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Semantic Factors in Verb Retrieval: An Effect of Complexity

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Aphasic patients often have more difficulty retrieving verbs than nouns. We present data from eight aphasics demonstrating that they have a selective impairment for verb retrieval. We then explore the role of semantic complexity (i.e., the number of semantic features) in verb retrieval using a delayed repetition/story completion task. The results indicate that six of the patients are better at retrieving semantically complex verbs (e.g., run) than semantically simpler verbs (e.g., go). The results have implications for accounts of the noun/verb dissociation in aphasia, as well as for theories of verb representation.

INTRODUCTION

Many aphasic patients have more difficulty producing verbs than nouns (e.g., Miceli, Silveri, Villa, & Caramazza, 1984; Zingeser & Berndt, 1990). This pattern, which is often associated with agrammatism (Myerson & Goodglass, 1972; Saffran, Schwartz, & Marin, 1980), has sometimes been attributed to the greater syntactic complexity of verbs (see Zingeser & Berndt, 1990; Berndt, Haendiges, Mitchum, & Sandson, in 1997b, for discussion). However, the argument that verb retrieval deficits are the result of a syntactic processing disorder has difficulty accounting for recent reports of verb retrieval deficits in nonagrammatic populations; some Wernicke's aphasics have also demonstrated greater difficulty with verb than noun retrieval (Williams & Canter, 1987; Berndt, Mitchum, Haendiges, & Sandson, 1997a). Other researchers (Miceli et al., 1984) reject the syntactic processing disorder hypothesis, arguing that the deficit is one of lexical processing involving the

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category of verbs. According to this view, the phonological output lexicon is organized along the lines of grammatical class (also see McCarthy & Warrington, 1985; Caramazza & Hillis, 1991, for related arguments and dissociations) and the lesion selectively disrupts verbs.

Most of the research into selective loss of verbs has been restricted to comparisons of verb and noun performance on a variety of tasks (picture naming, sentence completion, synonymy generation, sentence generation). We are aware of only a few studies that have explored possible differences *within* the category of verbs. Using an on-line sentence processing task, Shapiro & Levine (1990) found that agrammatics displayed normal sensitivity to argument structure complexity in verbs (but see Schmauder, 1991; Schmauder, Kennison, & Clifton, 1991). Breedin & Martin (1996) examined verb comprehension and production in four aphasic patients and reported that patients differed in their sensitivity to the action, thematic roles, and subcategorization information specified by verbs. Their findings are compatible with early attempts to describe the conceptual structure of verbs as compositional (e.g., Miller & Johnson-Laird, 1976), that is, decomposable into a set of semantic features or components. This view was undermined by the experimental finding that semantically complex words took no longer to process than semantically primitive words (see Fodor, Garrett, Walker, & Parkes, 1980). However, recent theories of verb representation have returned to the compositional view (Pinker, 1989; Jackendoff, 1990; Bierwisch & Schreuder, 1992). According to these models, a limited set of predicate terms (e.g., GO, BE, HAVE, ACT), conceptual categories or features (e.g., THING, EVENT, PATH), and sets of functions (e.g., to, into, at) combine to represent specific verbs. Thus, all verb meanings decompose into some subset of predicate terms, conceptual constituents, and appropriate functions. An example of this type of representation for the verb *to go* is depicted in Fig. 1a.[1]

The verb *to go* represents a core predicate (or primitive) that can also occur as a component of the meaning of other verbs (e.g., *to run*). Verbs like *go,* such as *have, do, come, give, get, make,* and *take,* are referred to in the linguistic literature as ‘‘light’’ verbs (Jesperson, 1965). These verbs bear some resemblance to closed class morphemes and can be viewed as transitional between open and closed class words (Pinker, 1989). Some are used as auxiliaries in English (*go, have, do*) and often appear in idioms (e.g., *make do, take over*). In other languages, these primitives frequently occur not as freestanding morphemes but as affixes. While light verbs may be among the most frequently occurring words in the language, the vast majority of verbs are not light but ‘‘heavy,’’ in that they contain primitives as well as other semantic components that render their meanings more specific; compare *go* with *run* (see Figs. 1a and 1b), *get* with *grab* (which specifies the manner

[1] This depiction of verb representation is adopted from Pinker (1989).

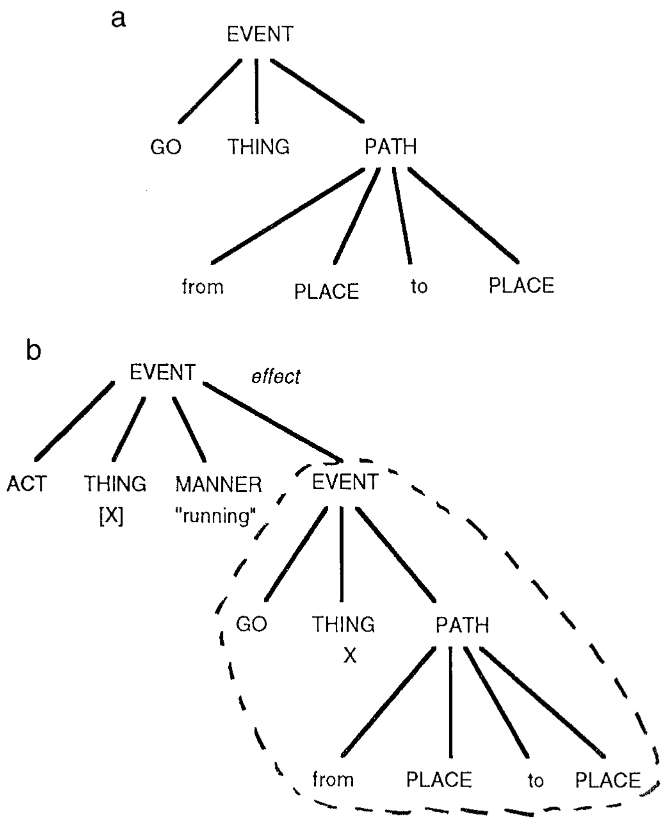

FIG. 1. Schematic representation of the verbs (a) ''to go'' and (b) ''to run.''

in which the exchange happens), and *give* with *sell* (which adds the features of monetary exchange). In this sense, these verbs are more complex.

We speculated that semantic complexity might play a role in the verb retrieval of aphasic patients. Conceivably, heavy verbs would be easier for some patients to retrieve because they have richer semantic representations with a greater number of features. This point has been made in connection with the greatly magnified advantage for concrete over abstract words that is a key feature of deep dyslexia (e.g., Plaut & Shallice, 1993). Other patients might find heavy verbs especially difficult due to their lower frequency of occurrence in the language or perhaps because their greater complexity makes them harder to process. We are aware of only two studies that have specifically investigated light verb production in aphasia. Kohn, Lorch, and Pearson (1989) examined verb and noun production using a sentence generation task with a group of aphasic patients. They found that the majority of the patients tended to produce proportionately more light verbs (e.g., *take*, *do*) than light nouns (e.g., *thing, stuff, boy*), which was the same pattern shown by normal controls. Berndt et al. (1997b) examined the types of verbs produced in narrative speech by patients with and without deficits in naming verbs relative to nouns. They found that patients who were impaired in naming verbs relative to nouns showed a strong tendency to use light verbs in producing sentences. These patients produced a higher proportion of sentences with light verbs compared to patients who did not have relative verb naming deficits. Note that neither of these studies involved tasks that targeted specific verbs for production.

In this first attempt to explore the role of semantic complexity in verb retrieval, we examined three types of semantic variation. First, we compared retrieval of *light* and *heavy* verbs (e.g., *to go* and *to hurry*). But as there are only a small number of very high frequency verbs that qualify as *light* verbs because they represent core predicates, we increased the number of verb pairs by including two other types of verb contrasts that involve subsets of *heavy* verbs. First, we contrasted *general* verbs that specify some function (e.g., *clean*) with more *specific* verbs that specify additional information about how the action is performed (e.g., *wipe* indicates something about the manner in which the action is performed and also implies a smaller set of possible instruments for performing the action). Second, we compared verbs in which the direct object assumes the thematic role of *patient* (e.g., *the bug* in sentence 1) with verbs in which the direct object also undergoes a change of place or state as the result of the action (*patient+state;* e.g., *the bug* in sentence 2). Thus, sentence (1) indicates that the bug has been hit but nothing of the action's effect on the bug; sentence (2) incorporates the effect of Rachel's action on the bug.

(1) Rachel *hit* the bug.
(2) Rachel *smashed* the bug.

For the most part, patients' verb retrieval has been examined with picture naming tests. While Kohn et al. (1989) point out that static depictions of actions may elicit ''noun like representations'' from patients, Berndt et al. (1997a) compared patients' verb retrieval to pictures and videotapes of the actions and found no difference in performance. For the purposes of the present study, however, picture naming did not seem a suitable methodology. We were interested in whether patients were more likely to retrieve semantically complex or semantically primitive verbs given equivalent cues. It would be difficult to construct a set of pictures that would be equally effective at eliciting a semantically complex verb (e.g., *buy*) and a semantically primitive verb (e.g., *give*). Furthermore, some verbs are difficult to depict with pictures (e.g., *prepare, donate, scold*, etc.). Therefore, to facilitate direct comparison of the three verb contrasts (light vs. heavy, general vs. specific, patient vs. patient+state), we used a task that combined story completion with delayed repetition. We created short paragraphs that could contain either of the two contrasting verbs followed by a question designed to elicit the verb (see 3).

(3) The bus stopped and let people on.
Marty *went*/*walked* to the back.
There were plenty of seats there.
What did Marty do when he got on the bus?

Patients heard the stories and were instructed to try and answer the question. Since the subject hears the target word before being asked to produce it, this task allows the speaker to draw upon short-term memory in addition to the usual resources for language production.

Before presenting the results of this study, we provide background information on our aphasic subjects that demonstrates their selective deficits in verb retrieval, in the context of relatively preserved verb comprehension. After demonstrating that semantic complexity affects their ability to retrieve verbs, we discuss the implications of these findings for theories of verb representation and the nature of verb impairments in aphasics.

PATIENT DESCRIPTIONS

Eight patients who were aphasic as the result of left hemisphere cerebrovascular accidents participated in the study. These patients were selected because they appeared to have inordinate difficulty producing verbs in spontaneous speech. We did not restrict patient selection to the agrammatic population (although three of the eight patients were considered to be agrammatic), since there is evidence that verb retrieval deficits can occur in other syndromes (Miceli et al., 1984; Berndt et al., 1997a). All of the patients were at least one year post CVA at the time of the test. Background information on the patients is given in Table 1. All of the patients had infarcts in frontal and/or parietal lobes. Single word comprehension was measured with the Peabody Picture Vocabulary Test (PPVT; Dunn & Dunn, 1981). All of the patients were within two standard deviations of the mean for normal subjects.

Speech Production

Patients' speech production was analyzed using the procedure developed by Saffran, Berndt, & Schwartz (1989). This technique involves eliciting a narrative sample from patients by having them tell a familiar story (e.g., Cinderella). Based on this sample, various lexical and structural indices are computed. In the present study, four indices were adopted for classifying a patient's production as agrammatic: (1) proportion of words in the narrative that appeared in ''sentences'' (minimally defined as NP V); (2) the ratio of nouns to verbs; (3) the proportion of closed-class words; and (4) the auxiliary

TABLE 1
Background Information on Aphasic Patients

Patient	Sex	Age[a]	Post-onset[a]	Education[a]	Etiology	Lesion site[b]	PPVT[c]
SD	F	54	3	12	LCVA	frontal, parietal, temporal	70
PJ	F	54	12	12	LCVA	not available	78
CN	F	61	16	16	aneurysm	frontal, parietal	93
LN	M	50	2	12+	LCVA	frontal, parietal, temporal	83
FO	M	60	5	16	LCVA	parietal	106
VP	M	63	3	14	LCVA	frontal, parietal	81
SS	M	62	3	14	LCVA	anterior parietal	109
EW	F	61	7	16+	aneurysm	frontal, parietal	100

[a] Years.
[b] Based on CT-scan reports.
[c] Scores are derived from norms for 40-year-old normal subjects. For normal subjects, the mean is 100 and the standard deviation is 15.

complexity score.[2] Patients were considered ‘‘agrammatic’’ speakers if their performance fell within the agrammatic range, as given in Saffran et al., on at least three of the four indices. In addition, speech rate, defined as the number of words produced per minute, was calculated for each patient. Patients whose production rate was below the range of the control subjects were classified as ‘‘nonfluent’’ speakers.

The results of the production analysis for each patient are presented in Table 2. Three of the eight patients can be classified as agrammatic speakers (SD, SS, and EW). Note, however, that all eight patients were below the normal range on the proportion of words they produced in sentences. In addition, five of the patients (SD, SS, FO, CN, and EW) produced a higher ratio of nouns to verbs than normal speakers. As measured by speech rate (words per minute), all of the patients were below the normal range and on these grounds can be classified as nonfluent.

Like Berndt et al. (1997b), we examined the types of verbs that patients produced in narrative production. In Table 3, we present the proportion of light and heavy verbs produced by patients. Verbs were classified as *light* if they were among the eight presented in Appendix A plus the verbs *to be* and *to do*. Light verbs used as auxiliaries for a heavier verb (e.g., ‘‘is marrying’’) were not scored; instead, the entire verb phrase was scored as heavy. Of the five patients who produced a high ratio of nouns to verbs, four of them (SD, SS, FO, and EW) generated a higher proportion of heavy verbs

[2] This score is computed by identifying the main verb in the sentence and adding points (to a baseline of 1 for an uninflected verb in the present tense; e.g., *give*) for the addition of an auxiliary, inflection, tense change, modal, or negative particle. For example, *could not have given* would receive a score of 5.

TABLE 2
Patients' Performance on Production Analysis

	Patients								Controls (n = 5)	
Index	SD	PJ	CN	LN	FO	VP	SS	EW	Mean	Range
Proportion of words in sentences	.48*	.97	.90	.64	.78	.94	.15*	.66	1.00	
Noun/verb ratio	2.69*	1.07	1.77*	.77	2.19*	1.17	6.40*	2.18*	1.18	(.93–1.71)
Proportion of closed class words	.50	.56	.49	.58	.42*	.62	.12*	.39*	.56	(.50–.59)
Auxiliary complexity	.60*	.84	1.11	.86	1.14	1.47	.13*	.77*	1.43	(1.00–1.79)
Speech rate (WPM)	72.15	96.16	47.83	31.91	30.28	68.53	16.72	35.80	132.42	(106–154)

* In the agrammatic range.

TABLE 3
Proportion of Light and Heavy Verbs Produced in Narrative Production

Patient	*N* of verbs	Light	Heavy	To be
SD	17	.41	.59	.35
PJ	87	.60	.40	.31
CN	48	.56	.44	.21
LN	45	.69	.31	.38
FO	38	.42	.58	.24
VP	39	.85	.15	.54
SS	22	.09	.91	.05
EW	21	.38	.62	.24

than light verbs. This result is somewhat different from the findings of Berndt et al. (1997b), whose deficient verb producers ($n = 5$) were especially dependent on light verbs in narrative production. It is also worth noting (see Table 3) that the verb *to be* accounted for over 50% of the light verbs produced by all of the patients except CN. If one treats the verb *to be* as a special case (the lightest of the light verbs) and removes it from the analysis, then six of the patients produce more heavy verbs than light verbs; the exceptions are LN and VP. It is important to keep this in mind because the verb *to be* was neither a target verb nor a valid substitution for the target verbs in our task.

Noun–Verb Naming

Patients' ability to name line drawings depicting nouns or verbs was examined with Zingeser and Berndt's (1990) noun–verb naming test. The results are presented in Table 4. Normal control subjects were at ceiling for both noun and verb naming. Although nouns and verbs are matched for frequency of occurrence, all of the patients show a numerical advantage for naming

TABLE 4
Patients' Performance on Noun–Verb Naming Test (Proportion Correct)

Patient	Nouns ($N = 60$)	Verbs ($N = 30$)	χ^2
SD	.57	.43	1.43
PJ	.95	.87	1.94
CN	.90	.67	7.45*
LN	.78	.43	11.03*
FO	.97	.73	11.03*
VP	.40	.17	4.99*
SS	.88	.83	.43
EW	.92	.73	5.44*

* $p < .05$.

nouns compared to verbs. This difference was statistically reliable ($p < .05$) for all but three of the patients (SD, SS, and PJ). Note that two of the three (SD and SS) had high noun/verb ratios in the narrative production task (Table 2).

Verb–Picture Matching

Although the focus of this paper is on verb retrieval, the experimental task does entail verb comprehension. Therefore, we examined patients' verb comprehension with two tasks: (1) an auditory verb–picture matching test developed by Breedin (1991; Breedin & Martin, 1996); and (2) a noun–verb synonymy judgment task from the Philadelphia Comprehension Battery (Saffran, Schwartz, Linebarger, Martin, & Bochetto, 1988). We report the results of the verb–picture matching task first. Patients' performance on three subsets of the verb–picture matching test is presented. The first subset, *unrelated* verb pairs, examines sensitivity to broad semantic distinctions between verbs (e.g., *to learn–to scrub*). The second subset, *related function* verbs, probes more specific knowledge of the properties of verbs. For example, both *to listen* and *to look* are sensation verbs; however, they differ in the instruments used for sensing (ears vs. eyes) and the type of energy that is sensed (soundwaves vs. light). Finally, the *reverse-role* verbs subset was designed to test a patient's knowledge of the thematic roles filled by a verb's arguments. These verbs imply similar actions but differ in the thematic roles that they assign to specific grammatical positions in the sentence. For example, both the verbs *to buy* and *to sell* involve transfer of an item from one person to another as a result of a transfer of money from the recipient to the original possessor. The verbs differ, however, with respect to the relationships between arguments and syntactic positions.

Pairs of color photographs of a girl performing the different actions were used as stimuli. On each trial, two photographs were presented and the experimenter produced a verb. The patients' task was to point to the picture in which the girl was performing the specified action. For verbs requiring two actors (e.g., *to buy* has both a buyer and a seller), the picture showed the girl and a boy and the patient was instructed to select the picture in which the girl was performing the specified action.

The patients' performance is summarized in Table 5. For the *unrelated* verb set, all of the patients were above 90% correct, indicating preserved knowledge of broad distinctions in verb meaning. Some of the patients were impaired on the other two verb sets (SD and VP performed below 90% correct on the related function verbs and SD, PJ, and VP were below 90% correct on the reverse-role verbs). In general, however, the results indicate that, despite marked difficulty with verb production, comprehension of broad semantic distinctions between verbs is fairly well preserved in these eight aphasic patients. We should note, however, that it is extremely difficult to

TABLE 5
Patients' Performance on Verb Comprehension Test (Proportion Correct)

Patient	Verb set Unrelated (*N* = 208)	Related function (*N* = 100)	Reverse-role (*N* = 24)
SD	.96	.89	.71
PJ	.99	.98	.88
CN	.99	.92	.96
LN	.98	.93	.95
FO	.99	1.00	1.00
VP[a]	.93	.85	.83
SS[b]		1.00	.96
EW	.99	.97	.92
Controls (*n* = 5)			
Mean	1.00	.99	.98
Range		(.99–1.00)	(.96–1.00)

[a] VP is one of the four cases reported in Breedin & Martin (1995).
[b] SS was tested on a shorter version of the test which did not include *unrelated* verbs and included only 30 *related function* verbs.

equate performance on production and comprehension tasks. For the comprehension tasks, the correct answer is presented as one of a limited number of choices and the patient must select it; in contrast, for the production tasks, the patient must retrieve the correct answer from a potentially much larger set of alternatives within the mental lexicon.

Noun–Verb Synonymy Triplets

The verb–picture matching task did not contrast patients' performance on nouns and verbs. In addition, the word–picture matching paradigm might not be sensitive to comprehension deficits in contexts where a pictorial representation of the event being described is not present. To test other aspects of verb comprehension, the synonymy subtest from the Philadelphia Comprehension Battery (Saffran et al., 1988) was used. Patients were presented with three words (all nouns or all verbs) in written form while the experimenter also read them aloud. They were instructed to indicate the two words that were most similar in meaning. For example, in the case of the noun triplet *lake–brook–stream*, *stream* and *brook* are most similar. Similarly, in the verb triplet *to shine–to scrub–to polish, to shine* and *to polish* are most related.

The results are presented in Table 6. Four of the patients (FO, CN, PJ, and EW) continued to demonstrate fairly good comprehension of verbs and showed no difference between nouns and verbs. The other four patients (SD, LN, SS, and VP) had more difficulty with verbs than nouns, although the

TABLE 6
Patients' Performance on the Noun–Verb Synonymy Triplets Test (Proportion Correct)

	Patient								Controls (n = 21)	
Triplet type	SD	PJ	CN	LN	FO	VP	SS	EW	Mean	Range
Nouns (n = 15)	.80	1.00	.87	.80	1.00	.67	.93	1.00	.96	(.80–1.0)
Verbs (n = 15)	.47	1.00	.87	.53	1.00	.60	.67	.93	.97	(.87–1.0)
Difference	.33	0.00	0.00	.27	0.00	.07	.26	.07		

differences in performance on these word classes failed to reach statistical significance.

Summary of Patient Descriptions

We have presented background data on eight aphasic patients who have difficulty producing verbs in spontaneous speech. For seven of the eight patients, the difficulty with verb retrieval was confirmed by high noun/verb ratios in story narration or by a significant noun superiority on a picture naming test. One patient (PJ) did not meet either of these criteria, although she did show numerical superiority for nouns on the picture naming task and a mild deficit for *reverse-role* verbs on the verb–picture matching task. Three of the patients (SD, SS, and EW) were classified as agrammatic speakers. In addition, all eight of the patients were found to have reasonably well-preserved auditory verb comprehension as measured by performance on the *unrelated* verb set of the picture–verb matching test. The synonymy test revealed comprehension deficits in four of the patients (SD, LN, VP, and SS) although there was no significant difference in performance between nouns and verbs. We will consider the comprehension data further after presenting the results of the verb production study.

VERB STORY COMPLETION TEST

Development of Verb Stories

As we noted earlier, the story completion with delayed repetition allows for a direct comparison between two verbs that differ in degree of specificity. However, story contexts can vary in the degree to which they constrain production of a given verb. For example, when given the incomplete sentence ''The woman ______ a cake'' most people would complete it with the verb *bake*. Therefore, before testing patients, we tested normal controls to determine the extent to which our materials encouraged subjects to expect particular verbs.

Materials. We created 50 three-sentence stories, each of which provided a coherent context for both members of a contrastive pair of verbs. Twenty of the stories contrasted semantically *light* verbs (e.g., give, go) with semantically *heavy* verbs (e.g., buy, walk). Twenty of the stories contrasted *general* verbs (e.g., clean, cut) with more *specific* verbs (e.g., wipe, rip). Ten of the stories contrasted *patient* verbs (e.g., hit, raid) with *patient+state* verbs (e.g., smash, destroy). In assessing verb retrieval, it is desirable to use verbs that are unambiguous with respect to grammatical category, avoiding verbs that have noun homophones (e.g., *to watch* and *a watch*). We were not able to meet this constraint; however, when verbs with noun homophones were used, we tried to select words for which the verb usage occurred more frequently in the language. Verb pairs were chosen so that both verbs could fit equally well within the same sentence frame and require the same number of arguments. We did not attempt to match verbs for subcategorization frame and argument structure complexity.[3]

Subjects. Thirty-five native English speakers from the Temple University School of Medicine and Temple University Department of Speech–Language–Hearing served as control subjects and were either given course credit or paid $5.00 for their participation. Thirty of the subjects were female and five male with a mean age of 31 years (range: 19–65). One of the subjects' responses were dropped from the analysis because she failed to follow the instructions.

Procedure. Test booklets were created by printing the 50 stories with the verb deleted from the second sentence. To the right of each story, there were three blank lines. Five versions of the booklet were created by printing the stories in different random orders. On the first page of each test booklet, an example was given and subjects were instructed to read each story and to try to generate three verbs that could fit into the blank in the second sentence. They wrote their responses in the blank lines provided.

Results. For each story, the verbs that subjects used to complete the sentence were recorded, along with the frequency with which subjects' verb choice overlapped with that of other subjects. Examination of these data indicated that some of the story contexts induced grossly discrepant frequencies for members of the pair. We either deleted these stories from the set or replaced one of the verbs with another chosen on the basis of subjects' performance. We were left with 19 heavy–light verb stories; 14 general–specific verb stories; and 8 patient–patient+state verb stories. The entire set of verb stories is presented in Appendix B. Of the 82 verb stories (two versions of each of the 41 stories), 49 contained verbs which had noun homo-

[3] For example, both the verbs *give* and *donate* can be used in the same V NP PP subcategorization frame (gave the money to the museum and donated the money to the museum) but only *give* can alternate to the V NP NP subcategorization frame (gave the museum the money but not donated the museum the money). Similarly, the verb pair *bring* and *rush* have meanings that require an argument to fill the role of patient (e.g., the woman brought the children to school and the woman rushed the children to school); however, the verb *rush* can also be used without requiring the role of patient (e.g., the woman rushed to school but not the woman brought to school).

phones. We considered a verb to have a noun homophone if it had a noun listing in Francis & Kucera (1982); thus, the noun must occur at least once per million words in the written language. All but five of the homophones had a more frequent verb than noun usage. In addition, homophones were fairly evenly distributed between the sets of less ($n = 24$) and more complex verbs ($n = 25$). We were not able to match verb pairs for frequency of occurrence, because light verbs tend to be among the most frequently occurring verbs in the language. However, the relationship between frequency and performance was examined and will be discussed in the Results section. The verb pairs along with their frequencies (Francis and Kucera, 1982) are presented in Appendix A.

Method

Materials. The two versions of the 41 stories were randomly assigned to one of four blocks, with the constraint that a given story context appeared only once in a block and that the three verb contrasts (heavy vs. light, general vs. specific, patient vs. patient+state) were distributed evenly across the four blocks. There were 21 stories in blocks 1 and 2 and 20 stories in blocks 3 and 4. An additional 5 stories using different verbs were developed for practice.

Procedure. The four blocks of stories were each presented twice over eight test sessions with at least 48 hours between each session. The order of presentation was random except that a given block was not presented a second time until all four blocks had been presented once. Patients were told that they would hear short paragraphs and then be asked a question about the story. At the beginning of the first session, patients watched a short videotape in which the task was modeled. They were instructed to attempt to use words from the story when answering the question and were then given five practice trials in which feedback was provided. Patients were encouraged to try to answer the question with a complete sentence. No feedback was given during the test trials, but if the patient failed to produce a verb, the experimenter prompted him/her by saying ‘‘yes, but what was he/she doing?’’ At the beginning of each testing session, the five practice stories were repeated with feedback. The entire testing session was recorded on audio tape for subsequent transcription. Finally, the test was simplified for three of the patients. After testing VP and SD on the first presentation of the four blocks, it was apparent that they were having difficulty remembering the verb. Therefore, on the second presentation of the four blocks, the sentence following the one containing the verb was omitted for these two patients.[4] LN showed similar difficulty on the practice trials; therefore, he was given two-sentence stories for all eight sessions.

Results

Patients’ responses were transcribed and the number of times a target verb was produced, regardless of whether it appeared in a complete sentence, was counted. Responses that differed from the target by only one phoneme were considered correct if they did not constitute another related verb (e.g., ‘‘tust-

[4] This modification in the procedure did not appear to affect the pattern of verb retrieval, but rather the number of verbs retrieved. Thus, VP retrieved 11 simple verbs and 11 complex verbs on the first administration. On the second administration, he retrieved 23 simple verbs and 24 complex verbs. SD showed the same pattern (administration 1: simple = 2, complex = 6; administration 2: simple = 6, complex = 9).

ing'' was accepted for *dusting,* but ''tumble'' was not accepted for *stumble*). Examples of patients' responses are presented in Appendix C. Note that, in general, patients used the appropriate verb morphology, indicating that they were attempting to produce verb forms rather than noun forms.

We begin by presenting the results for the patients as a group and then go on to examine the performance of individual patients. The Wilcoxon Signed Ranks Test was used to determine whether differences between verb types were statistically significant (see Siegel & Castellan, 1988). Overall performance for the eight aphasic patients on the three verb contrasts is summarized in Fig. 2. Patients produced more *heavy* verbs than *light* verbs (T^+ ($N = 7$) $= 35$, $p < .02$) and more *specific* verbs than *general* verbs (T^+ ($N = 6$) $= 32$, $p < .03$). Although there was a numerical advantage for *patient+state* verbs relative to *patient* verbs, this difference was not statistically significant (T^+ ($N = 8$) $= 24$, $p < .46$).

The results for individual patients are summarized in Table 7. The total number of target verbs produced by each patient is presented in the first row. The patients' overall performance ranged from 14 (SD) to 63% (FO) correct. We examined individual patients' performance on the simple (light, general, and patient) verbs relative to the complex (heavy, specific, and patient+state) verbs (see rows 2–4 of Table 7). All of the patients retrieved a greater number of complex verbs than simple verbs. This difference was statistically significant for four of the patients (LN, FO, SS, and EW).

This effect was further examined by type of complexity contrast. Again, most of the patients show a numerical advantage for the more complex verbs, although statistical significance was difficult to achieve given the relatively small number of items in each comparison. In the case of the light vs. heavy distinction, all of the patients except for CN produced more *heavy* than *light* verbs; this difference was statistically significant for SS and PJ and marginally significant for SD. Patients showed a similar pattern of performance for the general vs. specific distinction. All of the patients except for VP and SD produced more *specific* verbs than *general* verbs; this difference was statistically significant for LN. For the patient vs. patient+state verbs, five of the patients produced more *patient+state* verbs, a difference that was statistically significant for SS and FO; one subject (PJ) tended to produce more *patient* verbs than *patient+state* verbs, although this difference was not statistically significant.

Before settling on the complexity variable as the source of these differences, we need to consider whether it is possible to account for the patients' verb production in terms of a general variable like frequency or the verb expectancy produced by the story context. As we noted earlier, we were not able to control for verb frequency. We attempted to control for story context during test construction, but there was still some variability. To examine these possibilities, we carried out several correlational analyses.

We correlated patients' verb retrieval with the natural log frequency of

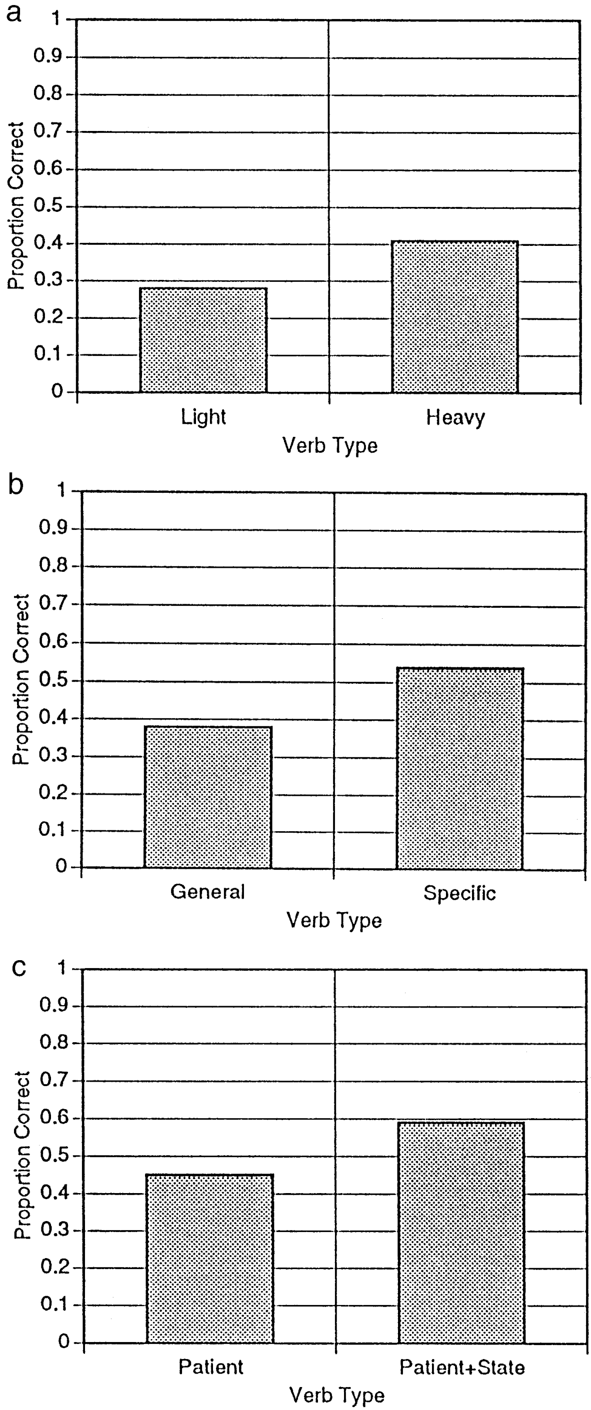

FIG. 2. Patients' mean performance on the verb story completion task: (a) light vs. heavy; (b) general vs. specific; (c) patient vs. patient+state.

TABLE 7
Number of Verbs Produced Correctly in the Story Completion Task

	Patient							
Verb type	SD	PJ	CN	LN	FO	VP	SS	EW
Total (n = 164)	23	78	54	61	104	69	85	73
Simple (n = 82)	8	33	24	23	45	34	31	29
Complex (n = 82)	15	45	30	38	59	35	54	44
Fisher's Exact Test ($p<$)	.18	.09	.41	.02	.04	1.0	.0005	.03
Light (n = 38)	1	9	11	9	20	13	12	9
Heavy (n = 38)	7	18	11	15	22	15	22	14
Fisher's Exact Test ($p<$)	.06	.05	1.00	.22	.82	.81	.04	.32
General (n = 28)	5	11	8	7	16	13	12	13
Specific (n = 28)	5	17	10	17	22	13	18	18
Fisher's Exact Test ($p<$)	1.00	.18	.78	.01	.15	1.00	.18	.28
Patient (n = 16)	2	13	5	7	9	8	7	7
Patient+State (n = 16)	3	10	9	6	15	7	14	12
Fisher's Exact Test ($p<$)	1.00	.21	.23	1.00	.04	1.00	.02	.15

the verb and with three different verb expectancy measures obtained from normal subjects. All of the patients showed a negative relationship between correct responses and verb frequency, indicating that retrieval performance was superior for *low* frequency verbs. This effect was significant for four of the patients (SS, $r = -.37$, $p < .001$; PJ, $r = -.48$, $p < .0001$; EW, $r = -.40$, $p < .0001$; SD, $r = -.22$, $p < .05$) and marginally significant for one other patient (FO, $r = -.20$, $p < .06$).

Our first measure of verb expectancy was simply the proportion of normal subjects who generated a target verb as their first response (scores could range from 0.0 to 1.0). Our second measure was the number of subjects who generated the target, regardless of whether it was the first, second, or third response (scores could range from 0 to 34). Finally, the third measure gave each first response a score of three, each second response a score of two, and each third response a score of one. These numbers were totaled for each verb (scores could range from 0 to 102). The scores for each verb for all three measures are presented in Appendix A. The results of these analyses were almost exclusively negative: Only one of the patients demonstrated sensitivity to any of the three verb expectancy measures (CN: expectancy 1, $r = .20$, $p < .08$; expectancy 2, $r = .25$, $p < .02$; expectancy 3, $r = .26$, $p < .02$).

We also examined the types of errors patients made when they failed to produce the target verb. If semantically complex verbs are easier for patients to retrieve because they have richer representations, we would expect patients to demonstrate a similar pattern in their substitution errors; that is, patients should substitute semantically complex verbs when unable to retrieve the target verb. To address this possibility, patients' transcripts were

TABLE 8
Type and Number of Errors Produced in the Story Completion Task

	Patient							
Error type	SD	PJ	CN	LN	FO	VP	SS	EW
Incorrect	100	28	40	74	12	56	51	54
Equal	4	8	10	4	11	5	6	8
Heavier	24	30	18	11	26	5	17	15
Lighter	13	20	42	14	11	29	5	14
Difference	11	10	−24	−3	15	−24	12	1

independently rated by one of the authors (SB) and by one of two speech pathology graduate students who were blind to the design of the study. Errors were assigned to one of four error categories. Responses that contained no verb or a verb that was unrelated to the target were treated as incorrect. When patients produced verbs that were semantically richer or more specific than the target verb (e.g., *to wipe* for *to clean*), the error was scored as ''heavier.'' When substitutions were semantically less specific than the target (e.g., *to go* for *to stumble*) the error was termed ''lighter.'' Finally, a response could be scored as equivalent to the target on the light/heavy dimension (e.g., *to fix* for *to prepare*). The raters agreed on these classifications 85% of the time; disagreements were resolved by a third judge (ES).

Patients' error data are presented in Table 8. Three different patterns occurred. Two of the subjects (LN and EW) tended to substitute heavier and lighter verbs equally often. Two of the patients (CN and VP) tended to produce semantically lighter verbs when they were unable to retrieve the target verb. In fact, they each had a light verb that they seemed to rely on when unable to retrieve the target verb: CN used the verb *to go* in 36% of her substitutions and 45% of VP's substitutions involved the verb *to get*. The four remaining patients (SD, SS, FO, and PJ) tended to substitute semantically heavier verbs when they were unable to retrieve the target verb.

GENERAL DISCUSSION

We have presented data from eight aphasic patients, seven of whom had difficulty producing verbs relative to nouns in narrative production and/or a picture naming test. We then examined the role of semantic complexity in patients' ability to retrieve verbs. The results of the verb story completion task indicate that patients' verb retrieval is affected by the semantic complexity of the verb. In general, patients were more likely to retrieve target verbs that incorporate a greater number of semantic features according to a compositional view of verb representation. The effect of complexity was not as strong in the patient vs. patient+state verb contrast. There are several possible reasons for this. First, there were fewer items in this verb set. Second, unlike the other two verb contrasts, which tended to differ in perceptual, manner, or instrument features, the patient vs. patient+state contrast differed in the number of thematic roles assigned to the direct object.[5] Performance on this contrast may have been complicated by the fact that some patients have difficulty with this component of the verb (Breedin & Martin, 1996).

Patients' verb retrieval patterns could not be accounted for in terms of frequency of occurrence. Surprisingly, almost all of the patients showed a negative frequency effect, that is, they were more likely to retrieve low frequency verbs than high frequency verbs. We consider this negative frequency effect to be an artifact of semantic complexity. Semantically light or empty verbs tend to be very high in their frequency of occurrence. Note, however, that CN and VP differed from the other patients in that they did not show a negative frequency effect.

The tendency for better performance on semantically complex verbs did not appear to be tightly linked to the agrammatic speech pattern. Two of the agrammatic patients (EW and SS) were significantly better at retrieving complex than simple verbs. However, LN and FO, who were not judged to be agrammatic speakers on the basis of the criteria used here, also showed statistically reliable semantic complexity effects on this measure.[6]

The distribution of patients' verb retrieval errors showed a similar pattern to their overall performance on the verb story completion task: half of the patients were more likely to substitute a heavy verb than a light verb when unable to retrieve the target. The error analysis also revealed that two patients (CN and VP) showed the opposite pattern, tending to substitute light verbs when they could not retrieve the target. Note that these two patients also produced more light than heavy verbs in narrative production. Their tendency to favor light verbs did not emerge in the data for number of target verbs produced; both produced an equal number of target verbs in the light vs. heavy and general vs. specific conditions. However, this performance pattern differed from that of the rest of the patients, all of whom produced more complex verb substitutions for both the light vs. heavy and general vs. specific contrasts.

We are reluctant to draw strong conclusions about this second verb deficit pattern. The patients clearly have a deficit, but their performance pattern may reflect a strategy of relying on a limited set of high frequency verbs. We should also note that one of these two, CN, was the only patient to show an effect of a supportive narrative context; she was more likely to retrieve the

[5] Note that the issue of how many thematic roles a noun phrase can play is somewhat controversial within the linguistic community (see Pinker, 1989).

[6] FO was considered to be agrammatic at an earlier point in his recovery. We should also note that he was one of the patients who showed improvement following participation in mapping therapy (Schwartz, Saffran, Fink, Myers, & Martin, 1994).

target verb if the story provided a strong context. The remainder of the discussion will therefore focus on the more intriguing pattern displayed by the majority of the patients, which points to a semantic complexity effect in verb retrieval.

Although the task was developed to assess verb retrieval, it also involves a memory component, and one might argue that the effect of semantic complexity is due to memory demands created by the task. It is conceivable that semantically complex verbs are remembered better because they are more distinctive than the semantically simpler verbs (e.g., the von Restorff effect). We note, however, that the patients not only retrieved a larger proportion of the more complex verbs, but also substituted more complex verbs for simpler verb targets. It is unclear how the memory factor would account for the substitution data. Conceivably, the patients are elaborating a richer, more detailed representation for heavier verbs that would result in generation of a heavier verb, even if not the target. But as the majority of the six patients who showed a complexity advantage in the verb story completion task also demonstrated a preference for heavy verbs in narrative production, we think it unlikely that the results can be accounted for by mnestic factors alone.

Patients were tested on verb comprehension measures in an attempt to rule out a comprehension deficit in performing the verb story completion task. We did not, however, probe for understanding of the verbs that were targeted for production. While the comprehension measures served to demonstrate that the patients were at least sensitive to broad distinctions in verb meaning, some of the patients had difficulty with verbs in the more demanding synonymy test. However, there is no evidence that comprehension failures can account for the pattern of results in the production task. Note that two of the patients, SD and VP, performed poorly on the verb comprehension measures (Tables 5 and 6), but showed very different performance patterns in story completion. SD had a strong tendency to produce more complex verbs and VP simpler ones.

Previous research has demonstrated a double dissociation for noun and verb retrieval: some patients are impaired on verbs with respect to nouns and others show the opposite pattern (Miceli et al., 1984; Caramazza & Hillis, 1991; Damasio & Tranel, 1993; Daniele, Giustolisi, Silveri, Colosimo, & Gainotti, 1994). Although not always explicitly articulated, these investigators appear to favor the view that this dissociation is occurring at the level of lexical form (i.e., output phonology or orthography) where, it is claimed, items are organized according to grammatical category. The strongest argument has been made by Caramazza and Hills (1991) who propose

> that the deficit concerns the activation of the category verb in modality-specific lexical components, . . . either because of damage directly to modality-specific lexical representations or because of damage to access of these representations. The implication of this conclusion is that phonological and orthographic output representations are organized by grammatical category. (pp. 789–790)

Their argument is based, in large part, on the demonstration of modality-specific dissociations within and across patients: they report a patient who shows superiority for nouns in written production and no difference in oral production and a second patient who shows superiority for nouns in oral production but no difference in written production. These patients showed differences between nouns and verbs even when items were homophones (e.g., *to brush* and *a brush*).

Clearly, words have to be marked for grammatical class, but most current theories of language production assume that this information is stipulated at the point at which conceptual information is lexicalized, i.e., at the level of the lemma, where words are not yet specified for phonological (or orthographic) form (e.g., Levelt, 1989). The phonological (or lexeme) level of representation is, on these theories, blind to syntactic category, and, for that matter, to semantic distinctions as well. Consistent with this view, there is evidence from studies of normal subjects that homophones (e.g., *in* and *inn*) share a common representation at the level of phonological form (Dell, 1990; Jescheniak & Levelt, 1994). Thus, there is reason to question the position adopted by Caramazza & Hillis (1991). The data from the present study show that verb retrieval in at least some patients is sensitive to a semantic variable. It is clear that the addition of semantic features can facilitate verb retrieval for some aphasics, and it may be that paucity of semantic features can impede verb retrieval for others. The complexity effect points to a problem in the representation of verb meaning or in access to lemmas from conceptual representations. The fact that some of these patients performed very well on tests of verb comprehension would seem to argue against a problem in the representation of verb meaning, but it is possible that the comprehension measures employed in this study were not sensitive enough to reveal their deficits. The additional complexity associated with the added features would seem to argue against a representational deficit, since it is difficult to see why complexity should make representations more coherent; however, viewed from the perspective of connectionist models (e.g., Plaut & Shallice, 1993), additional features imply more connections among the components of the semantic representation, which could well promote such an effect. Alternatively, the benefit of additional meaning components could occur at the point of lemma access, where activation summed over additional features would be advantageous.

Breedin, Saffran, and Coslett (1994) addressed a related set of issues in a recent case study of a patient with a semantic impairment. The patient, DM, showed a general superiority for abstract over concrete words; he also performed better on verbs than nouns. On tests of semantic knowledge, DM showed a disproportionate loss for perceptual properties of things. There was evidence, too, that this loss extended to manner features of verbs, many of which have a perceptual basis (compare *to whisper* and *to shout*, for example). Breedin et al. hypothesized that his superiority for abstract words might also have reflected this loss of perceptual features. It is possible that we are seeing the opposite effect here, i.e., that the presence of perceptual feature components in the heavier verbs results in a faciliatory effect on verb retrieval. This possibility requires further investigation, as we did not specifically manipulate this factor here. Alternatively, it may not matter what the additional feature is, as long as it is present: that is, the effect could simply be due to representational complexity. These possibilities—a complexity effect, as opposed to an effect of a particular type of semantic feature—remain to be explored.

An alternative explanation for the patients' performance pattern is that simpler and more complex verbs, as defined here, differ in the extent to which their meaning constrains the contexts in which they can occur. Like abstract words in general, simple verbs can occur in many different contexts and their meaning is often modified by that context (e.g., *take* a cookie, *take* a wife, *take* a trip). In contrast, more complex verbs appear to be less flexible with respect to the contexts in which they can appear (e.g., *grab* a cookie, **grab* a wife, **grab* a trip). Thus, it may be that the more complex verbs have a more uniform representation, whereas the simpler verbs are, in this respect, more variable. Consequently, when a heavy verb is activated, only one meaning is retrieved, whereas activation of a light verb may generate a number of meanings, in which case the patient might have difficulty selecting the one that is appropriate to the context.

Whatever the specific nature of this effect, the results of the present study are consistent with a compositional view of verb representation. There has been little support for this view from on-line studies of normal language processing (see Fodor et al., 1980, for review) and verb production (Roelofs, 1993). However, these studies were motivated by what Gentner (1981) refers to as the ''Complexity Hypothesis,'' the view that the number of components predicts processing rate (Kintsch, 1974; Fodor et al., 1980). Gentner points out that the number of semantic components may not be as important in processing as the structure of the components and suggests that a verb that specifies a greater number of relationships among nouns might have a stronger ''memory trace'' than one which specifies fewer relationships. This notion appears very close to the one suggested above for features in a connectionist model. On this view, the prediction that words with more complex representations should be processed more slowly may simply be wrong. In any case, differences that arise from representational variables may be difficult to detect in studies of normal language processing. They are likely to have a greater impact on language processing in the event of damage to the lexical/semantic system.

Finally, we should take note of the fact that the lesion sites in our subjects are consistent with other studies in pointing to anterior regions of the left hemisphere language areas as the locus of verb retrieval deficits. Other patients with verb retrieval deficits have had lesions in the left dorsolateral frontal lobe (e.g., Damasio & Tranel, 1993; Daniele et al., 1994). All eight of the patients reported in this paper have lesions involving the frontal and/or parietal regions of the left hemisphere. In contrast, the opposite pattern—a superiority for verbs over nouns—is associated with lesions in the anterior middle and inferior temporal lobe (Damasio & Tranel, 1993; Breedin et al., 1994; Daniele et al., 1994).

APPENDIX A

Verb Pairs Used in Story Completion Task

A. Light vs. Heavy verbs

		Expectancy measure					Expectancy measure		
Light	Frequency	1	2	3	Heavy	Frequency	1	2	3
1. bring	488	.32	24	54	send	253	.56	28	73
2. bring	488	0.0	6	9	rush	42	.15	8	20
3. come	1561	.09	5	11	hurry	45	.03	4	8
4. come	1561	.09	19	37	arrive	108	.74	30	83
5. come	1561	.15	13	28	drive	203	.15	14	33
6. get	1486	.29	21	49	find	1033	.68	30	82
7. give	1264	.38	28	62	buy	162	.56	29	76
8. give	1264	.21	25	49	donate	12	.35	23	53
9. go	1844	.50	28	69	walk	287	.29	28	61
10. go	1844	.29	27	60	fly	92	.32	24	52
11. have	12458	.09	20	37	ask	612	.09	27	46
12. make	2312	.12	12	26	build	249	.42	20	51
13. make	2312	.47	26	66	bake	15	.29	23	51
14. make	2312	.18	15	32	mix	56	.35	20	49
15. move	447	.21	14	30	roll	88	.32	18	46
16. put	513	.21	21	43	drop	159	.35	20	50
17. put	513	.21	19	39	throw	150	.47	23	60
18. take	1575	.29	18	41	choose	177	.29	19	47
19. take	1575	.68	32	85	grab	37	.06	23	40
Mean	1872	.25	20	44	Mean	212	.34	22	52

APPENDIX A—*Continued*

B. General vs. Specific verbs

General	Frequency	Expectancy measure 1	2	3	Specific	Frequency	Expectancy measure 1	2	3
1. carry	304	0.0	14	22	deliver	71	0.0	9	14
2. clean	58	.50	29	73	wipe	35	.21	26	51
3. cut	245	.50	28	67	rip	14	.06	17	29
4. eat	122	.82	34	95	dine	32	.15	28	58
5. eat	122	.91	34	99	lick	14	.06	28	52
6. fall	239	.12	6	16	stumble	31	.09	7	14
7. fill	184	.03	6	13	stuff	10	.24	9	26
8. hold	509	.29	23	51	carry	304	.50	27	68
9. look	910	.68	33	87	glance	43	.26	28	63
10. look	910	.47	31	76	stare	95	.44	26	64
11. mix	56	.24	18	41	stir	39	.24	19	40
12. prepare	163	.09	8	18	dust	9	0.0	12	16
13. say	2765	.35	18	45	shout	77	.18	10	24
14. work	496	.76	32	84	teach	153	.21	24	53
Mean	635	.41	22	56	Mean	49	.19	19	41

C. Patient vs. Patient+State

Patient	Frequency	Expectancy measure 1	2	3	Patient+State	Frequency	Expectancy measure 1	2	3
1. drop	159	.35	20	48	break	228	.24	22	47
2. fight	155	.44	23	54	kill	153	.29	26	57
3. hit	126	.32	23	53	smash	18	.18	20	43
4. pound	11	.06	2	6	crush	17	.03	3	7
5. raid	4	.09	5	13	destroy	104	.03	4	7
6. scold	2	.06	3	8	hurt	31	0.0	4	6
7. strike	108	.09	6	13	sink	40	.03	8	14
8. treat	122	.12	16	30	cure	20	.59	29	76
Mean	86	.19	12	28	Mean	76	.17	15	32

APPENDIX B

Stories Used in Story Completion Task

A. Light vs. Heavy verbs

(1) Ken's mother had an operation yesterday.
Ken is *bringing/sending* her some flowers.
Hopefully, they will cheer her up.
What is Ken doing for his mother?
(2) The children were late getting up this morning.
Their mother *brought/rushed* them to school.
The children got into their seats just before the bell rang.
What did the mother do?
(3) The hospital was always crowded.
Sam *came/hurried* into the emergency room.
There were lots of people there already.
What did Sam do?
(4) The convention starts today.
Mr. Wilson, the main speaker, *came/arrived* yesterday.
A big turnout is expected.
What did Mr. Wilson do yesterday?
(5) The bar closed at 2:00 a.m.
Henry *came/drove* home.
Nobody heard him come in.
What did Henry do after the bar closed?
(6) The car company had to fire Bob.
Bob *got/found* a new job.
His wife was glad.
What did Bob do?
(7) Jane loves antiques.
Tom *gave/bought* her an oak chest.
Jane took very good care of it.
What did Tom do for Jane?
(8) The Hunts had a painting by Renoir.
They *gave/donated* it to a museum.
Everyone wants to see it.
What did the Hunts do with their painting?
(9) The bus stopped and let people on.
Marty *went/walked* to the back of the bus.
There were plenty of seats there.
What did Marty do when he got on the bus?
(10) It gets cold in Philadelphia during the winter.
The Smiths are *going/flying* to Florida tomorrow.
It should be warm there.
What are the Smiths doing tomorrow?

APPENDIX B—*Continued*

(11) Marsha was feeling very lonely.
So, she *had/asked* some friends over for dinner.
It was a pleasant evening.
What did Marsha do about her loneliness?
(12) Lots of people have hobbies.
Carl *makes/builds* boats.
Each one takes a long time.
What does Carl do in his spare time?
(13) The children went to their grandmother's house on Saturday.
She *made/baked* a wonderful dessert.
The children loved it.
What did grandmother do?
(14) It was Jack's birthday.
Helen *made/mixed* the cake batter.
The guests were due at six o'clock.
What did Helen do to the cake batter?
(15) Jack's office was too crowded.
He *moved/rolled* the computer into the closet.
It was on a table with wheels.
What did Jack do with the computer?
(16) Ellen was busy typing a letter.
The delivery man *put/dropped* the mail onto her desk.
She looked up.
What did the delivery man do with the mail?
(17) The clothes were dirty.
Janet *put/threw* them in the laundry.
The hamper was overflowing.
What did Janet do with the clothes?
(18) Jenny offered Sam one of her three balloons.
Sam *took/chose* the blue balloon.
Blue is his favorite color.
What did Sam do?
(19) Catherine was playing happily.
Steve *took/grabbed* her doll away from her.
Catherine cried.
What did Steve do to make Catherine cry?

B. General vs. Specific verbs

(1) Sandy turned 35 yesterday.
Zack *carried/delivered* the cake to the party.
The party was a big success.
What did Zack do?

APPENDIX B—*Continued*

(2) The kitchen table is the perfect place for the children to do finger painting.
Their mother *cleaned/wiped* off the table afterwards.
Fortunately, the paint came off easily.
What did the mother do to the table?
(3) Macy's was having a sale.
Alice *cut/ripped* the ad out of the newspaper.
The prices were great.
What did Alice do with the newspaper?
(4) It was Roger and Tanya's first date.
They *ate/dined* at a French restaurant.
The food was expensive.
What did Roger and Tanya do on their first date?
(5) It was very warm outside.
Mike *ate/licked* his ice cream quickly.
It was delicious.
What did Mike do?
(6) The path was littered with debris.
The children *fell/stumbled* down the hill.
The dog came running after them.
What happened to the children?
(7) Frank watched his mother prepare dinner.
His mother *filled/stuffed* the peppers with meat.
They smelled wonderful.
What did Frank's mother do to the peppers?
(8) Several people played key roles at the wedding.
John was the one who *held/carried* the ring.
It was a great honor.
What was John's role?
(9) Mary was late again.
Now and then, Greg *looked/glanced* at his watch.
It was 9:00.
What did Greg do?
(10) The class was boring.
Jill *looked/stared* out the window.
Finally the bell rang.
What did Jill do during class?
(11) Wonderful smells came from the kitchen.
The chef was *mixing/stirring* cream into the sauce.
It tasted great.
What did the chef do to the sauce?
(12) Sally's parents are coming to visit.
Sally is *preparing/dusting* the guest room.

APPENDIX B—*Continued*

It is very dirty.
What is Sally doing?
(13) The restaurant was very busy and noisy.
Kyle *said/shouted* to his friends.
They came to the table.
What did Kyle do?
(14) Camille is a lovely person.
She *works/teaches* at a daycare center.
Her classroom is very sunny.
What does Camille do?

C. Patient vs. Patient+State verbs

(1) Mary was putting her ice tea on the table.
She *dropped/broke* the glass.
What a mess.
What did Mary do to the glass?
(2) Everyone in the village was scared of the dragon.
George *fought/killed* the dragon.
It was a long battle.
What did George do to the dragon?
(3) A huge bug was walking across the kitchen counter.
Rachel *hit/smashed* it with her shoe.
It died instantly.
How did Rachel kill the bug?
(4) We took a field trip to the quarry.
The workers were *pounding/crushing* rocks.
It was hard work.
What were the workers doing?
(5) The camp was full of enemies.
The army *raided/destroyed* the camp.
A few people managed to escape.
What did the army do to the camp?
(6) The whole family dislikes Uncle Herb.
He always *scolds/hurts* the children.
They try to avoid him.
What does Uncle Herb do?
(7) The fog was very thick.
The barge *struck/sank* the ship.
The passengers were all saved.
What did the barge do?
(8) Dan had been sick for almost a year.
The doctor *treated/cured* his illness.
Now Dan feels well enough to work.
What did the doctor do for Dan?

APPENDIX C

Examples of Patients' Responses on the Verb Story Completion Task

1. Carl makes boats. (light)

SD	A ship, a ship and banging, banging, no, no, one ship and not banging it but I can't say it.
PJ	Carl . . . is building, building boats.
CN	Uhm uh he . . . uh paints not no inside he uh.
LN	He the boats . . . muper. He is a boat muper . . . he is a boat maper.
FO	She, oh . . . he practice no, no . . . he bake boats. Uh . . . Phil . . . no . . . boats, oh . . . he . . got, oh uh . . . Phil, oh . . .
VP	She m-makes boats.
SS	Build boats.
EW	Carl . . . is the . . . boats.

2. Carl builds boats. (heavy)

SD	Builds boats.
PJ	Carl is . . . the, Carl is building the boat.
CN	He builds boats . . . for a hobby.
LN	He, he, he . . . brows boats (Ex. One more time) Let me see, he . . . builds boats.
FO	She, no uh, she, no . . . Carl is . . . boats, oh . . . build boats eh-uh Carl and he and she comes out different.
VP	Builds boats . . . and a lot of it.
SS	Boats (Ex. Can you give me the action?) . . . boats . . . build boats.
EW	hobby . . . boats.

3. Jill looked out the window. (general)

SD	Not studying but uhm the sky and everything is br brew (Ex. What is she doing?) Just sitting it . . . sitting it.
PJ	Jill is . . . Jill is . . . the boring she in the . . . the . . . Jill is wondering . . . no . . . Jill is the window, I can't say that . . . the Jill is wondering . . . no.
CN	She uh . . . she . . . at the window. She uh blank out the window . . .
LN	Boring so he, he . . . boring so he . . . it's boring so . . . oh boy
FO	Uh . . . Jill is . . . uh boring, oh uh, class.
VP	Looked out the window and said ''what a beautiful day.''
SS	Eyes (Ex. Can you try and say it?) Chair, chair.
EW	I don't know.

4. Jill stared out the window. (specific)

SD	Thinking. (Ex. Can you put it in more of a sentence?) The bell, the bell and thinking very
PJ	The Sue is staring . . . outside.
CN	Stared out the window.
LN	It's boring so he, he . . . boring so . . . it's boring. (Ex. So what does she do?) He, he . . . I know it, but I can't . . . boring so . . . boring . . . don't know the word.
FO	She stared out the window.
VP	Sh-sh-sh she staled out the window. I don't know why.
SS	Stare.
EW	Jane sared out the window.

APPENDIX C—*Continued*

5. She dropped the glass. (patient)
   - SD Dropped the iced tea.
   - PJ The Mary is dropping the tea, it's a mess.
   - CN The glass was broken . . . and the cup.
   - LN He, he . . . it's um . . . he, he . . . he got the glass.
   - FO Dropped the glass.
   - VP Drop it.
   - SS Broke it.
   - EW She broke the glass.
6. She broke the glass. (patient+state)
   - SD Speeled, speeled it with the glass.
   - PJ Mary is . . . no, no Mary is the . . . Mary is . . . I can't say it.
   - CN Mary broke the glass.
   - LN He broke the gas.
   - FO Break the glass. Mary broke the glass.
   - VP B-broking it . . . breaking it and that's it.
   - SS watching . . . (Ex. What did Mary do?) I don't know.
   - EW She . . . broke the . . . ice tea all over the room and

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