

The Conceptualization of Nouns and Verbs evidence from paraphasia¹

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A number of aphasia studies have reported selective dysfunction for noun and verb grammatical categories which appears to correspond to frontal and parietal cortical damage: Broca's aphasics tend to have difficulty accessing verbs, whereas Wernicke's and Anomic aphasics tend to have greater difficulty accessing nouns. The fact that either nominal or verbal word categories are selectively affected by aphasia indicates that nouns and verbs are differentiated in the cognitive processes involved in lexical representation and access. Thus, the distinction between nouns and verbs must have a fundamental cognitive basis. This paper investigates the lexical selection of nouns and verbs by three Wernicke's aphasics. Two trends were observed for all three subjects: (a) there were more errors for nouns than for verbs and (b) most of the lexical substitutions were semantically related to the target. Based on these results and an analysis of one patient's lexical substitutions, I argue that the categorical distinction between nouns and verbs must be a semantic/conceptual one, following Bates, Chen, Tzeng, Li, & Opie, 1991, rather than due to grammatical category coding in the lexicon.

It has been claimed that nouns and verbs constitute one of the most basic distinctions made in language; unlike other parts of speech, no language fails to distinguish between nouns and verbs (cf. Sapir, 1949; Givón, 1984). In addition to typological evidence of the fundamentality of the noun/verb distinction, numerous behavioral studies provide evidence that nouns and verbs are cognitively dissociated. This paper addresses the nature of the grammatical distinction between nouns and verbs. Based on evidence from paraphasia, an aphasic disorder, it will be argued that the cognitive dissociation between nouns and verbs arises from differences in the way they are conceptualized.

Behavioral studies of noun/verb dissociation range from language acquisition, memory, and semantic priming in lexical access studies to hemispheric specialization in split brain studies and language breakdown in aphasia. Gentner (1982) reports language acquisition data which show that children learn nouns before verbs. This generalization held crosslinguistically for both comprehension and production. In memory tasks, adult subjects have been found to remember nouns more easily than verbs (Gentner 1982). Noun/verb dissociations have also been found in semantic priming experiments. Hagoort (1990) found that elderly subjects showed differential priming effects from college-aged subjects for homographic noun-noun and noun/verb ambiguous words. In split-brain studies, the disconnected right hemisphere has been found to have greater difficulty processing verbs than nouns in comprehension tasks. Although some patients may be able to comprehend verbs, they are unable to carry out simple verbal commands. Some split-brain patients display no comprehension of verbs following surgery but later regained the ability to comprehend them (Joanette, Goulet, & Hannequin, 1990). Numerous psycholinguistic studies of aphasia have found evidence of selective dysfunction for nouns or for verbs as a result of local cerebral damage. Some patients have greater difficulty accessing nouns; other patients have greater difficulty accessing

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verbs. Physiologically, the noun/verb dissociation appears to correspond to anterior and posterior cortical brain damage (Goodglass, 1976).

The fact that either nominal or verbal word categories are selectively affected by aphasia indicates that nouns and verbs are differentiated in the cognitive processes involved in lexical representation and access. This is supported by the diverse range of behavioral evidence of noun/verb dissociations summarized above. Thus, the distinction between nouns and verbs must have a fundamental cognitive basis. I will argue that the categorical distinction between nouns and verbs must be a semantic/conceptual one (following Bates, Chen, Tzeng, Li, & Opie, 1991) rather than due to grammatical category coding in the lexicon. The evidence is based on an analysis of the lexical selection of nouns and verbs by three Wernicke's aphasics. In the first section, I will describe the phenomena of noun/verb dissociation in aphasia. In the second section, I will show that only a semantic/conceptual explanation can account for the dissociation of nouns and verbs in impaired language production based on both a group study and a case study of paraphasia. In the third section, I will describe how the grammatical categories noun and verb could be derived from differences in conceptualization.

1. The dissociation of nouns and verbs in aphasia

The respective difficulty of using nouns or verbs appears to correspond to different aphasic syndromes: Broca's aphasics have trouble describing actions (McCarthy & Warrington, 1985; Miceli, Silveri, Villa & Caramazza, 1984; Bates et al., 1991); whereas Wernicke's aphasics show the greatest word-finding difficulties with object names (Caramazza & Hillis, 1991; Gleason, Goodglass, Obler, Green, Hyde & Weintraub, 1980; Baxter & Warrington, 1985; Goodglass, Kline, Carey, & James, 1986). By comparing the abilities of patients with different syndrome types to perform various language-related tasks, researchers have attempted to determine the cognitive structures and processes that support linguistic activity; in this case, the cognitive basis of nominal and verbal grammatical categories. In this section, I will provide a brief overview of the dissociation. Then I will discuss theoretical models that have been proposed to account for the dissociation. In the following section, I will predict how an analysis of lexical substitution could shed light on the nature of the dysfunction.

1.1. Overview: Aphasic syndromes are characterized by a range of linguistic abnormalities,² (see Table 1 for symptoms of Broca's and Wernicke's aphasia). However, any one of these symptoms may occur independently of the others, so that the form that aphasia takes may actually vary considerably from patient to patient. In other words, patients classed as having the same syndrome may actually suffer from different language difficulties.³ Wernicke's aphasia is associated with lesions in the posterior

2 The division of language disorders into syndromes is complicated by the fact that a patient may experience modality specific aphasic symptoms, such as selective disruption in the ability to read or write, which may or may not co-occur with spoken language impairment.

3 The potential for individual variation within subject groups based on clinical syndromes (e.g., Broca's and Wernicke's aphasia) complicates the study of language breakdown in aphasia.

left cortex, resulting in impaired comprehension and qualitative language production problems including lexical substitution (paraphasia). Broca's aphasia is associated with lesions in the anterior left cortex, resulting in various kinds of reduced speech output. The finding that difficulty in producing nouns is associated with lesions in posterior cortical areas and difficulty in producing verbs is associated with lesions in anterior cortical areas is intriguing because it supports the idea that nouns and verbs are either stored or processed differently.

Table 1: Symptoms associated with Broca's and Wernicke's aphasia

Wernicke's Aphasia (fluent aphasia)	Broca's Aphasia (non-fluent aphasia)
posterior left hemisphere lesions <ul style="list-style-type: none"> • posterior-superior temporal gyrus 	anterior left hemisphere lesions <ul style="list-style-type: none"> • posterior-inferior frontal lobe
fluent speech production <ul style="list-style-type: none"> • characterized by jargon and circumlocutionary speech • normal syntactic complexity • word blendings 	non-fluent speech production <ul style="list-style-type: none"> • slow, halting speech • reduced phrase length • reduced syntactic complexity • poor pronunciation
severe anomia: <ul style="list-style-type: none"> • characterized by lexical substitution paragrammatism: substitution of closed class items	some anomia: <ul style="list-style-type: none"> • characterized by lexical omission agrammatism: reduced use of closed class items
paraphasia: substitution of open class items	

For Broca's and Wernicke's aphasics, the noun/verb dissociation shows up in the omission and substitution of words which they are unable to access. Broca's patients tend to omit verbs or to substitute a nominal form for the verb, such as referring to 'swimming' as "the swim". Wernicke's patients tend to overuse pronouns and other semantically vague forms in place of the target noun, such as calling a 'present' "something good". They might also resort to grasping for phonemically and/or semantically similar forms, as in calling a 'cat' a "cow". Sometimes they use short phrases which approximate the meaning of the sought-after word such as referring to 'crying' as "tears going down". Often they go through long word searching episodes (circumlocutions) in an attempt to arrive at the target word (e.g., for 'car': "truck, no

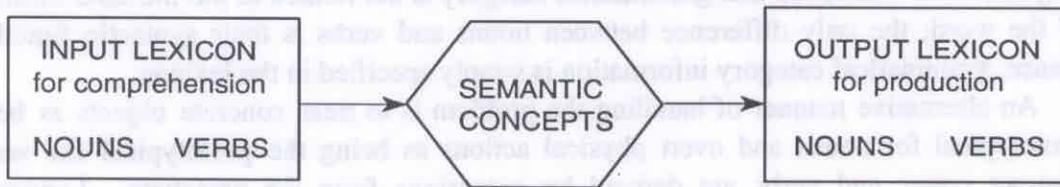
Caramazza and Badecker argue that clinical syndromes cannot serve as the basis for theoretically meaningful research because individual variation in performance within a clinical category cannot be assumed to be unimportant. Thus, they question the validity of group studies, and recommend the use individual case studies (Caramazza, 1986; Badecker & Caramazza, 1986; Caramazza & Badecker, 1989). However, both Zurif and Bates defend the use of statistical analysis in group studies as a means of circumventing the difficulties posed by group studies to which Caramazza and colleagues have objected (Zurif, Gardner & Brownell, 1989; Bates, Appelbaum, and Allard, 1991; Bates, McDonald, MacWhinney, & Appelbaum, 1991; Bates, Wulfeck, & MacWhinney, 1991; see also Caplan, 1986; Zurif, Swinney, & Fodor, 1991). It is this author's belief that both group studies and case studies have merit and should be pursued.

gosh, tear duct, look at that will ya, I look at that every day! .. a van, its a da, ah car”). In many cases, however, the intended meaning is not recoverable (e.g., for ‘donut’: “and that was that same one looks kind of the hole gyad what those things no is got”).

Evidence of a noun/verb dissociation for production is quite robust (Miceli et al., 1984; Miceli, Silveri, Nocentini, & Caramazza, 1988; Bates et al., 1991; Gleason et al., 1980; Zingeser & Berndt, 1988). Evidence of a noun/verb dissociation for comprehension is weaker (Miceli et al., 1988; Bates et al., 1991). In addition, the dissociation may be modality specific (Baxter et al., 1985; Caramazza et al., 1991).

1.1. Potential theoretical explanations of noun/verb dissociations: Because the dysfunction primarily affects words of a particular grammatical category, it has been suggested that the dysfunction occurs at the lexical level -- where grammatical category information is stored with other syntactically relevant information. This is based on a modular functional model of language processing (Figure 1), where semantic and grammatical category information are located in separate modules.

Figure 1: a modular model of lexical access



In this vein, Miceli et al. (1984) and Caramazza et al. (1991) propose a lexical explanation of the noun/verb dissociation by attributing it to a breakdown in processing with respect to a subcomponent of the lexicon. Miceli et al. suggest that words are listed in the lexicon according to their grammatical class; difficulty with the production of verbs indicates a breakdown in the part of the lexicon where verbs are represented. They argue that because agrammatic patients sometimes produce a nominalized form of the verb, the dysfunction is not at the semantic level.

In contrast to the lexical explanation of the noun/verb dissociation, Bates et al. (1991) attribute the dissociation to a semantic/conceptual difference between nominal and verbal meaning. They suggest that the anterior and posterior cortex is differentially involved in the representation and processing of action and object meanings. The cortical regions responsible for the semantic representation of actions lie near the motor cortex (commonly the site of damage for Broca’s aphasics) and the cortical regions responsible for the semantic representation of object names draw input from sensory association areas (areas which are implicated in Wernicke’s aphasia). However, they do not provide a characterization of how nouns and verbs can be semantically/conceptually differentiated. This issue will be addressed in section 3.

Anomia (difficulty in accessing words) is common to most aphasic syndromes. It has been found that some aphasic patients have particular difficulty in accessing words belonging to specific semantic categories such as concrete versus abstract words

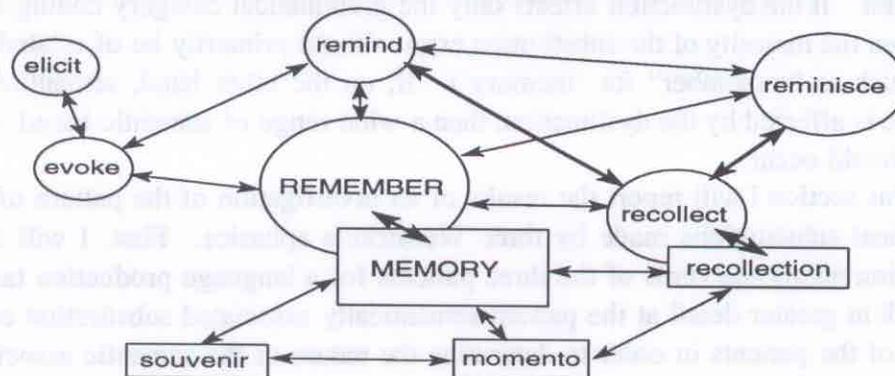
(Warrington & Shallice, 1979; 1984), living things versus inanimate objects (Damasio, 1990), fruits and vegetables (Hart, Berndt, and Caramazza 1985), body parts, letters, and color names (Goodglass et al., 1986). Given the lexical explanation, the noun/verb dissociation could not be related to these findings; however, the semantic/conceptual explanation would indicate that the noun/verb dissociation may be related to the disruption of other types of semantic categories.

The lexical and the semantic/conceptual explanations described above depend on different assumptions about the nature of grammatical class distinctions. Intuitively, the conceptual basis of nouns is derived from labeling concrete objects and the conceptual basis of verbs is derived from labeling overt physical actions. However, there are many nouns which do not refer to concrete objects, such as 'love', and there are many verbs which do not refer to overt physical action, such as 'resemble'. Moreover, there are a number of words which can occur as either a noun or as a verb, such as 'work' and 'bomb'; just as there are a number of events which could be described with either a verb or a derived nominal, such as 'migrate' and 'migration'. Hence, a clear-cut semantic distinction between nouns and verbs is difficult to formulate. For this reason, many linguists have concluded that grammatical category is not related to the intrinsic meaning of the word; the only difference between nouns and verbs is their syntactic function. Hence, grammatical category information is simply specified in the lexicon.

An alternative manner of handling the problem is to treat concrete objects as being prototypical for nouns and overt physical actions as being the prototypical for verbs; abstract nouns and verbs are derived by extensions from the prototype. Langacker (1987b) has suggested that a noun and a verb may describe the same objective situation, but they differ in how the situation is conceptualized. For example, the related noun/verb pair 'remember' and 'memory' share the same basic semantic content; however, the noun 'memory' is construed as an entity, whereas its verbal counterpart 'remember' is construed as a process which evolves over time. Thus, for Langacker, grammatical category is a reflection of how the intrinsic meaning of the word is construed.

A crucial difference between these two theoretical approaches is that the lexical account of grammatical class predicts that the difference between nouns and verbs is in their representation, whereas the cognitive account predicts that the difference between nouns and verbs lies in how they are processed conceptually. Miceli et al.'s lexical explanation of the noun/verb dissociation in aphasia appears to draw from the lexical representation of grammatical category differences and a modular account of lexical access. Bates et al.'s semantic/conceptual explanation appears to draw from a cognitive account of semantic representation and conceptualization and a semantic network model of lexical access (see Figure 2).

Figure 2: Semantic network model incorporating nominal and verbal meaning



A network model of lexical access draws on the assumption that words are related to each other by a number of association links. Some links may be stronger than others, so that some types of associations are more likely to facilitate activation of related word/concepts. I will argue for a network model in which the links between words/concepts are derived from real-world experience. Thus, numerous different types of associations should be reflected in the network.

2. The noun/verbs dissociation in paraphasia: group and case study

In a modular theory of lexical access, the dysfunction for nouns or verbs must occur in the output lexicon, i.e. after the semantic level has been accessed. However, many of the lexical substitutions reported for aphasic patients are not merely nominalized forms of verbs; some lexical substitutions involve diverse semantic associations with the target word such as calling a 'baby' a "cradle" (Miceli et al., 1984) and referring to 'sitting' as "chairing" (McCarthy et al., 1985). A dysfunction which selectively affects grammatical category coding in the lexicon could account for the noun/verb dissociation. However, such a dysfunction would not motivate semantically related substitutions unless grammatical category differences involve the semantic/conceptual level of representation. A cognitive theory in which grammatical category information is incorporated in the semantic/conceptual characterization of a lexical item, such as that proposed by Langacker (1987b), could account for the noun/verb dissociation in aphasia by affecting the semantic/conceptual basis of grammatical category representation. If the noun/verb dissociation is based on a difference in the conceptualization of a word then the substitution of a verb by a related nominal form may be grouped with other types of semantically related substitutions. A purely lexical explanation would not be able to make this generalization.

To make a case for the semantic/conceptual basis of grammatical category representation, I will show that nouns and verbs are differentially affected by the dysfunction and that various types of semantically related substitutions occur in the aphasic patient's production of nouns and verbs. The prediction is that if the dysfunction

affects words of a particular grammatical category without semantic/conceptual structure being involved, then the majority of the substitutions should not be semantically associated. If the dysfunction affects only the grammatical category coding of a lexical item, then the majority of the substitution errors should primarily be of related noun/verb pairs (such as “remember” for ‘memory’). If, on the other hand, semantic/conceptual structure is affected by the dysfunction, then a wide range of semantic based substitution errors should occur.

In this section I will report the results of an investigation of the pattern of omissions and lexical substitutions made by three Wernicke’s aphasics. First, I will discuss the production nouns and verbs of the three patients for a language production task. Then I will look in greater detail at the pattern semantically associated substitution errors made by one of the patients in order to determine the nature of the semantic associations that hold between the target structure and the actual output.

2.1. The lexical selection of nouns and verbs of three Wernicke’s aphasics: In this section, I will look at the omissions and lexical substitutions (i.e., real word substitutions) made by three subjects clinically diagnosed as Wernicke’s aphasics.

2.1.1 Method: All three subjects became aphasic as a result of a stroke. Although they varied with respect to the exact location of the lesion, it was in the left parietal region in all three cases (see Table 1). Each was tested at least one year following the stroke. All three had fairly fluent speech and relatively good pronunciation with the exception of VS who experienced some dysarthria (speech production problems).

Table 1: Subjects history

Patient:	DR	LP	VS
Lesion:	left frontal-parietal reg.	left parietal region	left temporo-parietal region
Age at onset:	74	56	43
Tested: (following onset)	1 year	4 years	6 years
Education:	high school	2 yrs college	4 yrs college

Task: Each subject’s response in the given/new picture description task was compared. The given/new task, developed by MacWhinney and Bates, consists of nine sets of picture triplets, each consisting of a similar scene in which all but one of the elements remain constant: in some triplets the subject or object is changed (e.g., A {bear, mouse, bunny} is crying), in other triplets the action is changed (e.g., A boy is {running, swimming, skiing}). The subjects were asked to describe what they saw in each series of three pictures. In order to compare the production of nouns and verbs, each instance of a noun or verb produced was counted. Sequences of repeated words (perseveration) were

counted as one. Pronouns used for the first mention of a nominal were counted as semantically vague substitutions. Circumlocutions which could not reliably be related to any of the target words were not counted. Neologisms (word-blends and non-words) were not counted because they do not constitute lexical (real word) substitutions.

2.1.2. Results: The total number of hits and errors are shown in Table 2. The errors are subdivided into omissions and substitutions. Because the subjects often made several attempts at expressing a word, the total number of hits and errors generally outnumbered the total number of target nouns and verbs.

Table 2: Total number of omissions and substitutions

subject n/v	total hits	total errors	type of error	
			omission	substitution
DR N	34 (47%)	39 (53%)	10 (26%)	29 (74%)
DR V	4 (11%)	33 (89%)	20 (61%)	13 (39%)
LP N	54 (75%)	18 (25%)	4 (22%)	14 (78%)
LP V	12 (44%)	15 (56%)	4 (27%)	11 (73%)
VS N	67 (85%)	12 (15%)	0	12 (100%)
VS V	23 (79%)	6 (21%)	2 (33%)	4 (67%)

Total noun targets: 54; total verb targets: 27

Upon comparing their responses it was found that, while there were more noun errors than verb errors, the percentages show that the proportion of errors/target was greater for verbs than for nouns. This trend was found for all three patients. Note that this finding is not consistent with that reported in the literature. All three subjects made errors for one verb in particular: "give". Errors for "give" account for 5 out of 33 (15%) of DR's verb errors, 6 out of 15 (40%) of LP's verb errors and 2 out of 6 (33%) of VS's verb errors. "Give" differed from the other target verbs in requiring both a direct and an indirect object, in addition to the subject. All three subjects managed to express all of the nominative arguments in their descriptions.

The total number of errors for both nouns and verbs dropped when compared across the three subjects: DR made the most errors and VS made the fewest. Note that the number of omissions dropped more sharply than the number of substitutions. The patients most commonly erred by substitution rather than by omission. This trend held for both nouns and verbs for two of the three patients. It did not hold for DR's verb errors; DR correctly produced only 4 out of 27 target verbs; most of which he omitted.

These results indicate that both noun and verb categories are impaired by the dysfunction, though not equally so. In addition, they show the relevance of lexical substitution to the dysfunction. It was predicted above (section 2) that the nature of the lexical substitutions should indicate whether or not semantic/conceptual structure is

affected by the dysfunction. In order to determine the nature of the substitution errors, they were divided into three types: phonologically similar, semantically similar, and unrelated. The results are shown in Table 3:

Table 3: Breakdown of substitution errors by type

subject	N/V	total subst	types of substitutions		
			phonolog	semantic	unrelated
D.R.	Nouns	29	10 (34%)	15 (52%)	4 (14%)
	Verbs	13	7 (54%)	4 (31%)	2 (15%)
L.P.	Nouns	14	0	12 (86%)	2 (14%)
	Verbs	11	0	10 (91%)	1 (9%)
V.S.	Nouns	13	1 (8%)	11 (84%)	1 (8%)
	Verbs	4	0	4 (100%)	0

An example of the phonologically similar items would be “robber” used for ‘rabbit’. In most cases, the subject was aware of the inappropriateness of the word and continued to attempt to produce the target. Semantically similar words were usually from the same general semantic category such as “rabbit” used for ‘bear’. Also included in this group were inappropriately used pronouns and semantically vague terms such as referring to a donut as “those things”. The subjects rarely attempted to correct the semantically related errors. The unrelated items were words for which there was no obvious relationship between the word and target such as saying “key” for ‘flower’ and “smashing” for ‘crying’. Note, however, that in every case the grammatical category of the target was preserved; all of the nouns were substituted with other nouns and all of the verbs were substituted with other verbs.

Although the patients varied with respect to the exact nature of the errors they made, it can be seen that semantic-based substitution errors were the most common for all three patients. Of all the lexical substitution errors, only one involved a related noun/verb pair where DR appears to have used “the swim” to mean ‘water’. The robustness of semantically related substitution suggests that the disruption of lexical access occurs at a point where semantic relations between words are still available. The occurrence of phonologically related lexical substitutions suggests that both semantic and phonological information must be concurrently available.

2.1.3. Discussion: All three subjects showed somewhat greater production impairment for nouns than for verbs, but that the proportion of errors/target indicated that the subjects had greater difficulty expressing verbal notions and nominal notions. This second result is inconsistent with those reported in the literature. In general, it can be said that the subjects had difficulty with expressing words of both grammatical classes but that the nature of the difficulty was different for the two classes: verbs tended to be omitted and

nouns tended to be substituted by other nouns. In section 2.2. differences between nominal and verbal substitutions will be discussed.

The fact that, for all three subjects, the majority of the lexical substitutions were related (semantically or phonologically) to the target is evidence that lexical substitutions are motivated by associations between words. Semantic priming studies have shown that words which are semantically and phonologically related to a target are more highly activated than words which are not associated with the target (Milberg, Bloomstein, & Dworetzky, 1988; Holley-Wilcox & Blank, 1980). It is possible that given some kind of disruption in lexical access of the target, the patient latches onto an associate (semantic or phonological) which is also highly activated. The fact that both semantic and phonological information must be concurrently available is predicted in Langacker's theory, in which words are conceptualized as symbolic units with both a semantic pole and a phonological pole. Thus, priming can occur through association links to both semantic and phonological poles at the same time.

The subjects varied in the types of lexical errors made (i.e. omission versus substitution; substitution of related versus unrelated forms, and substitution of phonologically versus semantically related forms). There could be several reasons for the individual variation among the subjects. First, the location and extent of the lesion sites are not identical (cf. Table 1). In addition, the amount of time that occurred between the onset of the lesion and the test date is quite different. Both LP and VS have had a greater chance for recovery and to develop strategies for exploiting unimpacted cognitive processes to compensate for the unrecovered ones. Lastly, DR was quite a bit older at the age of onset than LP and VS were. This could have reduced DR's ability to develop compensatory strategies.

The results shown in Tables 2 and 3 could be indicative of a recovery process. The overall number of errors progressively diminished across the three subjects: DR > LP > VS. Furthermore, the percentage of omissions dropped off in relation to substitutions. Lastly, the percentage of unrelated, idiosyncratic substitutions also decreased. The differences in the severity of the dysfunction can be seen in the quality of the output of the subjects. Below are excerpts of the transcripts:

Target: *A girl is eating an apple/donut/ice cream.*

DR: To me to note that don't say this little girl I know it's I wasn't supposed to say no but ice cream ice cream and little girl capple apple and that was that same one looks kind of the hole gyad what those things no is got I know what it is dough it no I can't make it, can't make it. Dough it dough it dough it.

LP: All right, she's got ice cream here and she's just looking at it with cherry on the top and right now she's um eaten part of it but here she just had a bite a a bite she a piece of it, because here eaten two times but here she's eaten that two times. Ice cream and apple or whatever. Apple, apple.

VS: Uh this a girl and she iy...eatin' a apple. Uh...she's still eat her apple but it's 'bout half gone. Uh now she got ice cream.

It is possible that recovery from (or compensation for) anomia follows a progression of increasing semantic relatedness of lexical substitutions coupled with a drop in lexical omission. Similar results were reported by Zengesser and Berndt (1988). They discuss the error patterns of an anomic patient on three different administrations of the Boston Naming Test one, two and four years after the stroke which resulted in aphasia. They found that in the earliest testing, the subject's responses were primarily circumlocutions of which 30% bore little or no semantic relation to the target, 55% had a weak semantic relation and 14% had a strong semantic relation to the target. In the second testing (eight months later) the number of unrelated circumlocutions had dropped to 8%, while 54% were weakly related and 38% were strongly related to the target. In the most recent testing, all the circumlocutions were weakly (69%) or strongly (31%) related to the target.

2.2. LP's lexical selection of nouns and verbs: So far I have shown that semantically related substitutions were the most common type of substitution error for all three patients. In order to investigate the types of the semantic associations that hold between a substituted lexical item and the target, I will now discuss semantic substitutions which occurred fairly systematically. Of the three subjects discussed above, LP showed the most regularity in the use of certain lexical substitutions, both in free speech and in naming tasks. For example, he used the verb 'say' to mean 'write' seven times during the initial interview session. D.R. also used 'say' to mean 'write' during his initial interview; however, he did so only once. In the given/new task analyzed above, LP primarily made use of semantically related words in his lexical substitutions. In free conversation it is not always possible to know when a substitution error has occurred; however, non-standard use of nouns and verbs was common.⁴ The following analysis is based on the subject's speech production in comprehension and naming tasks, a description of the "cookie theft" picture and from spontaneous speech.

2.2.1. Nominal substitutions: Nominal substitution errors occurred most often during tasks which required the subject to relate names of objects to pictures. In the majority of the cases where the subject did not use the target word, he used a word which was drawn from the same typological category. The target words were primarily taken from the basic level of the folk taxonomy, such as 'book', 'chair', and 'cup'. Where the subject deviated from the target, his lexical selection tended towards more type-specific items rather than basic-level terms. In the confrontation naming task, the subject was asked to name objects portrayed in pictures. For the first three items listed in Table 4, the subject provided a subordinate name.⁵ In the comprehension task the subject was asked to

⁴ For the sake of convenience, I shall refer to both substitution errors and non-standard lexical selection as lexical substitutions.

⁵ Scientific and folk taxonomies may differ in the level of detail and the exact organization of the category members. It is not possible to know if "ape" (Table 4) is a superordinate category for the patient or not; however, "ape" is a less frequently used word than "monkey".

point to the picture of the object named by the interviewer. Here, upon hearing the basic-level target word, he repeated the target word to himself, then shifted to the more type-specific term he had used in the confrontation naming task in order to be able to select the appropriate picture.

Table 4: Typologically related nominal substitutions

target	Confront. Naming without prompts	Comprehension without prompts	Confront. Naming with prompts
rock	quartz	.. rock ... quartz	rock
dog	collie .. dog	dog .. dog .. collie	NA
monkey	ape .. chimpanzee ... chimpanzee	monkey .. monkey .. (prompt) a monkey?	... ape ... chimpanzee
zebra	small horse	zebra? ... horse? ... zebra?	small horse (mule)

The picture of the dog was of a collie and the picture of the rock was of a quartz. Thus, it is not unlikely that the subject used the terms 'collie' and 'quartz' because the dog was a collie and the rock was a quartz. However, the fact that he was unable to point to the respective pictures in the comprehension task until he had made the connection to the more type-specific term indicates that he was not able to make the expected association from the basic level terms to the pictures.

In the case of 'donkey', the subject was unable to correctly identify the picture, nor was he able to grasp the target word when verbally prompted by the interviewer. Yet, some degree of comprehension did take place, because he was able to produce words within the same general semantic domain. In the confrontation naming task, the subject called the donkey a "small horse". Upon hearing the word 'donkey' in the comprehension task, he asked if the interviewer had said "zebra" or "horse". Neither 'zebra' nor 'horse' bear much phonological resemblance to 'donkey', yet they are all horse-like animals. When the interviewer repeated the word 'donkey', he again asked if she had said "zebra". This example shows that, while neither seeing the picture, nor hearing the word 'donkey' afforded full lexical access, some priming of the appropriate semantic category had occurred.

Although most of the nominal substitutions were based on typological categories, some substitutions were motivated by other types of semantic relationships. In the confrontation naming task, the subject used the word "square" instead of the target 'block'. Here, the subject focused on a salient feature of the block, its shape. This substitution is based on a metonymic relationship between an object and a salient feature of the object. In another task, the subject was asked to describe a drawing of a little boy standing on a stool in order to reach a cookie jar. In describing the scene, the subject used the word "ladder" instead of 'stool'. Here, the substitution is based on a functional

similarity established by the context: the stool is being used to reach a high place; thus, it is functioning like a ladder.

2.2.2. Verbal substitutions: The subject was quite consistent in his use of 'hear' to mean 'understand' and 'say' to mean 'write'. Throughout the interview he said that he could not 'hear' a word to indicate that he did not understand it. He contrasted 'hear' with 'understand', however, when the interviewer asked if he could hear her: "I can hear fine but I don't understand that. Aphasia." In this case, he used the word 'hear' with its more standard meaning. Similarly, he consistently used 'say' to mean 'write': "And if I can't hear I have paper so she can say it down". Elsewhere, he used the word 'say' in contexts appropriate to its standard usage. He used the word 'write' elsewhere, but given the context he appeared to mean 'erase'.

The fact that the subject used 'hear' to mean 'understand' is interesting because this type of semantic extension from a verb of perception to refer to the mental state of understanding (e.g., *see* -> *understand* as in "I see what you mean") is quite common across languages and is also quite common in diachronic semantic change (cf. Sweetser, 1987; Traugott, 1985). The semantic extension may involve both metaphoric and metonymic relationships: metaphoric in that cognition is understood in terms of perception, and metonymic in that one must hear something before one can understand what was expressed. LP may have capitalized on an established semantic extension, or he may be making use of cognitive mechanisms which enable one to use semantic extensions productively. In either case, the end result is that he has generalized the meaning of the word 'hear' to include the concept of 'understand'. The use of 'say' to refer to the process of writing involves semantic generalization. The primary meaning of 'say' refers to verbal expression; however, its use has been extended to refer to written expression in certain circumstances (e.g., one asks what a letter, book, or article *says*). On the basis of this pre-existing association of the meaning of 'say' to include written communication, the subject may have generalized the meaning of 'say' to incorporate the process of writing. This use of 'say' is well entrenched for the subject, such that he always refers to the process of writing with the verb 'say'.

The use of a verb from the same semantic domain which is more general in meaning than the anticipated target-word also occurred with regard to motion. In the description of the cookie theft picture the subject described the stool tipping over in the following ways: "he went going down", "the ladder went down", and finally as "they fell down". It appears as if the word 'fell' was temporarily blocked from lexical access. The verbs 'go' and 'fall' share the semantic domain of motion; they differ in that 'go' does not have a natural end point, whereas 'fall' does, i.e. when the ground is hit. However, if the subject had difficulty in retrieving the word 'fall', the meaning of 'go' is schematic enough to be used to express any kind of motion, including that of falling.

Note that in the above example "go" is followed by the preposition "down" to indicate the path of motion. The verb 'go' followed by "down" also occurred in a circumlocution for 'cry' in the given/new task: "tears going down". Again, the word 'cry' appeared to be blocked so he used the related nominal and a description of the

process in relation to its motion and path (e.g., the motion of the tears going down the face).

In sum, I found that, while the semantic network appears to be intact, the scope of the meaning of some words may have shifted. The types of relationships found for LP's systematic substitutions are shown in Table 5:

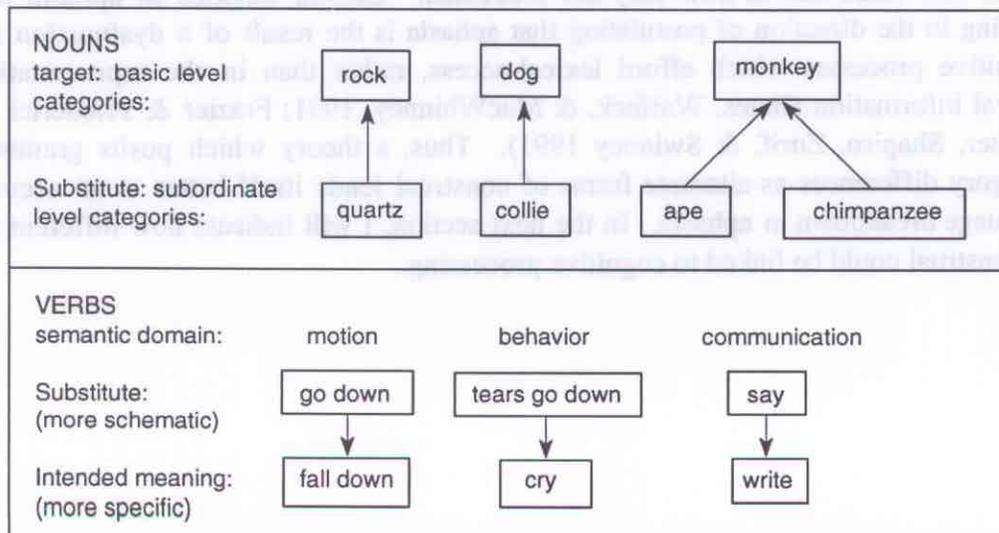
Table 5: Semantic basis of LP's nominal and verbal substitutions

Nominal Substitutions:	Verbal Substitutions:
1. Typological Membership a) Same level, related by family horse, zebra → donkey b) More specific for more general collie → dog 2. Functionally Related ladder → stool 3. Salient feature (metonymic) square → block	1. Same semantic domain a) Semantic generalization say → write (communication) b) More general for more specific go → fall (motion) 2. Across semantic domains Metaphoric/metonymic extension hear → understand (perception) → (cognition)

The fact that typological relatedness, function and salient features were relevant in nominal substitutions and that metaphoric and metonymic relationships were relevant in verbal substitutions indicates that a wide range of semantic information must be available at the point in lexical access where the dysfunction occurs.

In addition, in the case of nouns a more specific term tended to be substituted for the target, where as in the case of verbs a more general term tended to be substituted for the target, as shown in Table 6. This indicates that different levels of schematicity are operative for the two grammatical categories.

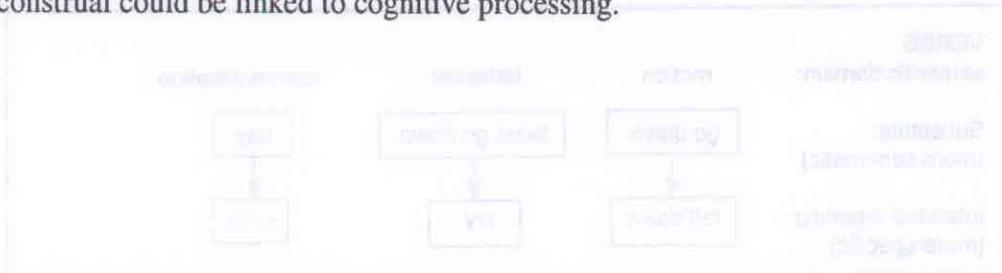
Table 6: Levels of schematicity in typologically related substitutions



2.3. Discussion: At the beginning of section 2, I predicted that if the dysfunction affects words of a particular grammatical category without semantic/conceptual structure being involved, then the majority of the substitutions should not be semantically associated. If the dysfunction affects only the grammatical category coding of a lexical item, then the majority of the substitution errors should primarily be of related noun/verb pairs (such as “remember” for ‘memory’). If, however, semantic/conceptual structure is affected by the dysfunction, then a wide variety of semantic based substitution errors should occur. I found in both the group study and in the single case study that diverse semantic associations were reflected in the lexical substitutions made by all three subjects.

For all three subjects, the majority of the lexical substitutions were semantically or phonologically related to the target. Given that grammatical category is relevant to the dysfunction, this data indicates that both grammatical category information and a complex array of semantic associations between words must be available at the point where the disruption occurs. A modular lexical explanation (cf. figure 1) cannot account for these results because semantic information is stored in a separate module from grammatical category information. A non-modular semantic network could account for this data if grammatical category is represented in the semantic network. (cf. Figure 2). Langacker (1987b) proposed that grammatical category information is incorporated in the semantic/conceptual characterization of a lexical item. If the dysfunction affects the cognitive processes underlying alternate forms of construal (for an entity or for a process), then the noun/verb dissociation in aphasia could be accounted for. The fact that different levels of schematicity were reflected in the substitutions for nouns than for verbs, and that metaphor and metonymy also played a role in the verbal substitutions supports this idea.

It would be possible to simply code words for grammatical category in the semantic network. In this case, the difference between nouns and verbs would be in their representation. This is contrasted with Langacker’s hypothesis, where grammatical category differences are a matter of construal; in which case, the difference between nouns and verbs lies in how they are processed. Current theories in aphasia are all moving in the direction of postulating that aphasia is the result of a dysfunction in the cognitive processes which afford lexical-access, rather than in the representation of lexical information (Bates, Wulfeck, & MacWhinney, 1991; Frazier & Friederici 1991; Prather, Shapiro, Zurif, & Swinney 1991). Thus, a theory which posits grammatical category differences as alternate forms of construal lends itself better to an account of language breakdown in aphasia. In the next section, I will indicate how different forms of construal could be linked to cognitive processing.



3. Conceptual Processes and Construal

The lexicon has been viewed as a list of words whose lexical entry incorporates minimalistic semantic representation as well as non-predictable phonological and syntactic information (such as grammatical category). This is compatible with Caramazza and Miceli's lexical account of noun/verb dissociation in aphasia, i.e., that the lexicon is organized by grammatical category. An alternative view of the lexicon does not recognize a separation between linguistic knowledge and other types knowledge derived from real-world experience. This is compatible with the notion of the lexicon taking the form of complex semantic/conceptual networks. In this section, I will discuss conceptual processes which could distinguish nouns from verbs.

3.1. Lexical Networks and Categorization

Haiman (1979), suggested that relating words to each other in a lexicon would be useless unless, at some point, their meaning were anchored in a fuller conceptualization of reality. In other words, conceptual knowledge of the world is the basis of meaning. In this vein, cognitive theories of linguistics do not maintain a rigid distinction between meaning and the conceptualization of world-knowledge. In a network model of the lexicon, semantic and phonological representations of words are stored as a conceptual network of associations. The types of associations that link words in the network may be quite varied, as they are based on real-world experience, as well as on metaphoric extensions (Lakoff 1987) and schemas (Langacker 1987) which have been derived from real-world experiences. For this reason, association is a productive process.

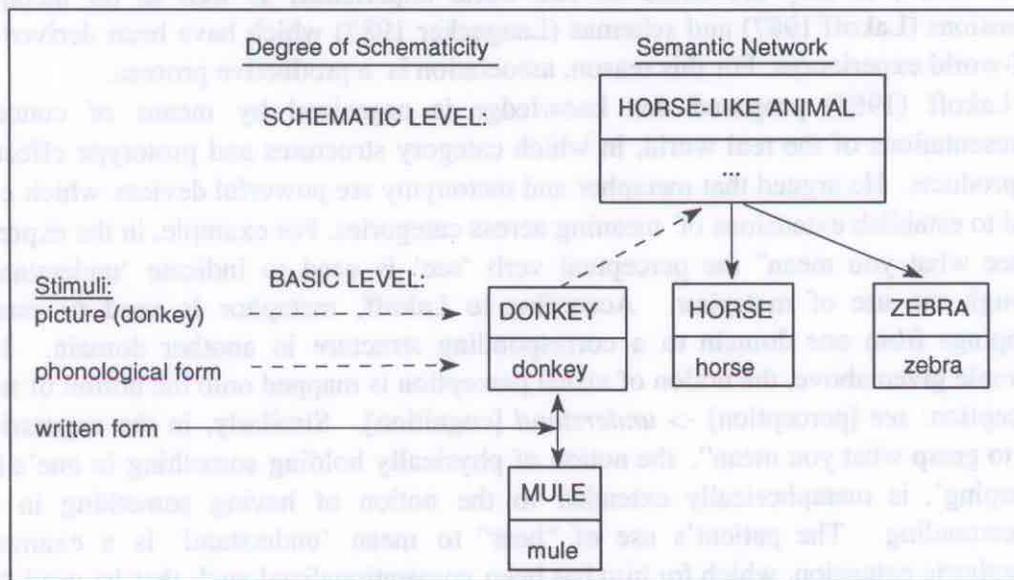
Lakoff (1987) proposed that knowledge is organized by means of conceptual representations of the real world, in which category structures and prototype effects are by-products. He argued that metaphor and metonymy are powerful devices which can be used to establish extensions of meaning across categories. For example, in the expression "I see what you mean" the perceptual verb 'see' is used to indicate 'understanding' through the use of metaphor. According to Lakoff, metaphor is used to establish mappings from one domain to a corresponding structure in another domain. In the example given above, the notion of visual perception is mapped onto the notion of mental perception: *see* [perception] -> *understand* [cognition]. Similarly, in the expression "I fail to grasp what you mean", the notion of physically holding something in one's hand, 'grasping', is metaphorically extended to the notion of having something in one's understanding. The patient's use of "hear" to mean 'understand' is an example of metaphoric extension, which for him has been conventionalized such that he used "hear" to mean 'understand' throughout the interview.

Langacker (1987b) notes that linguistic categories (e.g., nouns and verbs) group together elements which may be quite disparate. These elements are not always susceptible to a uniform characterization; membership may be a matter of degree and is subject to conventionalization. Langacker invokes the notion of schematicity, in addition to prototypicality, to account for many instances of categorization. Where a prototype is a typical instance of a category, a schema is an abstraction derived from all the members (instantiations) of a category, representing their commonality. The difference between a

prototype and a schema is that a prototype is an representative member of the category, whereas a schema is an abstract conceptualization.

In the data discussed above, an abstract schema appeared to drive the substitution of “horse” and “zebra” for ‘donkey’ (see Table 4). The subject was unable to correctly identify the picture, nor was he able to grasp the target word when verbally prompted by the interviewer. Yet, some degree of comprehension did take place, because he was able to produce names of animals which share horse-like properties. Thus, while neither seeing the picture, nor hearing the word ‘donkey’ afforded full lexical access, some priming of a schematic notion of ‘horse-like animal’ had occurred resulting in the patient’s response of “horse” and “zebra”. Figure 3 shows a representation of the conceptual network for ‘horse-like animals’ based on the patient’s performance. Following Langacker (1987a), the semantic component of a lexical item is depicted in capital letters and the phonological component is represented in lower case letters. The schematic notion of ‘horse-like animal’ represents what all of these entities have in common while remaining semantically and phonologically unspecified. The dashed arrows represent low-level priming, while the solid arrows represent sufficient priming to afford lexical selection.

Figure 3: Conceptual network of horse-like animals



These examples show how cognitive linguistic theory could provide an inciteful account of lexical substitutions in aphasia.

3.2. Processes involved in construal

Gentner (1982) suggests that nouns constitute the way in which the world is parsed into discrete objects. She points out that that the lexicalization of actions/events (i.e., relational terms - verbs, prepositions, adverbs, etc.) is more variable crosslinguistically

than the lexicalization of objects (i.e. nominals). Gentner notes that it is unlikely that languages would parse concrete physical objects in radically different ways. For example, the word for 'tree' is likely to denote the same constituent parts, (i.e., roots, trunk, branches, and leaves) crosslinguistically. There is much greater crosslinguistic variability, however, in the types of semantic elements which are lexicalized in verbs.

Talmy (1985) discusses different meaning elements which may be lexicalized in a verb of motion: *motion, path, figure, ground, manner, and cause*. The basic motion event consists of an object, the *figure*, which moves with respect to a reference object, the *ground*. The *path* is the course followed by the figure. *Manner* indicates some characteristic of the motion (e.g., The stone rolled down the hill). *Cause* lexicalizes the external event which brought about the motion (e.g., The paper blew off the table). Languages differ in which meaning elements tend to be lexicalized in verbs of motion. English tends to lexicalize manner or cause in a verb of motion: *John twisted the top off the bottle; Janet kicked the trash out the door*. Spanish, on the other hand, tends to lexicalize the path of motion: *Maura subió la escalera corriendo* (Maura went up the stairs, running); *las chicas se juntaron, corriendo* (The girls moved together, running). Atsugewi, a northern California Indian language, tends to lexicalize the figure with a verb of motion. For example, the verb root *qput* denotes 'loose dry dirt to move/be-located' and the verb root *caq* denotes 'a slimy lumpish object (e.g. a toad) to move/be located'.

Gentner (1981) suggests that language is constrained by the nature of the perceptual world to make coherent lexicalizations of objects. Similar constraints do not hold for verbs and other predicates because relations are perceptually less constrained. Concrete entities, which are prototypical perceptual structures lexicalized as nominals, have highly cohesive perceptual elements (i.e., a 'face' reliably consists of eyes, a nose, and a mouth; these separate elements maintain a spatial relationship with each other even as the face changes position or ages). The perceptual elements that are lexicalized as verbs, on the other hand, tend to lexicalize elements which have a high degree of external relations with other elements (i.e., 'sitting' involves a relation between the one who is doing the sitting and the thing which is being sat on). In other words, objects are more perceptually autonomous, whereas relations are perceptually dependent. This perceptual distinction (autonomy versus dependence) leads to conceptual autonomy and dependence respectively.

Langacker (1987b) accounts for less prototypical nouns (e.g., generation, habitat, property) and verbs (e.g., speculate, know, resemble) by extending the semantic characterization of nouns and verbs to highly schematic notions. A noun is an unspecified entity, a verb is an unspecified process. A stem which can function as either a noun or as a verb (e.g., 'bomb') takes on the differentiating properties of one class or the other when it is employed in a particular construction. The difference in construal imposed by nouns and verbs is captured by the theory as a profile/base distinction. The base of a linguistic expression is the cognitive structures it presupposes. For example, 'migrate' and 'migration' share the same base (i.e., large-scale mass movement of animals or people) because they have the same intrinsic content. Where they differ is in the profile imposed on the base. The profile is the substructure of the base which is made

prominent as the entity which the expression designates. Migration profiles a thing; migrate profiles a process.

Langacker proposes that the profile of a noun designates a "region" in some domain (e.g., time or space); count nouns designate a region which is bounded. For example, the count nouns 'island', 'continent', and 'archipelago' all represent a bounded region in space; 'moment', 'minute', and 'millennium' represent a bounded regions in time. He points out that bounding is a matter of how the conceived entity is construed; it is not necessarily determined by any objective consideration. For example, a group of stars may form a constellation, but which stars are grouped into which constellations is culturally determined. A verb, on the other hand, is a relational expression because it designates a relation (or series of connected relations) that holds between entities. An event can be scanned as a sequential series of events, or it can be viewed wholistically. Verbs are distinguished from other relational expressions (adjectives, adverbs, and prepositions) by their profile, in which the conceived relation is mentally scanned sequentially (i.e., it is conceived of as unfolding though time). This provides verbs the conceptualization of a coherent scene which evolves over time.

In summary, the difference between nouns and verbs can be semantically characterized. A nominal is a conceptually autonomous notion because it does not presuppose any other structure. A verb, on the other hand, is a conceptually dependent structure because to conceive of a relation it is necessary to conceive of the entities which are in the relation. In addition, nominals profile an entity whereas verbs profile a process. This difference in conceptualization is equated with different cognitive processes, such as sequential scanning for verbs. Noun and verb schemas are incorporated in the semantic/conceptual network by means of the profile (entity or process) imposed on the base (intrinsic semantic content) of the lexical item.

A semantic/conceptual explanation of the noun/verb dissociation in aphasia would provide a basis for the different types of semantically and phonologically related substitutions that occur. A model of the lexicon which is structured by complex networks of relationships between words such as that proposed by Langacker (1987a) could account for the different types of lexical substitutions which occur. With a lexical network model, impaired processing may invoke the use of existing cognitive mechanisms which are found in normal populations to compensate for difficulties in lexical access. What follows is an account of how this model might handle lexical substitutions in aphasia.

Noun/verb dissociations: noun/verb dissociations found in aphasia could reflect a dysfunction in the cognitive procedures involved in accessing conceptualizations of an entity or of a processes. For example, the impairment may reflect a dissociation in the processes involved in conceiving of autonomous and dependent notions. This would predict that difficulty producing verbs would co-occur with a disruption in the ability to produce other relational notions which are conceptually dependent.

Related lexical substitutions: Spreading activation through established semantic associations would facilitate semantic associates. If access to the most appropriate word were blocked, then a semantic associate which is highly activated (or which has a low

threshold value) would be accessed. If this procedure occurs often, then the use of a particular semantic associate in that context may become entrenched. This would lead to the systematic use of that semantic associate. Phonologically related lexical substitutions would occur in a similar manner through spreading activation along the phonological poles to phonologically similar words. Words which are both phonologically and semantically related such as 'cat' and 'cow' would receive priming from both the semantic and phonological poles.

Thus, a semantic/conceptual explanation of lexical substitution provides grounds for the tendency of lexical substitutions to be related to the target. The fact that grammatical category can be a factor in selective impairments need not be problematic for a semantic/conceptual account because grammatical categories are, in and of themselves, conceptual in nature. Such an account suggests that the dysfunction is not necessarily in the lexical network, rather it may be attributed to the processes involved in conceptualizing lexical items in order to access them or in the process of spreading activation through the network. When disruption occurs, a patient may learn to rely on other cognitive processes for access, such as those used for making semantic extensions in meaning, in order to compensate for the affects of anomia.

4. Conclusion

A number of studies have reported selective dysfunction for the grammatical categories noun and verb in aphasia. This indicates that these two grammatical classes are cognitively differentiated. Both lexical and semantic/conceptual explanations have been proposed to account for the dissociation. It was predicted that if grammatical categories have a semantic/conceptual basis, then the majority of substitutions should reflect diverse semantic associations. It was found that all three Wernicke's patients primarily produced semantically related substitutions. In addition, one of the subjects repeatedly produced nominal substitutions which were typologically or functionally related or focused on a salient attribute of the target noun and verbal substitutions which involved metaphoric and metonymic semantic extensions in meaning. Different levels of schematicity were operative in noun substitutions and verb substitutions. These results show that the disruption affects both nouns and verbs but in different ways. A lexical explanation of the noun/verb dissociation in aphasia could not account for these results.

The noun/verb dissociation found in aphasia could be accounted for given a semantic characterization of nominal and verbal notions. A cognitive semantic theory of semantic networks in which a word was conceived of as a symbolic unit with both a semantic pole and a phonological pole (cf. Langacker 1987a) would allow spreading activation to both semantically related and phonologically related associates. Disruption of noun and verb production could be attributed to a dysfunction in the processes involved in the conceptualization and access of nominal and verbal notions. The impairment may reflect a dissociation in the processes involved in conceiving of autonomous and dependent notions or in construing entities and processes.

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