicturable collective nouns were named least accurately. NBD subjects averaged 62% correct, RHD/LN subjects averaged 42% correct, and RHD/HN subjects averaged only 18% correct on nonpicturable collective nouns.

A one-way analysis of variance (ANOVA) was calculated on the difference in accuracy among the groups on single nouns. It yielded a significant main effect for groups [$F(2, 51) = 7.56$, $p < .002$]. Follow-up tests using the Scheffé procedure for multiple comparisons (Table 2) revealed that the NBD group was significantly more accurate than the RHD/HN group. There was no significant difference in accuracy between the RHD/HN group and the RHD/LN group, or between the RHD/LN group and the NBD group.

A second one-way ANOVA was calculated on the differences among groups for picturable collective nouns. It yielded a significant main effect for groups [$F(2, 51) = 10.93$, $p < .001$]. Follow-up tests, using the Scheffé procedure (Table 3) revealed that the NBD group was significantly more accurate on picturable collective nouns than either the RHD/HN or the RHD/LN group. There was no significant difference between the RHD/HN group and the RHD/LN group.

Table 2. Results of Scheffé's Follow-Up Tests on Differences Among Groups on Single Nouns

Comparison	*Probability*
NBD (60.4) vs. RHD/LN (56.7)	.343
NBD (60.4) vs. RHD/HN (50.9)	.002
RHD/LN (56.7) vs. RHD/HN (50.9)	.076

Note: Type 1 error (alpha) ≤ .05 for rejection of null hypothesis. NBD = non–brain-damaged; RHD/LN = right hemisphere–damaged low neglect; RHD/HN = right hemisphere–damaged high neglect.

Table 3. Results of Scheffé's Follow-Up Tests on Differences Among Groups on Picturable Collective Nouns

Comparison	*Probability*
NBD (16.7) vs. RHD/LN (12.9)	.049
NBD (16.7) vs. RHD/HN (10.1)	.006
RHD/LN (12.9) vs. RHD/HN (10.1)	.211

Note: Type 1 error (alpha) ≤ .05 for rejection of null hypothesis. NBD = non–brain-damaged; RHD/LN = right hemisphere–damaged low neglect; RHD/HN = right hemisphere–damaged high neglect.

A third one-way ANOVA on differences among groups on nonpicturable collective nouns also yielded a significant main effect for groups [$F(2, 51) = 16.56$, $p < .001$]. Follow-up tests (Table 4) revealed that each of the groups differed significantly from each of the others in accuracy. The NBD group was significantly more accurate than either the RHD/HN group or the RHD/LN group, and the RHD/LN group was significantly more accurate than the RHD/HN group.

To provide a qualitative analysis of subjects' responses, each subject's responses were assigned to one of 10 categories (see Appendix B). Figure 1 shows the data for single nouns. The pattern of responses was similar for all three groups. Most responses were correct. When subjects made errors, they tended to be in Category 4 (semantic, or naming of a related item). Although only the RHD/HN group was significantly less accurate than the NBD group, both RHD groups had about the same number of semantic errors. The RHD/HN group, however, had more visual confusion errors (Category 3) than did the other groups. Visual confusions represented 24% of their errors. It appears that most of the difference in accuracy between the RHD/HN group and the NBD group can be attributed to these visual errors, rather than to semantic errors.

Figure 2 shows the distribution of responses for picturable collective nouns. Categories 4 (semantic) and 5 (listing of items in a group) accounted for most of the errors. The percentage of semantic errors was low and approximately the same for all groups. Differences among the groups emerged on listing errors. Both RHD/HN and RHD/LN subjects had more listing errors than did NBD subjects. The RHD/HN group had over five times as many and the RHD/LN group had over three times as many listing errors as did the NBD subjects. NBD subjects' errors were fairly evenly distributed among semantic and listing categories, with 39% semantic errors and 42% listing errors. The majority of errors for the two RHD groups were listing errors,

Table 4. Results of Scheffé's Follow-Up Tests on Differences Among Groups on Nonpicturable Collective Nouns

Comparison	*Probability*
NBD (5.6) vs. RHD/LN (3.8)	.053
NBD (5.6) vs. RHD/HN (1.5)	.004
RHD/LN (3.8) vs. RHD/HN (1.5)	.124

Note: Type 1 error (alpha) ≤ .05 for rejection of null hypothesis. NBD = non-brain-damaged; RHD/LN = right hemisphere–damaged low neglect; RHD/HN = right hemisphere–damaged high neglect.

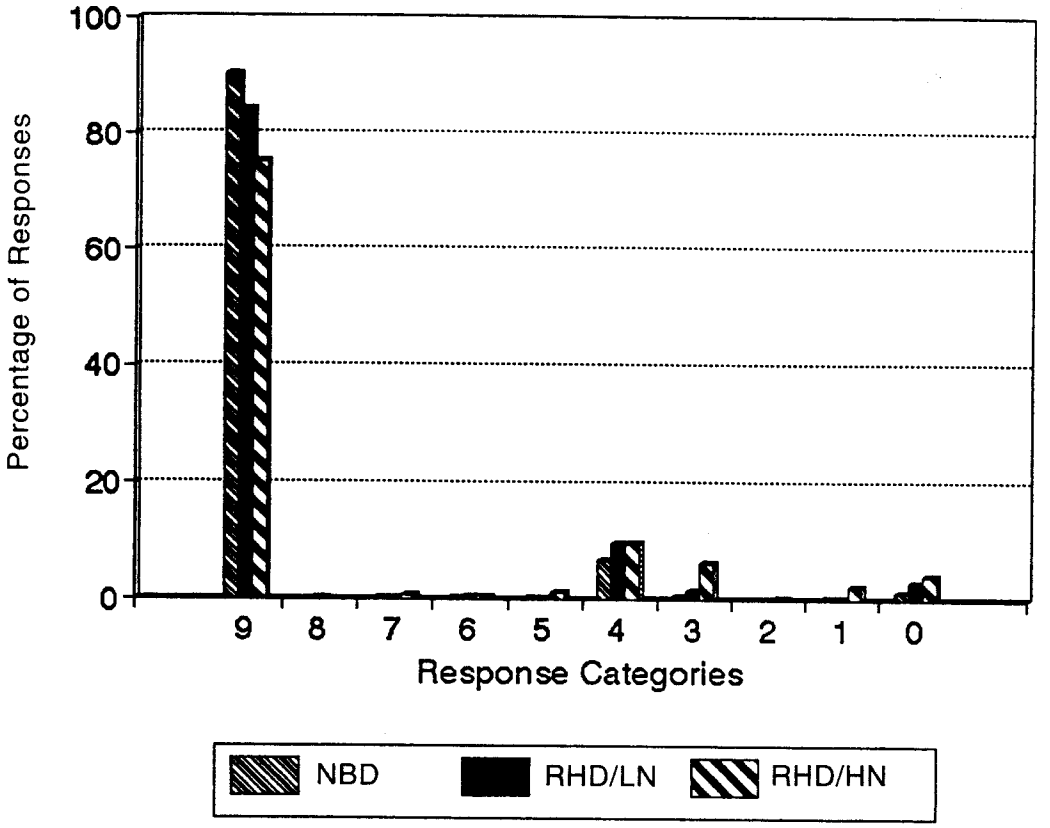

Figure 1. Distribution of responses to single nouns in each of 10 response categories by non–brain-damaged (NBD), right hemisphere–damaged with low neglect (RHD/LN), and right hemisphere–damaged with high neglect (RHD/HN) groups. For key to response categories, see Appendix B.

accounting for 72% of the errors for the RHD/LN group and 69% of the errors for the RHD/HN group.

As Figure 3 shows, errors increased for all three subject groups in response to nonpicturable collective nouns. The percentage of Category 4 (semantic) errors was considerably greater than it was for picturable nouns, but again about equal among the groups. Category 5 (listing) responses also increased for all groups. Again, RHD subjects had more errors of this type than did NBD subjects. The NBD group made 17% more semantic than listing errors. The number of listing errors by the two RHD groups remained greater than the number of semantic errors they made.

The only other noteworthy differences between the groups across both single and collective noun types occurred for visual confusion (Category 3), neglect (Category 2), and unrelated (Category 1) errors. RHD subjects had appreciably more responses in these categories than

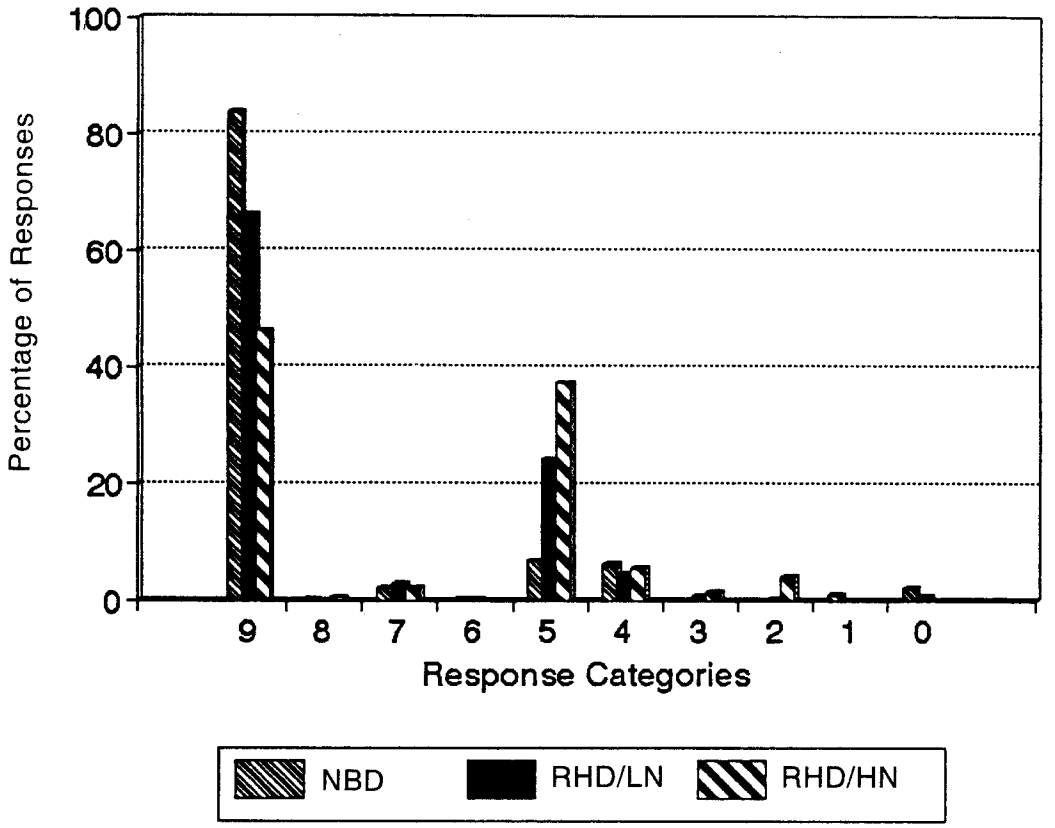

Figure 2. Distribution of responses to picturable collective nouns in each of 10 response categories by non–brain-damaged (NBD), right hemisphere–damaged with low neglect (RHD/LN), and right hemisphere–damaged with high neglect (RHD/HN) groups. For key to response categories, see Appendix B.

did NBD subjects, although the actual percentages were very small. The number of neglect responses was surprisingly low. For example, only 3 of the 1,344 responses, or .01% of the errors, by the RHD/LN subjects were in the neglect category. Only 17 of the 960 responses, or .05% of the errors, by the RHD/HN group were in that category.

DISCUSSION

Our results for single nouns do not support the suggestion by Gainotti et al. (1983) that RHD patients may have a true lexical–semantic deficit. RHD/LN subjects performed comparably to NBD subjects in accuracy on single nouns and, like NBD subjects, most of their errors were semantic. RHD/HN subjects were less accurate than NBD subjects in

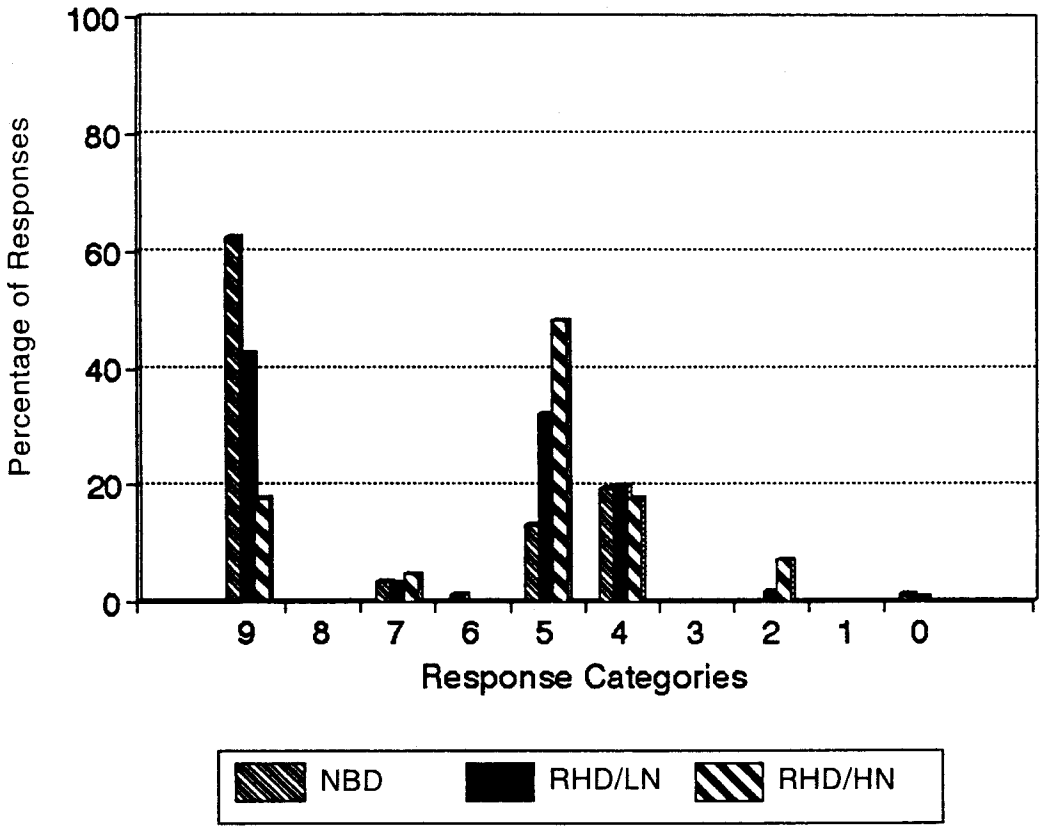

Figure 3. Distribution of responses to nonpicturable collective nouns in each of 10 response categories by non–brain-damaged (NBD), right hemisphere–damaged with low neglect (RHD/LN), and right hemisphere–damaged with high neglect (RHD/HN) groups. For key to response categories, see Appendix B.

single-noun naming; however, unlike the other groups, their single-noun errors were distributed among the semantic and visual confusion categories. This suggests that patients with severe neglect may have some problems related specifically to right hemisphere damage, such as impairments in two-dimensional single-object recognition.

We did not include an aphasic group. However, the absence of literal paraphasia (Category 8), function for word (Category 6), and unrelated (Category 1) responses indicates that the problems of RHD/HN subjects are not similar to those of most aphasic patients. It is important to remember that our task was a challenging vocabulary test and that all subject groups made semantic errors on single nouns. Semantic errors by our subjects may have been more indicative of their vocabulary level than of a pervasive deficit in word retrieval.

The results for collective nouns suggest that generating the superordinate category name for collective nouns is more difficult than

single-noun naming, particularly for RHD subjects. Both RHD groups were less accurate than the NBD group on collective nouns.

Differences in patterns of response between the NBD and the RHD groups also emerged in response to collective nouns. Most of the NBD errors on collective nouns were semantically related to the category name; that is, subjects arrived at a collective name for the objects depicted, even though it might have been inaccurate. The majority of RHD subjects' collective noun errors, however, fell into the response category of listing errors, suggesting that subjects were able to name members of a group, but had trouble generating the group name.

Clearly, all RHD subjects understood the task because every subject accurately labeled at least some of the picturable and some of the nonpicturable nouns. Their tendency to list items, rather than responding with a related, but inaccurate label, suggests not so much a lexical-semantic error as difficulty with inferring the organizing principle among a collection of objects. In addition, although we did not include the three plural nouns in the data analysis, there were no listing errors on these nouns. Thus, listing seems to occur not because of the number of items depicted, but because of uncertainty about the category to which they belong. Even among NBD subjects, listing may be an overt process involved in attempting to ascertain the connections between a group of objects when those connections may not be immediately apparent.

The listing behavior of our subjects may echo some of the discourse impairments seen in some RHD subjects. For example, Mackisack et al. (1987) found that, when asked to explain the events in complex scenes, RHD subjects labeled significantly more objects than did NBD subjects. Listing of objects often occurred at the expense of producing the inferences necessary to explain what was happening in the scenes. Mackisack et al. concluded that this listing behavior may have been a strategy used by some RHD patients in response to uncertainty about the meaning of the scenes. In other words, it may be a strategy used to generate inferences. Like collective nouns, scenes are collections of objects and their connections must be deduced to understand a scene's meaning.

The results of this study may also help inform us about the role of neglect in confrontation naming. Given the poor performance of the RHD/HN group on all three noun types, it appears that there is a relationship between severity of neglect and severity of impairment on confrontation naming. However, the very small number of neglect and visual confusion errors and the large number of listing and semantic errors by this group suggest that their performance was related more to cognitive than to visual factors. It may be, for example, that patients with high levels of neglect suffer from a greater resource allocation

or computational problem than that experienced by patients with less neglect. Perhaps the effort involved in attending to the array of pictured items leaves fewer resources available for discovering the connections among them.

On the other hand, both picturable and nonpicturable collective nouns contain object clusters. However, the accuracy of all groups, particularly the RHD/HN group, was worse on nonpicturable than on picturable ones. This suggests that the difficulty of the inferences, and not the number of objects in the visual array, is the issue.

Finally, the results of this study suggest that confrontation naming skills in RHD patients should continue to be investigated. If they are, analyzing error types and contrasting performance on collective nouns with performance on single nouns might inform us further about the features of confrontation naming problems that may or may not be unique to this population.

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APPENDIX A: DEFINITIONS OF NOUN TYPES

Single nouns—Items depicting a single individual object or animal.

Picturable collective nouns—Items depicting a group of objects or animals that belong to a category of objects or animals for which there is an obvious or prototypical visual referent.

Nonpicturable collective nouns—Items depicting a group of objects or animals that belong to a category for which there is no obvious visual or prototypical referent.

APPENDIX B: RESPONSE CATEGORIES

9 = Correct

8 = Literal paraphasia (e.g., "ostra" for ostrich)

7 = Superordinate category for item name (e.g., "animal" for tiger)

6 = Function for item name (e.g., "flightless birds of the Arctic" for penguin)

5 = Listing individual items in a collective noun group rather than naming the category to which they belong

4 = Naming a related item (e.g., "lion" for tiger)

3 = Visual confusion (e.g., "smoke" for clouds)

2 = Neglect—naming only the right half of object clusters or of a given object

1 = Unrelated response (e.g., "swan" for bus)

0 = No response/refusal

Note: The above response categories were established by the two authors who independently assigned all subjects' responses to one of the 10 response categories. Differences were resolved through discussion.