The Efficacy of a Semantic Cueing Procedure on Naming Performance of Adults With Aphasia

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The effects of self-selected semantic cues on naming performance of three individuals with aphasia were studied. Using a single-subject multiple-baseline design, a procedure incorporating semantic feature analysis was used to facilitate generalization. Two subjects showed improved naming performance on trained items, with robust generalization to untrained items and maintenance over a one-week period. Performance remained stable on a control measure of productive morphology throughout training, indicating that improved naming performance was not due to generalized language improvement. The third subject did not show substantial improvement. For the two subjects who improved, results suggest that they learned a semantic cueing strategy and applied it to both trained and untrained items for improved naming performance.

A major barrier to effective communication for people with aphasia is their impaired ability to name. Cueing is a common facilitation technique for impaired naming, but studies documenting its effectiveness are limited. Researchers have documented facilitating effects of both phonologic and semantic cueing (Li & Williams, 1989; Marshall, Neuburger, & Phillips, 1992; Stimley & Noll, 1991), and studies exploring the treatment efficacy of both types of cues have found greater and more durable effects with semantic cueing or facilitation techniques (Howard, Patterson, Franklin, Orchard-Lisle, & Morton, 1985a, 1985b; Marshall, Freed, & Phillips, 1994).

Howard and colleagues (1985a) contrasted semantic and phonological facilitation techniques. Semantic treatment conditions involved tasks such as answering yes/no questions regarding the meaning of the target, whereas phonological treatment conditions involved aspects of target production (e.g., a phonemic cue). All facilitation activities were generated and provided by the experimenter. Overall naming performance was significantly better as a result of semantic treatment conditions, as was generalization to untreated items, although the degree of generalization was small.

Marshall and colleagues (1992, 1994) explored the effects of various cueing techniques on the ability of subjects with aphasia to name arbitrary word-symbol pairs. In both studies, nouns and verbs were arbitrarily matched to novel symbols, with naming of those symbols serving as the dependent variable. Marshall et al. (1994) contrasted the effects of phonologic versus semantic, self-generated cues on subjects' ability to provide the target word for each symbol presented. Pre- and post-training labeling probes revealed significantly better performance under the self-cueing condition. Marshall et al. (1992) contrasted the efficacy of several cueing and facilitation techniques and found that self-cueing was the only condition that resulted in significant maintenance of increased naming at one week post-training.

Most studies that have explored the treatment effects of semantic facilitation and cueing on naming have practical limitations, such as reliance on clinician-provided cues and limited generalization to untrained items (Behrmann & Lieberthal, 1989; Howard et al., 1985a, 1985b; Li & Williams, 1989). Marshall and colleagues (1992, 1994) explored cueing effects with arbitrary word and symbol pairs versus those associated with actual naming errors, thus the application of their findings to word retrieval deficits is not known.

The present investigation was designed to explore a training protocol that employed self-selected semantic cues for improving naming in subjects with aphasia. The issues addressed were threefold: (a) Does semantic self-cueing result in improved naming performance? (b) Does training generalize to untrained items? (c) Are training effects maintained? A single-subject, multiple-baseline design was used to investigate the approach.

Method

Participants

The men who were studied had each suffered a single, left thromboembolic stroke resulting in persistent aphasia. Specific subject information is summarized in Table 1. The Aphasia Diagnostic Profiles (ADP; Helm-Estabrooks, 1992) was used to obtain aphasia classification and severity scores. The Reading Comprehension Battery for Aphasia (LaPointe & Horner, 1979), subtests I, II, and III, was used to ensure that subjects were able to read single words, as this ability was a component of the study. Pyramids and Palm Trees (Howard, unpublished research edition) was used to obtain information regarding subjects' semantic knowledge base.

The ADP classified subjects BB and SB as having conduction aphasia, and subject BG as having anomic aphasia. Aphasia severity was moderate for all three subjects, ranging from the 77th percentile on the ADP for BG to the 55th percentile for SB. Whereas BB and BG performed similarly on the naming subtest of the ADP (Standard Score = 10 and 11, respectively), SB exhibited greater impairment of naming (Standard Score = 7). All subjects were at least 9 months postonset of aphasia. Subjects had a history of previous speech-language treatment and

TABLE 1. Summary of subject information.

	BB	BG	SB
Age	74	76	66
Time postonset	1 yr., 4 mo.	9 mo.	2 yr., 6 mo.
Aphasia Diagnostic Profiles			
Aphasia type	Conduction	Anomic	Conduction
Aphasia severity	68	77	55 %tile
Personal info.[a]	9	11	7
Info. units[a]	17	12	9
Naming[a]	10	11	7
Repetition[a]	8	14	7
Reading Comprehension Battery for Aphasia			
I-Word-Visual	10/10	10/10	9/10
II-Word-Auditory	10/10	10/10	10/10
III-Word-Semantic	10/10	10/10	10/10
Pyramids and Palm Trees[b]	96	94	94

[a]Standard Score, Mean = 10
[b]Percent correct, Mean = 99% for adults with normal language

were concurrently involved in communication groups. None were receiving individual or group therapy intended to improve naming deficits during the course of this study.

Pretraining Assessment and Stimuli

A large set of picturable nouns (black and white line drawings on 3x 5 inch cards) was presented to each subject in three pretraining assessments. Thirty-six items that were not named correctly in at least two of three naming assessments were selected as experimental items. No corrective feedback was provided. Experimental items contained a mixture of 2-error and 3-error items; relative weight of each type was not calculated. Twelve items comprised the target items for the semantic training protocol (trained condition). Twelve additional semantically related items and 12 unrelated items were assigned to the untrained condition. Six items from each of the three conditions were randomly selected and assigned to List 1; remaining items were assigned to List 2.

For all error items from the initial three pretraining assessments that were not selected as experimental items, a combined percentage accuracy over the three initial assessments was calculated. This served as a pretraining/post-training comparison for items that did not receive further exposure or training. These percentages were calculated for BB and BG, with 38 items for BB and 49 items for BG. For each training item, semantic cues were developed that represented various semantic associative categories. To elicit these one to three word cues, the experimenter asked questions pertaining to superordinate, function, functional context, attribute, and class coordinate relations.

A Semantic Feature Analysis Diagram adapted from Haarbauer-Krupa, Moser, Smith, Sullivan, & Szekeres (1985) was used to facilitate training of the semantic elaboration process. (See Appendix A.) Semantic Feature Analysis has been used to improve organization of verbal output and word retrieval skills in children, adolescents, and adults with traumatic brain injury. Use of the diagram has been suggested as a method of promoting self-cueing and generalization of semantic training effects (Massaro & Tompkins, 1994). The rationale for providing the diagram in this study was that the provision of a visual schema might allow subjects to visualize a systematic route for elaborating on semantic information regarding a target, which could then be used independently (without use of the actual board) to generate semantic information regarding any word they wished to retrieve.

Responses generated by the subject, as well as experimenter-provided responses, were written on index cards by the examiner. From those responses, the subject selected four that were most meaningful for him. Those four cues comprised the semantic cues for the target. For example, for the target *sofa*, cue words for one subject were *sit in*, *household furniture*, *living room*, and *cushions*, representing the associative categories of function, superordinate, functional context, and subordinate, respectively.

To control for exposure to the items presented during cue generation, a recognition task was given for the untrained items. A field of four target pictures was presented, and the subject was asked to point to the picture that the experimenter named (with each untrained item named once, and only untrained items included). No corrective feedback was given.

A productive morphology task (Goodglass & Berko, 1960) was also administered periodically to establish that changes in naming were not due to a generalized language improvement. The task required phrase completion with a single word (e.g., "The millionaire bought a new horse. He now has a whole stable full of horses"). This was administered on each of the three pretraining naming assessments.

Training

Following the three initial sessions to establish baseline naming performance for all items, training was initiated for the six items in List 1 (trained items). During training, the experimenter and subject read all four of the cue words aloud, and then the subject was asked to name the target item. Naming performance was probed for the 12 untrained items for List 1 with a frequency equal to that of the trained items, with probe order randomly varied. Probing consisted of presentation of the target picture with a request for its name. For all items not named correctly (trained or untrained), written corrective feedback was given (a card with three written choices, including the target), and the subject was asked to read the correct choice aloud.

During training, one cycle consisted of exposure to all 18 trained and untrained items for List 1 (or later for List 2), and each session consisted of two or three training cycles. Three training sessions were held per week, on different days.

Items were trained until a score of 5/6 correct was achieved in two consecutive sessions, with a combined percentage of accuracy in each of these sessions of >50%, or until 6–7 training sessions were completed. If criterion was reached with List 2 items in fewer cycles than with List 1, training was continued until List 2 had been presented for the same number of cycles (to reduce discrepancies in exposure between Lists 1 and 2). When criterion was reached, the productive morphology task was readministered, and a fourth baseline probe of the List 2 items was obtained. In the next session, training for List 2 items was begun. Maintenance of effects after one week was also explored.

To examine generalization, performance on trained versus untrained items was compared. In addition, a follow-up naming assessment was carried out for all items that were named incorrectly in the original corpus but were not selected as experimental items. This allowed for a comparison between trained items and untrained items that were not repeatedly probed.

Scoring Criteria and Reliability

Subjects' responses were scored as correct or incorrect. If multiple responses were given, the best response was scored. Recognizable phonemic paraphasias with 1–2 phonemic substitutions were counted as correct, since accuracy of naming, not speech production, was the target of training. Phonemic paraphasias that resulted in different, real words were scored as incorrect.

Interrater and intrarater agreements were calculated for approximately 20% of each of the subjects' responses. Agreement was assessed from written, transcribed responses and audio tapes of sessions, and point by point agreement for correct versus incorrect responses was calculated. To estimate interrater agreement, a certified speech-language pathologist with experience in aphasia was instructed on the scoring criteria and then scored the responses. Interrater agreement was 99% for BB, 99% for SB, and 97% for BG. Intrarater agreement was 99% for BB, 100% for SB, and 97% for BG. Interrater agreement for the productive morphology task was 95% for BB, 97% for SB, and 98% for BG. Intrarater agreement was 98% for BB, 95% for SB, and 100% for BG.

Results

Subject BB

Relatively stable baselines were achieved by BB during pretraining assessments for Lists 1 and 2. (See Figure 1.) For BB, List 1 contained 7 items rather than 6, so scores were converted to percentages and then transformed to a 0–6 scale. When training was introduced, naming performance increased rapidly for the target items. Criterion was reached for both List 1 and List 2. BB maintained a relatively high level of performance one week after training ended. Performance on the productive morphology task was stable throughout the training program.

As shown in Figure 2, substantial generalization to untrained items was evidenced, with gains similar to those for trained items. In fact, BB improved his naming of untrained, related items as well as untrained, unrelated items. It should be noted that generalization did not occur until untrained items were probed on every cycle.

FIGURE 1. Subject BB. Number correct for trained items from List 1 (A) and List 2 (B); dashed line indicates when training was initiated. Percentage correct on productive morphology control task (C).

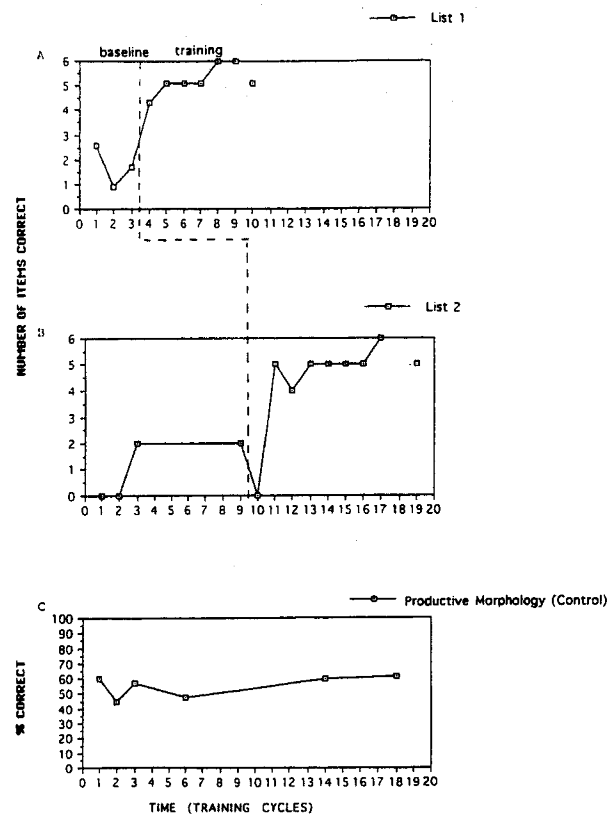


FIGURE 2. Subject BB. Number correct for generalization items that were untrained, semantically related (A) and untrained, unrelated (B). Vertical dashed lines indicate initiation of training for Lists 1 and 2 as indicated in Figure 1, (A) and (B).

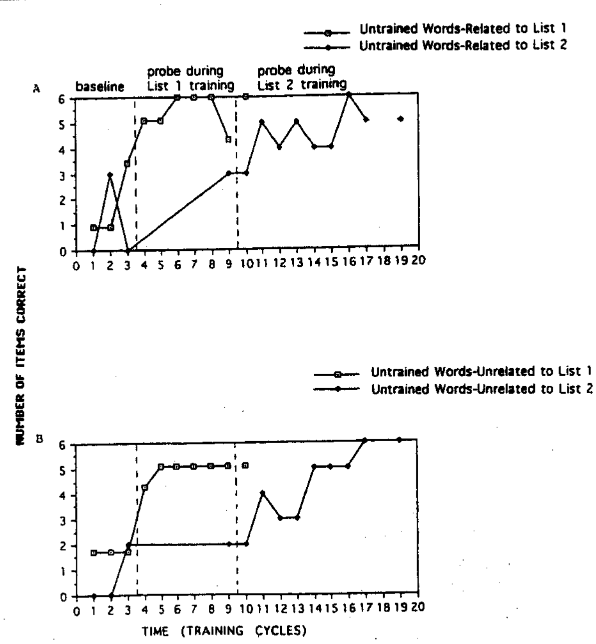


FIGURE 3. Subject BG. Number correct for trained items from List 1 (A) and List 2 (B); dashed line indicates when training was initiated. Percentage correct on productive morphology control task (C).

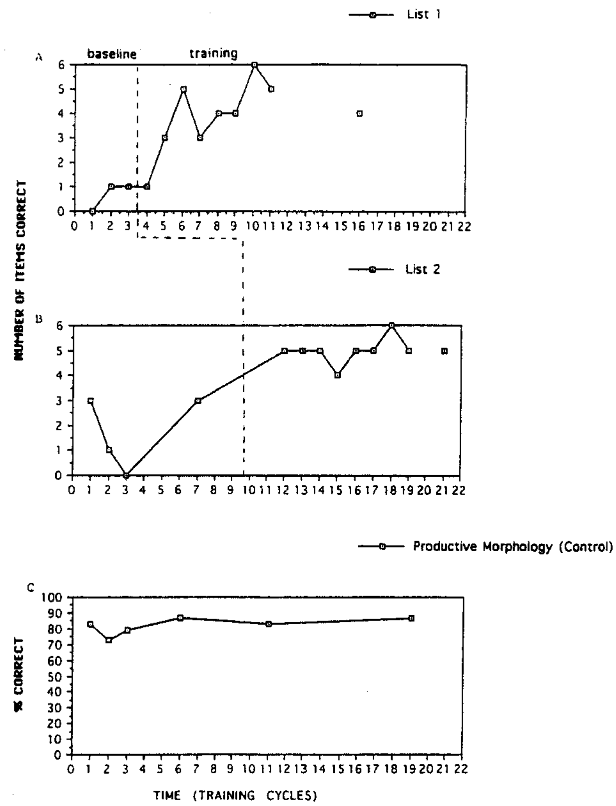
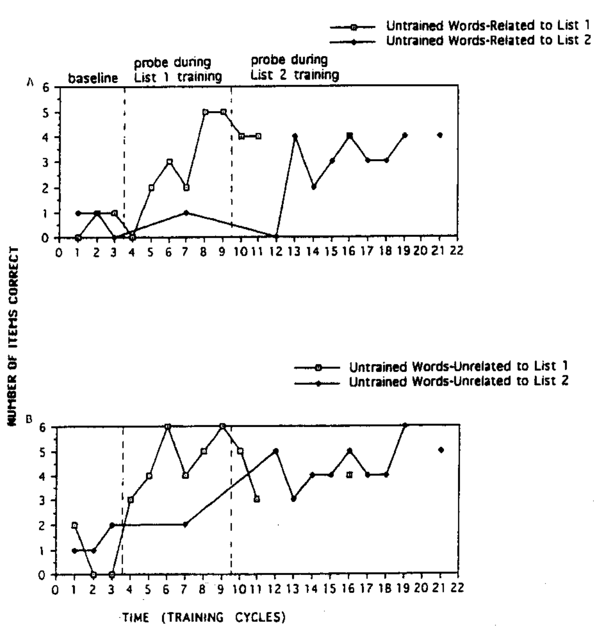


FIGURE 4. Subject BG. Number correct for generalization items that were untrained, semantically related (A) and untrained, unrelated (B). Vertical dashed lines indicate initiation of training for Lists 1 and 2 as indicated in Figure 3, (A) and (B).



Follow-up testing of all items administered during the initial naming assessments that were not selected for training also documented impressive generalization. Whereas 21% of the items were named correctly in the initial assessments, 47% were correctly named post-training.

Subject BG

A stable baseline was achieved for Subject BG for List 1 items. However, the baseline was variable for List 2. (See Figure 3.) As with BB, when training was introduced, naming performance increased rapidly for Lists 1 and 2. Criterion was reached for both word lists. One week after training, performance was relatively stable for both lists. Also as with BB, BG's performance on untrained items showed little change during infrequent probing but rose when more frequent probes were begun. Performance on the productive morphology measure remained stable throughout the training program and was near ceiling level (ranging from 73% to 87% accuracy).

Substantial generalization to untrained items was evidenced, as shown in Figure 4. No difference in amount of generalization between the untrained, related items and the untrained, unrelated items was observed. Whereas pretraining performance on error items that were not selected for any experimental condition was at 18% accuracy, at the post-training assessment, performance rose to 45% accuracy.

Subject SB

As shown in Figure 5, SB's performance differed substantially from that of BB and BG. Initial pretraining performance for trained items was close to 0% accuracy. Trained items did not show change after training was introduced. Criterion was not reached for either word list. Performance on the productive morphology measure remained low and stable throughout training. Naming of untrained items remained stable until the final five sessions, and then showed minimal improvement. (See Figure 6.) Because SB was going on vacation, follow-up naming assessment of nonexperimental error items was not obtained.

Discussion

The semantic self-cueing procedure was effective in improving naming for two subjects (BB & BG). Substantial change was documented in the number of correct responses relative to baseline performance. The training effect was most clearly observed for subject BB, who had stable baseline performance that quickly increased when training was introduced. Subject BG improved to criterion on both word lists, but the lack of a stable baseline for List 2 and the near ceiling performance on the productive morphology task may have reduced experimental control.

The stable performance on the productive morphology task for both subjects, however (although high for BG), supported the notion of training-specific effects rather than general improvement of language skills. Maintenance of improved naming at one week post-training for BB and BG corroborates the results of Howard and colleagues (1985a), who found better maintenance with semantic facilitation than with phonologic cueing.

An interesting result was seen on untrained, experimental items for BB and BG. Although none of those items were trained, when items were probed during every cycle their pattern and extent of improvement was similar to results with trained items. Naming did not improve for items probed only once during this period. Performance on those items rose only after they were repeatedly probed with the List 2 trained items. Thus, for the untrained experimental items, generalization appeared to be facilitated by repeated probes during semantic training. Potential contributions to this facilitation effect include repeated opportunity to name, effectiveness of corrective feedback, or the repeated demonstration of the procedure.

BB and BG showed gains of similar magnitude for untrained related and unrelated items. Therefore, generalization did not appear to depend on semantic relatedness. Observations of such generalization present an interesting dilemma for researchers in aphasia treatment. When the goal is to train a strategy that has potential for widespread applicability, there is no way to prevent alert subjects with aphasia from generalizing that strategy use, regardless of our research needs to maintain experimental control. In retrospect, there was no reason to assume that these patients would choose to generalize only to those items that were determined a priori as likely candidates for generalization, and to ignore others.

Repeated naming opportunity and corrective feedback were not the only contributors to generalization, however. Comparisons between the pre- and post-training assessments of the items that were not included as trained or untrained items revealed a more generalized effect of improved naming. Performance on these items showed significant improvement from pre- to post-training assessment.

FIGURE 5. Subject SB. Number correct for trained items from List 1 (A) and List 2 (B); dashed line indicates when training was initiated. Percentage correct on productive morphology control task (C).

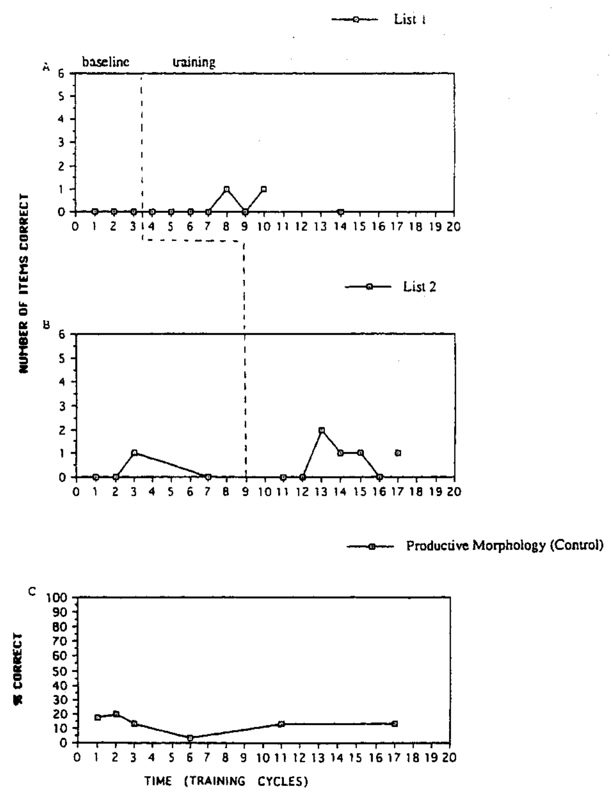
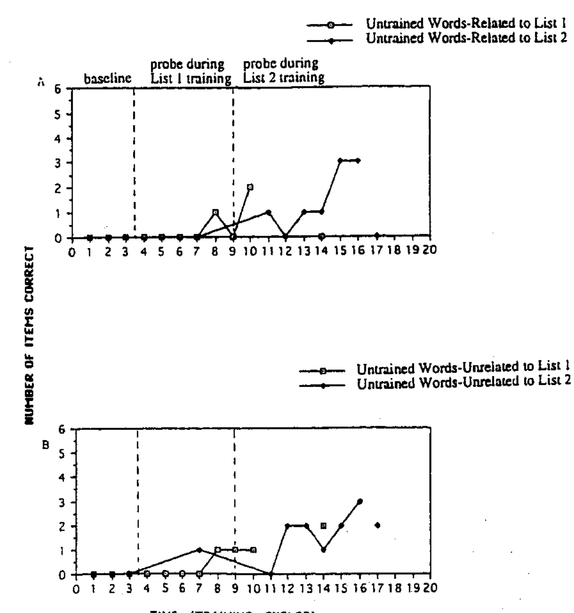


FIGURE 6. Subject SB. Number correct for generalization items that were untrained, semantically related (A) and untrained, unrelated (B). Vertical dashed lines indicate initiation of training for Lists 1 and 2 as indicated in Figure 5, (A) and (B).



These items did not receive repeated exposure or corrective feedback, arguing against the explanation that exposure alone contributed to increased naming performance. Instead, performance on these items suggests that subjects may have adopted the semantic strategy and applied it widely.

In contrast to BB and BG, SB did not show substantial improvement during training, indicating that this procedure was not helpful for him. SB differed from BB and BG in his severity of speech production deficits, as is evidenced by his substantially lower scores on expressive portions of the ADP. It is possible that SB exhibits greater impairment of phonological or semantic access than BB and BG, and therefore improved semantic activation was not sufficient to overcome the deficit.

An alternative explanation for SB's lack of responsivity to training was suggested by his poor performance on a battery of nonverbal cognitive tests that were administered as part of an unrelated study. Although SB has no history of additional neurological problems, he performed in the low-moderate range relative to other individuals with aphasia on those tests. In contrast, the subjects who benefitted from the training procedure (BB and BG) scored in the high range. It is conceivable that SB's cognitive limitations precluded his ability to use the semantic strategy trained here. We had not anticipated that cognitive differences would be of significance in this study; nevertheless, further research should address the effect of nonverbal cognitive skills on learning to apply lexical retrieval strategies, such as the one trained here.

This study deliberately sought to train a general naming strategy that could be self-generated when difficulties in naming any item arise. Such semantic cueing strategies may have potential widespread generalization, typically not demonstrated in previous studies. Further research is needed to help discern which factors, if any, contribute to successful application of semantic cueing strategies. Additional questions to be addressed include whether such training effects can be maintained over long periods of time, and whether training effects evidenced with a confrontational naming task generalize to word retrieval in spontaneous speech.

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Appendix A

Modified Version of the Semantic Feature Analysis Diagram [Adapted from Haarbauer-Krupa et al. (1985)]