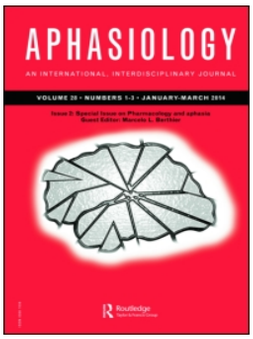

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Connecting lexical patterns of verb usage with discourse meanings in aphasia

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The paper describes the impact of lexical patterns found in the discourse of aphasic speakers on overall discourse meanings and ability to participate in everyday genres such as the recount. In particular, the usage of different types of verbs by four aphasic speakers and their functions in the discourse are examined and compared with that of normal control speakers. Results suggest that the semantic patterns of verbs used by aphasic speakers are different from those of normal speakers, leading to restricted variety of meanings conveyed in recounts and for some speakers, restricted communicative functions. Effects of word frequency and imageability are also discussed.

Functional and pragmatic approaches to language in speech pathology have provided us with much information regarding the aphasic speaker's global communication performance in everyday situations (Holland, 1982; Loams et al., 1989) as well as detail on specific discourse skills such as turn-taking, topic maintenance and conversational repair strategies (Ferguson 1994, 1998; Lindsay & Wilkinson, 1999; Ulatowska et al., 1992). However, while these approaches provide the aphasiologist with valuable information at both the social and discourse levels of language, they provide little information on the lexical and syntactic resources required for the speaker to achieve these levels.

On the other hand, research investigating lexical and grammatical abilities of aphasic speakers has rarely looked at the semantic implications of these abilities on the discourse or social levels of language use. Such analyses have been undertaken using samples of spontaneous speech or discourse (Bastiaanse, Edwards, & Kiss, 1996; Goodglass, Christiansen, & Gallagher, 1993; Saffran, Berndt, & Schwartz, 1989), but implications are usually restricted to clause level meaning and functioning in terms of postulating possible processes involved. Consequently a gap currently exists between viewing the ''end product'' (which is the discourse) and viewing its constituent parts, with the analyst and ultimately the clinician taking either a ''linguistic'' view of aphasic language or a ''functional'' view.

This paper presents data within a framework that attempts to incorporate both perspectives. It investigates an aspect of the grammar, verb usage, from a systemic-functional perspective (Halliday, 1985), examining the verb's role in the creation of discourse meanings at the level of genre. In the case of verbs, textlinguistic research suggests that different genres of text, such as recount, procedure, and exposition, may be

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characterised by different kinds of verbs or process types (Eggins & Martin, 1997; Halliday, 1985). It has been proposed that a recount, for example, is characterised predominantly by material verbs (material verbs being actions of some kind e.g., *run*, *make*), whereas expository discourse, involving primarily description of objects/conditions and/or events requires a predominance of relational types of processes such as the verbs *be* and *have*. A speaker's ability to participate in a variety of such genres is central to his/her functional communication.

VERB USAGE IN APHASIA

Verb usage in aphasia has received increasing attention of late. Initially, interest in aphasic speakers' use of verbs stemmed from the agrammatic aphasic speaker's difficulty in producing verbs. It was generally observed that agrammatic speakers had more difficulty producing verbs than nouns and that fluent aphasic speakers had more difficulty with nouns (Miceli, Silveri, Villa, & Caramazza, 1984; Zingeser & Berndt, 1990). Agrammatic speakers' morphological problems, omission and nominalisation were reported (Marin, Saffran, & Schwartz, 1976; Miceli et al., 1984; Myerson & Goodglass, 1972) as well as difficulty in the processing of verbs' thematic and mapping information (e.g., Byng, 1988; Jones, 1986; Nickels, Byng, & Black, 1991; Schwartz et al., 1994). More recently, Thompson et al. (1997) examined types of verbs used in the discourse of agrammatic speakers, according to complexity of argument structure, and reported that these speakers found increasing difficulty with retrieval with increase in complexity of argument structure involved.

Attention has more recently focussed on the grammar of fluent aphasic speakers. Although they mostly appear to have relatively intact syntactic sub-categorisation skills (i.e., the ability to specify the syntactic frames in which the verb may occur), specific impairments in verb mapping have been reported (Marshall, Chiat, & Pring, 1997), as well as limited lexical diversity (Bastiaanse & Jonkers, 1998; Edwards & Bastiaanse, 1998). However, verb argument structure, in terms of complexity, appears to be similar to normal controls (Bastiaanse et al., 1996; Bastiaanse & Jonkers, 1998; Edwards & Bastiaanse, 1998).

In efforts to explore the lexico-semantic nature of the deficits evident in both fluent and nonfluent speakers, a small number of studies have examined the effects of word frequency, imageability, and phonemic length on verb retrieval during discourse. Bird and Franklin (1996) and Berndt, Haendiges, Mitchum, & Sandson (1997) both reported aphasic subjects using predominantly high-frequency, ''light'' verbs (Jesperson, 1965) such as ''do'', ''go'', ''make'', and ''get'' in their narratives (both fluent and nonfluent speakers), although Bird and Franklin reported that one agrammatic speaker used verbs that were of lower frequency than those of the normal controls. The authors attributed this pattern of usage to an imageability effect, which, however, was not observed in any of the other speakers. Breedin, Saffran, and Schwartz (1998) reported on a group of eight nonfluent aphasic speakers of whom four predominantly used low-frequency, semantically complex verbs in their narratives, and suggested that such a pattern may have been due to the fact that additional semantic information attached to semantically complex words may in fact facilitate retrieval in some speakers.

VERBS AND THEIR SIGNIFICANCE IN DISCOURSE

Another perspective on verb usage comes from a functional grammatical perspective in which there is a dual focus on meaning and form, relating both to the level of genre or text type. In this framework, each aspect of the lexicogrammar can be analysed in terms

of its contribution to the discourse of which it is an integral part. For example, the verbs used on a specific occasion of talk relate very much to what social activity the speakers are engaged in, which is of course related to the generic identification of the discourse. Martin and Rothery (1986) and Eggins and Martin (1997) discuss the sorts of verbs, or in their terminology ''processes'', characterising different genres (in systemic-functional grammar, the process is said to be ''realised'' by the verb, with the process being intrinsically linked to the participants and circumstances associated with it).

In the recount genre (a reconstruction of a series of events from the speaker's own experience), they postulate that material processes predominate as the speaker reports what happened in material terms as well as reflects on these to some extent in the form of mental processes. Consider the following example (Daly 1977, p. 114) taken from an ''action-packed'' political autobiography (material processes in bold):

> Mullens **leapt** angrily from his seat several rows back and **tried** to **scramble** over the benches to the central table where Pollard was **standing**. Pat Galvin (Labor, S.A.) **jumped** from his seat and **grabbed** Mullens by the tie and coat lapels to **stop** him from **rushing** Pollard.

In the case of expository discourse in which there is a description of objects/conditions and/or events for the purpose of illustrating some interpretation of the speaker's world, relational processes are said to predominate, i.e., the verbs *be* and *have*. Consider the following text taken from a journal article (Lebrun, 1999, p. 5) discussing tactile aphasia (relational processes in italics):

> Tactile, optic, and auditory aphasias *are* modality-specific aphasias. According to Campbell and Manning (1996), ''the modality-specific aphasias *are* among the more inscrutable clinical aphasias.'' It may be wondered whether this *is* not so because they *are*, in fact, artificial nosographic entities.

Of course, genres are not always as ''pure'' as such characterisations might suggest. For example, a recount may also include an exposition at some point, or numerous other genres. Particularly in oral discourse speakers tend to become ''side-tracked'' or elaborative and often stray from what had been their original genre (Cloran, 1993). However, examination of patterns of process or verb usage illuminates the sorts of meanings being created by the speaker and assists in the identification of particular genres.

Just as the kinds of structural and lexical information in the aphasiology literature reported earlier is important in contributing to our understanding of the aphasic speaker's language system, so are the effects of the processes involved on the aphasic speaker's ability to participate in different genres of discourse. In fact, systematic functional grammar (Halliday, 1985) suggests that the language system is indeed functionally organised, i.e., that the use to which the language is put is not separate from the organisation of the language system itself; the functions the language serves are just as important in the internal organisation of that language as are the syntactic and lexical-semantic rules, and that each of these aspects is interrelated with the others.

For this reason, investigation of the aphasic speaker's use of verbs from a functional perspective may not only add to the aphasiologist's knowledge of how aphasic speakers might perform in everyday discourse, but may eventually provide a further categorisation system which will shed more light onto the differential usage of verbs in aphasia by incorporating both structural and discourse features into the one analysis.

The questions being explored in the current paper are the following:

1. How are verbs used to contribute to the discourse meanings produced by aphasic speakers?
2. How, if at all, does this usage differ from that observed in normal speakers' discourse?

METHOD

Subjects

The discourse analysed for the study was obtained from four aphasic speakers and four matched controls. (Subject characteristics are given in Table 1.) They were matched as closely as possible in terms of sex, age, and level of education. Ages of subjects ranged from 57 to 80 years old. Education levels varied. All subjects were native speakers of English and none had suffered any neurological events prior to the stroke documented in this study. The four aphasic subjects were classified as fluent aphasic speakers all following left-sided CVA one month prior to the recordings for the study, although lesions varied in location. The category of ''fluent'' was based on each speaker's phrase length ratio (proposed by Goodglass, Quadfasel, & Timberlake, 1964), number of words spoken per minute (proposed by Kerschensteiner, Poeck, & Bruner, 1972) and rating scales from the BDAE for Melodic Line, Phrase Length and Articulatory Agility (Goodglass & Kaplan, 1983). Two clinicians also rated each subject in terms of their performance on the section of the BDAE entitled ''Conversational and Expository Speech'' as well as assigned a severity rating using the BDAE Aphasia Severity Rating Scale. Each subject's profile on the Boston Diagnostic Aphasia Examination at 1MPO is given in Appendices A–D.

Data

The aphasic speakers' discourse samples consisted of four texts elicited at 1 month post-onset of CVA, discussing the stroke, wartime experiences, job history, and a happy event. The normal speakers' samples were elicited using the same questions except that they were asked to tell about any illness experience they had had. The texts were largely monologues, with the researcher not entering into the conversation a great deal after the initial eliciting question. However, in order to make the situation as natural as possible, the researcher made conversational responses where appropriate.

TABLE 1
Subject characteristics

Subject	*Sex*	*Age*	*Years education*	*BDAE Severity rating*	*Lesion*	*MPO*
A1	F	80	9	2	Left infarct P, IC	1
A2	F	65	12	3	NA	1
A3	M	57	9	2	Left infarct MCA	1
A4	M	70	25	3	Left infarct P, EC, B, G	1
N1	F	79	10	N/A	N/A	N/A
N2	F	63	9	N/A	N/A	N/A
N3	M	56	10	N/A	N/A	N/A
N4	M	70	14	N/A	N/A	N/A

P = parietal lobe, EC = external capsule, IC = internal capsule, BG = basal ganglia, MCA = middle cerebral artery, NA = no abnormality shown on CT, MPO = months post onset of CVA.

She answered questions, asked for clarification where necessary, supplied words if the subject was demonstrating undue frustration and provided encouragement with responses such as ''mmm''. The frequency of such responses varied for each subject, but was minimal overall. The length of these texts was not controlled and is referred to in Table 2. Each sample consisted of over 90 clauses—often over 1000 words, which is well over the 300–400 words recommended by Brookshire and Nicholas (1994) for test–retest reliability. All texts were audiotaped and orthographically transcribed for analysis purposes.

Analysis

Each verb was categorised as belonging to one of Halliday's (1985) five primary categories of process types: material, relational, mental, verbal, and behavioural. Definitions and examples of these categories are given in Table 3.

TABLE 2
Number of clauses produced by each speaker across the four texts

Speaker	*No. clauses*	*Speaker*	*No. clauses*
N1	151	A1	125
N2	235	A2	234
N3	253	A3	173
N4	190	A4	94

TABLE 3
Verb categories (Halliday, 1985)

Verb type	*Definition*	*Discourse function*	*Example*
Material (MAT)	Process of ''doing''	Recounting actions, events, happenings	The boy was *walking* The storm *wrecked* the town
Relational (REL)	Processes of ''being'', ''having'', and ''being all'' i.e., intensive, possessive, and circumstantial	Description Evaluation/opinion Categorisation Connections of discourse participants	The car *was* white The play *was* great He *was* an artist He *had* a new dog
Mental (MENT)	Processes of sensing—feeling, thinking, and perceiving	Evaluation/opinion Reflection Conveying feelings Reporting experiences	I *believed* it was true I *decided* to go I *felt* tired I *heard* the noise
Verbal (VERB)	Processes of saying	Reporting conversation Metaphorical usage	He *said* he would come This book *tells* you a lot about the world
Behavioural (BEH)	Physiological/ psychological processes	Reporting of physiological and psychological ''actions''	She *dreams* a lot He *coughed* badly They *smiled* at the newcomer

Each verb category has a particular discourse function—material verbs are processes of ''doing'', enabling the speaker to provide the facts related to events of ''what happened''; relational verbs are processes of ''being'', ''having'', and ''being at'', relating one element in the clause to another, e.g., something and its attribute, an Actor and a circumstance, and these enable the speaker to describe or evaluate someone or something; mental verbs are processes of sensing: ''feeling'', ''thinking'', and ''perceiving'', and allow the speaker to convey personal opinions; verbal processes allow the speaker to report conversations, e.g., *say*, *talk*, *speak*. Behavioural verbs are what Halliday terms ''physiological'' and ''psychological'' in nature and include such processes as: *sleep*, *sneeze*, *cough*.

Only main verbs were counted, e.g., the verbs *be* and *have* functioning as auxiliaries were not counted. When it was impossible to ascertain whether these words were functioning as main verbs or auxiliaries due to clausal incompleteness, they were excluded from the analysis, e.g., *she is*...

Although it was not the purpose of this study to propose explanatory models for patterns found, rather to look at the semantic impact of the patterns on discourse meanings, the following measures were taken in order to relate the data to potential word access effects previously reported in the literature—type–token ratios, word frequency, and imageability of verbs. The latter two factors were analysed using values from the MRC Psycholinguistic Database (Coltheart, 1981).

Twenty five percent of the data was analysed for categorisation of verbs by a second analyst for reliability purposes and intra-rater reliability was also examined.

RESULTS

The normal speakers used either predominantly material verbs, or they used material and relational verbs about equally and demonstrated some usage of all verb types (see Table 4). Their texts consisted of recounts of events, with reflection on these events in terms of opinions and evaluations primarily through the use of relational verbs, with mental verbs used to a lesser extent for this purpose. Two of the aphasic speakers, A1 and A2 (the two females) used similar proportions of each verb type to their controls. However, A3 and A4 had different patterns from their normal controls, with both using more material verbs, with fewer relational and mental verbs in particular. The effect of the higher usage of material verbs was that although A3 and A4 were able to convey some idea of material events and happenings, there was often little or no personal evaluation, opinion, or perspective conveyed compared to their normal controls, as demonstrated in the following extract from A4's wedding recount (material verbs in bold, relational verbs in italics):

TABLE 4
Percentage process usage by the aphasic speakers (A1–4) and their normal controls (N1–4)

	A1	*N1*	*A2*	*N2*	*A3*	*N3*	*A4*	*N4*
MAT	46%	42%	37%	37%	72%	40%	81%	49%
REL	33%	35%	38%	41%	17%	42%	16%	36%
MENT	16%	15%	20%	13%	4%	13%	0%	10%
VERB	3%	4%	4%	6%	3%	3%	3%	4%
BEH	2%	4%	0%	3%	4%	2%	0%	1%

Yeah we just got **came** down in nineteen forty three
And got **married** at uh Artarmon
Wherewith mother and her ... Dawn'*s* the wife
Cos she got married too
And the mother the two mothers together and **got** everything together in the way of eating
And just *had* a good time
We **left** on the Saturday
Saturday night we **stayed** the night at a youth uh uh air ... on a ... anyway
You would ... **stay** ... stay overnight
And then on the Sundey afternoon we had to **catch** the train on to
Car ... Cootamundra to Cootamundra

This text contrasts with N4's version of his wedding:

Uh it'll *be* forty years in June
Since we since it **occurred** on the seventh of June nineteen fifty two
And uh well it *was* back in the days
When weddings Catholic weddings had to **take place** in the morning
So it *was* nine o'clock on a Saturday
That *was* the stupidest time
Anybody could possibly get **married**
Because the guests were **put** to a maximum amount of inconvenience
Since they had to **travel** great distances to **get** there at some ungodly hour
But anyway they **did**
All our friends **turned up**
And uh it *was* a very nice morning and uh in June in Adelaide
And uh the first problem *I had was* **getting** to the church on time
Because the taxi that was **calling** to **pick up** the best man and I who were **waiting** for it didn't **arrive**
So **I despatched** my best man around to the nearby Anzac Highway...

One can see that the normal speaker made more use of relational processes to set the scene initially, and then to make evaluations throughout, whereas the aphasic speaker's text was mainly focused on events.

Initial word frequency measures revealed that A1 and A2 used words of significantly higher mean frequency than their normal counterparts, while A3 and A4 used words of lower mean frequency (see Table 5). However, this result was only true when the verbs

TABLE 5
Word measures[1] for pair N1 and A1

	N1 mean	*A1 mean*	*t value*	*df*	p *value*
Wd Freq (be & have included)	2972.239	6070.02	−1.71	245	.009*
Wd Freq (be & have excluded)	349.46	435.92	−1.62	165	.11
Imag. (be & have included)	323.21	541.84	−1.34	197	.18
Imag. (be & have excluded)	367	374.74	−0.44	117	.66

Frequency (Kucera & Francis, 1967, including and excluding ''be'' and ''have''), imageability (with and without ''be'' and ''have'' included).

* = significance at $p < .05$.

[1] Scores calculated from MRC Psycholinguistic Database (Coltheart, 1981).

be and *have* were included in the analysis. As *be* and *have* are both high-frequency words and also words that can be used as auxiliaries (not differentiated in the MRC database), the results could be explained by the fact that the two male speakers used fewer relational verbs and hence received lower frequency values. When frequency measures were taken excluding the verbs *be* and *have*, A3 and A4 were found to use more higher-frequency words than their normal controls, but there was no difference between A1 and A2 and their normal counterparts. Significant differences were noted in three of the four speaker pairs in terms of imageability (see Tables 6–7), however these were mixed with some aphasic speakers demonstrating higher imageability and some lower imageability verbs than their normal controls.

It was observed that some of the normal speakers were able to use more topic-specific words such as *detonate* and *infiltrate* for the war topic and *diagnose, eliminate possibilities*, *blood pumping*, and *shiver* for the illness recount, where the aphasic speakers did not use these to a large extent at all.

Although a greater number of different verbs were used by the normal speakers, given the actual greater quantity of language produced, type–token ratios did not greatly differentiate the normal from the aphasic speakers (see Table 9). In order to see if different text lengths may have influenced the TTR, ratios were also calculated for the first 200 words in each sample, as well as for the total discourse data set for each speaker. Although the type–token ratios were generally lower when only 200 words were used, there was still no difference between the aphasic speakers and their normal controls. Similarly, when copulas were excluded from the analysis (as proposed by Bastiaanse &

TABLE 6
Word measures[1] for pair N2 and A2

	N2 mean	*A2 mean*	*t value*	*df*	p *value*
Wd Freq (be & have included)	2966.62	4101.19	−2.07	412	.04*
Wd Freq (be & have excluded)	598.31	442.65	1.84	265	0.67
Imag. (be & have included)	335.18	304.48	1.16	352	.002*
Imag. (be & have excluded)	378.25	344.70	2.48	204	0.01*

Frequency (Kucera & Francis, 1967, including and excluding ''be'' and ''have''), imageability (including and excluding ''be'' and ''have'').

* = significance at $p < .05$.

[1] Scores calculated from MRC Psycholinguistic Database (Coltheart, 1981).

TABLE 7
Word measures[1] for pair N3 and A3

	N3 mean	*A3 mean*	*t value*	*df*	p *value*
Wd Freq (be & have included)	3368.66	2318.99	2.41	423	.02*
Wd Freq (be & have excluded)	388.28	744.11	−3.38	283	.0008*
Imag. (be & have included)	310.93	332.18	−2.28	376	.02*
Imag. (be & have excluded)	351.37	352.09	−.06	234	.95

Frequency (Kucera & Francis, 1967, including and excluding ''be'' and ''have''), imageability (including and excluding ''be'' and ''have'').

* = significance at $p < .05$.

[1] Scores calculated from MRC Psycholinguistic Database (Coltheart, 1981).

TABLE 8
Word measures[1] for pair N4 and A4

	N4 mean	*A4 mean*	*t value*	*df*	p *value*
Wd Freq (be & have included)	2773.54	1576.33	2.53	306	.02*
Wd Freq (be & have excluded)	289.11	432.4	−2.08	221	.04*
Imag. (be & have included)	317.30	351.11	−2.85	222	.0005*
Imag. (be & have excluded)	364.38	372.85	−.58	137	.56

Frequency (Kucera & Francis, including and excluding ''be'' and ''have''), imageability (including and excluding ''be'' and ''have'').

* = significance at $p < .05$.

[1] Scores calculated from MRC Psycholinguistic Database (Coltheart, 1981).

TABLE 9
Type–token ratios (TTR) for verbs for the normal and aphasic subjects (including and excluding ''be'' and ''have'').

Normal speakers	*TTR (be & have included)*	*TTR (be & have excluded)*	*Aphasic speakers*	*TTR (be & have included)*	*TTR (be & have excluded)*
N1	0.26	0.34	A1	0.30	0.33
N2	0.26	0.34	A2	0.21	0.40
N3	0.27	0.23	A3	0.23	0.55
N4	0.41	0.23	A4	0.47	0.27

Jonkers, 1998, and Edwards & Bastiaanse, 1996), similar results were found, except for one of the aphasic speakers, A3, who actually had a much higher type–token ratio than his normal counterpart.

In terms of reliability, percentage inter-rater agreement for the verb categorisation procedure was 95% and intra-rater reliability was 98%.

DISCUSSION

Examination of the lexical and grammatical abilities of aphasic speakers in relation to overall discourse meaning and attempts at producing particular genres promises to clarify the impact that their well-documented lexical and grammatical problems have on their abilities to participate in social discourse. The data presented in this paper, while mixed and obviously requiring further investigation, suggest that the semantic pattern of verbs used by some aphasic speakers is different from that of normal speakers, and can lead to restricted variety of meanings conveyed in recounts and for some, restricted communicative functions.

The different patterns of verb usage in terms of verb type demonstrated by the two male aphasic speakers in this study particularly highlight the way in which a lack of relational and mental verbs can lead to the absence or at least restricted incidence of certain types of discourse functions, e.g., opinions, evaluations, descriptions, or even limited text structure in the form of an impoverished introduction in which the setting and the participants are described only minimally. A materially based text largely restricts the speaker's meanings to the actual occurrence of events, with little room for reflection on the speaker's own perspective of those events. This in turn restricts the speaker in

asserting his/her own particular view of the world and hence asserting his/her own individuality and life experience.

Reliance on material verbs could reflect lexical access problems, difficulty with argument structure associated with other verb types, broader cognitive problems involving reflection on events, or difficulty with more abstract relational processes. Although it has not been the purpose of this paper to postulate the specific processes responsible for the patterns observed, it is of interest to speculate on the potential effects of specific process impairment. If one was to discover that the reliance on material verbs was, say, a lexical access problem affecting relational and mental verbs specifically, then in terms of the speaker's access to other genres, one could expect a similar pattern of verb usage across genres. This may possibly impair the speaker's ability to produce certain genres at all. For example, if the speaker has specific difficulty with relational words, expository discourse or the discourse of argument will be extremely problematic for him/her. Hence, the effects of particular category deficits may be far-reaching in functional terms and restrict certain types of social interaction.

Of course, this discussion views the discourse from a deficit perspective only. The patterns observed might also be viewed from a ''strength'' perspective, i.e., by examining the linguistic resources the aphasic speaker still has and the way(s) in which the speaker utilises these resources and even (consciously or unconsciously) compensates for deficits with those remaining resources. It may be that relational verbs are more difficult for the aphasic speaker, either due to the nature of the verb itself, or to restricted access to other key elements necessary to complete a relational process. For example, the speaker may have difficulty accessing names functioning as circumstances (e.g., the car was in the ... [garage]) or adjectives functioning as attributes (e.g., the man was very ... [angry]) and as a result, may avoid these kinds of constructions. The fact that material verbs are easier for a particular speaker may direct him/her into a more material recount from the beginning, rather than directing him/her towards descriptions requiring these kinds of clause elements which they find problematic.

The mixed effects of word frequency and imageability across speakers are consistent with previous findings, e.g., Berndt et al., 1997; Bird and Franklin, 1996; Breedin et al., 1998. Certainly, the two male speakers' discourse contained many general and high-frequency words such as *go*, *do* etc. However the two female speakers were not differentiated from normal (once the verbs *be* and *have* were removed from the analysis). As mentioned earlier, researchers are now suggesting that there may be differential effects of word frequency, although it is not apparent why they arose in this particular study. Breedin et al. (1998), for example, suggest that some aphasic speakers—particularly nonfluent speakers—might find lower-frequency, more semantically complex, and specific words easier in that they contain more marked semantic information which cues retrieval. To date, studies in this area have had small sample sizes only, and involved subjects with various types of aphasia. As more research is done using larger sample sizes, we may learn more about the possible lexical effects of these variables among aphasia types.

The lack of difference in diversity of verbs between the aphasic and normal speakers as reflected in the type–token ratios differed from the results of studies by Edwards and Bastiaanse (1996) and Bastiaanse and Jonkers (1998), who found that their aphasic speakers, in terms of group measures, used less diversity of lexical verbs than their normal controls. However, both these studies reported individual patterns that varied from this general pattern, where certain individuals performed similarly to the normal controls. Hence, there may indeed be individual differences and the small numbers

involved in the present study may well reflect just one particular pattern. The fact that one aphasic speaker, A3, actually had a much higher type–token ratio than his normal control (when copulas were removed from the analysis), was of interest, in that this may in some way reflect this speaker's post-CVA reliance on material verbs. His normal control, N3, had a much higher use of relational processes, used when describing his feelings, opinions, and also the participants and places in the recounts. In the latter case, it was more these relational verbs and processes that provided N3's text with its diversity in meaning, the material verbs playing a lesser role, whereas A3 depended on his material verbs for diversity of meaning. Hence, when the copulas or relational verbs were removed from the analysis, A3's use of material verbs reflected a wider diversity in this particular category as opposed to N3 who depended less on material verbs and who used them with apparently less diversity. However, as this was not the case with A4, who also used predominantly material processes, this explanation can be a preliminary suggestion only.

Although there are insufficient data in this study to make any definite statements about the usefulness or otherwise of the type–token ratio as a measure of discourse skills, it could be possible that it is a useful way of differentiating diversity of usage of categories of words—certainly its claimed purpose—but may not be of great value when attempting to examine how such categories affect meaning at the discourse level. It may not simply be the number of different types of words used within one category or across categories that reflects richness of meaning or diversity of meaning in a text; rather, it may be the actual types of words used which achieve certain functions in the discourse and which give a text its semantic ''richness''—properties of the text that may be captured by the verb types or process types utilised for analysis in this study.

Following on from this notion that quantitative values may not always reflect what it is that we are trying to capture in analysing aphasic discourse, the use of more topic-specific words by the normal speakers raises topic as another potential variable in lexical usage. Although this may be considered as just another type of semantic specificity, it may well be that familiarity of topic, and/or frequency of use of the topic may affect a speaker's access to particular words related to that topic. While there may not have been a significant quantitative difference in the usage of such words between the normal and the aphasic speakers, often given only two or three occurrences of them within a text, it appears that they may contribute to easier identification of topic and the conveying of richer, more specific meanings. Further research into the effects of topic on lexical access may be another avenue for investigating possible verb category specific deficits.

In future research, the need to explain the ease or difficulty with which the types of verbs examined in this study are used may well incorporate investigation of argument structures involved or in terms of systemic-functional grammar (Halliday, 1985)—transitivity patterns. The isolating of verbs in this study was purely an attempt to highlight the meanings conveyed in the discourse, using the verb as reflecting the central clausal meanings. In order to obtain a richer understanding of the meanings involved, complementary description of the full realisation of the ''process'' involved in each clause, in the form of an analysis of argument structure or transitivity, is certainly required.

The notion of connecting lexical-syntactic patterns with discourse functions (functional communication) has important implications for both assessment and treatment. Rather than analysing each separately, or focusing on one aspect only, which are both current clinical options, the approach used here encourages the clinician to examine the kinds of discourse the speaker can produce (i.e., in terms of genres) and to

examine how s/he achieves or does not achieve this using the lexical-syntactic resources at his/her disposal. As a result, rather than having a functional goal such as ''can produce a recount'', with sub-goals such as achieving an introduction, complicating action, and resolution, the sub-goals might be to create specific meanings relevant to recounts through certain word types. Although the data presented in this paper are preliminary only, with respect to patterns of semantic impairments related to verbs, they raise potential sociolinguistic variables to be further investigated which may affect lexical access as much as word imageability and frequency, i.e., topic, genre, gender. Knowledge about these factors as well as genre requirements may well complement the lexical access work that is often central to aphasia therapy, while addressing how language is used for everyday purposes.

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APPENDIX A

Speaker A1's Boston Diagnostic Examination Subtest Summary profile

Percentiles:	0	10	20	30	40	50	60	70	80	90	100
Severity Rating		0	1				2		3	4	5
Fluency											
Articulation Rating		1	2	4	5	6		7			
Phrase Length			1	3	4	5	6	7			
Melodic Line		1	2	4		6	7				
Verbal Agility		0	2	5	6	8	9	11	13	14	
Auditory Comprehension											
Word Discrimination	0	15	25	36	37	46	53	60	64	67	70	72
Body-part Identification	0	1	5	10	12	13	15	16	17	18		20
Commands	0	3	4	6		8	10	11	13	14	15	
Complex Ideational Material		0	2	3		4	5	6	8	9	11	12
Naming											
Responsive Naming			0	1		5	10	11	15	20	24	27	30
Confrontation Naming		0	9	28		43	47	60	72	84	94	105	114
Animal Naming				0		1	2	3	4	6	9	23
Oral Reading											
Word Reading			0	1		3	7	15	17	21	26	30	
Oral Sentence Reading						0	1	2	4	7	9	10
Repetition											
Repetition of Words		0	2	5		7	8		9		10	
High-probability			0	1			2	3	4	5	7	8	
Low-probability						0	1			2	4	6	8
Paraphasia											
Neologistic	40	16	9	4	2	1			0			
Literal	47	17	12	9	6	5		3	2	1	0	
Verbal	40	23	18	15	12	9	8	7	4	3	1	0
Other	75	12	5	3	1	0						
Automatic Speech											
Automatized Sequences		0	1	2	3	4	6	7		8	
Reciting				0	1				2		
Reading Comprehension											
Symbol Discrimination	0	2	5	7	8	9			10		
Word Recognition	0	1	3	4	5	6		7		8	
Comprehension of Oral Spelling				0	1			3	4	6	7	8
Word-picture Matching		0	1	4	6	8		9		10	
Reading Sentences and Paragraphs		0	1	2	3	4	5	6	7	8	0
Writing											
Mechanics	1		2		3		4			5	
Serial Writing		0	7	18	25	30	33	40	43	46	47
Primer-level Dictation		0	1	4	6	9	11	13	14	15	
Spelling to Dictation					0	1	2	3	5	7	10
Written Confrontation Naming				0	1	2	3	6	7	9	10
Sentences to Dictation						0	1	3	6	8	12
Narrative Writing		0	1			2			3	4	5
Music											
Singing		0	1		2						
Rhythm		0	1				2				
Spatial and Computational											
Drawing to Command	0	6	7	8	9	10	11	12		13	
Stick Memory	0	3	4	6	7	8	9	10	11	13	14
3-D Blocks		0	2	4	5	6	7	8	9	10	
Total Fingers	0	54	70	81	93	100	108	120	130	141	152
Right-Left	0	1	3	4	6	8	9	11	14	16	
Map Orientation	0	2	5	6	9	11	13		14		
Arithmetic		0	2	4	8	11	14	17	21	27	32
Clock Setting	0	3	4	6		8	9	10	12		
	0	10	20	30	40	50	60	70	80	90	100

APPENDIX B

Speaker A2's Boston Diagnostic Examination Subtest Summary profile

Percentiles:	0	10	20	30	40	50	60	70	80	90	100
Severity Rating		0	1				2		3	4	5
Fluency											
Articulation Rating		1	2	4	5	6		7			
Phrase Length			1	3	4	5	6	7			
Melodic Line		1	2	4		6	7				
Verbal Agility		0	2	5	6	8	9	10	11	13	14
Auditory Comprehension											
Word Discrimination	0	15	25	37	46	53	60	64	67	70	71 72
Body-part Identification	0	1	5	10	13	15	16	17	18		20
Commands	0	3	4	6	8	9 10	11	13	14	15	
Complex Ideational Material		0	2	3	4	5	6	8	9	11	12
Naming											
Responsive Naming			0	1	5	8 10	15	20	24	27	30
Confrontation Naming		0	9	28	43	60 70	72	84	94	105	114
Animal Naming				0	1	2	3	4	6	9	23
Oral Reading											
Word Reading			0	1	3	7	15	20 21	26	30	
Oral Sentence Reading					0	1	2	4 5	7	9	10
Repetition											
Repetition of Words		0	2	5	7	8		9		10	
High-probability			0	1		2	4	5	7	8	
Low-probability					0	1		2	4	6	8
Paraphasia											
Neologistic	40	16	9	4	2	1		0			
Literal	47	17	12	9	6	5	3	2	1	0	
Verbal	40	23	18	15	12	9	7	4	3	1	0
Other	75	12	5	3	1	0					
Automatic Speech											
Automatized Sequences		0	1	2	3	4	6	7		8	
Reciting				0	1				2		
Reading Comprehension											
Symbol Discrimination	0	2	5	7	8	9		10			
Word Recognition	0	1	3	4	5	6	7		8		
Comprehension of Oral Spelling				0	1		3	4	6	7	8
Word-picture Matching		0	1	4	6	8	9		10		
Reading Sentences and Paragraphs		0	1	2	3	4	5	6	7	8	0
Writing											
Mechanics	1		2		3		4			5	
Serial Writing		0		18	25	30	33	40	43 45	46	47
Primer-level Dictation		0	1	4	6	9	11	13	14	15	
Spelling to Dictation					0	1	2	3	5	7	10
Written Confrontation Naming				0	1	2	3	6	7	9	10
Sentences to Dictation						0	1	3	6	8	12
Narrative Writing		0	1			2			3	4	5
Music											
Singing		0	1		2						
Rhythm		0	1				2				
Spatial and Computational											
Drawing to Command	0	6	7	8	9	10	11	12		13	
Stick Memory	0	3	4	6	7	8	9	10	11	13	14
3-D Blocks		0	2	4	5	6	7	8	9	10	
Total Fingers	0	54	70	81	93	100	108	120	130	141	152
Right-Left	0	1	3	4	6	8	9	11	14	16	
Map Orientation	0	2	5	6	9	11	13		14		
Arithmetic		0	2	4	8	11	14	17	21	27	32
Clock Setting	0	3	4	6		8	9	10	12		
	0	10	20	30	40	50	60	70	80	90	100

APPENDIX C

Speaker A3's Boston Diagnostic Examination Subtest Summary profile

Percentiles:	0	10	20	30	40	50	60	70	80	90	100
Severity Rating		0	1				2		3	4	5
Fluency											
Articulation Rating		1	2	4	5	6		7			
Phrase Length			1	3	4	5	6	7			
Melodic Line		1	2	4		6	7				
Verbal Agility		0	2	5	6	8	9	11	13	14	
Auditory Comprehension											
Word Discrimination	0	15	25	37.5	46	53	60	64	67	70	72
Body-part Identification	0	1	4	5	10	13	15	16	17	18	20
Commands	0	1	3	4	6	8	10	11	13	14	15
Complex Ideational Material		0	2	3	4	5	6	8	9	11	12
Naming											
Responsive Naming			0	1	5	10	15	20	24	27	30
Confrontation Naming		0	9	28	43	60	72	73	84	94	105	114
Animal Naming				0	1	2	3	4	6	8	9	23
Oral Reading											
Word Reading			0	1	3	7	15	21	26	28	30	
Oral Sentence Reading					0	1	2	4	7	8	9	10
Repetition											
Repetition of Words		0	1	2	5	7	8		9		10	
High-probability			0	1			2	4	5	7	8	
Low-probability					0		1		2	4	6	8
Paraphasia											
Neologistic	40	16	9	4	2	1		0				
Literal	47	17	12	9	7	6	5	3	2	1	0	
Verbal	40	23	18	15	12	9	7		4	3	1	0
Other	75	12	5	3	1	0						
Automatic Speech											
Automatized Sequences		0	1	2	3	4	6	7		8		
Reciting				0	1				2			
Reading Comprehension											
Symbol Discrimination	0	2	5	7	8	9		10				
Word Recognition	0	1	3	4	5	6	7		8			
Comprehension of Oral Spelling				0	1		3	4	6	7	8	
Word-picture Matching		0	1	4	6	8	9		10			
Reading Sentences and Paragraphs		0	1	2	3	4	5	6	7	8	0	
Writing												
Mechanics	1		2		4		4			5		
Serial Writing		0	7	18	25	30	33	40	43	46	47	
Primer-level Dictation		0	1	4	6	9	11	13	14	15		
Spelling to Dictation					0	1	2	3	5	7	10	
Written Confrontation Naming				0	1	2	3	4	6	7	9	10
Sentences to Dictation						0	1	3	6	8	12	
Narrative Writing		0	1			2			3	4	5	
Music												
Singing		0	1		2							
Rhythm		0	1				2					
Spatial and Computational												
Drawing to Command	0	6	7	8	9	10	11	12		13		
Stick Memory	0	3	4	6	7	8	9	10	11	13	14	
3-D Blocks		0	2	4	5	6	7	8	9	10		
Total Fingers	0	54	70	81	93	100	108	120	130	141	152	
Right-Left	0	1	3	4	6	8	9	11	14	16		
Map Orientation	0	2	5	6	9	11	13		14			
Arithmetic		0	2	4	8	11	14	17	21	27	32	
Clock Setting	0	3	4	6		8	9	10	12			
	0	10	20	30	40	50	60	70	80	90	100	

APPENDIX D

Speaker A4's Boston Diagnostic Examination Subtest Summary profile

Percentiles:	0	10	20	30	40	50	60	70	80	90	100
Severity Rating		0	1				2		3	4	5
Fluency											
Articulation Rating		1	2	4	5	6		7			
Phrase Length			1	3	4	5	6	7			
Melodic Line		1	2	4		6	7				
Verbal Agility		0	2	5	6	8	9	11	13	14	
Auditory Comprehension											
Word Discrimination	0	15	25	37	46	53	60	64	67	68 70	72
Body-part Identification	0	1	5	10	13	15	16	17	18	19	20
Commands	0	3	4	6	8	10	11	13	14	15	
Complex Ideational Material		0	2	3	4	5	6	8	9	11	12
Naming											
Responsive Naming			0	1	5	10	11 15	20	24	27	30
Confrontation Naming		0	9	28	43	60	72	84	94	105	114
Animal Naming				0	1	2	3	4	6	9	23
Oral Reading											
Word Reading			0	1	3	7	15	21	26	30	
Oral Sentence Reading					0	1	2	4	7	8 9	10
Repetition											
Repetition of Words		0	2	5	7	8		9		10	
High-probability			0	1		2	4	5	7	8	
Low-probability					0	1		2	4	6	8
Paraphasia											
Neologistic	40	16	9	4	2	1		0			
Literal	47	17	12	9	6	5	3	2	1	0	
Verbal	40	23	18	15	14 12	9	7	4	3	1	0
Other	75	12	5	4	3	1	0				
Automatic Speech											
Automatized Sequences		0	1	2	3	4	6	7		8	
Reciting				0	1				2		
Reading Comprehension											
Symbol Discrimination	0	2	5	7	8	9		10			
Word Recognition	0	1	3	4	5	6	7		8		
Comprehension of Oral Spelling				0	1		3	4	6	7	8
Word-picture Matching		0	1	4	6	8	9		10		
Reading Sentences and Paragraphs		0	1	2	3	4	5	6	7	8	0
Writing											
Mechanics	1		2		3		4			5	
Serial Writing		0	7	18	25	30	33	40	43	46	47
Primer-level Dictation		0	1	4	6	9	11	13	14	15	
Spelling to Dictation					0	1	2	3	5	7 8	10
Written Confrontation Naming				0	1	2	3	6	7	9	10
Sentences to Dictation						0	1	3	6	7 8	12
Narrative Writing		0	1			2			3	4	5
Music											
Singing		0	1		2						
Rhythm		0	0				2				
Spatial and Computational											
Drawing to Command	0	6	7	8	9	10	11	12		13	
Stick Memory	0	3	4	6	7	8	9	10	11	13	14
3-D Blocks		0	2	4	5	6	7	8	9	10	
Total Fingers	0	54	70	81	93	100	108	120	130	141	152
Right-Left	0	1	3	4	6	8	9	11	14	16	
Map Orientation	0	2	5	6	9	11	13		14		
Arithmetic		0	2	4	8	11	14	17	21	27	32
Clock Setting	0	3	4	6		8	9	10	12		
	0	10	20	30	40	50	60	70	80	90	100