

## Background

Semantic Feature Analysis (SFA), which trains individuals to access semantic knowledge to facilitate access to specific labels, takes advantage of the fact that lexical retrieval is predicated upon intact access to accurate semantic information (Boyle, 2004; Boyle & Coelho, 1995; Coelho, McHugh, & Boyle, 2000; Conley & Coelho, 2003; Lowell, Beeson, & Holland, 1995). The ultimate goal of lexical retrieval treatment is functional use in communicative discourse (Thompson, 1989). SFA seems well-suited for training within discourse because it promotes habituation of semantic-self cueing and semantically appropriate circumlocution, thereby facilitating meaningful communication even when retrieval of the intended target fails. Studies of SFA trained using single words have inconsistently reported improved lexical retrieval during discourse (Boyle, 2004; Coelho et al., 2000). Improvements have more consistently been reported for use of trained items in the context of “training-specific” discourse tasks (e.g., story retell), while generalization to untreated discourse contexts has been less frequently demonstrated (Cameron, Wambaugh, Wright, & Nessler, 2006; J. E. Davis, Harris Wright, & Page, 2005; Insalaco, Gugino, & Ulicki, 2007, Peach & Reuter, 2010).

Antonucci (2009) trained SFA on increasingly complex discourse tasks during group aphasia therapy. Participants engaged in discourse tasks and were guided through SFA in instances of lexical retrieval difficulty as it occurred naturally during connected speech. Results showed increased communicative efficiency and/or increased informativeness of discourse. These data provided preliminary evidence that SFA treatment can result in improved lexical retrieval when trained as a strategy during group aphasia therapy. The present study extends the work of Antonucci (2009) to a larger group of participants with varied etiologies of aphasia. Daily home practice was also introduced. Daily homework has been shown to increase language improvement when added to skilled language intervention (Meinzer et al, 2005). As in Antonucci (2009) it was hypothesized that participants’ lexical retrieval will improve along with overall communication effectiveness (e.g., increase in semantic self-cueing or semantic circumlocution; decrease in empty circumlocutions, pauses, fillers).

## Method

Four individuals with aphasia resulting from left hemisphere infarct or injury participated in group aphasia therapy. Three were right-handed, one ambidextrous, and all were native English speakers. Participants varied greatly in etiology of aphasia, aphasia type and severity and time post onset (Table 1). In addition, P2 participated in an earlier study of SFA trained in discourse during group therapy providing an opportunity for comparison between homework and no homework conditions.

The present study employed methodology from Antonucci (2009). One-and-a-half to two hour group treatment sessions were provided twice weekly for seven weeks. Initial sessions focused on naming of pictured objects to facilitate learning of the SFA strategy. When participants had difficulty naming an object, the clinician guided them through a SFA chart posted for all to see (Figure 1). During initial sessions, participants were prompted to provide all appropriate features, even once the name had been retrieved, in order to provide additional practice with the strategy. Subsequent sessions were dedicated to practice of SFA in connected speech, with elicitation procedures and task progression similar to that described in Antonucci (2009). At that point, participants proceeded with their narrative as soon as the target word was communicated to keep discourse as natural as possible. As treatment progressed, participants proceeded through increasingly more challenging discourse tasks (Table 3). Individualized homework was assigned daily (Figure 2) to increase practice intensity and promote carryover to other environments.

Samples of connected speech were obtained and evaluated for measures of discourse and lexical retrieval in discourse according to the following schedule. During the pre-treatment phase, discourse was assessed once weekly for three weeks, biweekly during treatment, twice immediately following the conclusion of treatment, and twice after a 6-week follow-up period. Stimuli for language probes were selected from those developed by Nicholas and Brookshire (1993), consisting of complex picture description and extemporaneous discourse tasks. Performance at each time point was averaged across five stimuli to obtain a stable sample size (Brookshire & Nicholas, 1994). Stimuli items used as language probes were not utilized during treatment.

Analyses include the calculation of Correct Information Units (CIUs), % CIUs, and CIUs/minute (Nicholas & Brookshire, 1993). More specific measures of lexical retrieval were calculated to quantify successful noun and verb retrieval attempts (% nouns retrieved, % verbs retrieved) (Mayer & Murray, 2003). The first author utilized Systematic Analysis of Language Transcripts 2008 (SALT) software program (Miller & Chapman, 1985) to quantify these measures from orthographic transcriptions of participants' narrative samples. Effect size (*d*) (Busk & Serlin, 1992) was calculated for all discourse measures. The a priori benchmark was set at  $> 2.74$ , which was recently reported as the mean effect size for generalization to connected speech in lexical retrieval studies (Beeson & Robey, 2008).

## Results

P1 demonstrated fluent verbal output, characterized by phonemic paraphasias, false starts, self-repetitions and deleted or non-specific terms during early sessions. Following treatment, the informativeness of his utterances qualitatively improved due to a decrease in his use of deletions and non-specific terms decreased as well as uninformative repetitions. From baseline to maintenance, P1 also showed significant increases in communicative efficiency as evidenced by the substantial increase in CIUs/minute, which was stable at follow-up (Figures 3-7).

P2, a participant in a previous study of SFA in discourse, presented with borderline fluent conduction aphasia. His noun retrieval attempts were characterized by semantic and phonological paraphasias, semantic circumlocutions and deletions /non-specific terms. Previous treatment gains in % nouns and % CIUs had been maintained at the current study's baseline, while #words and #CIUs achieved following the first treatment had increased by the time of the current study's baseline. Following participation in the current treatment, P2 increased #CIUs and CIUs/minute, indicative of positive change in informativeness and efficiency. At the 6 week follow-up, the increase in CIUs/minute, but not # CIUs, was stable (Figures 8-12). However, comparison of #CIUs from baseline to follow-up yielded an effect size of 4.34, exceeding the a priori benchmark.

P3, with severe Broca's aphasia, utilized inefficient gestural communication and uninformative over-learned/automatic utterances at baseline. Most communicative attempts were abandoned with apparent frustration. Following treatment, P3 demonstrated a reduction in #words with a corresponding increase in %CIUs. At follow-up #words had increased, but the positive change in %CIUs was maintained, likely due to a slight increase in #CIUs (Figures 13-16).

P4, with severe transcortical motor aphasia, initially produced primarily inaccurate words or non-specific reactive utterances, with a paucity of CIUs. Immediately following treatment, P4 showed a large increase in # CIUs (Figures 17-20). This facilitated communication and reduced the need for scaffolding from listeners.

Percentage of homework completed was calculated (Table 5), which will be evaluated relative to treatment effect, across participants.

**Discussion**

Data reported here confirm and extend the findings of Antonucci (2009) which provided preliminary evidence that SFA treatment can result in improved lexical retrieval and communicative effectiveness when trained as a strategy during group aphasia therapy. Furthermore, this study provides additional support for the notion that individuals with different etiology, nature, and severity of lexical retrieval impairments can derive gains from participation in the same group. All participants were treated together within a single group, which provided a naturalistic environment for production of discourse. Yet, each participant improved individually.

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**Table 1: Demographic information of participants**

	<b>P1</b>	<b>P2</b>	<b>P3</b>	<b>P4</b>
Age (years)	35	55	31	62
Education (years)	16	18	10	16
Time Post Onset (years)	6	13	8	2
Etiology	Multiple CVAs	Single L CVA	Traumatic Brain Injury	Multiple CVAs
Gender	Male	Male	Male	Female
Aphasia Type (WAB)	Conduction	Conduction	Broca's	Transcortical Motor

**Table 2: Standardized test performance**

	<b>P1</b>		<b>P2</b>		<b>P3</b>		<b>P4</b>	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
<i>Western Aphasia Battery</i>								
Information content / Fluency	8 / 5 8.4	8 / 8 7.55	7 / 6 7.5	8 / 6 8.6	5 / 4 5.9	5 / 4 6.55	6 / 4 5.6	7 / 4 4.5
Comprehension	5.1	4.4	5.2	5.6	0.5	0.8	8.8	7.1
Repetition	8.3	9.2	4.8	4.2	1.4	2.1	1.8	3.1
Naming								
Aphasia Quotient (AQ)	69.6	74.3	61.0	64.8	33.6	36.9	52.4	52.0
<i>Boston Naming Test</i>	21/60	26 /60	6 / 60	6 / 60	2 / 60	1 / 60	7 / 60	14/60
<i>Pyramids &amp; Palm Trees Test</i>	49/52	50/52	48/52	48/52	47/52	48/52	34/52	41/52
<i>Raven's Coloured Progressive Matrices</i>	36/37	33/37	29/37	26/37	26/37	29/37	23/37	18/37

**Table 3. Task flow sheet.**

single picture scenes	single picture scenes in which there is a problem to identify	picture sequences 2-5 pictures	telling a story from a picture sequence once the pictures had been taken away	telling the story of a fairy tale without pictures (listeners guess which fairy tale)	telling the group the plot of your favorite movie (listeners guess which movie)
Week 2	Week 3	Weeks 4-6		Week 7	

\* Stimuli were selected individually as appropriate to each participant's level and adjusted as performance improved. Participants with more severe word finding difficulty described less complex picture scenes or picture sequences with fewer pictures.

**Table 4. Effect sizes (d) for discourse measures**

	P1		P2		P3		P4	
	Maintenance	Follow-up	Maintenance	Follow-up	Maintenance	Follow-up	Maintenance	Follow-up
# Words (average)	0.00	- 0.39	1.83	- 0.96	- 3.88**	7.59**	.80	1.61
# CIUs (average)	0.30	- 0.30	6.8	- 2.8**	1.37	0.40	3.95**	0.02
% CIUs	0.45	- 0.17	1.9	- 8.8**	3.71**	- 2.07	- 0.00	- 0.50
CIUs/minute	3.14**	- 0.44	7.56**	- 0.98	- 0.02	- 0.76	1.28	- 0.28
% nouns retrieved	- 0.54	0.09	0.27	-0.60	tbd	tbd	tbd	tbd
% verbs retrieved	1.10	- 0.63	7.69**	- 0.04	tbd	tbd	tbd	tbd

Effect size d is calculated as (mean 2 – mean 1)/ standard deviation of mean 1

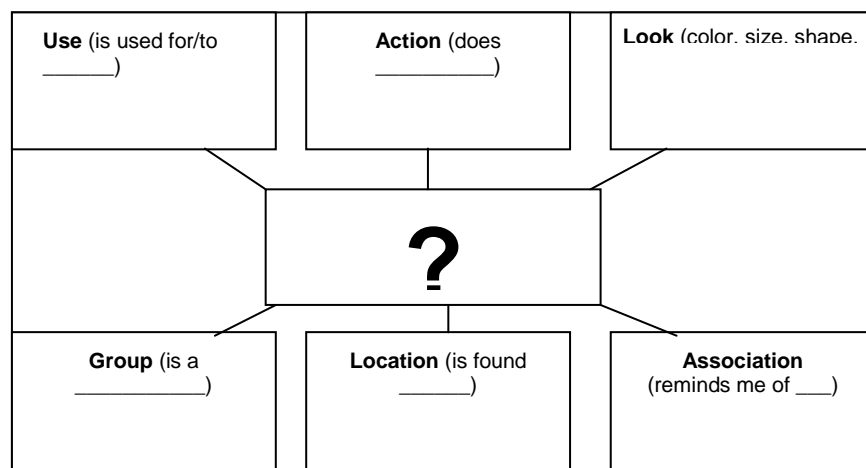
\* % nouns and % verbs for P3 and P4 – to be determined (tbd)

\*\* indicates effect size at or above minimum benchmark for lexical retrieval in connected speech (per Beeson & Robey, 2008)

**Table 5. Total homework completed**

	P1	P2	P3	P4
Homework Score	18	19	14	6
Percent Completed	82%	86%	64%	27%

Completed homework was assigned a score of 2, partially completed homework was assigned a score of 1, a 0 was given if homework was not done. The total possible homework score was 22.

**Figure 1: Semantic Feature Analysis Chart**

\*Chart was enlarged to 2'x3' for all to view

**Figure 2. Daily homework worksheet**

## Semantic Feature Analysis Homework

Name \_\_\_\_\_

Date \_\_\_\_\_ Week 1 2 3 4 5 6 7

### Daily Homework

M	T	W	Th	F	S	Su
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Used SFA\_\_\_\_\_ Used SFA\_\_\_\_\_ Used SFA\_\_\_\_\_

Notes:\_\_\_\_\_

M	T	W	Th	F	S	Su
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Used SFA\_\_\_\_\_ Used SFA\_\_\_\_\_ Used SFA\_\_\_\_\_

Notes:\_\_\_\_\_

M	T	W	Th	F	S	Su
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Used SFA\_\_\_\_\_ Used SFA\_\_\_\_\_ Used SFA\_\_\_\_\_

Notes:\_\_\_\_\_

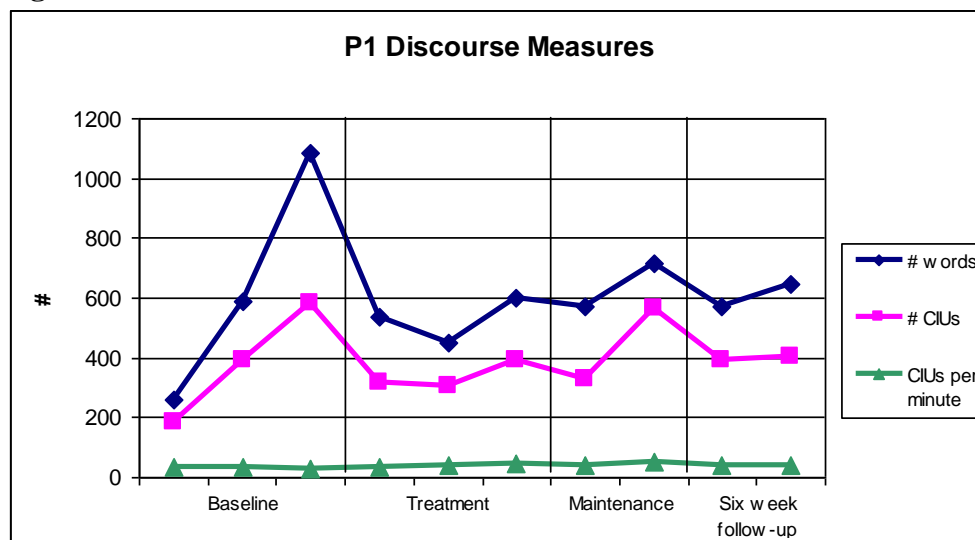
M	T	W	Th	F	S	Su
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Used SFA\_\_\_\_\_ Used SFA\_\_\_\_\_ Used SFA\_\_\_\_\_

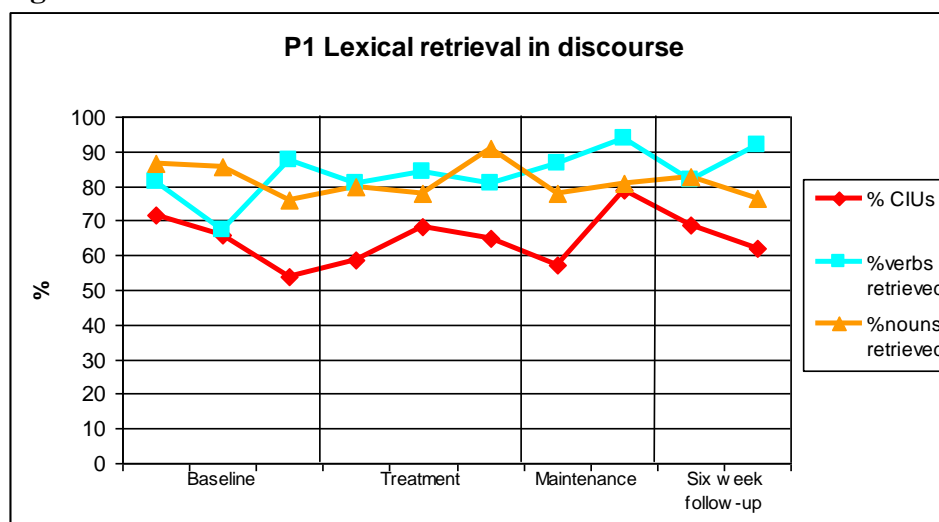
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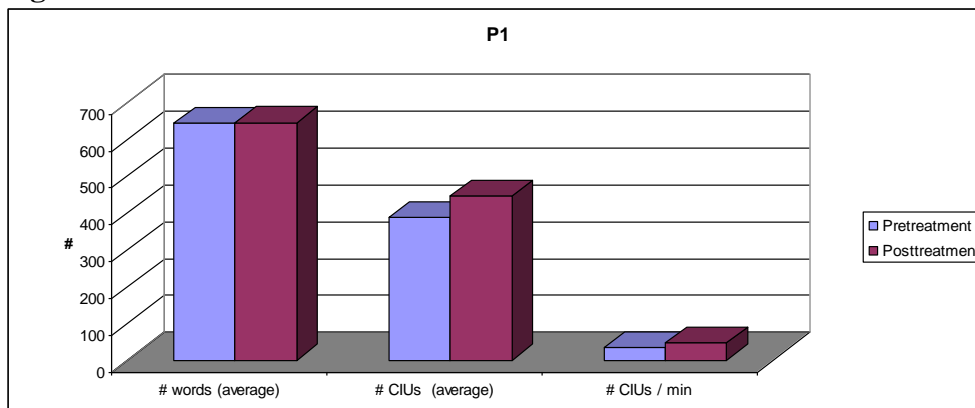
**Figure 3. P1 Discourse measures**



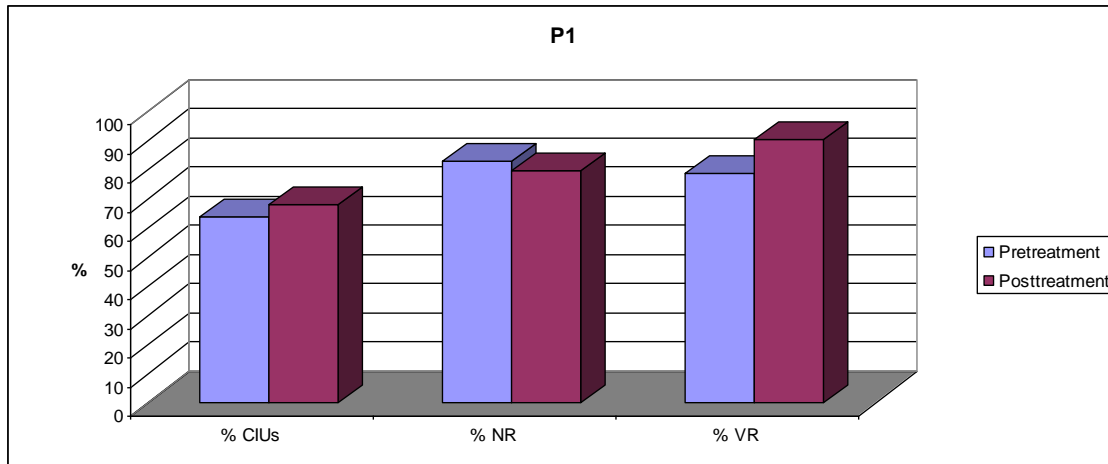
**Figure 4. P1 Lexical retrieval in discourse**



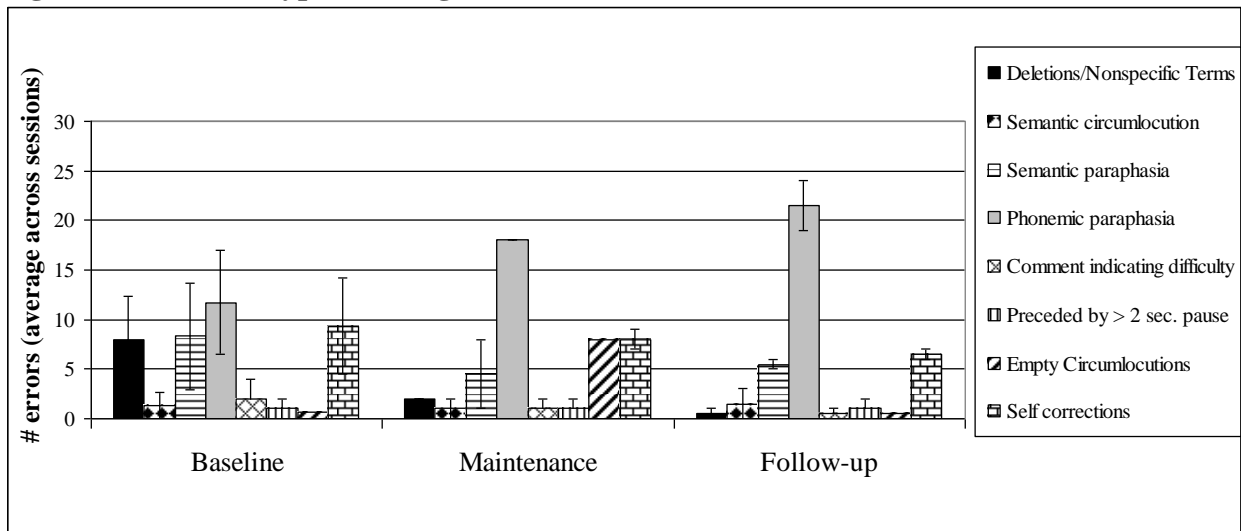
**Figure 5. P1 Mean discourse measures at baseline and maintenance**



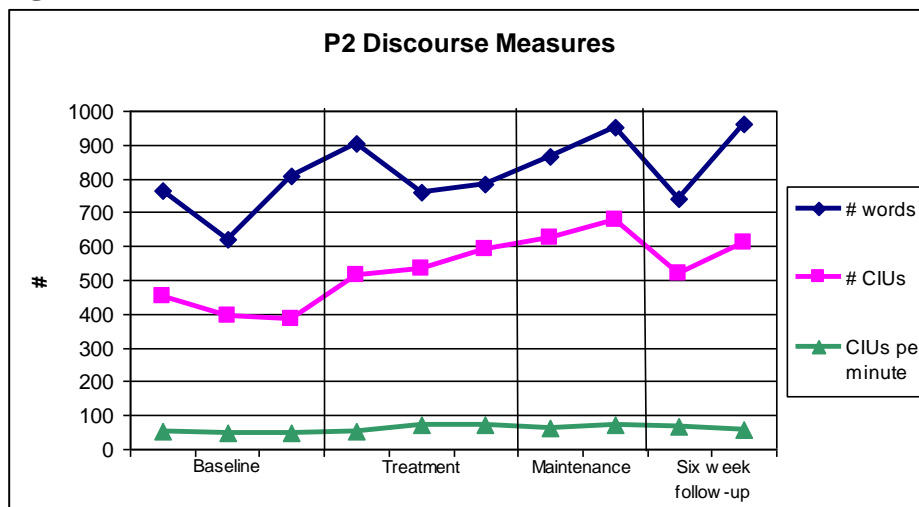
**Figure 6. P1 Mean lexical retrieval measures at baseline and maintenance**



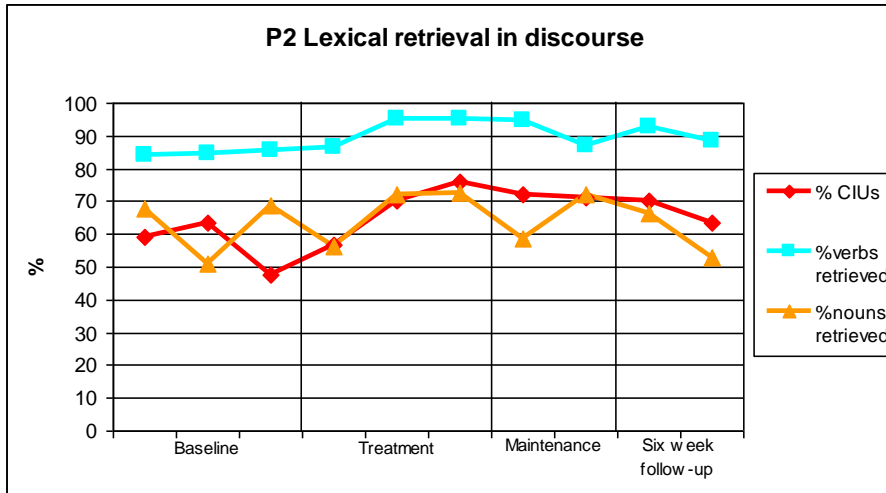
**Figure 7. P1 Error types (averaged across sessions)**



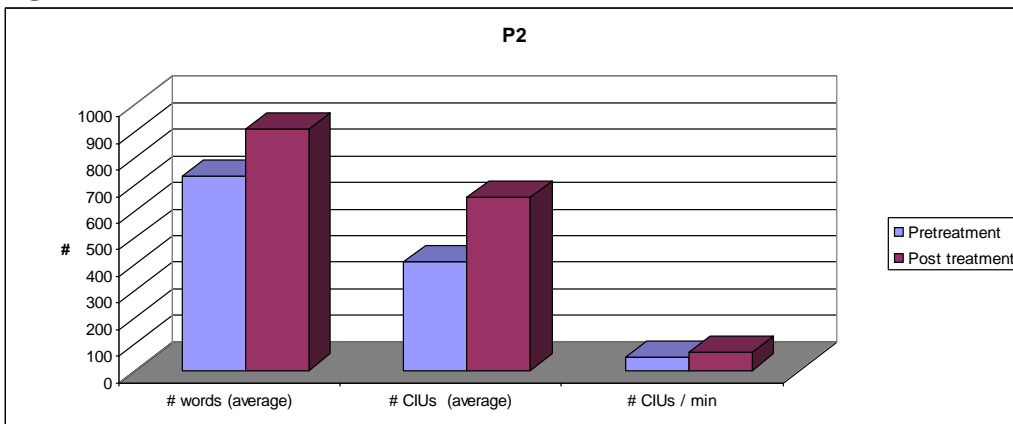
**Figure 8. P2 Discourse measures**



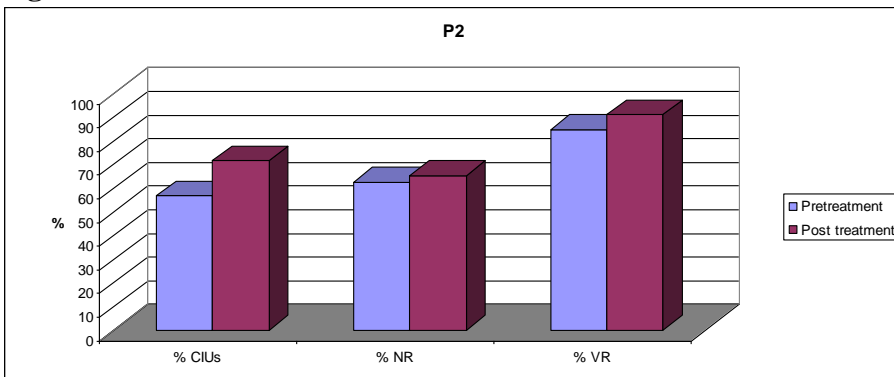
**Figure 9. P2 Lexical retrieval in discourse**



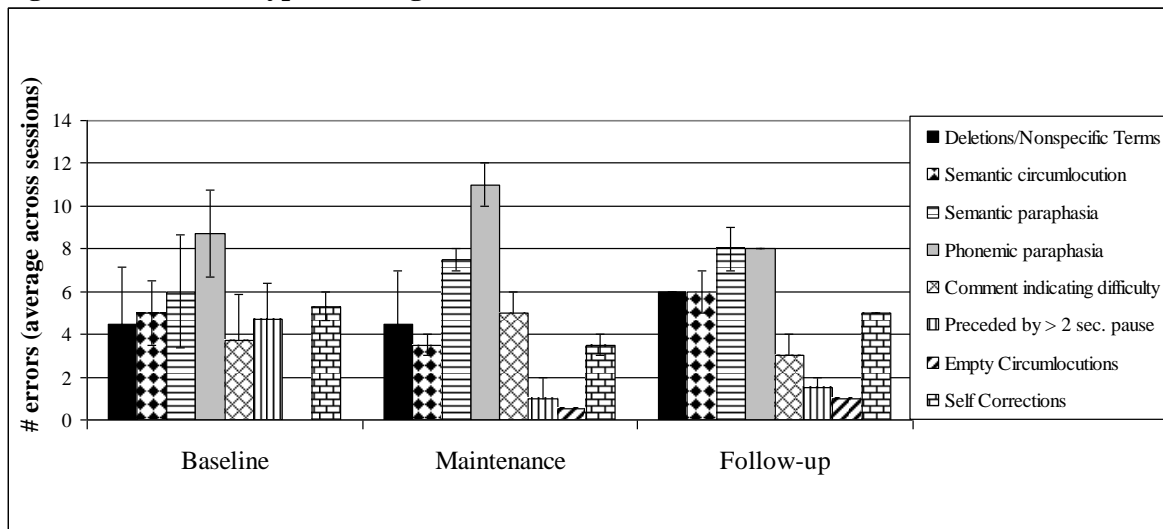
**Figure 10. P2 Mean discourse measures at baseline and maintenance**



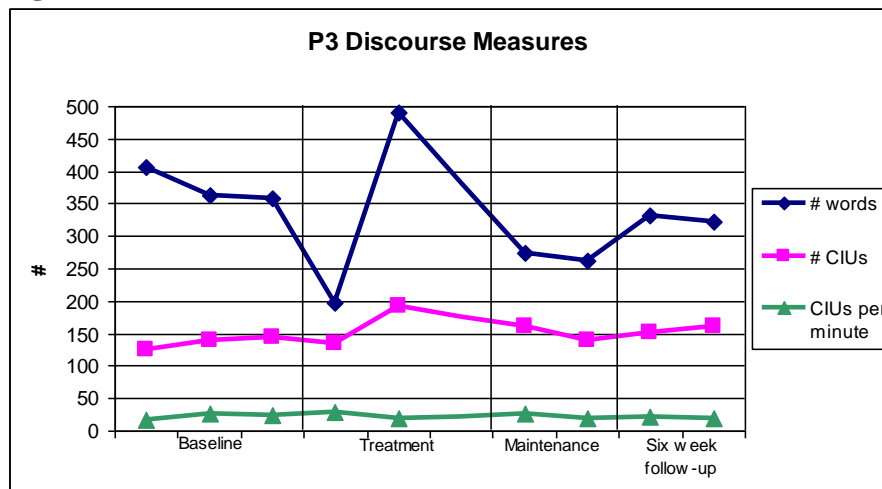
**Figure 11. P2 Mean lexical retrieval measures at baseline and maintenance**



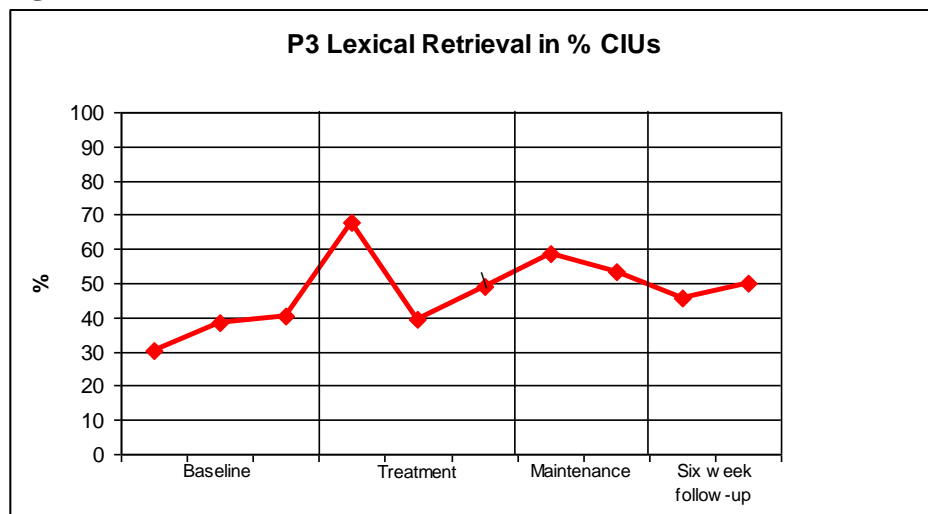
**Figure 12. P2 Error types (averaged across sessions)**



**Figure 13. P3 Discourse measures**

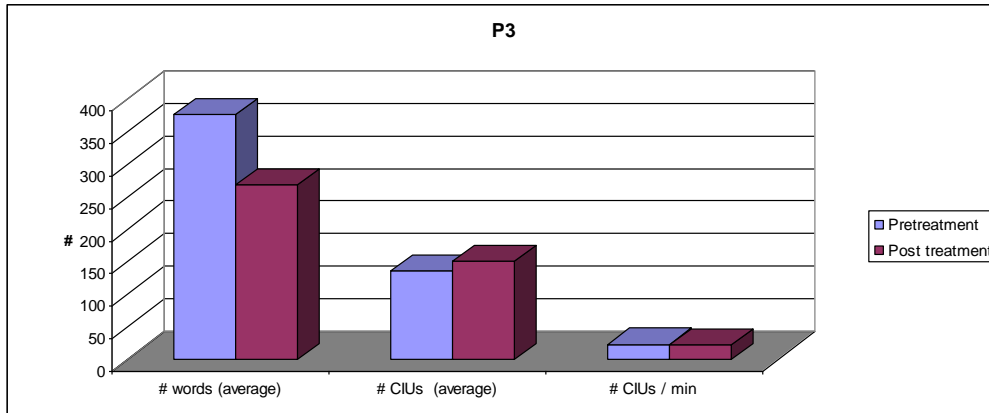


**Figure 14. P3 Lexical retrieval in discourse**

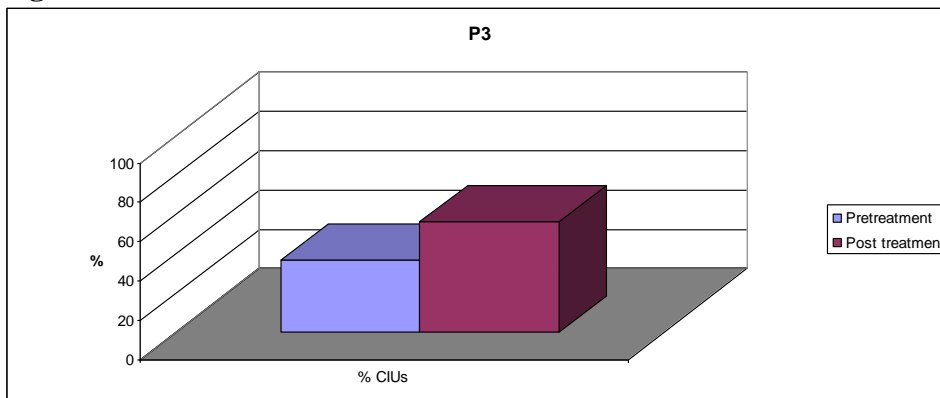


\* % nouns and %verbs to be determined

**Figure 15. P3 Mean discourse measures at baseline and maintenance**

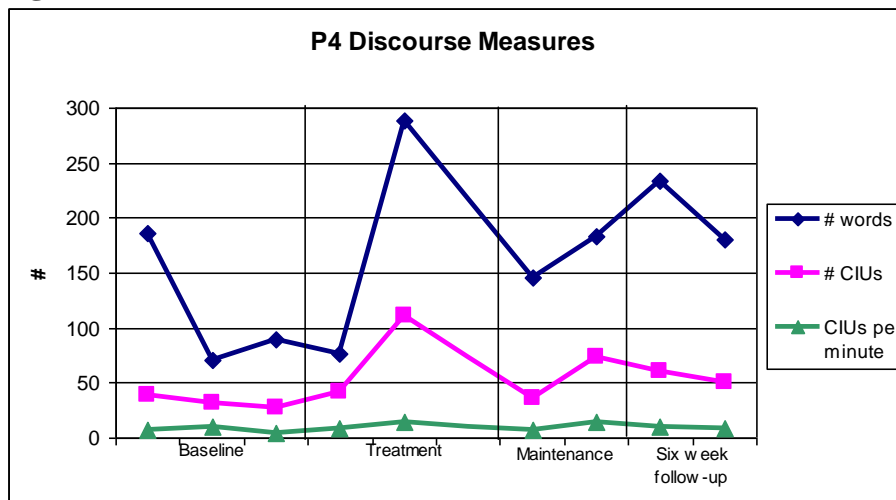


**Figure 16. P3 Mean lexical retrieval measures at baseline and maintenance**

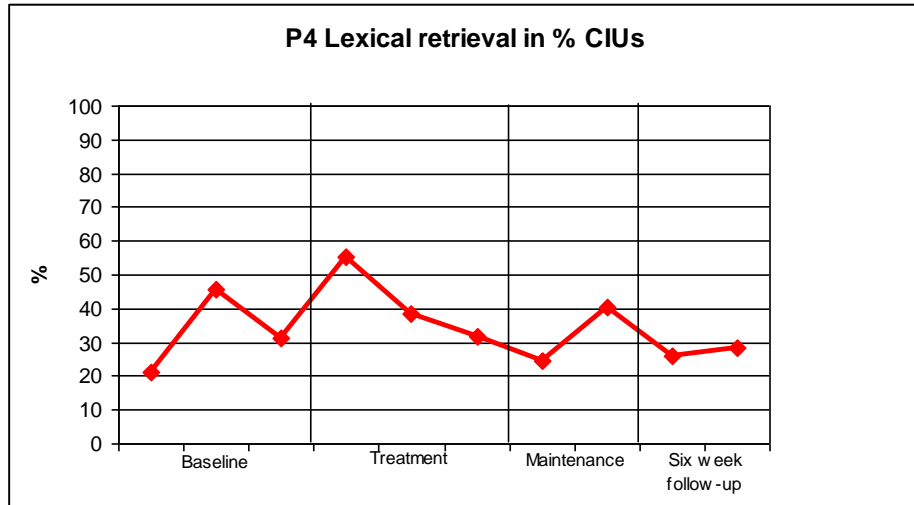


\* % nouns and %verbs to be determined

**Figure 17. P4 Discourse measures**

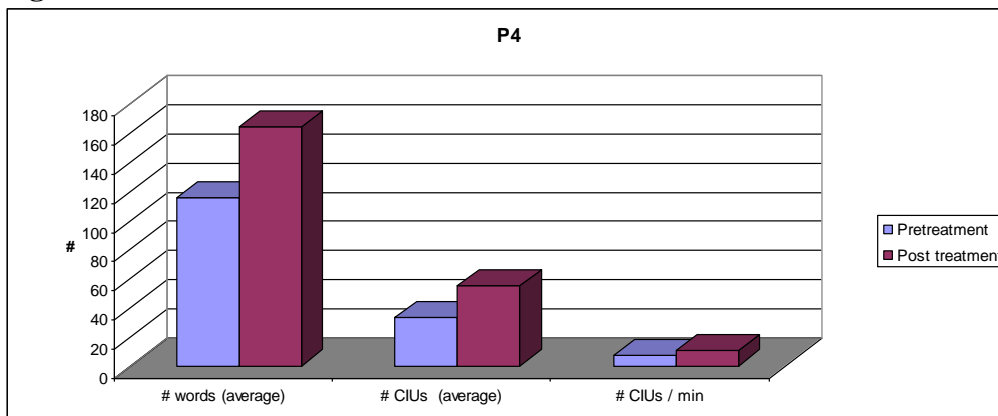


**Figure 18. P4 Lexical retrieval in discourse**

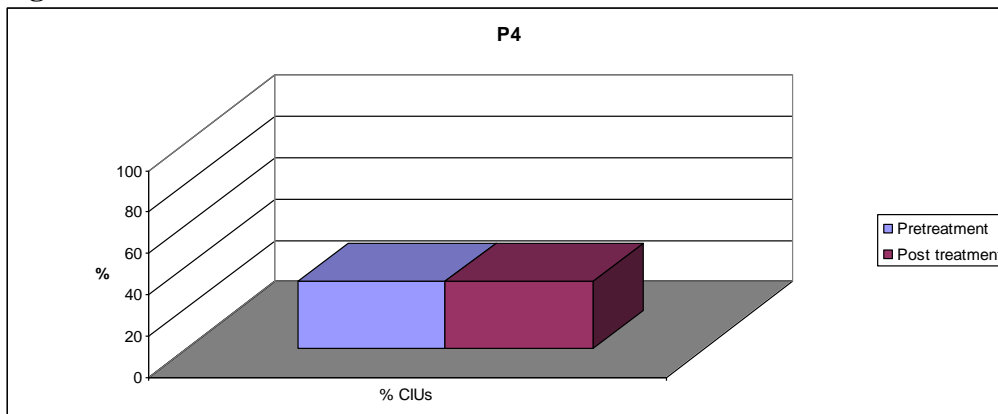


\* % nouns and % verbs to be determined

**Figure 19. P4 Mean discourse measures at baseline and maintenance**



**Figure 20. P4 Mean lexical retrieval measures at baseline and maintenance**



\* % nouns and % verbs to be determined