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The Effect of Cue Origin on the Facilitation of Aphasic Subjects' Verbal Labeling

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A newly developed, semantically based training method known as *self-cueing* has been shown to be an effective method of teaching aphasic subjects the labels of abstract novel symbols. This cueing method was first examined by Marshall, Neuburger, and Phillips (1992) in a study that compared the effectiveness of eight training procedures on aphasic adults' long-term labeling accuracy. The results indicated that, once training was completed, labeling scores declined rapidly in all conditions except the self-cue. An additional study also showed the self-cue training procedure to be a particularly successful facilitator of long-term naming in aphasic adults (Marshall, Freed, & Phillips, 1994).

Self-cueing is a training procedure that asks aphasic subjects to create their own cues to help them recall a target word. By allowing the subjects the freedom to develop their own cues, they have the opportunity to include personally relevant semantic information about the target words in the cues. The presence of this personalized information was hypothesized to enhance long-term naming abilities because it might help build associations between the target word and other semantic information already present in secondary memory (Bjork & Bjork, 1992).

This research project examined aphasic adults' abilities to recall the labels of novel visual stimuli under two training conditions: self-cueing and provided cueing. Specifically, it was designed to determine if aphasic subjects must create their own cues to obtain the long-term labeling benefits observed in prior research or if it is possible to provide the subjects with semantic cues that result in comparable labeling performance over equivalent periods of time. This question has important clinical implications. If it was found that provided cues resulted in the same naming accuracy as cues created by the subjects, the time spent in developing effective therapy material could be greatly reduced. If, however, the time and effort spent by the subjects and clinician in developing the cues contributed to enhanced long-term labeling accuracy, this would be an important and necessary part of the therapy process.

METHOD

This study was designed as an independent group comparison. The two experimental training conditions each contained one pretraining probe, eight training trials, and five labeling probes. The pretraining probe measured the subjects' ability to label the experimental stimuli prior to training. The training trials were used to teach the subjects the labels of the stimuli. The labeling probes were administered during and after the training trials as a measure of the subjects' recall of the stimuli.

Subjects

Fourteen aphasic subjects from the Portland Veterans Affairs Medical Center participated in the study. All subjects met the following selection criteria: (a) right-handed; (b) between 50 and 75 years of age; (c) aphasic, as the result of a thromboembolic stroke as confirmed by computerized axial tomographic (CAT) scan, medical history, or clinical neurologic exam; (d) at least 6 months postonset; (e) no major oral-motor, visual, or hearing defects that would affect participation in the study; (f) a total score higher than 20 on the *Coloured Progressive Matrices* (Raven, 1962); and (g) moderate to mild language deficits as determined by the overall percentile rankings on the *Porch Index of Communicative Ability* (PICA) (Porch, 1981). The subjects' overall PICA percentile scores ranged from 66 to 88, with a mean of 77. See Table 1 for a summary of subject data.

Assignment to the experimental groups was based on a rank ordering of the subjects' overall percentile *PICA* scores. The top two scoring subjects were numerically "yoked" together and randomly assigned to the two experimental groups. (The yoking of subjects is explained later in the Procedure section.) This same assignment procedure was followed for the third and fourth ranked subjects, the fifth and sixth ranked, and so forth, until all subjects had been paired and randomly placed into the two experimental groups.

Table 1. Summary of Subject Data

Training Condition	*Age*	*MPO*	*Site of Lesion*	*PICA OA %ile*	*Raven Total Correct*
1. SC	60	11	A	88	31
2. PC	51	72	P	87	32
3. SC	70	164	P	86	23
4. PC	60	200+	SC	82	28
5. PC	58	10	A	79	21
6. SC	44	29	A	78	36
7. PC	62	84	A	77	24
8. SC	63	65	A	76	21
9. SC	59	61	SC	75	32
10. PC	51	60	P	74	31
11. SC	65	39	A	72	24
12. PC	63	54	SC	72	33
13. SC	70	82	P	70	28
14. PC	61	57	A	66	27

Note: Training condition = subject number and condition assignment (SC = self-cueing; PC = provided cueing); MPO = months postonset; Site of lesion, A = anterior, P = posterior, SC = subcortical; PICA OA %ile = overall percentile score from the *Porch Index of Communicative Ability* (Porch, 1981); Ravens Total Score = total correct answers (out of possible 36) from *Coloured Progressive Matrices* (Raven, 1962).

Experimental Stimuli

The experimental stimuli consisted of 30 English words and 30 black-and-white symbols. Each word was paired with one symbol. Twenty stimuli were assigned verbal cues to facilitate the subjects' learning of the word–symbol pairs. The 10 remaining stimuli were nontrained control items. These 10 control items were randomly mixed with the 20 cued items during the training trials and labeling probes. Identical word–symbol pairs were assigned to each experimental condition. All target words were highly concrete nouns that had been matched for length (one, two, or three syllables) and degree of concreteness (Brown & Ure, 1969). The symbols were modified Blissymbols (Hehner, 1983) that were totally noniconic in appearance (see Figure 1). These symbols were used in place of more traditional visual stimuli (e.g., words or pictures) to isolate the effects of the cueing procedures from the subjects' prior learning. Precautions were taken not to pair a word with a symbol that had any obvious visual associations with its assigned word. The symbols were printed on 8 x 11 inch white cards.

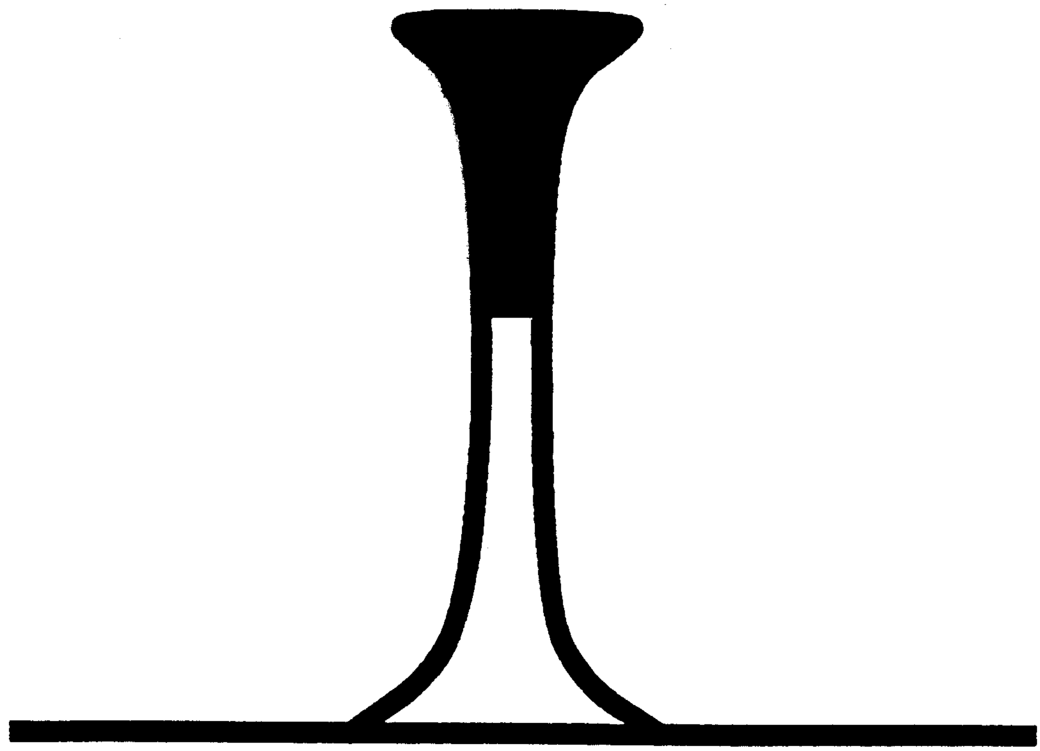

Figure 1. Symbol used for the target word *candy.*

Procedures

Creation of the Self-Cues. Before beginning the self-cue training trials, the subjects were required to develop their self-cues for each cued word–symbol pair. To accomplish this, the examiner presented the first symbol and verbally provided its paired word. The subjects were then asked to create a personalized "clue" to aid in the later recall of that word. To help them develop the most useful cues possible, the subjects were told to draw upon (a) their semantic knowledge of the target words and (b) any perceptual characteristics of the stimuli that were meaningful. A five- to six-word limit was placed on each self-cue to maintain a consistent cue length for all subjects. Subjects who created longer cues were asked to condense them to six or fewer words. Examples of cues developed for Figure 1 (*candy*) include "a rotten tooth," "a kiss," and "a stand for a bowl."

Self-Cue Training Trials. Once the cues were developed, the first training trial was begun. For the 20 cued items, the examiner singly presented the symbols and verbally provided the self-cues. For the 10 control items, only the symbols were presented. If the subjects correctly labeled the symbols, the examiner confirmed the accuracy of the response. If the response was incorrect, the examiner provided the correct word and repeated the self-cue. The first training trial was completed when all 30 symbols had been presented. Subsequent self-cue training trials followed the same procedure; however, the order of symbol presentation varied from trial to trial.

Provided-Cue Training Trials. In this condition, the subjects did not develop their own cues. The self-cues from the previous condition were "recycled" as the provided cues. Cue assignment was based on the yoking of the subjects. For example, the first self-cue developed by subject number one in the self-cue condition was the first provided cue for subject number one in this condition.

The first portion of the provided-cue training trials oriented the subjects to the target words, symbols, and cues. To accomplish this, the examiner presented the first symbol and verbally provided three pieces of information: (a) the word paired to that symbol, (b) the provided cue for that symbol, and (c) a brief but complete rationale for using that cue with the symbol. This rationale was the same as that given by the self-cue subjects when they created the cues. In the few cases where the self-cue referred to excessively subjective interpretations of the stimuli, the examiner minimally modified the information to make it more understandable. The provided-cue training sequence was identical to that in the self-cue training trials.

Labeling Probes. During the labeling probes, the examiner singly presented the 20 cued and 10 control symbols and asked the subjects to provide the correct target words. These probes were administered after the fourth (i.e., midway through training) and the eighth (i.e., immediately after training) training trials. Additional labeling probes were administered 24 and 72 hours after the completion of training.

Results

The results of this study were divided into two data sets, each analyzed using a two-factor analysis of variance with repeated measures.

Cued Items from the Labeling Probes. This analysis compared the cued items from the five labeling probes (see Figure 2). Neither the cue effect [$F(1, 12) = 1.176$, $p > .05$] nor the cue x trial effect reached significance [$F(4, 48) = .557$, $p > .05$]. Only the trial effect was significant [$F(4, 48) = 498.8$, $p = .0001$], with an analysis of simple effects showing a significant difference only between the pretest and mid-training probes. Table 2 lists the group means and standard deviations for the cued items from the labeling probes.

Control Items from the Labeling Probes. This analysis examined the noncued control items from the labeling probes (see Figure 3). The cue effect [$F(1, 12) = 5.77$, $p = .0334$], the trial effect [$F(4, 48) = 37.709$, $p = .0001$], and the cue x trial effect [$F(4, 48) = 3.615$, $p = .0118$] all reached significance. An analysis of simple effects revealed significant differences at the mid-training, posttraining, 24-hour, and 72-hour probes. Table 3 lists the group means and standard deviations for the control items on the labeling probes.

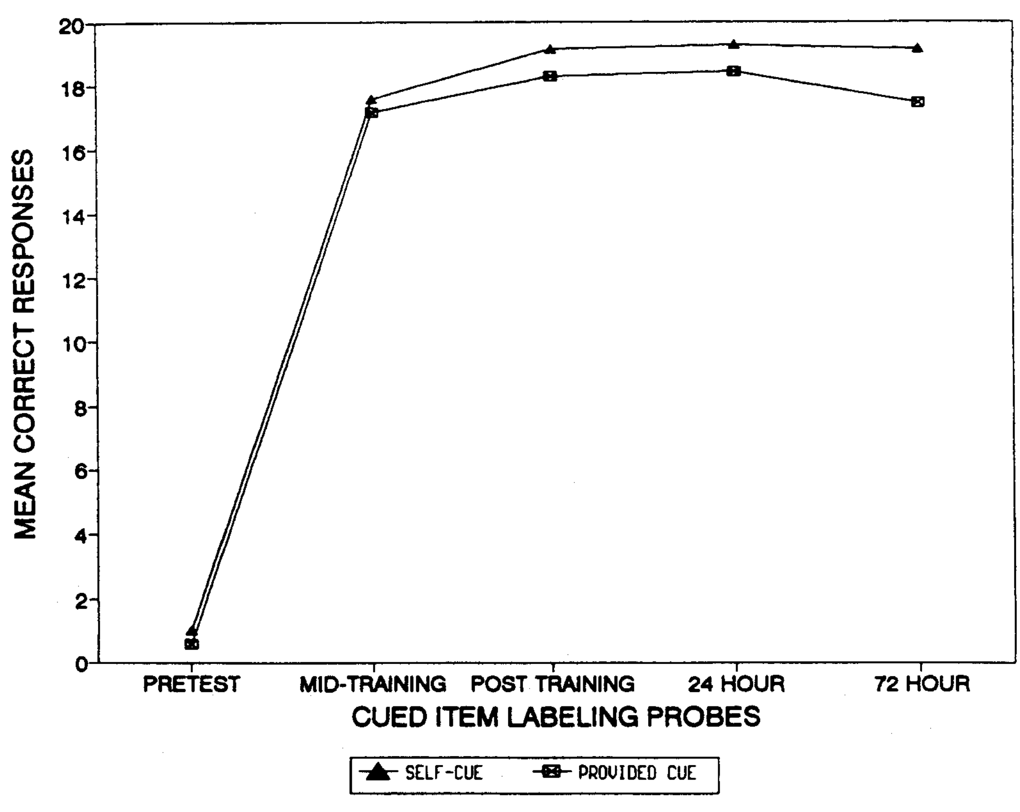

Figure 2. Mean number of correct responses on the cued items from the five labeling probes.

Table 2. Group Means and Standard Deviations for the 20 Cued Items on the Labeling Probes

	Self Cue		*Provided Cue*	
	Mean	SD	*Mean*	SD
Pretest	.9	.7	.5	.8
Mid-training	17.6	1.1	17.1	2.8
Posttraining	19.1	1.1	18.0	1.4
24-hour	19.3	1.1	18.1	1.6
72-hour	19.1	1.6	17.4	2.5

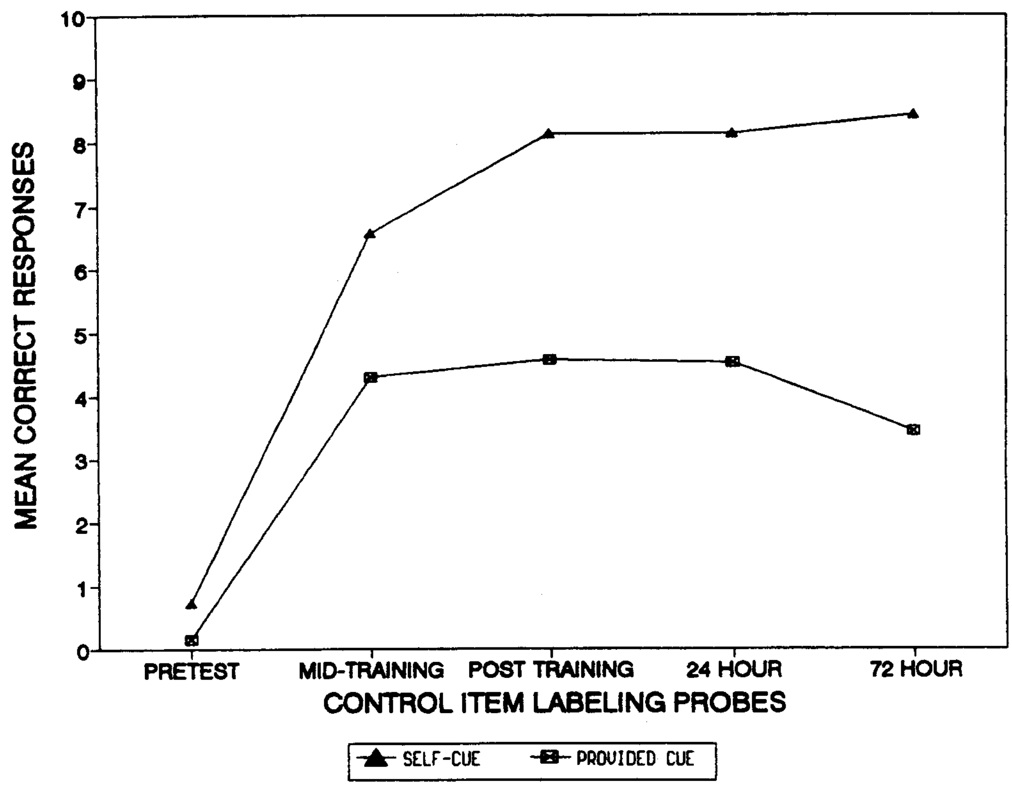

Figure 3. Mean number of correct responses on the nontrained control items from the labeling probes.

DISCUSSION

The results revealed no significant difference between the self-cue and provided-cue subjects' labeling accuracy on the cued items. This suggests that, when aphasic subjects are provided with semantically based

Table 3. Group Means and Standard Deviations for the 10 Control Items on the Labeling Probes

	Self Cue		*Provided Cue*	
	Mean	SD	*Mean*	SD
Pretest	.7	1.1	.1	.4
Mid-training	6.6	3.6	4.3	2.8
Posttraining	8.1	3.3	4.6	2.6
24-hour	8.1	3.2	4.5	2.6
72-hour	8.4	3.3	3.4	1.2

cues, labeling accuracy is approximately as strong as when they are required to create their own personalized cues. However, the analysis of the control items from the labeling probes revealed that subjects in the self-cue condition were significantly more accurate in labeling the nontrained stimuli. Poststudy interviews found that subjects in the self-cue condition created their own cues for the control items far more frequently than did the provided-cue subjects.

This increased use of spontaneous cues in the self-cue condition was probably a result of how the two groups were prepared for the training trials. The self-cue subjects were guided by the examiner in the best methods of developing their cues. They were shown how to creatively visualize the symbols and how to build associations between the symbols and the target words. They were also asked to generate 20 of their own self-cues before training was started. In contrast, the provided-cue subjects did not receive instructions on developing cues. They were given complete rationales for the cues, but they were never explicitly told how to make them. Furthermore, they were never given the opportunity to "practice" creating cues before the training trials. As a result, the provided-cue subjects were probably less adept at formulating spontaneous cues for the control items during the training trials.

This finding reveals several important characteristics of the self-cue procedure. First, it shows that self-cueing can be readily learned by many mildly to moderately impaired aphasic subjects. In this study, the process of explaining and creating the self-cues took approximately 30 minutes. Even the most impaired subjects were capable of learning and implementing the procedure in reasonable amounts of time.

A second important feature of self-cueing is demonstrated by the ease with which the subjects applied the procedure to the nontrained control items. With no prompting from the examiner, *all* self-cue subjects spontaneously attempted to create their own cues for the control stimuli. Far fewer of the provided-cue subjects attempted to do likewise. This finding suggests that the self-cueing procedure can be more readily generalized to untrained materials than can the provided-cue procedure. The clinical value of this should not be minimized. It is critical that aphasic adults are able to readily transfer a training technique to new stimuli and situations if their word-finding abilities are to be enhanced outside of the treatment room.

In conclusion, the results of this study indicate that self-cueing and provided cueing result in comparable amounts of long-term naming accuracy on trained stimuli. The effectiveness of these techniques is most dramatically seen in the stability of the correct responses throughout all phases of the study. For example, 72 hours after training was discontinued, the mean percentage of correct responses for the cued items was 92% in the self-cue group and 83% in the provided-cue group. These findings are especially robust given that all subjects demonstrated some word-finding difficulties as a result of their aphasia. Furthermore, the task they were being asked to perform (i.e., to remember randomly assigned names of noniconic symbols) was rather abstract and impersonal in nature. It is possible that even stronger training effects could have been obtained on a more functional training task.

Although the results for both conditions were comparable for the trained items, the findings for the control items favored self-cueing. The enhanced performance noted in this condition did not appear to be the result of any special memory enhancing properties inherent within the self-cues. Instead, it was attributed to the specialized training the self-cue subjects received prior to training. Given the strong performance by the subjects in this study, both cueing procedures appear to be promising methods of enhancing the word-finding abilities of aphasic subjects. Of the two procedures, self-cueing seems to provide optimal long-term naming accuracy as a result of the added instruction and practice given to the subjects as they create their own cues.

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