

Introduction

Word retrieval impairments are common in individuals with aphasia. For some, a semantic breakdown leads to difficulty in both word comprehension and retrieval. For others, intact semantic information fails to activate stored phonological lexical representations, in which case difficulty is evident only in word retrieval. Given the pervasiveness of word retrieval problems, many studies have examined effects of training for word retrieval impairments (e.g., Nickels, 2002; Raymer, 2005). Training effects are largest for trained words after intensive clinician-supported training protocols. Techniques are needed that patients can implement independently to increase opportunity to practice functional vocabulary. One means of supporting independent practice is through the use of computers.

Several computerized software programs are available for purchase to practice word comprehension and naming skills. Little data exist, however, to indicate whether these programs are effective for improving comprehension and naming impairments associated with aphasia. Moss Talk Words (Fink et al., 2001) is an experimental word retrieval training program designed to provide feedback as patients participate in one of two training modules, cued naming or multi-mode matching. Fink and colleagues (2002) reported that the Moss Talk cued naming component (computer presented cueing hierarchies) was useful for improving word retrieval in individuals with phonologic retrieval impairments in aphasia.

Less is known about the effectiveness of Moss Talk's multi-mode matching module for improving word retrieval. Multi-Mode Matching Exercises are patterned after studies reporting word retrieval improvements following semantic comprehension training in which patients complete word/picture matching tasks, answer yes/no questions about target pictures, or sort pictures by categories (e.g., Pring et al., 1990; Nickels, 1996). Patients who perform matching tasks demonstrate increases in word retrieval abilities, particularly when semantic training is paired with spoken production of words (Drew & Thompson, 1999). The purpose of this study was to evaluate the effects of the Moss Talk multi-mode matching modules for improving word comprehension and retrieval in individuals with word retrieval impairments associated with aphasia.

Participants

The study included five right handed individuals (2 men, 3 women) with aphasia subsequent to left hemisphere stroke that occurred at least 4 months prior to the study (Demographic information in Table 1). All participants were administered the Western Aphasia Battery (Kertesz, 1982), the Boston Naming Test (Kaplan et al., 2001), and two informal tasks to assess picture naming and comprehension for the same 60 nouns (Zingeser & Berndt, 1990). Results (Table 1) indicate that, whereas the participants presented with different patterns of aphasia (1 mixed transcortical, 2 Broca's, 2 conduction), all had significant word retrieval impairments. Performance on the informal noun tasks relative to normal controls indicated that two individuals were impaired in word comprehension and retrieval, suggesting a semantically-based word retrieval impairment. The other three participants performed within normal levels in word comprehension, but were impaired in picture naming, suggesting a phonologic word retrieval impairment. All provided written informed consent to participate in this treatment study.

Treatment Design and Methods

The study incorporated a single-participant time series design (McReynolds & Kearns, 1983). The daily probe tasks included: 1) picture naming for 60 nouns; 2) word/picture yes/no verification for 60 nouns, presented once with the correct word for “yes” and once with a related distractor for “no” (administered to only CO1 and CO2); and 3) oral reading of 20 adjectives (control task). Two sets of 20 pictures were implemented in training phases 1 and 2, and a third set of 20 pictures remained in extended baseline. The dependent variable in all tasks was percent correct. Reliability was assessed with a second examiner who scored responses for 15% of sessions and ranged 96.7-100% across the five participants.

Probes were administered for 3-5 baseline sessions. Participants then took part in two training phases, separated by a one month break. In training, each session was initiated with probes followed by training involving three Moss Talk Multimode Matching Exercises: 1) spoken+written word/picture matching; 2) spoken word/picture matching; 3) written word/picture matching. Each exercise was implemented for each of the 20 target words with three semantically related distractors. If incorrect in matching, the correct response was provided. The participant then repeated the target word three times. If necessary, the clinician provided additional visual cues to promote correct repetition. Participants were seen 1-2 sessions per week in one phase, and 3-4 sessions per week in a second phase, with order of training counterbalanced among the participants. Treatment ended when performance reached 90% accuracy in 2 sessions or after 12 treatment sessions. (C05 completed phase 2 after only 10 treatment sessions because of an equipment failure.) Results were graphed and analyzed using the C statistic (Tryon, 1982). Effect sizes (d) were evaluated comparing means in treatment and baseline relative to the baseline standard deviation (Busk & Marascuilo, 1992). An effect size >2.0 was considered large.

Results

Results are represented in Table 2. No participant demonstrated significant improvement in the control oral reading task. Therefore, changes evident in verification and picture naming tasks are likely related to training effects. No participant reached the criterion level of performance before 12 sessions were completed, yet all demonstrated improvements in verification and naming tasks.

Significant improvements in verification were evident for both CO1 and CO2. In phase 1, CO1 improved for the trained set and one untrained set. Further improvements were evident in phase 2 for only the trained set. CO2 also improved in phase 1 for the trained set and one untrained set. No further significant improvements were evident in phase 2, however.

Significant improvements were also evident in picture naming for all five participants. All participants improved for trained pictures in both training phases except for CO4 in phase 2. Generalized improvements to untrained pictures were seen for CO4 and CO5 in phase 1 and for CO3 in phase 2.

No consistent patterns of improvement were evident across participants in standardized testing at the conclusion of the experiment.

Discussion

Consistent with prior semantic training studies, computerized training with the Moss Talk multi-mode matching module paired with verbal rehearsal led to

improvements in lexical processing in five individuals with aphasia. Improvements were evident in picture naming for all five, particularly for the trained sets. Smaller generalized increases in untrained words were present for 3/5 participants, two of whom were only 4 months post stroke at treatment start. Therefore spontaneous recovery cannot be ruled out, though no changes were evident in the control task. Generalization in C03 was seen in phase 2 for the set that had been practiced in phase 1, indicating a delayed training effect from phase 1. That is, training effects for picture naming were largely item-specific for trained items.

Reported less often in prior studies are effects of semantic training for lexical comprehension. Two individuals with semantic impairment demonstrated improved comprehension, greater for trained over untrained words, suggesting a treatment specific effect. Some generalized increases in comprehension for untrained words suggests that training led to improvements in general language and attentional skills. The Moss Talk matching modules are effective training tools for improving both word comprehension and retrieval in individuals with severe lexical impairments. All individuals were enthusiastic about the computer training and expressed the desire to implement the program independently.

References:

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Table 1: Demographic data.

	C01	C02	C03	C04	C05
Age (yrs)	70	72	51	82	79
Educ (yrs)	14	12	14	9	8
Time post stroke (mos)	20	22	42	4	4
Gender	F	M	M	F	F
WAB					
Aphasia Quotient (max. 100)	44.8	41.2	33.2	76	71.4
Fluency (max.10)	2	3	1	8	8
Aud Comp (max. 10)	3.7	7.9	7.6	9.2	9.2
Naming (max. 10)	2.9	2.3	2.6	7.2	5.8
Repetition (max. 10)	8.8	2.4	2.4	5.6	5.7
BNT (max. 60)	0	1	2	24	7
Noun Battery					
Picture Naming (max. 60)	0	1	3	36	17
Word/Picture Verification (max. 60)	22	15	52	53	52

Table 2: Percent accuracy in baseline and treatment phases. Treated items are indicated in bold and * indicates large effect sizes.

	C01	C02	C03	C04	C05
Baseline % Accuracy					
Picture Naming 3-4/wk	3.4	0	7	5	5
Picture Naming 1-2/wk	1.7	0	7	3.4	7.5
Picture Naming untrained	6.7	1.25	7	5	7.5
Verification 3-4/wk	23.4	31.25			
Verification 1-2/wk	28.4	30			
Verification untrained	23.4	27.5			
Oral read control	0	0	0	3.4	0
Tx 1-2/wk % Accuracy					
	Phase 2	Phase 1	Phase 1	Phase 2	Phase 2
Picture Naming 3-4/wk	23.6	2.9	14.3	52	44
Picture Naming 1-2/wk	24.3*	5.7*	22.2*	62.2	42*
Picture Naming untrained	4.3	5	9.3	38.6	34
Verification 3-4/wk	60	45.7			
Verification 1-2/wk	65.7*	54.3*			
Verification untrained	44.3	52.2*			
Oral read control	0	0	0	13.6	4
Tx 3-4/wk % Accuracy					
	Phase 1	Phase 2	Phase 2	Phase 1	Phase 1
Picture Naming 3-4/wk	20.7*	12.2*	38.6*	60*	37.2*
Picture Naming 1-2/wk	2.2	12.9	40*	39.3*	26.5*
Picture Naming untrained	2.2	5	16.5	31.5*	22.9*
Verification 3-4/wk	56.5*	47.2			
Verification 1-2/wk	44.3*	48.6			
Verification untrained	36.5	39.3			
Oral read control	0	0	0	10	1.5