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A Measure of the Differential Effects of Two Language Training Sequences: Expressive-Receptive and Receptive-Expressive

Melbourne Frank Hovell

Western Michigan University

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A MEASURE OF THE DIFFERENTIAL 
EFFECTS OF TWO LANGUAGE TRAINING SEQUENCES: 
EXPRESSIVE-RECEPTIVE AND RECEPTIVE-EXPRESSIVE

by

Melbourne Frank Hovell

A Thesis
Submitted to the
Faculty of The Graduate College
in partial fulfillment
of the
Degree of Master of Arts

Western Michigan University
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August 1973
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I wish to express my sincere gratitude to Dr. Jack Michael, Dr. David Lyon, and Dr. Wade Hitzing for their helpful advice and careful instruction. I also wish to acknowledge the generous support and cooperation extended by Mr. Richard Pattison and Miss Leslie Rose of the John F. Kennedy Center and other members of the Kalamazoo Public School District.

Melbourne F. Hovell
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CHAPTER I

The Problem and Its Background

Language is often said to follow a developmental sequence of first receptive or "comprehension" skills and subsequently, expressive or vocal responses (McCarthy, 1954, pp. 500, 504). Said another way, children appear to understand the meanings of words, or appropriately respond to verbal stimuli produced by their parents and others, before they begin to speak themselves.

Some of the most notable theoretical works regarding language development are the mentalistic views of Noam Chomsky (1967) and Eric H. Lenneberg (1967), and the functional analyses of B. F. Skinner (1957). Chomsky (1967, p. 81) asserts that language is a function of the maturational development of internal language processes, or "deep structures." Chomsky explains that this underlying abstract system is not acquired by learning. Instead, this conceptual apparatus is used to specify the form of the language to which an individual is exposed.

Lenneberg (1962) believes that verbal behavior involves the learning of "meanings", and these are then manifested first in receptive and later expressive language. For example, Lenneberg (1962, p. 424) states,
"In the process of language learning, the acquisition of grammatical rules must occur first in connection with analyzing incoming sentences: then with producing outgoing sentences."

He goes on to explain that the difference between receptive and expressive language is only in form, and that an individual possessing these forms understands the underlying meaning of the word(s).

Skinner (1957, pp. 185-198) explains verbal behavior in terms of its environmental effects or function. He asserts that receptive and expressive language skills are separate repertoires, which are a product of different controlling variables, and not the result of an underlying process such as "knowing" the meaning." Skinner's operant analysis of a gestural response which is indicative of receptive language points out three major controlling variables: (1) a nonverbal stimulus, (2) a verbal stimulus, and (3) a history of reinforcement for similar responses. Thus, a pointing response would be controlled by the object pointed to, another individual's question or comment concerning the object, and the history of reinforcement from the verbal community for such responses. The same type of analysis for an expressive response yields but two controlling variables—a nonverbal stimulus and reinforcement for similar responses (Skinner, 1957, pp. 81-146). For example, an individual in the presence of an automobile has an increased
probability of emitting the vocal response "car" providing he has been reinforced for similar responses in the past.

None of these theoretical positions thoroughly explain language acquisition. However, in spite of an incomplete account, these theories have been influential in the design of language training programs and the fostering of further language research. One empirical question of some importance in the design of language programs concerns the most effective sequencing of receptive and expressive training components.

Program designers attracted to Chomsky's explanation of language development would probably begin training with the teaching of receptive language skills and follow this with expressive. Because Chomsky believes that the development of an underlying process is the critical variable in the acquisition of language, there is a de-emphasis on the importance of learning. This is particularly true for the learning of these response forms; which is learned first would be considered of little significance. A programmer faced with teaching both repertoires and a theory which assigns no difference to the possible training orders would logically begin training by teaching the easiest response form to teach and learn. This is probably the gestural response. Following Lenneberg's explanation of language development, the design of a program must start with receptive training.
As reported above, he believes that "understanding" must be acquired by first "analyzing" incoming verbal stimuli and later by producing expressive responses.

Individuals designing language programs who are attracted to Skinner's analysis of verbal behavior are left in a somewhat ambiguous situation with respect to electing the most effective training sequence. From the position formulated upon an operant analysis, there is support for both a receptive-expressive and an expressive-receptive language training sequence. The following is an argument supporting a receptive-expressive training sequence. If a nonlanguage child does not have adequate receptive skills (e.g., does not point appropriately) then they must be shaped. Gestural responses indicative of these skills are relatively easy to shape compared to vocal responses. In other words, the gross muscle movements of pointing are more easily acquired than the finely coordinated muscle movements involved in articulating. Furthermore, many children exhibit well developed receptive ability prior to language training, so for these children, training is reduced to bringing an already established gestural response under new stimulus control. For these reasons, receptive language could probably be acquired and taught more easily than expressive.
There is also some reason to believe that training first receptive language will facilitate the acquisition of expressive. A child beginning language training usually has a history of emitting vocal noises, though these sounds may not qualify as language. This vocal repertoire appears to be "imitative," in that the child imitates his vocal stimulus/response. It is reasonable to expect that receptive training, which involves the presentation of an auditory stimulus associated with a particular object (or event), would facilitate the emission of a vocal language response for children with such a history. This process is not clearly generalization in that the reinforcement is often unknown and it is difficult to identify a stimulus gradient along which generalization might occur. However, something similar to stimulus generalization may be operable. A child may be able to imitate a vocal model which is repeatedly presented by a teacher during intensive receptive training after having developed such a "self-imitative" repertoire (Skinner, 1957, pp. 52-65, 125-126, 438-440). That is, children may be able to express the name of an object after hearing a teacher name it during receptive training. Subsequently, during expressive training there may be a savings in the number of training trials or possibly an improvement in the quality of performance due to this experience.
It is also plausible that an expressive-receptive training sequence may be as effective in establishing both expressive and receptive language as the reverse. Expressive responses consist in part of motor responses which may be considered as measures of receptive ability that happen to produce auditory stimuli. The training of expressive language may concurrently involve the training of receptive language. If this occurs, it is reasonable to expect that the concomitant training of expressive and receptive skills may facilitate the acquisition of receptive language prior to systematic receptive training.

In other words, training a child to say the name of an object may allow that child to point to the correct object when someone else names it. Thus, initiating language training with expressive training should result in a savings of the number of training trials required to establish receptive language. If this savings is large enough, the expressive-receptive sequence may be more efficient than the reverse.

A review of presently available language acquisition programs helps little in determining the difference between these two possible sequences. Both training sequences are represented. Programs designed by Gray and Ryan (1971), Kent, Klein, Falk and Guenther (1972) and Tawney and Hipsher (1972) employ a
receptive-expressive sequence. The reverse sequence is exemplified in separate language acquisition programs by Buddenhagen (1971), Lovaas (1966) and Sapon (1968). The procedural heterogeneity makes these programs virtually impossible to compare. This is certainly the case for demonstrating differences in the effectiveness of the two training sequences employed. However, these programs do serve as evidence that both sequences are effective in teaching receptive and expressive language skills.

Functional analyses (Rheingold, Gerwitz, and Ross, 1959; Risley, 1966; Lovaas, 1966; Brigham and Sherman, 1968) of language development have demonstrated the extensive control exerted by reinforcement. More recent investigations of verbal behavior have focused upon antecedent variables effecting language behavior. A number of studies (Frazer, Bellugi and Brown, 1963; Pimsleur, 1963; Winits and Preisler, 1965; Mann and Baer, 1971) have found that receptive training prior to expressive training facilitates the acquisition of the expressive repertoire.

The study by Mann and Baer (1971) is probably the best example of these investigations. This research involved the assessment of the effects of receptive language training on the articulation of nonsense words. Subjects were taught to point to the correct nonsense object in response to a nonsense word. After this training, the subjects were required to say both nonsense and English control words for which no training had been conducted.
Articulation was found to be superior for the nonsense words, and it was concluded that receptive training facilitates expressive language acquisition.

In contrast to these results are the findings of somewhat similar studies (Dickerson, Giradeau, and Spradlin, 1964; Hamilton, 1966; Guess, 1969). The study conducted by Guess (1969) involved measurement of the effects of receptive and expressive training on the acquisition of a plural morpheme (e.g. the use of "s" and "es" suffixes). None of these subjects were able to correctly vocalize plural responses after only receptive training. Following a "reversal" condition, where the experimenter trained plural responses to singular objects and singular responses to plural objects, results showed a maintenance of correct plural and singular usage. It was concluded that receptive language and expressive speech can be two separate and functionally independent classes of behavior. However, a more recent investigation conducted by Guess and Baer (in press) which again investigated the effects of transfer between receptive and expressive language, found mixed results. Three of four subjects exhibited essentially no transfer, but the fourth exhibited it in both directions.

Clearly, the research attempting to determine the relationship between expressive and receptive language has yielded ambiguous data. Results have shown that receptive
training improves vocal responding under some circumstances, and under different conditions expressive training appears to improve nonvocal responding. Certainly the mixed results obtained in these studies indicate the need for further research. Of particular importance is the execution of a more direct attack on the problem of differences between receptive-expressive and expressive-receptive training sequences. The above investigations have only tangentially obtained information related to these sequences, and then results were ambiguous.

The purpose of this study was to directly measure the differential effectiveness of receptive-expressive and expressive receptive language training sequences.
CHAPTER II

Method

Subjects and setting

Four trainable retarded children, seven and eight years old, served as subjects. These children had Stanford Binet IQ scores ranging from 38 to 52. All of the subjects were attending special education classes at the John F. Kennedy Center, part of the Kalamazoo Public School System.

Each experimental training session was carried out in a small conference room approximately eight by twelve feet, which was furnished with a low table and small chairs. Training sessions for each subject were conducted for approximately thirty minutes per day, four days a week.

Stimuli: Nonsense words

Two lists of nonsense words were used in this study. Each list contained three one-syllable, two two-syllable and one three-syllable nonsense words. Each syllable of these nonsense words consisted of a consonant-vowel-consonant trigram. These trigrams were constructed by combining the short vowel sound of a, e, or o with two consonant letters from the alphabet.
A list of 1326 consonant-vowel-consonant trigrams was produced using all consonants in the alphabet. This list was reduced by deleting all duplicate sounds (e.g. cag and kag) and all trigrams which were or sounded like English words (e.g. cat, lad). From this list, trigrams were randomly selected and combined to produce two groups of eighty two-syllable and three-syllable nonsense words. These two lists of eighty nonsense words were reduced to thirty each by eliminating those words subjectively assessed as very difficult to pronounce. The two and three-syllable nonsense words employed in this study were randomly selected from these remaining lists. One-syllable nonsense words were selected from the first syllable of the two and three-syllable word lists after the selection of the two and three-syllable nonsense words\(^1\).

**Stimuli: Nonsense objects**

Foam rubber, sandpaper, poster board, plastic, cloth, and other assorted materials were used to construct three dimensional objects of varying sizes, shapes, and colors. Twelve markedly different objects were constructed, six corresponding to each list.

\(^1\)The one syllable words were added to the lists in this manner as a revision to the original procedure.
For example, a flat disk of coarse black sandpaper cut into a three dimensional spiral, corresponded to the nonsense word "fapvotnol" for one list and an amoebic shaped piece of fluorescent orange posterboard with loops of blue yarn attached, corresponded to the nonsense word "wavjasket" for the second list. An effort was made to construct these stimuli so that they did not resemble one another or any common object in the environment.

Reinforcers

Stimuli used as presumed reinforcers were social praise and edibles. Following each correct response, the experimenter told the subject, "That's right, very good!" and presented him with a piece of candy or cereal (eg. M & Ms or Cherrios).

Training procedure

This experiment involved two training procedures: (1) expressive-receptive and (2) receptive-expressive. Each of the four subjects was exposed to both procedures. The order of exposure was reversed for half of the subjects. Thus, two subjects received (1) expressive-receptive training followed by (2) receptive-expressive training and the remaining two subjects received the reverse order. One of the lists of six nonsense words corresponded to one training sequence, and the other list
corresponded to the remaining sequence. Therefore each subject was taught all twelve nonsense words using both training sequences.

The expressive and receptive training components involved the same respective procedures for both training sequences. Expressive training consisted of the experimenter saying the subject's name and "what is this called?" while pointing to a nonsense object on the table in front of the subject. The experimenter prompted the correct response for the first trial and all trials preceded by two errors by saying, "Say fapvotnol" (or some other appropriate nonsense word) immediately after asking the subject what a given stimulus object was called. All correct responses, both prompted and unprompted, were consequated immediately with social praise and an edible. The edibles were placed in a cup before the subject following each correct response, and the subject was allowed to eat the contents of the cup following completion of a training session.

Incorrect responses were consequated by approximately five seconds of "time-out" during which the experimenter turned his head to the side looking away from the subject. Failure to respond after approximately ten seconds was also counted as an incorrect response and consequated as such.
The procedures involved in receptive training were essentially the same as those in expressive training, with the exception of the response requirement. The experimenter requested the subject to point to a particular nonsense object by saying the subject's name and "Point to the fapvotnol" (or some other nonsense word). The initial trial for each word was prompted by the experimenter's pointing to the correct nonsense object immediately following asking the subject to point.

Preceding each training component, the subjects were instructed as to the response requirement. For expressive training, the subjects were told that they were to tell the experimenter the name of the objects on the table when the experimenter asked them what they were called. Similarly, for receptive training, the subjects were told that they were to point to the correct object that the experimenter named.

The six nonsense objects were divided into two sets of three for each training component. Only three stimuli or one set was present at one time during training. The presentation of each nonsense stimulus was coordinated with the shaping

---

1It is not clear what effect these instructions had for such retarded subjects but it seemed safer to give the instructions anyway as a constant beginning to the procedure.
procedure for training. This was as follows. Object A was placed before the subject and the first trial initiated. If a correct response was emitted, two nonprompted trials were conducted. If either of these two nonprompted trials was responded to correctly, the experimenter continued to present nonprompted trials. Except for the first trial, prompting only followed two consecutive errors. After the subject had emitted two consecutive correct responses for stimulus A, stimulus B was placed next to A and the same training procedure was repeated. After two consecutive correct responses were emitted for stimulus B, stimulus C was presented, making a total of three stimuli present. Training was then conducted as for the previous two stimuli.

Once the complete set of three stimuli was placed before the subject, a criterion of four consecutive correct responses for completion of training was implemented. The experimenter presented trials for a specific stimulus object until two correct responses were obtained. This signalled movement to another stimulus object, where two consecutive correct responses were evoked before moving to the last object in the set. Immediately after two successive correct responses were made to each nonsense object, while all three were present, the experimenter randomized trials among the stimuli until four successive correct
responses were reached for each stimulus.

When the initial prompted trial for any object was responded to incorrectly, an additional prompted trial was conducted. If this second trial evoked a correct response, training proceeded as described above. When the second prompted trial resulted in an additional error, an imitation-shaping procedure was instituted. For expressive training, this consisted of breaking the nonsense word into syllables or sounds and training these individually and in combination using a backward chaining procedure. For receptive training, the experimenter physically moved the subject's arm in a pointing motion and slowly faded out his physical assistance.

If, at any time, 75 trials were conducted for a given response without reaching four consecutive correct responses, training for that word was discontinued. This overall training procedure was repeated for the second set of three stimulus objects to complete the list of six for each training component within each training sequence.

Testing

Three tests were administered for each training sequence. The first of these followed the first and preceded the second training component. This test was used to determine the need for
further training. When expressive training was the first training component, this test consisted of asking the subject to point to the appropriate object. The experimenter asked the subject to name the appropriate nonsense stimulus when receptive training constituted the first training component. The total array of six stimuli were present during both of these tests. Test trials were randomized for the six objects, and only two trials per object were presented. Those stimuli to which a subject responded correctly both times were excluded from training during the second component.

The second and third tests were administered at the completion of each training sequence after both receptive and expressive training. These tests were designed to assess both receptive and expressive skills. They involved the combined procedures of the expressive and receptive tests as described above. The six stimulus objects were presented together and the experimenter conducted randomly twelve receptive trials requiring a pointing response and twelve expressive trials requiring a vocal response for each test respectively. Trials for both tests were not prompted, and no differential consequence was presented for correct or incorrect responses.

Recording procedures

The experimenter and an observer were present during
virtually all training sessions, and both simultaneously recorded data. For expressive training, vocal responses were recorded as correct if they were reasonably close approximations to the model sound. The subjects were required to touch the object in question during receptive training in order for a pointing response to be scored as correct. Prompted trials were recorded as such during each component of training.
CHAPTER III

Results

Reliability measures

The experimenter and observer simultaneously recorded performance data for each subject during all but one training session. It was generally agreed that the experimenter's recording of the subjects' performance was accurate. The total number of agreements between the experimenter and observer was divided by the total number of agreements plus disagreements to obtain a reliability coefficient. For the 2574 trials conducted, the experimenter agreed with the observer for 2495 trials yielding a mean of 96.9% overall reliability. This same procedure was conducted for each subject individually and resulted in percent agreement figures ranging from 94.3 to 98.9. On one occasion (one session for one subject) the experimenter and observer did not agree upon the total number of trials presented. These data were not included in the reliability calculations.

Reliability measures were obtained for the first three subjects' expressive training \(^1\) by comparing the simultaneously

\(^1\)Time did not permit this same measure for subject four.
recorded data of the experimenter and an "outside" observer. This observer was trained as a secondary school English teacher. These reliability measures confirmed the above results. For 240 of the 2574 trials, a mean percent agreement of 97 and a range of 94 to 100 was obtained.

It was not feasible to separate the experimenter and observer during these reliability measures. As a consequence, the observer was able to see the experimenter's consequation of responses. To this extent these reliability measures are not independent.

However, reliability data collected during test trials was independent because no consequation of correct and incorrect responses was presented. The observer could not determine the experimenter's judgement. For the 144 test trials conducted, a range of 98 to 100 percent agreement was obtained for the four subjects.

**Training sequences**

The results indicate that the expressive-receptive training sequence was superior to the receptive-expressive sequence. All subjects required fewer median number of receptive training trials for the expressive-receptive sequence than they did for the receptive-expressive sequence. The data presented in Figure 1 depict this savings. When comparing each subject's performance during the two receptive training components it is apparent that
Fig. 1 Median number of training trials per training component for each training sequence and each subject.

* Training did not reach criterion for three or more words, therefore the true median is above this point.
fewer trials were required when receptive training followed expressive training. The resulting savings in median number of trials ranged from 5 to 21.5 for the four subjects.

The data (Figure 1) also show another slightly less dramatic but consistent result. The subjects' performance during expressive training appeared to be improved when preceded by receptive training. This can be seen by comparing each subject's expressive training components for the two sequences. The data show that fewer expressive training trials were required when the expressive component followed receptive training. In other words, the median number of training trials was lower for the expressive training component within the receptive-expressive sequence compared to the expressive training component of the reverse sequence. However, for subjects 1 and 2 this savings is difficult to interpret. Training did not reach criterion for more than three words during the expressive training components for these subjects. Consequently, the true median number of training trials is not known.

Test data confirm the facilitation effect of expressive training for receptive language. Data presented in Figure 2 indicate that expressive training resulted in receptive skills prior to training receptive usage for these subjects. This can be seen by comparing the three receptive test performances for the two sequences for each subject. For example, the receptive tests for subject 1 show that following expressive training the subject obtained 50% of the receptive test correct without
Receptive test following:

- Expressive training
- Expressive-Receptive training
- Receptive-Expressive training
- Receptive training
- Expressive-Receptive training
- Receptive-Expressive training

Expressive test following:

- Expressive-Receptive training
- Receptive-Expressive training

---

**Fig. 2** Mean percent of correct responding during expressive and receptive testing for each training sequence.
receptive training. After both expressive and receptive training his receptive test performance improved to 67%.

In contrast to these results, the receptive test following the receptive-expressive training sequence, reveals only 58% correct. Thus, prior to receptive training during the expressive-receptive training sequence, subject 1 performed almost as well as he did following receptive training during the receptive-expressive sequence. Furthermore, after both expressive and receptive training during the expressive-receptive sequence, subject 1 achieved a higher percentage correct on the receptive test than he did after receiving receptive-expressive training. Similar test results were obtained for the remaining three subjects and for only one word for subject four did the reverse facilitation appear. In this case, receptive training resulted in expressive ability prior to expressive training.

Comparing the final two tests for the two training sequences for each subject reveals the expressive-receptive sequence as the more effective for three of the four subjects. For subjects 1, 3 and 4 the expressive-receptive training sequence resulted in a greater percent correct per word during the final two examinations than did the receptive-expressive sequence. The test results for the one exceptional subject (subject 2) show mixed and poor performance across both training sequences.

Two major results were obtained from this study. First, expressive training facilitated acquisition of the receptive.
response repertoire. Secondly, receptive training slightly facilitated acquisition of an expressive repertoire.

Subject 1

Table I depicts a summary of the data for subject 1. It is again apparent that the expressive-receptive training sequence is superior to the receptive-expressive sequence. However, attention to the total number of trials for the two sequences indicates that the receptive-expressive sequence was slightly more efficient than the expressive-receptive. This result probably reflects an "inflation" of sixty trials for the expressive-receptive sequence, which was due to a procedural revision. The original presentation of stimuli resulted in virtually no correct responding and was revised to the procedure described above.

There did not appear to be an articulation difficulty during training for the three words not trained to criterion. The subject simply did not achieve four consecutively correct responses for these words. Interestingly, each of these words was only one syllable. There was no apparent explanation for this result.

Subject 2

The results in Table II show the generally poor performance achieved by subject 2. This subject did require less receptive training when it was preceded by expressive. However, support
<table>
<thead>
<tr>
<th>Nonsense Words</th>
<th>Expressive Training</th>
<th>Receptive Test</th>
<th>Receptive Training</th>
<th>Overall Test</th>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Expr.</td>
</tr>
<tr>
<td>Dop</td>
<td>63</td>
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<td>30</td>
<td>50%</td>
</tr>
<tr>
<td>Yad</td>
<td>75*</td>
<td>0%</td>
<td>38</td>
<td>0%</td>
</tr>
<tr>
<td>Hod</td>
<td>75*</td>
<td>50%</td>
<td>8</td>
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<td>Yafgeb</td>
<td>102</td>
<td>50%</td>
<td>28</td>
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<td>Regdof</td>
<td>35</td>
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<td>0</td>
<td>100%</td>
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<td>Fapvotmol</td>
<td>43</td>
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<td>100%</td>
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**SEQUENCE II**

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<th>Expressive Test</th>
<th>Expressive Training</th>
<th>Overall Test</th>
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<td></td>
<td></td>
<td></td>
<td>Expr.</td>
</tr>
<tr>
<td>Teg</td>
<td>7</td>
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<td>11</td>
<td>50%</td>
</tr>
<tr>
<td>Som</td>
<td>8</td>
<td>0%</td>
<td>65</td>
<td>0%</td>
</tr>
<tr>
<td>Yem</td>
<td>53</td>
<td>0%</td>
<td>75*</td>
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<tr>
<td>Nevsar</td>
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<td>58</td>
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<td>Mexpog</td>
<td>50</td>
<td>0%</td>
<td>24</td>
<td>0%</td>
</tr>
<tr>
<td>Wavjasket</td>
<td>48</td>
<td>0%</td>
<td>7</td>
<td>100%</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
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<td><strong>240</strong></td>
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<td><strong>MDN</strong></td>
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<td><strong>41</strong></td>
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* True totals are not known. Training was discontinued after completing 75 trials.

** Due to a procedural change this word received sixty additional training trials.
### TABLE II
A COMPARISON OF TWO LANGUAGE TRAINING SEQUENCES FOR SUBJECT 2

<table>
<thead>
<tr>
<th>Nonsense Words</th>
<th>Receptive Training</th>
<th>Expressive Test</th>
<th>Expressive Training</th>
<th>Overall Test</th>
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<td>25</td>
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<td>39</td>
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<td>Yad</td>
<td>17</td>
<td>0%</td>
<td>75*</td>
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<tr>
<td>Regdof</td>
<td>49</td>
<td>0%</td>
<td>71</td>
<td>0%</td>
</tr>
<tr>
<td>Fapvotnol</td>
<td>7</td>
<td>0%</td>
<td>75*</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>180</td>
<td></td>
<td>383</td>
<td></td>
</tr>
<tr>
<td><strong>MDN</strong></td>
<td>25</td>
<td></td>
<td>73*</td>
<td></td>
</tr>
</tbody>
</table>

#### SEQUENCE II

<table>
<thead>
<tr>
<th>Nonsense Words</th>
<th>Expressive Training</th>
<th>Receptive Test</th>
<th>Receptive Training</th>
<th>Overall Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Expr.</td>
</tr>
<tr>
<td>Teg</td>
<td>75*</td>
<td>0%</td>
<td>19</td>
<td>0%</td>
</tr>
<tr>
<td>Som</td>
<td>75*</td>
<td>50%</td>
<td>7</td>
<td>0%</td>
</tr>
<tr>
<td>Yem</td>
<td>65</td>
<td>0%</td>
<td>22</td>
<td>0%</td>
</tr>
<tr>
<td>Nevsar</td>
<td>62</td>
<td>50%</td>
<td>21</td>
<td>0%</td>
</tr>
<tr>
<td>Mexpog</td>
<td>75*</td>
<td>0%</td>
<td>35</td>
<td>0%</td>
</tr>
<tr>
<td>Wavjasket</td>
<td>75*</td>
<td>100%</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>427</td>
<td></td>
<td>104</td>
<td></td>
</tr>
<tr>
<td><strong>MDN</strong></td>
<td>75*</td>
<td></td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

* True totals are not known. Training was discontinued after completing 75 trials.
for one training sequence over another is tempered because neither expressive training components for the two sequences was powerful enough to train more than three words to criterion.

The failures to achieve criterion for this subject were associated with one, two and three syllable words. Because articulation difficulties were clearly apparent during expressive training, and because this subject was able to correctly identify five of these seven failed words during receptive testing, it appeared that these failures were largely due to an inability to approximate the correct enunciation of the words four times in a row.

Subject 3

The complete results for subject three are summarized in Table III. It is again apparent that the expressive receptive training sequence resulted in less receptive training compared to the receptive-expressive sequence, as measured by median number of training trials and percent correct during testing. The absolute total number of trials for the two sequences differed only slightly, and this difference was weighted in support of the receptive-expressive sequence. However, there is reason to believe this to be a by-product of confounding between two words in
### TABLE III

**A COMPARISON OF TWO LANGUAGE TRAINING SEQUENCES FOR SUBJECT 3**

<table>
<thead>
<tr>
<th>Nonsense Words</th>
<th>Expressive Training</th>
<th>Receptive Test</th>
<th>Receptive Training</th>
<th>Overall Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Expr. Recep.</td>
</tr>
<tr>
<td>Dop</td>
<td>17</td>
<td>50%</td>
<td>7</td>
<td>100% 100%</td>
</tr>
<tr>
<td>Yad</td>
<td>56</td>
<td>100%</td>
<td>0</td>
<td>0% 50%</td>
</tr>
<tr>
<td>Hod</td>
<td>34</td>
<td>100%</td>
<td>0</td>
<td>0% 100%</td>
</tr>
<tr>
<td>Yafgeb</td>
<td>75*</td>
<td>0%</td>
<td>7</td>
<td>50% 0%</td>
</tr>
<tr>
<td>Regdof</td>
<td>27</td>
<td>100%</td>
<td>0</td>
<td>0% 100%</td>
</tr>
<tr>
<td>Fapvotnol</td>
<td>75*</td>
<td>100%</td>
<td>0</td>
<td>100% 100%</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>284</strong></td>
<td></td>
<td><strong>14</strong></td>
<td></td>
</tr>
<tr>
<td><strong>MDN</strong></td>
<td><strong>45</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nonsense Words</th>
<th>Receptive Training</th>
<th>Expressive Test</th>
<th>Expressive Training</th>
<th>Overall Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Expr. Recep.</td>
</tr>
<tr>
<td>Teg</td>
<td>9</td>
<td>0%</td>
<td>40</td>
<td>50% 50%</td>
</tr>
<tr>
<td>Som</td>
<td>7</td>
<td>0%</td>
<td>10</td>
<td>50% 100%</td>
</tr>
<tr>
<td>Yem</td>
<td>14</td>
<td>0%</td>
<td>63</td>
<td>0% 100%</td>
</tr>
<tr>
<td>Nevzar</td>
<td>12</td>
<td>0%</td>
<td>37</td>
<td>50% 100%</td>
</tr>
<tr>
<td>Mexpog</td>
<td>13</td>
<td>0%</td>
<td>7</td>
<td>50% 100%</td>
</tr>
<tr>
<td>Wavjasket</td>
<td>7</td>
<td>0%</td>
<td>75*</td>
<td>0% 50%</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>62</strong></td>
<td></td>
<td><strong>232</strong></td>
<td></td>
</tr>
<tr>
<td><strong>MDN</strong></td>
<td><strong>10.5</strong></td>
<td></td>
<td><strong>38.5</strong></td>
<td></td>
</tr>
</tbody>
</table>

* True totals are not known. Training was discontinued after completing 75 trials.
the expressive-receptive list, which may have resulted in an artificial inflation in the total number of trials. The one syllable word "yad" was trained before the two syllable word "yafgeb". When "yafgeb" was trained, the subject responded with a vocal response similar to "yadgeb" - a combination of "yad" and "yafgeb". These responses were scored as errors and shaping procedures were instituted to correct them. As indicated in Table III, this correction procedure was not successful.

The other failed word (fapvotnol) appeared to be an articulation problem, rather than confusion with previously trained words. The middle syllable was difficult for the subject to say in combination with the other two. Shaping procedures were also unable to correct this response before reaching the 75 trial limit and discontinuing training.

Subject 3 was able to correctly identify the "fapvotnol" object during receptive testing before receiving receptive training. This result further supports the notion that articulation was the major difficulty for this word.

Subject 4

Subject 4 achieved the most notable results (as seen in Table IV) which again suggest that the expressive-receptive training sequence was superior to the reverse sequence. This was
TABLE IV
A COMPARISON OF TWO LANGUAGE TRAINING SEQUENCES FOR SUBJECT 4

<table>
<thead>
<tr>
<th></th>
<th>Number of trials to criterion</th>
<th>Percent correct</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sequences I</td>
<td>Sequences II</td>
</tr>
<tr>
<td>Nonsense Words</td>
<td>Receptive Training</td>
<td>Expressive Test</td>
</tr>
<tr>
<td>Dop</td>
<td>21</td>
<td>0%</td>
</tr>
<tr>
<td>Yad</td>
<td>29</td>
<td>0%</td>
</tr>
<tr>
<td>Hod</td>
<td>8</td>
<td>100%</td>
</tr>
<tr>
<td>Yafgeb</td>
<td>13</td>
<td>0%</td>
</tr>
<tr>
<td>Regdof</td>
<td>9</td>
<td>0%</td>
</tr>
<tr>
<td>Fapvotnol</td>
<td>19</td>
<td>0%</td>
</tr>
<tr>
<td>Totals</td>
<td>94</td>
<td>253</td>
</tr>
<tr>
<td>MDN</td>
<td>16</td>
<td>42.5</td>
</tr>
</tbody>
</table>

* True totals are not known. Training was discontinued after completing 75 trials.
clearly shown in both the median number of training trials and test measures recorded. Furthermore, this subject's performance yielded a large difference in the absolute number of training trials for the two sequences, and this difference was weighted in support of the expressive-receptive training sequence.

Subject four was the only subject who responded correctly during the expressive test following receptive training, and this occurred for the nonsense word "hod." This result was probably due to the subject emitting the vocal response imitatively while pointing to the correct stimulus object during receptive training for this word.

For the four words for which this subject failed to reach criterion, three appeared to be problems of articulation during expressive training. Again, this result was supported by this subject's ability to correctly identify these nonsense objects during receptive testing.

A review of Figures 1 and 2 and Tables I through IV shows that (1) expressive training leads to receptive language and (2) receptive training slightly facilitates the acquisition of expressive skills. By combining the median number of training trials for each sequence and subject it appears that the expressive-receptive sequence resulted in a savings of trials as compared to the receptive-expressive sequence. It also resulted in a greater number of correct responses during testing. Thus, it appears that the expressive-receptive training sequence is more efficient than the reverse.
CHAPTER IV

Discussion

Performance for the four subjects in this study indicated that training expressive "naming" responses facilitated the acquisition of receptive language. To a lesser extent, the results also showed a facilitation of expressive responding from receptive training. It was concluded from these results that an expressive-receptive language training sequence appears more efficient than the receptive-expressive sequence. These findings suggest that language training might best be conducted using an expressive-receptive sequence. Of course, further research is necessary to extend these findings to the more complex language functions encountered when training nonlanguage children.

In spite of the limitations of investigating this relatively simple language response (naming) instead of whole grammatical units, this study does relate to the theses upheld by Chomsky, Lenneberg and Skinner. Lenneberg believes that receptive skills are prerequisite to expressive. The results of this study do not refute this hypothesis. It may be that receptive language skill is required for the acquisition of expressive. This may have occurred in the process of expressive training. However, these results do suggest that the most logical language training sequence to employ based on Lenneberg's theory may not be receptive-expressive.
Chomsky's and Lenneberg's theories are also concerned with the underlying processes involved in language acquisition. This study serves as evidence that a functional analysis similar to that proposed by Skinner yields useful information without accounting for such internal processes.

The investigation by Guess (1969) resulted in no facilitation effect of receptive training to expressive responding. He concluded that the two response "classes" were functionally independent. In contrast to these findings, the present study obtained a facilitation effect from receptive training to expressive responding. These results imply a functional relationship and nonindependence between the two response forms. This is further supported by the relatively large facilitation effect obtained from expressive training to receptive responding.

A second study conducted by Guess and Baer (in press) resulted in both no transfer from one response form to the other for some subjects and transfer in both directions for other subjects. The present study supports the findings that training first expressive or receptive language may facilitate the acquisition of the alternate skill, and detracts from the findings of no transfer.
The facilitation of articulation skills resulting from receptive training found by Mann and Baer (1971) is also supported by this study. However, the present study goes one step further in that the subjects were taught to articulate the nonsense words and correctly identify the stimulus objects.

The nonsense words constructed for this study consisted of one, two and three syllables. This was to obtain an estimate of interaction between training sequences and the length of the vocal response. However, this resulted in little information. It appeared that two and three syllable words were more difficult than the one syllable words, but errors were not associated with a particular training sequence. It was concluded that two and three syllable words are more difficult to say than one syllable words; errors were idiosyncratic; and that any possible interaction between the length of a vocal response and these training sequences could not be determined from these results.

Two potentially confounding variables were present during this study. The first was a significant difference in the learning difficulty level of the two word lists. The second was a "learning-how-to-learn" phenomenon. It is possible that one word list was more difficult to learn than the other. If such
were the case, one of the two training sequences, the one associated with the more difficult list, would appear much less efficient than the other. It is also possible that exposure to either training sequence would improve the performance during the last sequence trained. In this case, the second sequence would always result in faster learning.

Reference to the data presented in Figures 1 and 2 and Tables I through IV indicates no noteworthy confounding of these variables. The subjects did not consistently do better during the second sequence trained and neither list resulted in a greater number of errors for any given subject.

Two additional questions regarding the best method of training expressive and receptive language did arise in the course of this study. The first concerned the difficulty level of the discriminations taught. The stimuli were markedly different from one another and it was assumed that the discrimination to be made between one object and another was relatively "easy" because of these large differences. A second study (Pisor, in progress) is investigating the interaction effects of these training sequences and more difficult stimulus discriminations. The preliminary results obtained from this study confirm the facilitation effect of receptive training to expressive responding, but do not support the reverse facilitation.

A second question arose as a function of subject four's performance during receptive training. This subject imitated the
experimenter's vocal response "hod" while simultaneously pointing to the correct stimulus object. Later this subject responded correctly to expressive testing for the response "hod". From this, it was apparent that a training procedure which combined both receptive and expressive training might yield still better performance than either sequence independently. This question is currently under investigation (Denniston, in progress).

It could be argued that, as a product of employing only four retarded subjects in this study, the obtained results are not representative of all language deficient individuals. In fact, this is a reasonable criticism. For these results to be the basis for decisions in language training programs, they should first be confirmed by additional investigations, and extended to more complex language functions and larger populations. However, while these subjects may not be representative, the results obtained from them do suggest the possibility that an expressive-receptive training sequence is more efficient than the reverse, and point out a direction for additional investigations.
REFERENCES


