Generalization training in word recognition¹

RICHARD D. PETRE

UNIVERSITY OF KANSAS & UNIVERSITY OF KANSAS MEDICAL CENTER

A study of the effect of number of instances of familiar nouns involved in a match-to-sample training task on subsequent application of the words to new instances was done with four preschool deaf and one normally hearing child. A transfer of training paradigm was used in which Ss were trained to match words with their respective pictures. When three pictures of each word were provided in training, subsequent correct application of words to new pictures was better ($p < .02$) than when training involved only one picture of each word.

Word recognition is generally considered to be a basic skill in early acquisition of reading (Smith & Dechant, 1961, p. 191), and can be defined as the ability of a child to respond to a written word in much the same way as he does to the spoken word. A common noun is an abstraction or class label, with several environmental referents, e.g., the word "dog" is applied to a set of environmental objects which differ in size, color, shape, behavior, etc., yet have certain attributes in common. One basic task of language learning is within-class generalization or the application of a word to all its environmental referents, and between-class discrimination.

The concern of the present study was with the arrangement of a training procedure in order to produce correct application of a word to new instances of it. There has been considerable interest in the problem of training for correct generalization (Morriset & Hovland, 1959; Mandler & Heinemann, 1956). Two important variables in training for generalization are considered to be the number of instances of the class to be learned that are available in training and the degree of original learning. The relationship between number of instances provided in original learning and subsequent correct generalization to new concept instances has not been very well worked out, however. Stern (1965) found no differences in transfer to new instances of trained concepts when groups trained with 12, 6, or 3 instances of each concept were compared. However, the number of concepts which were trained was confounded with the number of instances provided of each concept. In the present study the degree of original learning and the number of classes were held constant while the number of instances per class involved in training was varied. The training and testing procedure involved a match-to-sample task in which S responded to a picture by selecting the correct word for it from among three alternatives.

Method

Subjects. The Ss were four deaf children either five or six years of age who were enrolled in a university-operated preschool for the deaf, and a normally hearing

child, seven years of age, who was enrolled in a class for "emotionally disturbed."

Apparatus. The match-to-sample stimuli were presented by a Kodak Carousel projector by rear projection onto plexiglass panels. The sample stimulus was projected onto a 3 in. x 9 in. panel and three-choice-stimuli were located on three 3 in. x 3 in. panels directly below it. A transparent container was attached to the bottom left side of the response panel. The contingencies were programmed with relay and timing circuitry which was located in an adjoining room. A one-way vision mirror enabled observation of the Ss during training and testing.

The stimuli consisted of four sets of slides. A slide preparation method was used which is described elsewhere (Petre, 1966). Each set contained 48 training slides and 24 generalization-test slides. Each set of slides was designed to train Ss to match two words with their corresponding pictures. Two sets included the words "ball" and "leg" and two sets contained "hat" and "car." One set of each pair of words included three different pictures of each word and one set of each pair of words provided only one picture of each word in the training slides.

Procedure. Each S was trained and tested with each pair of words; one under the one-picture condition and the other under the three-picture condition. Table 1 provides an outline of the procedure for each S.

The preschool deaf Ss were taken into the lab and allowed to select a small toy. The first session consisted of match-to-sample training which involved geometric designs. After the Ss were shown how to operate the apparatus and several matches were made, they were told by gesture that they would get the toy to keep when they filled the marble container to a certain point. A marble was dispensed after each correct match. Each deaf S was given 48 trials of matching geometric designs, and each S matched at least 80% correctly. The normally hearing S did not receive the match-to-sample training but began the word-picture training immediately.

Table 1. The experimental procedure for each of five Ss.

S	Order of Training			
	I		II	
	N. Pictures	Words	N. Pictures	Words
1	1	hat, car	3	ball, leg
2	1	ball, leg	3	hat, car
3	3	hat, car	1	ball, leg
4	3	ball, leg	1	hat, car
5	1	ball, leg	3	hat, car

Table 2. Sessions to criterion and number of errors on the generalization test for the two training conditions.

S	Training Condition			
	1 Picture		3 Pictures	
	Sessions to Criterion	Test Errors	Sessions to Criterion	Test Errors
1	13	16	6	10
2	8	10	6	4
3	2	3	4	3
4	3	7	5	1
5	1	5	1	0

The word-picture matching task consisted of the following sequence: a picture was presented on the upper panel; a press of the upper panel presented three words on the three, lower choice-panels; the correct word, the other word of the pair being trained, and a nonsense syllable; a press of the lower panel containing the correct word delivered a marble and advanced the projector to the next slide. An incorrect response produced a 2 sec time-out before the next slide was presented. The Ss received 48 training trials in each session until the learning criterion or 22 correct trials in 24 was reached. Immediately after the learning criterion was met, 24 generalization-test slides were presented. The test procedure was similar to the training procedure with two exceptions: the sample stimuli consisted of three new pictures of each word which had not been involved in training; and each response, both correct and incorrect, delivered a marble so differential reinforcement would not be available.

Training on the second pair of words under the other training condition was begun with the next session. The Ss had daily sessions, and the total number of sessions ranged from 2 to 19.

Results

Table 2 presents learning data and generalization-test data for each S. It should be noted that S-5 was the normally hearing child who was somewhat older than the other Ss. Her performance differed somewhat in that the learning criterion was met in the first session for both sets of words. The same kind of relationship between training condition and generalization performance was obtained, however. The principal finding was that the number of pictures involved in training had a significant effect on subsequent correct application of words to new pictures ($t=3.94$, $df=4$, $p<.02$), with fewer errors made following training with three pictures. There was no difference in sessions to criterion between the training conditions. All Ss but S-5 took fewer sessions to reach the learning criterion for the second pair of words than for the first set; however, a t test based on all five Ss

did not reach statistical significance ($t=1.56$, $p>.05$). It should be pointed out that performance on the generalization test was significantly better than chance (binomial test, $p=.05$) for all Ss and both training conditions with the exception of S-1 following training with a single picture of each word.

Discussion

The preschool deaf Ss had not received reading instruction prior to participating in the present study. Although the older, normally hearing child could name the words used prior to training, the same relationship between training condition and generalization performance was observed. The specific response to words which was required with the present procedure was probably one which was new to the older S. Therefore, less than perfect transfer from the classroom learning situation to the laboratory would increase the control exerted by the training condition which would be expected to result in the obtained function.

It would seem probable that for young, normally hearing children who had not received reading instruction, the correct application of a printed word to new instances would be less dependent on the number of instances of it provided in training. If the word were a familiar one, either the printed word or a picture of one of its referents should have the ability to elicit a verbal response from the child which could then mediate the correct application of the printed word to a new instance. For young deaf children, the training could be considered to be analogous to original language learning of very young normally hearing children. However, developmental variables associated with age and a difference in the amount of pretraining stimulation might make such a comparison of limited usefulness in understanding language acquisition.

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Notes

1. This research was supported by Research Grant HD 00870-04 from the National Institute of Child Health and Human Development to the Bureau of Child Research, University of Kansas. The author wishes to acknowledge the kind cooperation of Mrs. Betty Bennett, teacher of the preschool for the deaf at the Children's Rehabilitation Unit, University of Kansas Medical Center and Dr. June Miller, professor in the Speech and Hearing Department.