An Intensive, Interdisciplinary, Treatment Program for Persons with Aphasia

Introduction

Traditionally, much of individual aphasia therapy has been focused on attempts to remediate underlying linguistic deficits. While many treatments have been shown to improve discrete language functions (Robey et al, 1998), those newly learned skills do not always transfer readily to non-trained environments. Over the past two decades, a growing number of aphasiologists have begun to focus their attention on social approaches to aphasia assessment and treatment (Elman, 2007). One such approach, group treatment, serves as a natural and dynamic vehicle to improve social communication, which has been shown to improve discrete language skills in persons with aphasia (pwa), (Elman & Bernstein-Ellis, 1999). Group treatment frequently co-occurs with individual therapy, but is rarely used as a formal mechanism to train generalization.

Another area of broad discussion in aphasia rehabilitation is the concept of treatment intensity. Basso (2005) reported that pwa who received a higher number of therapy sessions improved more than those who received a lower number of therapy sessions. Bhogal et al (2003) found that treatment provided on a more intense level (>8.8 hours/week) for a shorter period of time resulted in stronger improvements compared to treatment provided on a less intense level over a longer period of time.

A final issue is that individuals with stroke-induced aphasia often present with concomitant motor, cognitive and dietary/cardiac issues. Thus it seems that an interdisciplinary approach incorporating physical, occupational and nutritional therapy would also be beneficial.

This paper explores the speech-language effects of a treatment program, which attempts to incorporate evidenced-based treatment, in an intensive, interdisciplinary format. Pilot data from an initial cohort completed June 2011 as well as multiple-baseline data from a second cohort completed June 2012 is presented.

Methods

Participants:
Fourteen participants with a mild to moderate profile of aphasia were chosen to participate in these studies. Participants ranged in age from 46-72 years, (mean 58). Their education ranged from 12-20 years (mean 16 years). Time post-onset of stroke ranged from 16 months to 12 years (mean 4.9 years). All participants were diagnosed with aphasia s/p single CVA to the language-dominant hemisphere.

Stimulus Materials:
Speech-language measures (Table 1) were administered to all participants, immediately pre- and post- treatment for cohort one, and at four intervals for cohort two: one month pre-treatment, immediately pre-treatment, immediately post-treatment, and three months post-treatment.

Intervention:
Participants received six hours of interdisciplinary treatment each day, five days per week over a four-week interval. Treatment was individualized using current evidence-based approaches and was administered by licensed clinical faculty at X University. 30 hours of weekly therapy was provided in the following increments, 16.5 hours speech-language instruction (10.5 hours group, 3 hours dyadic, and 3 hours individual instruction), 4 hours group OT instruction, 4.5 hours group PT instruction and 5 hours group nutrition instruction (Table 2).

Individual specific language treatment approaches were developed for each participant. Table 3 details the primary areas of linguistic deficit, goal areas, treatment approaches, as well as measures of performance which were chosen to reflect these targeted language areas for each participant in the initial cohort.

Speech-language group treatments incorporated a Life Participation Approach to Aphasia (LPAA) (Chapey et al, 2008) and were designed to facilitate achievement of participants' community-based goals. Group treatments were linked with individual treatment tasks to attempt to enhance generalization of targeted behaviors to other contexts. IPad2s were provided to facilitate learning and carryover of goals for each discipline.

Results
Cohort One:
Mean percent accuracy was calculated for the group on all formal measures and then analyzed using the Wilcoxon signed-ranks test. No statistically significant changes were noted on any single measure for the group (Table 4). Given the wide range of severity levels among participants and the resultant diversity between participants' individual treatment goals, "targeted" measures (those on which a change would be expected based on treatment goals), were calculated for the group. Results revealed statistically significant changes pre and post treatment (Z=-3.020, df 31, p = <.01).

Narrative analyses for content information units (Nicholas and Brookshire, 1993) and the communicative effectiveness profile (Helm-Estabrooks and Albert, 2003) revealed an increase in the number of words produced (79 pre, 102 post) and the mean number of content information units (65 pre, 68 post). As a group, the mean scores moved closer to normal expectations in terms of the index of lexical efficiency and the index of grammatical support (Table 5)

Cohort Two
Eight language measures were administered across four intervals. Functional and quality of life measures were taken at two intervals. The Friedman test statistic was calculated to determine if a difference existed across the repeated measures for the group on each subtest. The Wilcoxon signed-rank test was subsequently calculated to determine the interval of change. The following measures were significant for only a pre-post treatment change: PNT, Oral Repetition, Production of Affixed Words, Sentence Production, Verb Naming Test, Discourse Comprehension Test and Alphabetical Word Fluency (FAS). (Table 6)

Data were also analyzed across subtests by participant. All participants demonstrated statistical variance across the four repeated measures for the combined tests (Table 7). 7/8 participants

demonstrated stable pre-treatment baselines, five of whom demonstrated a statistically significant change pre- and post- treatment, followed by stable and/or improved scores from post-treatment to 3-months follow-up.

Pre- and post- data from the ASHA FACS, a functional measure of communication, and the SIS, quality of life instrument, were also analyzed using the Wilcoxon signed rank test statistic. Significant changes were observed across both measures: $Z = -2.785$, $p=.005$, $Z= -3.648$, $p=<.001$.

"Targeted" measures (those on which a change would be expected based on treatment goals), were also analyzed separately. Once again, a stable performance between pre-tx baseline measures was observed, with a statistically significant change from pre-post treatment ($p=<.001$) and continued improvement at the three-month follow-up interval ($p=.003$).

Discussion

Significant changes were noted on measures of naming, syntax and morphology as well as oral repetition. The ASHA FACS reflected perceived improvements from each participants' significant other on communicative acts, such as increased initiation and increased effectiveness, in a functional conversational environment. These outcomes suggest a decrease in the communicative burden felt by the caregiver during conversational acts. The SIS scores reflected a significant change perceived by the participant in terms of communication and other participation level domains (physical, and occupational). These data were also supported by anecdotal comments provided by significant others and participants at the end of the program.

Improvement in targeted outcomes was seen pre-post treatment, and noted to continue to improve at three months follow-up. This suggests that the treatment not only helped improve function on these measures, but that the strategies learned during treatment continued to lead to greater performance over time.

The percentage of content information units per sample and the index of lexical efficiency moved closer to the normal range for the group suggesting improved effectiveness in their narratives. These data taken together with the ASHA FACS outcomes suggest improved narrative/conversational performance to the group to untrained contexts and environments.

Intensive group treatment programs are costly to undertake, yet growing quickly in number. These preliminary studies seem promising, although further studies with stronger experimental controls should be completed before firm conclusions regarding efficacy can be drawn.

Appendix

Table 1: Speech-Language Pathology Baseline Measures:

1. Verbal Narrative Production using picture description task (Nicholas and Brookshire, 1996).
2. *Psycholinguistic Assessment of Language* (Caplan and Waters, 1990)
    a. Oral Repetition
    b. Production of Affixed Words
    c. Picture Homophone Matching
    d. Sentence Production
3. *Philadelphia Naming Test* (Roach, A., Schwartz, M.F., Martin, N., Grewal, R.S., & Brecher, A., 1996).
4. *Northwestern Verb Naming Test* from the *Northwestern Verb Production Battery* (Thompson, C., 2002)
5. *FAS Word Fluency Test (*Strauss, E.; Sherman, E.M.S.; Spreen, O. 2006).
6. *Discourse Comprehension Test* (Brookshire, R. H. & Nicholas, L. E., 1993).
7. *Assessment for Living with Aphasia* (Kagan, A., Simmons-Mackie, N., 2011) – Cohort 1*
8. *Stroke Impact Scale* (Duncan, P.W., Wallace, D., Lai, S.M., Johnson, D., Embretson, S., Laster L.J. 1999)
9. *The American Speech-Language-Hearing Association Functional Assessment of Communication Skills for Adults. (*Frattali, D.M., Thompson, C.K., Holland, A.L., Wohl, C.B., & Ferketic, M.M., 1995). Cohort 2*

Table 2: Weekly Schedule for cohort one.

BU Aphasia Resource Center

	Monday	Tuesday	Wednesday	Thursday	Friday
9:30	Individual SLP/ Toastmasters	Individual SLP	Book Club	Toastmasters	Dyad SLP Tx/CILT
10:00					
10:30	Individual SLP/ Toastmasters		Games Group	Newsletter Group	
11:00					
11:30	Nutrition	Nutrition	Nutrition	Nutrition	Nutrition
12:00					
12:30	Lunch	Lunch	Lunch	Lunch	Lunch
1:00	PT	Computer Coaching	PT	PT	Computer Coaching
1:30					
2:00					
2:30	OT	OT	Dyad SLP Tx/CILT	OT	OT
3:00					
3:30	Conversation/Current Issues/Wrap-Up	Conversation/Current Issues/Wrap-Up	Conversation/Current Issues/Wrap-Up	Conversation/Current Issues/Wrap-Up	Conversation/Current Issues/Wrap-Up

Table 3: Individualized Speech-Language Treatment Plan Cohort One

Participants	**Speech-Language Concerns**	**Goal Areas**	**Individual Treatment Approach**	**Measures of Performance in Targeted Area**
1	Anomia (deficit at level of phonological output lexicon [POL]) Morphosyntactic deficits in production Reduced narrative production skills	Word Finding Sentence/Discourse Production	Phonological Components Analysis (Leonard, Rochon & Laird, 2008) Divergent Naming Treatment of Underlying Forms (Thompson & Shapiro, 2005)	PNT, VNT PAL: Picture homophone matching, production of affixed words, sentence production, oral repetition Picture Description task.
2	Anomia (alphabetical word fluency) Cohesion in Discourse	Word Finding Discourse Production	Semantic Feature Analysis (Boyle & Coelho, 1995) Sentence Production incorporating relative clauses Narrative production focusing on macrostructure, word-finding and increased number of clausal phrases.	Picture Description task
3	Anomia (phonemic output buffer) Prosodic abnormalities Morphosyntactic difficulties Discourse Comprehension	Word Finding Articulatory Precision/Apraxia Discourse Comprehension Reading Comprehension Sentence production	Word Fluency Discourse comprehension Treatment of Underlying Forms Multiple Oral Rereading (Beeson,1998) Narrative productions (using reading comprehension tasks).	PNT, PAL: production of affixed words, sentence production, oral rep DCT-R Picture Description task
4	Anomia (output semantic system and POL) Morphosyntactic difficulties at sentence level Narrative production	Word Finding Sentence Production	Semantic Feature Analysis, Word Fluency Conversational Scripts TUF – passive constructs	PNT PAL: production of affixed words, sentence production, oral rep Picture Description task
5	Anomia (output semantic system) verbs worse than nouns Morphosyntactic difficulties (produced mainly svo sentence constructs conjoined with “and”) Narrative production	Word Finding Verb Production Active-Passive sentence production	Word Fluency Semantic Feature Analysis (SFA) (Boyle & Coelho, 1995) Verb Network Strengthening Treatment (VNeST) (Edmonds,2009) Treatment of Underlying Forms (Thompson & Shapiro, 2005)	PNT VNT PAL: sentence production, oral rep Picture Description task
6	Anomia (output semantic system) Morphosyntactic difficulties Narrative Production Global dysgraphia	Writing Word Finding Personal Narratives	Anagram, Copy, Recall Therapy (Beeson,1999) Semantic Feature Analysis Conversational Scripts	PNT PAL: production of affixed words, sentence production, oral repetition Picture Description Task

Table 4: Cohort One: Pre-Post Comparisons per measure.

Measure	Test Statistic	df	Significance
PNT	Z= -2.023	5	0.43
Oral Rep	Z=- 0.542	5	0.59
Production of Affixed Words	Z= -1.153	5	0.25
Sentence Production	Z= -3.15	5	0.75
Picture Homophone	Z= -0.184	5	0.85
DCT	Z= -0.423	5	0.67
VNT	Z= -0.423	5	0.72
Stroke Impact Scale	Z= -1.219	5	0.22
ALA	Z= -1.604	5	0.11

Table 5: Narrative analyses for content information units (Nicholas and Brookshire, 1993) and communicative effectiveness profile (Helm-Estabrooks and Albert, 2003).

	CIU Analysis				CEP Analysis			
	Normal # Words: 62-176		Normal %CIU: 72-93		Normal ILE: 2.6-4.2		Normal IGS: 1.8-4.7	
	# words Pre	**# words Post**	**% CIUs Pre**	**% CIUs Post**	**ILE Pre**	**ILE Post**	**IGS Pre**	**IGS Post**
Mean	**79.67**	**102.00**	**65**	**68**	**5.01**	**4.92**	**3.33**	**3.74**
SD	46.22	64.47	0.08	0.12	1.63	1.67	0.80	1.04

Table 6: Performance by group across measures

Measure	Interval	Test Statistic	df	Significance
PNT	Four baselines	χ^2	3	.004
	Baseline 1-2 (pre tx baselines)	Z=-.631		.528
	Baseline 2-3 (pre-post tx)	Z=-2.392		.017
	Baseline 3-4 (post tx baselines)	Z=-1.122		.262
PAL Oral Rep	Four baselines	χ^2	3	.009
	Baseline 1-2 (pre tx baselines)	Z=-.734		.463
	Baseline 2-3 (pre-post tx)	Z=-2.383		.017
	Baseline 3-4 (post tx baselines)	Z=-1.123		.261
PAL Prod Affixed Words	Four baselines	χ^2	3	.001
	Baseline 1-2 (pre tx baselines)	Z=-2.060		.039
	Baseline 2-3 (pre-post tx)	Z=-2.386		.017
	Baseline 3-4 (post tx baselines)	Z=-.949		.343
PAL Sent Prod	Four baselines	χ^2	3	.005
	Baseline 1-2 (pre tx baselines)	Z=-.135		.893
	Baseline 2-3 (pre-post tx)	Z=-2.201		.028
	Baseline 3-4 (post tx baselines)	Z=-1.016		.310
PAL Pict Hom	Four baselines	χ^2	2	.343
	Baseline 1-2 (pre tx baselines)	Z=-.315		.752
	Baseline 2-3 (pre-post tx)	Z=.000		1.0
VNT	Four baselines	χ^2	3	0.19
	Baseline 1-2 (pre tx baselines)	Z=-.841		.400
	Baseline 2-3 (pre-post tx)	Z=-2.371		.018

	Baseline 3-4 (post tx baselines)	Z=-.850		.395
DCT	Four baselines	χ^2	3	.011
	Baseline 1-2 (pre tx baselines)	Z=-1.219		.223
	Baseline 2-3 (pre-post tx)	Z=-1.755		.079
	Baseline 3-4 (post tx baselines)	Z=-1.183		.237
FAS Naming	Four baselines	χ^2	3	.105
	Baseline 1-2 (pre tx baselines)	Z=-1.272		.203
	Baseline 2-3 (pre-post tx)	Z=-2.176		.030
	Baseline 3-4 (post tx baselines)	Z=-.420		.674

Table 7: Performance across measures by participants.

Participants	Test	Test Statistic	df	Significance
1	Four baselines	χ^2=8.500	3	.037
	Baseline 1-2 (pre tx baselines)	Z=-.524		.600
	Baseline 2-3 (pre-post tx)	Z=-1.120		.263
	Baseline 3-4 (post tx baselines)	Z=-1.572		.116
2	Four baselines	χ^2=15.333	3	.002
	Baseline 1-2 (pre tx baselines)	Z=-1.890		.059
	Baseline 2-3 (pre-post tx)	Z=-2.366		.018
	Baseline 3-4 (post tx baselines)	Z=-1.214		.225
3	Baseline 2-3 (pre-post tx)	Z=-1.752		.080
4	Four baselines	χ^2=12.380	3	.006
	Baseline 1-2 (pre tx baselines)	Z=-1.782		.075
	Baseline 2-3 (pre-post tx)	Z=-2.028		.043
	Baseline 3-4 (post tx baselines)	Z=-1.439		.150
5	Four baselines	χ^2=10.714	3	.013
	Baseline 1-2 (pre tx baselines)	Z=.000		1.0
	Baseline 2-3 (pre-post tx)	Z=-.980		.327
	Baseline 3-4 (post tx baselines)	Z=-2.527		.012**
6	Four baselines	χ^2=15.646	3	.001
	Baseline 1-2 (pre tx baselines)	Z=-.423		.672
	Baseline 2-3 (pre-post tx)	Z=-2.366		.018
	Baseline 3-4 (post tx baselines)	Z=-.135		.893
7	Four baselines	χ^2=12.205	3	.007
	Baseline 1-2 (pre tx baselines)	Z=-.524		.600
	Baseline 2-3 (pre-post tx)	Z=-2.313		.021
	Baseline 3-4 (post tx baselines)	Z=-1.782		.075
8	Four baselines	χ^2=20.766	3	<.001
	Baseline 1-2 (pre tx baselines)	Z=-2.214		.027
	Baseline 2-3 (pre-post tx)	Z=-2.521		.012
	Baseline 3-4 (post tx baselines)	Z=-2.383		.017

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