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Labeling of Novel Stimuli by Aphasic Subjects: Effects of Phonologic and Self-Cueing Procedures

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A large number of studies have examined the effectiveness of cueing aphasic subjects during episodes of word-finding difficulty (Barton, Maruszewski, & Urrea, 1969; Brown, 1972; Goodglass & Stuss, 1979; Li & Canter, 1983, 1987; Li & Williams, 1989; Love & Webb, 1977; Pease & Goodglass, 1978; Podraza & Darley, 1977; Rochford & Williams, 1962; Weidner & Jinks, 1983). Overall, these studies have clearly shown that immediate word retrieval can be significantly enhanced by cues that provide additional phonologic or semantic information about the target stimulus. Of the different cueing methods examined in these studies, the first-phoneme cue was frequently cited as one of the techniques that provided the highest immediate naming accuracy (Goodglass & Stuss, 1979; Li & Canter, 1983, 1987; Li & Williams, 1989; Love & Webb, 1977; Pease & Goodglass, 1978).

As its name implies, the first-phoneme cue provides additional phonologic information to the aphasic patient. Several authors have offered reasons why the first-phoneme cue is such an effective prompt. Luria (1970) and Bensen (1979) suggested that phonemic cueing supplies information needed to initiate articulation of the target word. Li and Canter (1991) suggested that it supplements the functioning of an "inadequate semantic system" by providing the additional information needed to trigger the target word.

Although the first-phoneme cue is undoubtedly successful in providing immediate help to aphasic subjects during instances of word-finding difficulty, studies have shown that its effectiveness is usually quite short-

lived (Howard, Patterson, Franklin, Orchard-Lisle, & Morton, 1985a; Patterson, Purell, & Morton, 1983). For example, Patterson et al. found that the benefits of a phonemic cue disappeared 30 minutes after its presentation. The transitory nature of the phonemic cue would, therefore, suggest that its value as a therapy tool may be limited, for the ultimate goal of aphasia rehabilitation is to increase speech and language functioning outside of therapy.

The effectiveness of a cue to assist aphasic patients' naming at some later time has been defined as "facilitation" (Howard et al., 1985a). Studies have suggested that the strongest facilitation of naming, ranging from 24-hours to slightly over one year, is obtained when therapy tasks require the activation of semantic representations of target words (Howard et al., 1985a, 1985b; Marshall, Neuburger, & Phillips, in press; Marshall, Pound, White-Thomson, & Pring, 1990; Pring, White-Thomson, Pound, Marshall, & Davis, 1990). The semantic training tasks used in these studies include pointing on auditory command to one of four pictures and making semantic judgments about the stimuli (e.g., answering a question like, "Is a car something you drive?").

The study presented in this chapter compared the effects of two training procedures on a delayed-naming task. The first procedure used repeated presentations of first-phoneme cues to teach aphasic subjects the labels of novel symbols. The second procedure used repeated presentations of subject-created self-cues on the same labeling task. No previous studies have directly compared the effectiveness of these two training procedures on delayed naming. It was hypothesized that the self-cue procedure would result in superior labeling performance because it required the subjects to semantically analyze the stimuli. In contrast, the procedure using the first-phoneme cue would require the subjects to attend only to the phonologic features of the stimuli. As a consequence, later naming performance would not be as accurate.

METHOD

Experimental Design

This study was designed as a repeated measures comparison with two experimental conditions: phonemic cue (PC) and self-cue (SC). Each experimental condition consisted of one pre-experimental probe, eight training trials, and three labeling probes. All sessions were conducted with individual subjects seated in a quiet therapy room. Table 1 illustrates the study's design.

Table 1. Sequence of Training Trials and Labeling Probes

First experimental condition

First session
Preexperimental probe

Second session
(Four days after preexperimental probe)

1. Training trial 1
2. Training trial 2
3. Training trial 3
4. Training trial 4

Midtraining probe

5. Training trial 5
6. Training trial 6
7. Training trial 7
8. Training trial 8

Posttraining probe

Third session
24-hour follow-up labeling probe

Second experimental condition

The second experimental condition was begun approximately one week after the first condition had been completed. The training and probe sequence was identical to that used in the first condition.

Subjects

Eight chronic aphasic subjects were recruited from the Portland Veterans Administration Outpatient Clinic for participation in the study. All were right-handed males. The mean age was 59 years (range, 49–69 years). Time post onset ranged from 30 to 72 months (mean, 51 months). Mean years of subject education was 13 (range, 11–20 years). All subjects demonstrated mild to moderate language deficits as measured by the *Porch Index of Communicative Ability* (PICA), (Porch, 1981) and the *Token Test* (Spreen & Benton, 1977). Each subject was informally screened for any visual, auditory, or oral-motor deficits that would interfere with his ability to complete the study.

Experimental Stimuli

Different but balanced sets of 12 words and 12 abstract symbols were assigned to each of the two experimental conditions. Each word was paired to one of the symbols. Each set contained six nouns and six verbs of no more than three syllables. All words were matched for their degree of picturability. Abstract black-and-white symbols were used as visual

stimuli to control for the effects of prior learning and to minimize the variable naming performance so characteristic of people with aphasia. The symbols, which were identical to those used by Marshall et al. (in press), were Blyssymbols (Hehner, 1983) that had been modified to ensure a totally noniconic appearance. Even so, care was taken not to pair a word to a symbol that had any subtle characteristics of the object or action represented by the word. Each symbol was printed on a white 4-x-4-in. square card. To ensure that all subjects had the same randomized symbol presentation order during training, separate packets of the 12 word-symbol pairs were created for each of the eight training trials within an experimental condition.

Procedures

Preexperimental Probe. The preexperimental probes measured the subjects' ability to recall the word-symbol pairs prior to training. Probe administration was divided into two parts. In the first portion, the examiner presented the symbols singly and verbally provided the matched target word. The subjects were given 15 to 20 seconds to study the symbol. The word was repeated once if requested by the subjects. After approximately a 1-hour interval, the examiner presented the symbols again in random order and asked the subjects to provide the correct labels. All responses were recorded as either correct or incorrect. Minor articulatory errors that did not affect the intelligibility of the responses were ignored. The examiner did not provide any training, cues, or feedback to the subjects during these probes.

Phonemic Cue Training Trials. The initial portion of the PC training trials oriented the subjects to the word-symbol pairs and the phonemic cue. In this first step, the examiner presented a symbol to subjects and verbally provided three pieces of information: (a) the word paired to that symbol, (b) the number of syllables in the word, and (c) the first phoneme of the word. The first-phoneme cue was a verbal production of the target word's initial phoneme followed by a neutral vowel. Words that began with consonant blends were presented as the first two phonemes and a neutral vowel, and those beginning with a vowel used the vowel as the cue. The cues were repeated once if requested by the subjects. After all 12 word-symbol pairs were presented, the subjects began the first PC training trial.

In the training trials, the examiner presented the first symbol and told the subjects (a) the number of syllables in the target word and (b) the initial phoneme. The subjects were then asked to label the symbol with the correct target word. If the response was correct, the examiner verbally indicated the accuracy of the answer. If the subjects were unable to recall

the word, the examiner provided the correct label and repeated the phonemic cue. The responses were recorded as either correct or incorrect. The first PC training trial was completed when the subjects had attempted to label all 12 symbols. Each subsequent PC training trial followed the same training procedure; however, the order of symbol presentation varied from trial to trial.

Self-Cue Training Trials. Before beginning the SC training trials, the subjects were asked to create the self-cues for each of the word-symbol pairs. The examiner presented the first symbol and verbally provided its paired word. The subjects were then requested to develop a personalized self-cue to aid in the later recall of that word. They were told to attend to the meaning of the target word and the perceptual characteristics of the symbol when formulating the cue. In those instances when the subjects could not create a self-cue, the examiner offered an example of what might be appropriate for that particular symbol. In most instances, one example from the examiner was sufficient to help the subjects develop their own self-cues. The final self-cues were almost always short phrases or sentences, five to six words in length. Once the self-cues were created, the first SC training trial began. All training steps in this condition were identical to those in the PC condition except that the subjects used self-cues instead of phonemic cues.

Labeling Probes. Three labeling probes were completed within each experimental condition: (a) a midtraining probe, (b) a posttraining probe, and (c) a 24-hour follow-up probe. In each of these probes, the examiner presented the 12 symbols from the appropriate experimental condition one at a time and asked the subjects to label the symbol. No cues or feedback regarding the accuracy of the responses was provided by the examiner.

RESULTS

The results were analyzed in two sections: training data and labeling probe data. Two-way Analysis of Variance (ANOVA) with repeated measures was used to evaluate the data. In the analysis of the training trials, the effect of the cue (SC vs. PC) was not a significant factor in the subjects performance during the training trials ($F = 2.40$; $df = 1, 7$; $p = 0.16$). The effect of the trials was significant ($F = 72.45$, $df = 8, 56$; $p = .0001$), indicating that subject performance improved as the number of training trials in both cueing conditions increased. The cue by trial interaction was not significant ($F = 72.45$, $df = 8, 56$; $p = .28$), indicating that the subjects' rates

and levels of improvement across training trials did not differ for the two cueing conditions. Overall, the analysis of training data revealed improved subject performance during the training trials but no significant distinctions between the two cueing conditions (see Figure 1).

In contrast to the training data, the probe data demonstrated significant differences between the PC and SC conditions. The cue effect was significant ($F = 12.95$; $df = 1, 7$; $p = .0088$), with mean group recall of the target words consistently higher in the SC probes than in the PC probes. The trial effect showed significant increases ($F = 38.35$, $df = 3, 21$; $p = .0001$) in subject labeling performance from the preexperimental probe to the 24-hour follow-up probe, indicating that probe scores increased for both conditions over time. Most importantly, the cue by trial effect revealed a significant difference ($F = 9.99$; $df = 3, 21$; $p = .0001$) between the two cueing conditions across time, with subject performance highest in the SC condition (see Figure 2).

An analysis of simple effects was conducted to examine differences between the two cueing conditions during each of the labeling probes. The results indicated that there was a significant difference ($p < .01$) between the two conditions on the midtraining, posttraining, and 24-hour follow-up probes. For these three probes, group mean performance was consistently higher in the SC condition. The difference between conditions during the preexperimental probe was not significant, which is an important finding because it suggests that the differences in subject performance were probably not due to unbalanced sets of experimental stimuli.

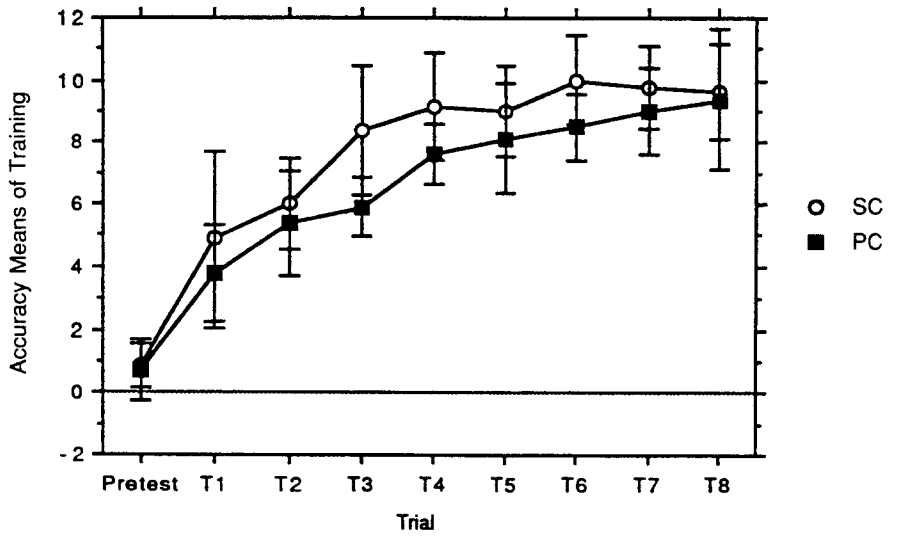

Figure 1. Group mean accuracy scores for training trials in the self-cue (SC) and phonemic cue (PC) conditions.

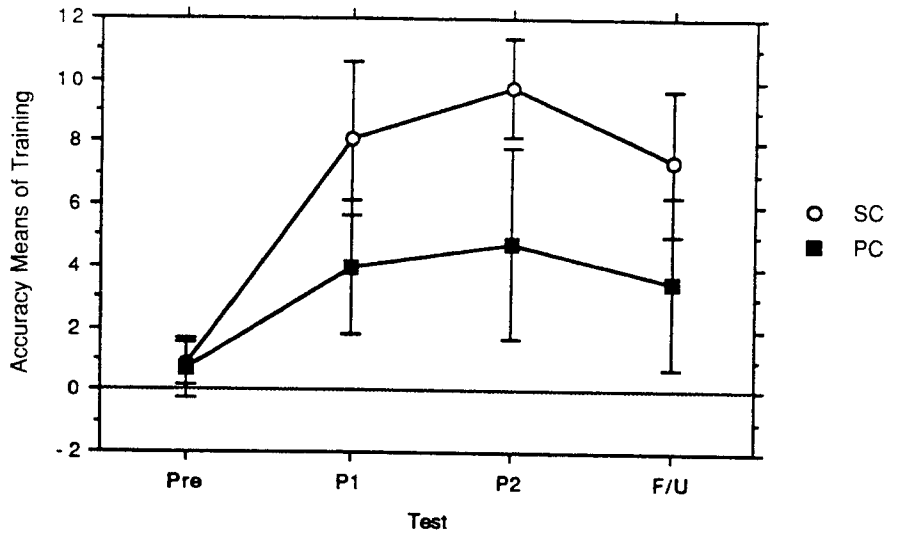

Figure 2. Group mean accuracy scores for preexperimental (Pre), midtraining (P1), posttraining (P2), and 24-hour follow-up (F/U) probes in the self-cue (SC) and phonemic cue (PC) conditions.

DISCUSSION

The findings of this study indicate that a training procedure requiring aphasic subjects to access semantic representations of target stimuli results in more accurate later naming than does a procedure that focuses only on phonologic representations. Overall, the results show that both the self-cue and the phonemic-cue training procedures were successful in teaching the labels of the novel symbols. On the labeling probes, however, subject naming performance was significantly more accurate in the self-cue condition, even after a 24-hour delay.

These findings are consistent with other studies that have examined the effects of semantic processing on word finding (Howard et al., 1985a, 1985b; Marshall et al., 1990; Marshall et al., in press; Pring et al., 1990) and may have clinical implications for aphasia therapy. They suggest that the quality of stimulus presentation may be more important than the quantity, especially when working to generalize aphasic subjects' word-finding skills to situations outside of therapy. This point is perhaps best illustrated by a brief examination of one of the techniques used in stimulation aphasia therapy. A hallmark of this therapy approach has been the use of "auditory bombardment" to enhance word finding in aphasic subjects (Schuell, Jenkins, & Jimenez-Pabon, 1964). This activity consists of presenting the subject with many verbal repetitions of a target word; Schuell

et al. recommended as many as 20 repetitions per word. In essence, such a procedure supplies only phonologic information to the subject and requires little, if any, semantic processing of the stimuli. As demonstrated in the present study, such an activity may successfully elicit the target word at the time of cue presentation, but it might not significantly enhance later naming performance. In contrast, a therapy activity that requires aphasic patients to analyze the semantic features of target words slowly and carefully may be a more effective method of generalizing the naming skills learned in therapy to other settings. Such an approach would differ significantly from the frequent presentations of phonological information currently used in much of traditional therapy.

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