

Improved Effects of Word-Retrieval Treatments Subsequent to Addition of the Orthographic Form

The development and testing of word-retrieval treatments for aphasia has generally focused on approaches that have targeted either the semantic or phonologic levels of processing (Nickels, 2002). There have been a few instances in which orthographic approaches have been studied and positive effects have been reported. Most often, letter to sound correspondences have been trained to facilitate self-cueing (see Nickels 2002 for a review), but letters cues alone have also been used (Herbert, Best, Hickin, Howard, & Osborne, 2001). An underlying assumption of such strategies is that knowledge of the written form is relatively intact. Consequently, there may be limited applicability of orthographic training in aphasia.

During the course of testing the relative effects of a semantic cueing treatment and a phonologic cueing treatment, a participant, MA, insisted that her response to the treatments would be much better if she were provided the written form of the word. The treatment protocol could not be adjusted during the course of that investigation to accommodate her request.

The present investigation was designed to examine the potential benefits of adding the orthographic form to the treatments that had produced negligible effects for MA. A series of two experimental designs were implemented to examine the effects of the modified treatments on MA's verbal naming of actions.

Method

Participant

The participant was a 62 year old female, who was 9 years post evacuation of a left temporal hematoma secondary to head injury. She evidenced moderate-severe Wernicke's aphasia, with significant word-retrieval difficulties (Table 1). MA had served as a participant in a prior investigation examining the effects of two treatments for verb retrieval: semantic cueing treatment (SCT) and phonologic cueing treatment (PCT), each applied to two lists of verbs, in the context of a multiple baseline, crossover design. MA demonstrated negligible improvement in oral naming of actions in response to both treatments. As seen in Table 2, immediately following treatment MA's naming of trained actions improved by 18-44% across the four lists. These gains were not maintained.

Table 2
Performance in Previous Study-Percent Correct Naming of Actions

	Baseline Average	End Tx.	3 wk. follow-up	6 wk. follow-up
List 1 (Semantic Tx.)	13%	47%	30%	20%
List 2 (Phonologic Tx.)	22%	40%	30%	20%
List 3 (Semantic Tx.)	20%	47%	40%	30%
List 4 (Phonologic Tx.)	26%	70%	50%	40%

Pre treatment assessment results suggested that MA's word retrieval difficulties stemmed from disruptions in both semantic and phonological levels of processing (Table 1). Although MA insisted that she would benefit from provision of the orthographic form of the target word, there was little evidence to suggest that this would be the case. Specifically, her written word to picture matching performance was poorer than her spoken word to picture matching, her oral reading was severely impaired, and her letter naming and matching skills were significantly disrupted. However, MA performed remarkably well on visual, lexical decision tasks (i.e., deciding if printed letter strings represented words), indicating that her "orthographic input lexicon" (Kay et al., 1992) was relatively intact.

Experimental Design

Two, sequential multiple baseline designs across behaviors were employed to examine the effects of treatment. In each design, naming of two sets of verbs was repeatedly measured in a baseline phase. Then, one treatment was applied sequentially to the verb sets. In the first design, a semantic cueing treatment (with orthographic cues) was applied. In the second design, a phonologic cueing treatment (with orthographic cues) was applied.

Experimental Stimuli

Two sets of actions were selected for each design on the basis of performance on *An Object and Action Naming Battery* (OANB; Druks & Masterson, 2000). A total of 40 items were selected, with 10 items designated per set. Items had not received treatment in the preceding study. Furthermore, items were selected to allow for balancing for familiarity, number of arguments, homophonous noun root, and image agreement across the lists in this investigation and in the previous investigation. Actions were depicted in line drawings.

Dependent Variable

Correct naming of the target action within 15 seconds of presentation of the line drawing in probes constituted the behavior of interest. Probes were conducted in which the twenty pictures depicting the actions were presented one at a time, in random order. MA was instructed to "tell me an action word, a verb that tells what's happening". No feedback concerning accuracy of naming was provided during probes.

Baseline probes were conducted 2-3 times per week (5 total). Probes conducted during the treatment phase were completed prior to each day's treatment session.

Treatment

The same treatments that were utilized in the previous investigation, SCT and PCT, were studied, with one modification: the written form of the word was printed below the drawings used in treatment. MA was *not* asked to read the word aloud and no attention was drawn to the printed word. Please note that the orthographic form was *not* included on the probe stimuli used to measure treatment effects.

Both treatments included a prestimulation phase, wherein MA was asked to choose the target item from a field of four pictures. Following prestimulation, the cueing hierarchy was applied to the target picture. Each of the 10 pictures was presented

individually in random order, with the prestimulation and cueing hierarchy applied to that picture prior to the presentation of the next picture (see Appendix).

A treatment session consisted of four applications of treatment to each picture. Sessions were conducted three times per week by an ASHA certified SLP. The criteria for termination of treatment were 1) 90% accuracy of naming on three consecutive probes, or 2) a maximum of 15 treatment sessions.

Results

Figures 1 and 2 depict MA's accuracy of naming in probes in response to **SCT + orthographic** and **PCT + orthographic**, respectively. MA demonstrated stable responding prior to the application of treatment for all lists, with obvious improvements in naming corresponding to the application of treatment. MA's response to both treatments was similar (i.e., there was no apparent treatment preference). She met the performance criterion within 15 sessions for all except the first SCT treatment set (and she reached 100% accuracy over two sessions for that set).

Positive treatment effects were limited to trained items; no generalization to untrained items was noted for either treatment. Treatment gains were maintained through the withdrawal period, with some decreases observed at 2 and 6 weeks post treatment probes.

Discussion

MA's response to the modified treatments was clearly superior to her response to the original treatments. Unfortunately, it is impossible to determine if order effects may have played a role in the obtained results. That is, the positive effects obtained in these investigations may have been due to the prior application of treatment. However, the previous investigation involved two applications of each treatment and prior experience with the treatment did not improve results in that investigation.

If the provision of the orthographic form was responsible for the improved naming performance, it is likely that the improvements were mediated by associations formed between the visual object recognition system and the orthographic input lexicon (Kay et al., 1992), with the phonological output lexicon being accessed directly by the orthographic input lexicon. Additional processing explanations will be explored and implications for treatment will be discussed.

References

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Appendix: Description of Treatments

Semantic Cueing Treatment (SCT)

Prestimulation. The target item was presented in picture form with 3 picture foils (2 semantically related, 1 unrelated). The examiner provided a verbal phrase describing the item and asked the MA to point to the correct picture.

Cueing Hierarchy. The application of the steps of the hierarchy was response-contingent. The steps were applied sequentially until a correct naming response was elicited. Then, the order of the steps was *reversed*, to elicit correct responses at each of the preceding steps. In the event that an incorrect response occurred during the hierarchy reversal, the order of hierarchy steps was again reversed until a correct response was obtained.

1. picture of target item presented, naming response requested, verbal feedback provided for correct or incorrect responses (7 - 8 second response time allowed - same for following steps)
2. picture of target item presented along with a verbal description of target, naming response requested, verbal feedback provided for correct or incorrect responses (e.g., target = climbing, “getting to the top of something using your legs”)
3. picture of target item presented along with a semantically non-specific sentence completion phrase, naming response requested, verbal feedback provided for correct or incorrect responses (e.g., “The man was....”)
4. picture of target item presented along with a semantically loaded sentence completion phrase, naming response requested, verbal feedback provided for correct or incorrect responses (e.g., “To get to the top of the tree, he put up a ladder and started....”)
5. picture of target item presented along with verbal model of target word, repetition of target word requested

Phonologic Cueing Treatment (PCT)

Prestimulation. The target item was presented in picture form with 3 picture foils (2 phonetically related, 1 unrelated). The examiner provided a rhyme corresponding to the item and asked MA to point to the correct picture.

Cueing Hierarchy. The application of the steps of the hierarchy was the same as above.

1. picture of target item presented, naming response requested, verbal feedback provided for correct or incorrect responses (7 - 8 second response time allowed - same for following steps)
2. picture of target item presented along with a verbal production of a non-real word that rhymed with the target (e.g., target = bleeding, “it rhymes with treeding”)
3. picture of target item presented along with a verbal first sound cue (e.g., “it starts with /bl/”)
4. picture of target item presented along with a sentence completion phrase that included the rhyme and the sound cue, naming response requested, verbal feedback provided for correct or incorrect responses (e.g., “The name of this picture rhymes with tweeding, it is a /bl/...”)
5. picture of target item presented along with verbal model of target word, repetition of target word requested

Table 1
Pre Treatment Assessment Results

Measure	Score
TAWF (German, 1990)	
Total Raw Score	0/107
Comprehension	74%
Coloured Progressive Matrices (Raven, Raven & Court, 1998)	
Total Score	33/36
Pyramids & Palm Trees (Howard & Patterson, 1992)	
Total Raw Score	47/52
An Object and Action Naming Battery (Druks & Masterson, 2000)	
Total objects	1/81
Total actions	7/100
Western Aphasia Battery (Kertesz, 1982)	
Aphasia Quotient	32.2
Classification	Wernicke's
PICA , 4 th Ed. (Porch, 2001)	
Overall Percentile	35th
PALPA (Kay, Lesser & Coltheart, 1992)	
<i>Auditory Rep. Gramm. Class</i>	
Nouns	0/15
Verbs	0/15
Adjectives	0/15
Functors	0/15
<i>Lexical Morphology & Rep.</i>	
Regularly inflected	0/15
Derived	0/15
Irregularly inflected	0/15
Regular infl. control	0/15
Derivational control	1/15
Irregular infl. control	1/15
<i>Grammatical Class Reading</i>	
Nouns	0/20
Adjectives	0/20
Verbs	0/20
Functors	0/20
<i>Spoken Word-Pic. Matching</i>	27/40
<i>Auditory Synonym Judgments</i>	
Hi Image	20/30

Lo Image	15/30
<i>Word Semantic Association</i>	
Hi Image	4/15
Lo Image	3/15
<i>Aud. Comp. of Verbs & Adj.</i>	
Form 1	26/41
Form 2	22/41
<i>Letter Naming & Sounding</i>	
Lower case letter naming	11/26
Upper case letter naming	12/26
<i>Spoken Letter-Written Letter Matching</i>	
<i>Visual Lexical Decision with 'Illegal' Nonwords</i>	
Exception words	12/15
Regular words	14/15
Nonwords	30/30
<i>Imageability & Frequency Visual Lexical Decision</i>	
High imageability/high frequency	12/15
High imageability/low frequency	11/15
Low imageability/high frequency	13/15
Low imageability/low frequency	6/15
Nonwords	46/60
<i>Letter Length Reading</i>	
<i>Syllable Length Reading</i>	
1-Syllable	1/8
2-Syllable	0/8
3-Syllable	0/8
<i>Spoken Word-Picture Matching</i>	
Errors (n=12): Close semantic:	10/40
Distant semantic:	0/40
Visual:	0/40
Unrelated:	2/40
<i>Written Word-Picture Matching</i>	
Errors (n=22): Close semantic:	9/40
Distant semantic:	3/40
Visual:	6/40
Unrelated:	4/40
<i>Picture Naming</i>	
Spoken Naming	1/40
Written Naming	0/40
Oral Reading	7/40
Repetition	8/40
Written Spelling	0/40

Figure 1: SCT + Orthographic

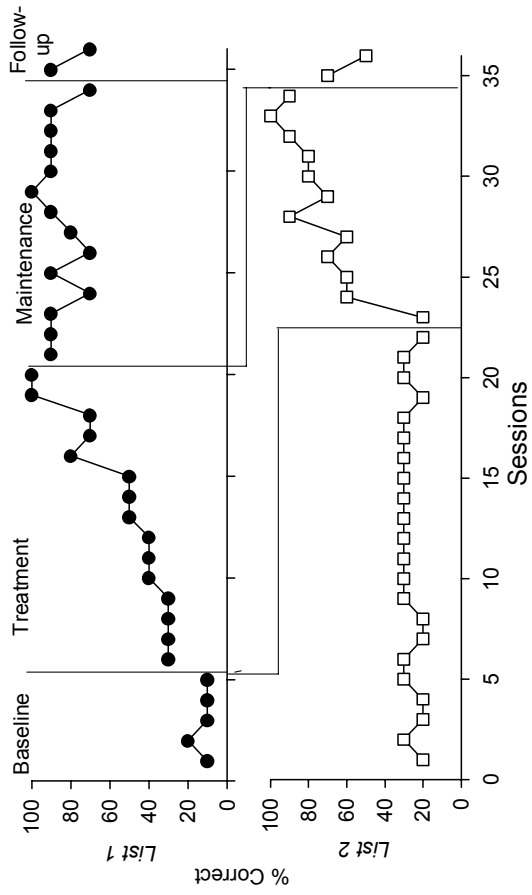


Figure 2: PCT + Orthographic

