

*INCREASING SPELLING ACHIEVEMENT:  
AN ANALYSIS OF TREATMENT PROCEDURES UTILIZING  
AN ALTERNATING TREATMENTS DESIGN*

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Two studies which examine the effectiveness of spelling remediation procedures are reported. In both studies, an alternating treatment design was employed. In the first study, positive practice overcorrection plus positive reinforcement was compared to positive practice alone and a no-remediation control condition. In the second study, positive practice plus positive reinforcement was compared to a traditional corrective procedure plus positive reinforcement and a traditional procedure when used alone. Results of both studies indicated that the combined positive practice plus positive reinforcement procedure was more efficient and that it was preferred by the children. Following brief training under this combined procedure, all children demonstrated 100% spelling accuracy.

DESCRIPTORS: academic behavior, remediation procedures, learning disabilities, children

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Spelling accuracy has been increased by a variety of procedures, including tokens (Chadwick & Day, 1971; McLaughlin & Malaby, 1971), peer influence (Evans & Oswalt, 1968; Lovitt, Guppy, & Blattner, 1969), and self-imposed contingencies (Lovitt & Curtiss, 1969). Despite these efforts, and those involving more traditional methods (Hall, 1964; Horn, 1967), poor spelling continues to be a problem of enormous proportion. In a recent survey, Ollendick (Note 1) found that 40% of children in grades three through six scored below grade level in spelling with 17% scoring one or more grade levels below the expected level for their

age. These findings confirm those of an earlier study conducted by Fox and Easton (1946) who reported that 48% of children in grades two through eight functioned below grade level in spelling.

In a recent attempt to devise an effective instructional method, Foxx and Jones (1978) developed a comprehensive procedure based on the principles of positive practice overcorrection and positive reinforcement. In their procedure, accurate spelling was reinforced with parental and teacher approval, prizes, positive teacher comments, and the posting of papers with high spelling marks. Inaccurate spelling, on the other hand, resulted in the student's writing out the word's correct spelling, correct phonetic spelling, part of speech, complete dictionary definition, and its correct usage in five sentences. In an analysis of their procedure, Foxx and Jones (1978) reported that those experimental conditions which utilized positive practice *and* positive reinforcement were more effective than those conditions which used positive reinforcement alone.

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Requests for reprints should be addressed to Thomas H. Ollendick, Department of Psychology, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061. This research was conducted at Western Psychiatric Institute and Clinic, University of Pittsburgh School of Medicine, while the senior author was on sabbatical leave from Indiana State University. Special thanks are extended to the staff at Western Psychiatric Institute and Clinic for their assistance in data collection.

Although positive practice alone was not evaluated in their study, positive practice alone was subsequently used in a study by Matson and Ollendick (Note 2) and found to be effective in remediating both spelling and reading deficiencies. However, in the Matson and Ollendick study, positive practice alone was not compared to a combined positive reinforcement plus positive practice condition.

In the present studies, an attempt was made to compare methods of spelling instruction that might be easily employed by teachers and that might be used for children exhibiting marked performance deficiencies. More specifically, a positive practice procedure modeled after that of Foxx and Jones (1978) and based on the correct spelling and pronunciation of misspelled words was evaluated in two studies using an alternating treatments design (Barlow & Hayes, 1979; Kazdin & Hartmann, 1978; Ulman & Sulzer-Azaroff, 1975). In the first study, the positive practice procedure alone was compared to a no-treatment control procedure and a procedure that used both positive practice and reinforcement for correctly spelled words. This analysis was undertaken to assess the efficacy of positive practice alone and to determine the necessity of including positive reinforcement in the remediation package as suggested by Foxx and Jones (1978). In the second study, the positive practice plus positive reinforcement procedure was compared to a traditional instructional procedure alone and a traditional procedure that included positive reinforcement.

Prior to the advancement of the alternating treatments design, the comparison of two or more treatments in a single-subject design was fraught with difficulties. In most single-subject designs (reversal, multiple-baseline, changing criterion), differences between treatments are confounded with sequence or order effects (see Hersen & Barlow, 1976). In the alternating treatments design, each treatment is systematically varied and counterbalanced across stimulus conditions within the same phase. Variations of stimulus conditions can involve different therapists, settings, time

periods, or combinations of these conditions. Typically, following baseline and alternating treatment phases, the most effective procedure is used in a third phase under specified stimulus conditions. The design permits a relatively rapid assessment of the differential effectiveness of two or more treatment procedures and avoids the use of a reversal phase to demonstrate functional control. These design features were especially crucial in the present study because accurate spelling was not likely to return to baseline rates during reversal and because children were enrolled in a short-term psychiatric facility designed to assess and prescribe treatments for academic remediation and community adjustment.

## STUDY 1

### METHOD

#### *Subjects*

Two children, one boy and one girl, hospitalized in a residential psychiatric facility participated in the study. Child 1, a white 10-year-old boy, was hospitalized for extreme aggressive behavior and failure to learn in school. An educational evaluation indicated problems associated with "attention span, visual-motor integration, impulse control, and auditory and sequential memory." He was functioning two grade levels below his expected age level in reading, spelling, and arithmetic and obtained a Verbal IQ of 107, a Performance IQ of 91, and a Full Scale IQ of 100 on the WISC-R.

Child 2, an 8½-year-old black girl, was the second participant. She was also hospitalized for extreme aggressive behavior and failure to progress academically. Her educational evaluation revealed "marked problems associated with visual, motor, and perceptual difficulties." She was functioning at the first-grade level in reading, spelling, and arithmetic and obtained a Verbal IQ of 91, a Performance IQ of 96, and a Full Scale IQ of 96 on the WISC-R.

Both children had been previously labeled as "learning disabled" and "minimal brain dysfunction." Neurological evidence to support the diag-

nosis of underlying brain dysfunction was not available.

### *Stimulus Materials*

The stimulus words used for the spelling exercises were taken from the Sivaroli Classroom Reading Inventory (1977), Equivalent Forms A, B, and C. Fifteen words were selected from the second-grade forms for Child 1 and from the primary and pre-primary grade forms for Child 2. A set of five words was selected from each of the equivalent forms and then randomly assigned to the three remediation conditions. Words selected from Form A were assigned to the positive practice condition; words from Form B were assigned to the positive practice plus positive reinforcement condition; and words from Form C were assigned to the no-remediation control condition. Pretesting assured equivalence of the sets.

### *Experimental Design*

An alternating treatments design was used to compare the two active remediation procedures (positive practice alone and positive practice plus positive reinforcement). In addition, both procedures were compared to a no-remediation probe procedure which served as a control condition. All procedures were implemented separately for each child in the regular classrooms by a teacher aide.

During the first phase, which served as a pre-remediation baseline condition, children were instructed to spell the stimulus words on paper. The three sets of words were administered each day, counterbalanced across the three time periods. No feedback as to the accuracy of spelling was provided. During the treatment phase, the two remediation procedures were alternated daily in a counterbalanced order while the no-remediation control procedure was probed on the first and last two days only. During the final phase, positive practice plus positive reinforcement was used with all three sets of words across all three time periods. Because Child 2 was released from the hospital setting unexpectedly,

she was observed for only three days under this final condition.

### *Experimental Conditions*

To enhance discrimination of the experimental conditions (Kazdin & Hartmann, 1978), specific instructions were provided that described the remediation condition in effect during each time period. For positive practice, the child was required to (a) listen to the word pronounced by the teacher aide, (b) pronounce the word correctly, (c) say aloud each letter of the word, and (d) write the word correctly. This sequence of remediation was designed to incorporate multiple channels of learning and was repeated five times for each misspelled word. The following specific instructions were used: "For this set of words, I am going to help you learn those words you misspell by having you listen while I say the word aloud. Then, I want you to pronounce the word correctly and then say aloud each letter of the word while you write it. I will have you repeat this practice five times for each word you misspell. Try your best." For positive practice plus positive reinforcement, the above requirements were completed for each misspelled word and the teacher aide placed a "star" beside each correctly spelled word and praised the child for his or her accomplishment. The following instructions in addition to those above, were given: "For this set of words, I will also place a star by each word you spell correctly and praise you for your good work. Remember, try your best." For the no-remediation control condition, children were simply instructed to spell the words as they did in the initial baseline phase. No feedback as to the accuracy of performance was provided.

### *Reliability*

To ensure accuracy of scoring the daily spelling exercises and adherence to experimental conditions, one of the authors double-checked (re-scored and reviewed) all spelling papers and checked that appropriate experimental procedures were followed. For example, in the positive

practice plus positive reinforcement condition, one of the authors not only rechecked spelling accuracy but also rechecked whether stars were administered for correct words and whether appropriate positive practice work was utilized for incorrect words. This process revealed adherence to proper procedures in all cases and near 100% accuracy in the scoring of the words (only one word was scored incorrectly out of the hundreds of words assessed).

### Participant Questionnaire

In an attempt to determine the children's reaction to, and satisfaction with, the experimental procedures, a questionnaire was administered requesting the children to indicate which procedure they preferred, with which procedure they learned the most, and which procedure they would choose to learn new sets of words. This questionnaire was administered on the last day of the study to each child.

## RESULTS

The primary question was whether the two procedures, positive practice alone and positive practice plus positive reinforcement, differentially increased spelling accuracy. The effects of the two interventions, along with the no-remedi-

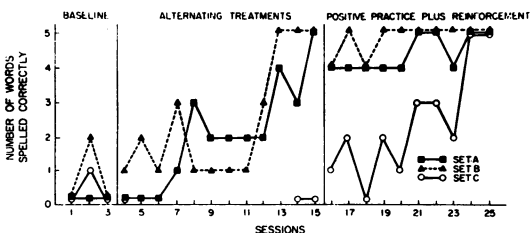


Fig. 1. The number of words spelled correctly by Child 1 during the three experimental phases for the three sets of words. During the alternating treatments phase, words from Set A were assigned to the positive practice condition; words from Set B were assigned to the positive practice plus positive reinforcement condition; and words from Set C were assigned to the no-remediation control condition. During the last phase, positive practice plus positive reinforcement was used with all three sets of words.

ation control probe, can be seen in Figures 1 and 2.

Examination of the data for Child 1 (Figure 1) during the alternating treatment phase indicates that spelling accuracy improved under both positive practice plus positive reinforcement and positive practice alone conditions. Further, both conditions were superior to the no-remediation control condition. Because positive practice plus positive reinforcement resulted in more rapid learning, it was implemented during all three time periods in the final phase, resulting in increased spelling accuracy for all three sets of words across all three time periods.

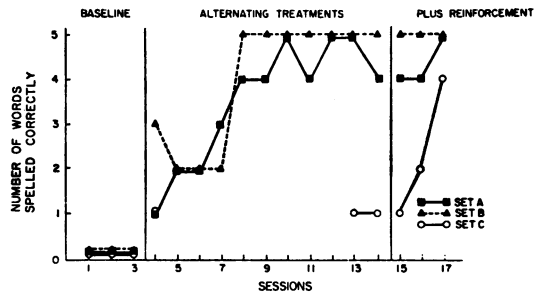


Fig. 2. The number of words spelled correctly by Child 2 during the three experimental phases for the three sets of words. During the alternating treatments phase, words from Set A were assigned to the positive practice condition; words from Set B were assigned to the positive practice plus positive reinforcement condition; and words from Set C were assigned to the no-remediation control condition. During the last phase, positive practice plus positive reinforcement was used with all three sets of words.

Examination of data for Child 2 (Figure 2) during the alternating treatment phase indicates slightly better performance under positive practice plus positive reinforcement than under conditions in which positive practice alone was used. Again, both conditions were superior to the no-remediation control condition. When positive practice plus positive reinforcement was implemented under all conditions during the final phase, continued spelling accuracy was evidenced for the two active conditions and a marked improvement in accuracy was noted for the former no-remediation condition.

Results of the questionnaire revealed that both children preferred positive practice plus positive reinforcement. However, whereas Child 1 reported that he learned the most and would select this combined condition to learn new words, Child 2 indicated that she learned the most in the positive practice alone condition and that she would select this condition to learn new words.

Although these results indicate that the two active remediation procedures did not differ markedly for either child, the positive practice plus positive reinforcement procedure was slightly more efficient and was preferred by both children. It is difficult to reconcile selection of positive practice alone to learn future words by Child 2. Her actual performance and overall preference for the positive practice plus positive reinforcement condition suggests otherwise. The responses to the questionnaire of Child 1 were more consistent and reflected an overall endorsement of positive practice plus positive reinforcement.

## STUDY 2

In Study 1, it was shown that when positive reinforcement was combined with positive practice, optimal performance was obtained. These findings confirm those of Foxx and Jones (1978) and extend the efficacy of such procedures to children with severe educational handicaps. Even though these children were functioning two or three grades below age level, they were able to demonstrate 100% spelling accuracy.

In the second study, an attempt was made to compare the positive practice plus positive reinforcement procedure to more traditional teaching procedures. Specifically, positive practice plus positive reinforcement was compared to a traditional corrective procedure and a traditional corrective procedure plus positive reinforcement. As with Study 1, these comparisons were examined in an alternating treatments design with two hospitalized children.

## METHOD

### *Participants*

Two children, one boy and one girl, hospitalized in the same psychiatric facility as the children in Study 1 participated in the second study. Child 3, a white 13-year-old girl, was hospitalized for extreme aggressive behavior and failure to learn in school. Educational and psychological evaluations revealed deficits in "auditory and visual sequencing, auditory and visual integration, and verbal abstraction." She was functioning two to three grade levels below her age level in reading, spelling, and arithmetic and received a Verbal IQ of 79, a Performance IQ of 106, and a Full Scale IQ of 91 on the WISC-R.

Child 4, a white 12-year-old boy, was also hospitalized for extreme aggressive behavior. Unlike the other children, he did not possess significant learning problems and was functioning academically at the expected level for his age. He was included to examine the generalizability of the remediation procedures to a non-learning-disabled but aggressive child. He obtained a Verbal IQ of 101, a Performance IQ of 109, and a Full Scale IQ of 105 on the WISC-R.

### *Stimulus Materials*

The stimulus words used for the spelling exercises were taken from the Sivaroli Classroom Reading Inventory (1977), Equivalent Forms A, B, and C. Twenty-four words were selected from the fourth- and fifth-grade forms for Child 3 and from the seventh grade forms for Child 4. A set of eight words was selected from each of the three equivalent forms and then randomly assigned to the three remediation conditions. Words selected from Form A were assigned to positive practice plus positive reinforcement; words from Form B were assigned to traditional plus positive reinforcement; and words from Form C were assigned to the traditional alone condition.

### *Experimental Design*

An alternating treatments design was employed, using the same counterbalancing strategies described in Study 1. During the first phase the three sets of words were administered each day, counterbalanced across the three time periods. No feedback as to the accuracy of spelling was provided. During the second phase, the remediation procedures were administered in counterbalanced order across the three time periods. During the third phase, positive practice plus positive reinforcement was used with all three sets of words across all three time periods. All procedures during each phase were implemented separately for each child in the regular classroom by a teacher aide.

### *Experimental Conditions*

For the positive practice plus positive reinforcement condition, the same procedure and instructions described in Study 1 were employed. In the traditional condition, the teacher aide placed a check mark beside those words spelled incorrectly and wrote the correct spelling beside the misspelled word. The child was instructed to study the words. The following instructions were employed: "For this set of words, I will correct those words you have wrong by placing a check mark by the incorrect spelling and then I will write the correct spelling beside them. After that, I want you to study those that you have wrong on your own for five minutes. Try your best." In the traditional plus positive reinforcement condition, these requirements were completed for each misspelled word and the teacher aide placed a star beside each correctly spelled word and provided praise for accuracy. In addition to the instructions for misspelled words, the child was instructed that "for those words you spell correctly you will receive a star plus praise from me on how well you are doing. Remember, do your best." The same questionnaire as described in Study 1 was used to assess the child's reaction to, and satisfaction with, the experimental procedures.

### *Reliability*

As in Study 1, the accuracy of scoring the daily spelling exercises and adherence to experimental conditions were checked by one of the authors. All spelling papers were checked. This process revealed adherence to proper procedures in all cases (e.g., stars were placed by correct words and appropriate exercises were followed for misspelled words) and near 100% accuracy in the scoring of the words (only two words, out of the hundreds scored, were scored incorrectly).

## RESULTS

Figures 3 and 4 show that positive practice plus positive reinforcement was superior to the other conditions during the alternating treatments phase. Although less effective than positive practice plus positive reinforcement, the traditional plus positive reinforcement condition was more effective than the traditional procedure alone. When positive practice plus positive reinforcement was implemented during all time periods in the last phase, spelling performance increased and was maintained at 100% accuracy for both children.

Results of the questionnaire revealed that Child 3 preferred the positive practice plus positive reinforcement condition whereas Child 4 preferred the traditional plus positive reinforcement condition. However, both children indicated that they learned the most in the positive practice plus positive reinforcement condition and that they would voluntarily select this procedure to learn new words. Child 4, the child who was not "learning disabled," was clear in his stated distaste for the condition incorporating positive practice procedures. He indicated that he "didn't like to write words" and that such procedures were for "kids who don't spell very well." Interestingly, although he did not prefer this procedure, he did indicate (with accuracy) that he learned the most from this procedure and would probably select it again if he had

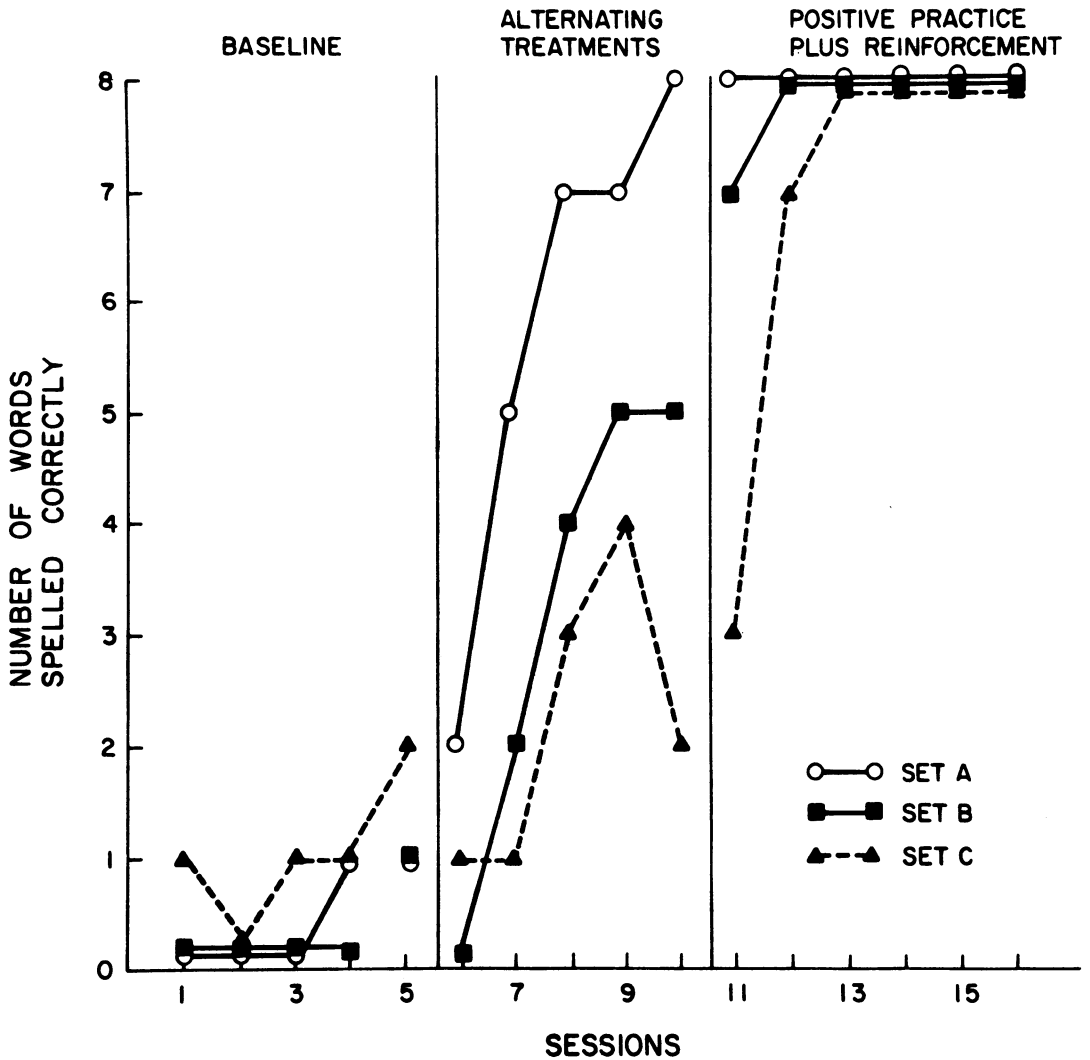


Fig. 3. The number of words spelled correctly by Child 3 during the three experimental phases for the three sets of words. During the alternating treatments phase, words from Set A were assigned to the positive practice plus positive reinforcement condition; words from Set B were assigned to the traditional plus positive reinforcement condition; and words from Set C were assigned to the traditional alone condition. During the last phase, positive practice plus positive reinforcement was used with all three sets of words.

to learn new words. Clearly, the procedure was effective, albeit not favored, by him.

DISCUSSION

The overall results of these studies indicate that an academic remediation procedure consisting of positive practice for incorrectly spelled words and positive reinforcement for correctly spelled words produces optimal gains in spelling

performance. In Study 1, this combined condition was clearly better than a no-remediation condition. Although it was not markedly better than a condition based on positive practice alone, the addition of positive reinforcement appeared to contribute to a more efficient acquisition of correct spelling. In Study 2, the combined procedure was clearly more effective than either a traditional procedure with positive reinforcement or a traditional corrective procedure alone.

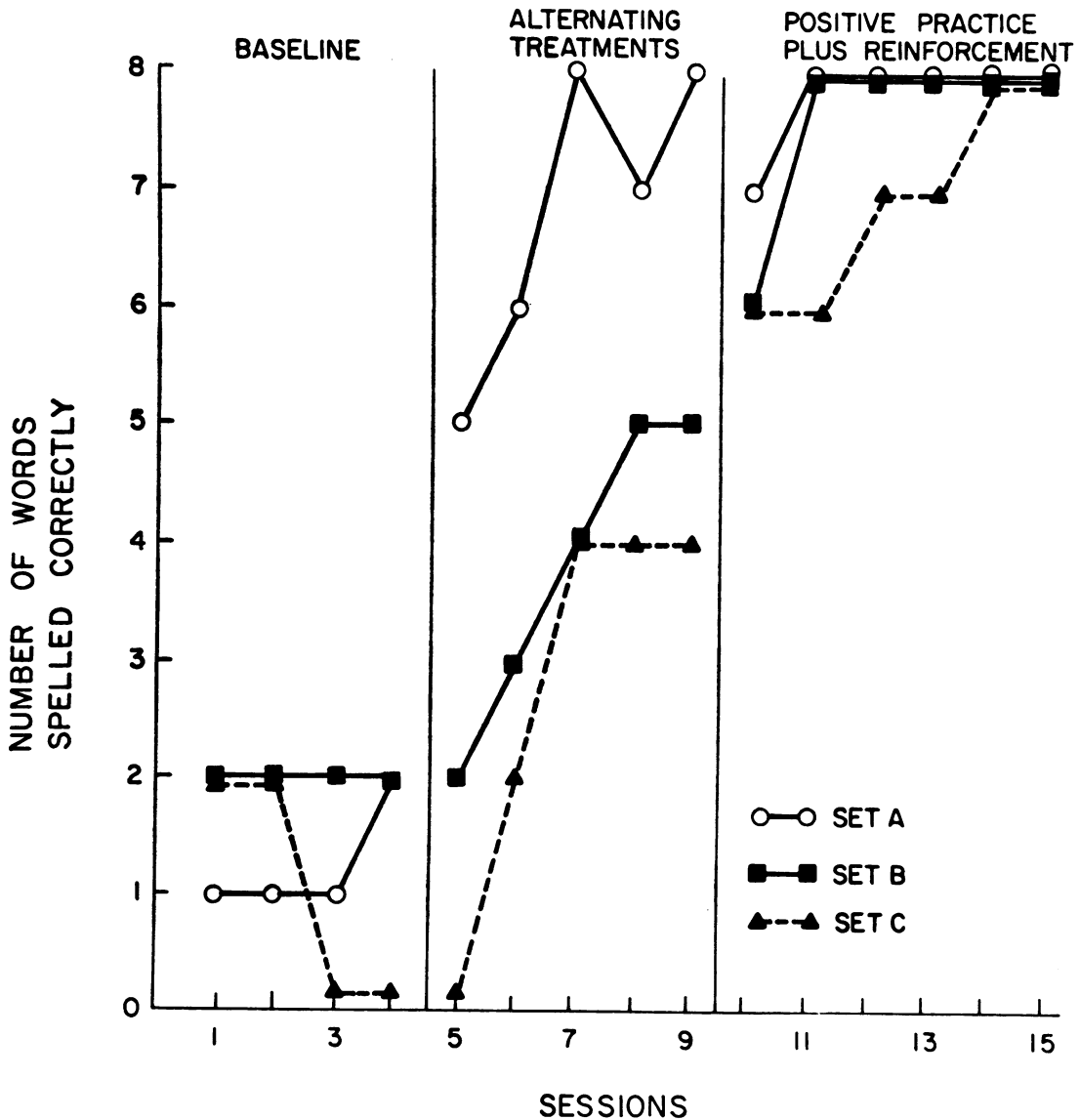


Fig. 4. The number of words spelled correctly by Child 4 during the three experimental phases for the three sets of words. During the alternating treatments phase, words from Set A were assigned to the positive practice plus positive reinforcement condition; words from Set B were assigned to the traditional plus positive reinforcement condition; and words from Set C were assigned to the traditional alone condition. During the last phase, positive practice plus positive reinforcement was used with all three sets of words.

Further, three of the four children preferred the combined positive practice plus positive reinforcement condition, even though the positive practice component probably functioned as an aversive consequence (Foxx & Jones, 1978; Ollendick & Matson, 1978). These findings extend those of Foxx and Jones (1978) and indicate that these procedures are effective in remediating

the spelling deficits of "learning disabled" and aggressive children as well as the more "normal" children examined by Foxx and Jones (1978).

Although the positive practice procedure was probably aversive, it is evident that three of the four children regarded the procedure as helpful. Self-reported endorsement of the procedure is



important because the procedure could result in more harm than good if the children developed an aversion for it. It is interesting to note that the one child who did not state a preference for the combined condition was Child 4. Unlike the other three children, he did not possess significant learning problems and reported that this procedure was ill-suited for someone like himself. Although this finding is in need of obvious replication, it suggests that the procedures used may be better suited for children with significant learning problems who may require, and seemingly prefer, remediation strategies based on multiple channels of learning. Less impaired children may feel that such extensive procedures are unwarranted albeit effective.

Undoubtedly, the most significant findings of the present studies are related to the speed with which children who were previously described by "learning disabled" and "minimal brain dysfunction" labels achieved 100% spelling accuracy. Using the combined positive practice plus positive reinforcement procedure, these three children learned new sets of words in five sessions or less (approximately 40-50 min of training time spread over 5 days). Although the findings of the present studies are limited to an experimental demonstration of the efficacy of this remediation package, they suggest that these "learning disabled" children possessed the ability to learn and to achieve correct spelling in a very short period of time. It would appear that these children may be more "teaching disabled" than "learning disabled." Partial support for this notion was recently shown by Matson and Ollendick (Note 2) who demonstrated that both reading and spelling deficits in "learning disabled" children could be remediated with the procedures used in the present study and maintained up to three months following training.

Final mention should be made of potential limitations of the alternating treatments design used in the present studies. As noted by Kazdin and Hartmann (1978) and Barlow and Hayes (1979), probably the greatest threat to the in-

ternal validity of this design is that of multiple treatment interference. We are unsure to what extent such interference was operative in the present studies. It is conceivable, for example, that "contrast" effects related to performing positive practice with and without positive reinforcement were present. If so, such effects would have a direct bearing on the validity of the obtained findings. Future research might address this issue by directly assessing the extent to which such effects are present, using procedures suggested by Barlow and Hayes (1979).

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