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IMPROVING CLASSROOM BEHAVIOR IN MENTALLY RETARDED CHILDREN THROUGH CORRESPONDENCE TRAINING

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Except for a few studies, most research investigating correspondence training procedures has been more analogue in nature. The purpose of the present set of studies was to examine whether a "say-do" correspondence training technique could be used with children in special education classes to improve classroom behavior. The specific behaviors targeted for change included: out-of-seat behavior (Experiment 1), sitting posture (Experiment 2), and on-task behavior (Experiment 3). The say-do procedure used in Experiment 1 resembled that of previous studies, whereas that in Experiment 2 was more elaborate in the specificity of verbal statements required from the children and the feedback given them. The training procedure in Experiment 3 used a format similar to the say-do approach, but stressed visual rather than verbal cuing because it was used with nonverbal children. All three studies used single-subject designs and examined maintenance and/or generalization questions. Experiments 2 and 3 also evaluated whether concomitant changes in performance on academic tasks occurred. The results of the three studies provide strong evidence that correspondence training can be effectively used with educationally handicapped children. Moreover, the successful modification of the "say-do" to a "show-do" procedure in Experiment 3 points out the flexibility of the correspondence training approach.

DESCRIPTORS: correspondence training, retarded children, academic behavior, attending behavior, generalization

There is a growing body of research concerned with the relationship between what people say and what they do. Much of this research is based on the assumption that a correspondence exists between verbal and nonverbal behavior. One implication of this research is that it may be possible in clinical situations to control nonverbal behavior by modifying verbal behavior. The appeal of this training procedure is related to the ready accessibility of an individual's verbal behavior to a trainer and to the fact that with this training, nonverbal behavior may be maintained in situations without directly monitoring and reinforcing it (Israel, 1978).

Theoretical formulations by Luria (1961) have catalyzed basic research investigating the relationship between verbal and nonverbal behavior (cf. Birch, 1966; Lovaas, 1961; Sherman, 1964). In general, this basic research has demonstrated that changing verbal behavior often results in subsequent changes in referent nonverbal behaviors. Examination of the applied research literature suggests, however, that the relationship between verbal and nonverbal behavior is complex. Brodsky (1967) failed to increase social behavior in an institutionalized retarded female after reinforcing her stated intentions to emit such behavior. Similarly, Risley and Hart (1968) and Karoly and Dirks (1977) found that merely reinforcing normal children's verbal behavior did not increase sharing and self-control

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behaviors. In both the Karoly and Dirks (1977) and Risley and Hart (1968) studies, however, prosocial behaviors did increase when reinforcement was delivered contingent on matching the children's verbal report to their actual performance.

One explanation regarding the inconsistency in correspondence between verbal and nonverbal behavior shown by children in past studies may be found in their differing reinforcement histories. For example, if a child has been reinforced for matching his or her verbal and nonverbal behavior, simply reinforcing and increasing the rate of verbal behavior will probably increase the corresponding nonverbal behavior for that child. Burron and Bucher (1978), putting this hypothesis to empirical test, found that children previously reinforced for matching verbal and nonverbal behavior were more likely to show correspondence in a temptation situation than children reinforced for counter-compliance. In combination, this and the other aforementioned studies suggest, consistent with Luria's (1961) speculation, that during early development verbal behavior does not naturally control nonverbal behavior but that such control can result through a teaching process.

With the exception of a few studies (cf. Rogers-Warren & Baer, 1976; Rogers-Warren, Warren, & Baer, 1977), most correspondence training studies have been analogue in nature and have not directly explored the educational utility of this procedure. Rogers-Warren and Baer (1976) and Rogers-Warren, Warren, and Baer (1977) used correspondence training to increase prosocial behavior in children who exhibited social skill deficiencies in sharing and praising. Despite the fact that correspondence training has been used only to a limited extent as an educational tool, its general applicability for developing adaptive as well as reducing maladaptive behavior seems obvious, particularly with children with behavioral and academic problems in preschool, elementary school, and special education classrooms. Moreover, correspondence training constitutes a potentially more efficient and effective alternative for changing classroom behavior than reinforcement programs that focus on directly changing nonverbal behavior. Initially, this procedure demands that both a child's verbal and nonverbal behavior be monitored, shaped, and systematically reinforced. The results of correspondence training studies indicate, however, that this procedure often effects rapid changes in behavior and that once verbal control is established, changes in nonverbal behavior can be maintained by reinforcing verbal reports alone, thus negating the need for continuous monitoring of each child's nonverbal behavior (cf. Risley & Hart, 1968).

Correspondence training may also potentially provide a solution to the problems of generalization. Wildman and Wildman (1975) and Stokes and Baer (1977) have pointed out that although behavior modification procedures such as differential reinforcement may be quite effective when the program is in operation, there is no guarantee that behavior changes will be maintained at other times or will generalize to other behaviors. The findings of Risley and Hart (1968) indicate that once correspondence is achieved, direct verbal control of the behavior in training is possible and that generalized verbal stimulus control of other nonverbal behavior may also occur without further correspondence training.

The purpose of the present set of studies was to examine whether a "say-do" correspondence training procedure (Israel & O'Leary, 1973) would be an effective therapeutic technique for improving classroom behavior. These studies are unique in several ways. First, they use low IQ and mentally retarded students, whereas previous correspondence studies have generally used normal preschoolers who, because of more highly developed language skills, would be expected to benefit from a procedure that emphasizes verbal cueing. In this regard, however, basic research has indicated that mentally retarded individuals can be trained to use verbal strategies and that once learned, such strategies do effect change in performance across a variety of task situations (cf. Borkowski, Cavanaugh, & Reichardt, 1978).

Based on the results of such studies, it would appear that correspondence training might be effective with a retarded population. Second, whereas previous studies focused on preacademic and prosocial behavior (cf. Rogers-Warren, Warren, & Baer, 1977), the present research is unique in its emphasis on using correspondence training for dealing with common classroom problems. Finally, this research, in contrast to most previous correspondence training studies, investigated whether treatment effects were maintained over time, whether they generalized over situations, and whether experimental control could be transferred to a natural training agent (i.e., a classroom teacher) without a decrease in effectiveness.

EXPERIMENT 1

The specific purpose of the first study was to examine whether correspondence training could be used to reduce the frequency of out-of-seat behavior in a child in a special education classroom and whether these changes would be maintained over time.

METHOD

Student and Setting

Linda, a 9-yr-old girl with an IQ of 70, participated in this study. She attended a primary level special class for the educable mentally retarded in a public school system. According to teacher report, Linda, functioning educationally at approximately the first-grade level, spent most of the day out of her seat. This high-rate behavior in turn interfered with the completion of classroom work and served to distract other children. All baseline and training sessions were held daily during the math period in the girl's classroom. The observation and training procedures were designed so as not to interfere with regular classroom routines. After training sessions, the experimenter took her out in the hall to deliver reinforcement.

Response Definition and Recording Rules

Linda was observed while doing her work. The experimenter sat against a wall in the classroom, approximately 10 feet from the child. During this period, one inappropriate response (out-of-seat) was recorded. This behavior was rated as occurring when the child did not have her buttocks in contact with the chair seat and body oriented toward her work. An event recording system was used to count discrete out-of-seat responses. In addition, the total duration of this response was recorded using a stopwatch which was started and stopped contingent on each response. Reliability was assessed by having two observers using the rating system record simultaneously but independently Linda's behavior. These checks were taken a minimum of two times per experimental condition. Observer agreement was calculated by dividing the number of out-of-seat responses scored by Observer 1 by the number of out-of-seat responses scored by Observer 2 and then multiplying by 100. Duration reliability was calculated in a similar manner. The mean reliability for the frequency of Linda's out-of-seat behavior was 99% (range 94-100%) and for the duration of her out-of-seat behavior was 96% (range 91-99).

Design

An ABAB design with an 8-mo follow-up was used to assess the effects of correspondence training on Linda's inappropriate classroom behavior.

Procedures

Baseline. Sessions were held Monday through Friday from 9:00 a.m. to 9:20 a.m. during the math period. In this and subsequent conditions, the experimenter observed Linda and recorded the target behavior. No discussion or interaction occurred between them.

Correspondence training. At the beginning of each treatment session, the trainer asked Linda: "Are you going to stay in your seat today?" On the third day and only on this one occasion the

experimenter explained to Linda exactly what "staying in your seat" meant. This was accomplished by paraphrasing for her the basic components of the response definition. The child's target behavior was then observed for 20 min as during baseline. At the end of the observation period, the experimenter approached the child and made one of the following statements: "You said you were going to stay in your seat and you really did," or "You said you were going to stay in your seat but you really didn't, did you? Well, you'll have to try harder tomorrow." If Linda actually followed through on her verbalized intention to stay seated, she was permitted to leave the room with the experimenter for a walk during which she received some candy. A rather stringent criterion for receiving reinforcement was in effect throughout the treatment condition; specifically, Linda's out-of-seat responses had to be three or fewer each day, with a total duration of less than 1 min. During Linda's second treatment condition the same procedures were in effect.

Follow-up. Follow-up observations were made 8 mo after termination of the treatment condition. During this condition, the baseline procedures were reinstated for eight sessions. The experimenter merely recorded the target behaviors, and did not reinforce Linda or interact with her in any other way.

Results

Linda. Figure 1 shows the effects of correspondence training on Linda's out-of-seat behavior during the math period. During baseline, she was out-of-seat for relatively long intervals per 20 min-session (mean = 6 min, 56 sec). When correspondence training was implemented, Linda always replied affirmatively to the experimenter's question concerning whether she was going to stay in her seat. During this experimental condition the duration of out-of-seat behavior declined (mean = 57.4 sec) and was at zero level for six of the last seven sessions. When the contingencies were no longer in effect during the second baseline condition, out-of-seat behavior increased (mean = 1 min, 42 sec). However, the reinstatement of correspondence training resulted in a decline in out-of-seat to a zero level (mean = 4 sec). Although duration of out-of-seat increased slightly during the 8-mo follow-up period (mean = 24 sec), it remained close to previous treatment levels. Similar changes could be seen in the frequency of Linda's out-of-seat behavior. During baseline, she left her seat an average of 3.67 times per session. This decreased to an average of 1.58 times during correspondence training. The return to baseline resulted in an increase to 2.55 times. However, the frequency declined during the reinstatement of the treatment contingencies to an average of 1.00 and was maintained at this level during the follow-up (mean = 1.36).

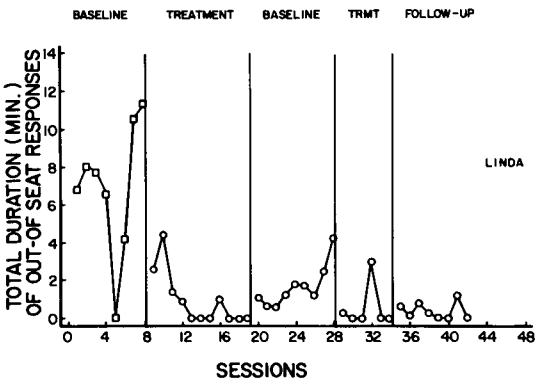

Fig. 1. Total duration of Linda's out-of-seat responses. (Follow-up occurred eight months after termination of treatment.)

Discussion

In this study, the introduction of a "say-do" training sequence (Israel & O'Leary, 1973) resulted in reliable treatment decreases in out-of-seat behavior. Although the reversal was not particularly large, its upward trend and subsequent decline during the second treatment condition provide tentative support to the hypothesis that the changes in out-of-seat behavior were due to the correspondence training procedure. These findings are important in that they suggest that correspondence training procedures can be effective in the treatment of behavior problems

and, in contrast to the results of Brodsky's (1967) investigation, indicate that such procedures can also be used with mentally retarded children. Moreover, despite the fact that baseline procedures were operational during the follow-up condition and no active attempt was made to program maintenance, treatment effects were maintained over an 8-mo period. This finding supports Israel's (1978) contention that correspondence training provides a solution to the maintenance problem.

EXPERIMENT 2

The posture of adults and children has been a focus of concern to health care personnel and educators alike. Both medical authorities and researchers have indicated that there is a direct relationship between posture and health problems such as arthritis, backaches, and disturbances of the nervous and circulatory system and abdominal viscera (cf. Sauer, 1964). Doane (1959), in a correlational study, reported a positive relationship between academic performance and the sitting posture of high school students. Azrin, Rubin, O'Brien, Ayllon, and Roll (1968), noting that proper posture is a matter of aesthetic as well as medical concern, have suggested that if the posture of mentally retarded and mentally ill residents in institutions were improved, it might facilitate successful discharge and greater acceptance of them by the community at large.

Despite the possible clinical, social, and educational implications of posture training programs, procedures for improving posture have seldom been empirically examined. Moreover, little empirical work has investigated the relationship between posture and collateral changes in other behaviors. Past research has suggested that exercise (Christaldi & Mueller, 1963), prosthetic devices (Azrin et al., 1968) and reinforcement techniques (Christy, 1975) can be used to improve sitting posture, but these procedures have been cumbersome and time-consuming to administer and have required considerable surveillance to ensure their effective deployment. In this study, the efficacy of correspondence training as an alternative procedure for developing appropriate posture was investigated in an academic situation with four children from a special education class. The generalized effects of the program across curriculum situations and the durability of its effects across time were examined. Maintenance of the behavior was also assessed during a separate condition when only the children's verbal intention to sit appropriately was reinforced and when responsibility for applying this technique was shifted from the experimenter to the classroom teacher. Finally, the relationship between proper sitting posture and academic performance in a mathematics and writing curriculum was investigated.

The training procedure used in this study differs from that of earlier correspondence studies in the specificity of the verbal statements required from subjects during the "say" phase of correspondence training and the feedback given to them during the reinforcement phase. Whereas in earlier studies an affirmative response (yes) or a brief reply (e.g., "I'll play with the toys") to questions was required during the "say" period (Israel & O'Leary, 1973; Karoly & Dirks, 1977; Risley & Hart, 1968), the present study required each child to state specifically his or her intention to emit four key behavioral components which constituted proper sitting posture. A shaping and prompting procedure was used to develop this chain of verbal responses. The feedback concerning a child's posture was also more detailed than that described in earlier studies, with children being told specifically "how" they had or had not done what they said they would do.

METHOD

Students, Setting, and Task Materials

The study took place in a special education classroom and an adjoining corridor. The class contained 17 students ranging in age from 9 to 12 yr old and in IQ scores from 52 to 88. Four white male students (C.A. range 11-12 yr, IQ

range 72-87) were chosen for training on the basis of teacher nomination and a prebaseline measure of sitting behavior. Both sources suggested that the boys were significantly inappropriate in their posture and that they were the lowest ranked children in the class in this respect. These students often sat slumped over their desks with their feet crossed or tucked beneath them while supporting their heads with their hands. Two other students, Tom and Lana, selected by the same procedures as the most appropriate sitters in the class, were rated during the study for criterion-comparison purposes. All students were exposed to a general curriculum that included math, spelling, science, reading, music, physical education, and social studies. Three of the experimental children, Dave, Jack, and Stan worked at the third-grade level in their classwork. The fourth student, Cal, worked at the fourth-grade level. The study was conducted during the math and writing periods. During math, sheets of 40 single and multiple digit addition, subtraction, multiplication, and division problems were given to the students who were required to copy and solve the problems on a separate sheet of paper. During writing, the children were required to copy story passages contained on cards given them.

Response Definitions and Rating System

The children's verbalizations concerning how they were going to sit and their actual sitting behavior were rated, respectively, during "say" and "do" periods. The appropriate sitting statement involved children verbalizing, without prompts, information concerning their feet, back, hands, and seat positions; specifically, each child was to say that his feet would be kept still and flat on the floor, his back would be against the back of the chair, his hands would be on the desk, and his buttocks would be in contact with the chair seat. When the four basic components were verbalized, the child was rated as having given an appropriate sitting posture statement. Each child's statements were tape-recorded and used subsequently for reliability purposes.

Consistent with the key statements verbalized by the children, appropriate sitting posture was defined as occurring when the child sat in the chair with both feet flat on the floor, buttocks on the chair seat, some portion of the back in contact with the back of the chair, and both hands on the desk top. Observations of sitting posture took place daily during a math and writing period, each of which was 16 min in duration. The rater, positioned in front of the class, alternated observation between pairs of students every minute. For each child, 16 min of data per session and 8 min per academic task were collected. A whole-interval rating system was used with each interval being 10 sec in length. Percent appropriate posture was determined separately during both math and writing by dividing the number of complete intervals that the child sat properly by the total number of rating intervals and multiplying by 100.

Correspondence was defined on a session-by-session basis as occurring when the child emitted an appropriate sitting statement before each session and then was observed to exhibit sufficiently appropriate sitting posture during math to meet the reinforcement criterion for that day. The reinforcement criterion was set during the first treatment session at a level 10 percentage points above each child's average percentage of appropriate sitting during the previous five baseline sessions. When the student exceeded the criterion by 10 or more points for two days in a row, the criterion was elevated to a level 4 percentage points above the average performance of the two preceding days. When the child displayed appropriate posture at least at a 75% level for two successive days, the reinforcement criterion was maintained at this level.

Performance Variables

To assess the effects of appropriate posture on math performance, the percentage of the total problems completed and the percentage of the total problems completed correctly were calculated each day. Measures of writing performance were also obtained except that units rather than

problems were evaluated. A unit was defined in terms of potential sources of error. These units included words, indentations, quotation marks, hyphens, and punctuation marks. As during math, percent total units completed and percent units completed correctly were assessed. A unit was considered to be completed correctly when each word, indentation, and punctuation was present, in the proper sequence, written legibly, and spelled correctly.

Reliability

To assess the reliability of the systems for rating the students' verbal statements, posture, correspondence behavior, and math and writing performance, two observers recorded each child's behavior simultaneously, but independently, twice during each week of the study. For posture, observer agreement was defined as occurring when both observers recorded either the presence or absence of appropriate posture during the same 10-sec interval. Reliability figures were calculated for both occurrence and nonoccurrence of appropriate posture and occurrence reliability coefficients were calculated for the other variables. The average rater agreement for occurrences of appropriate sitting posture was 92.4% (range 79-99%); for nonoccurrence of appropriate posture rater agreement was 92.5% (range 78-99%). Rater agreement for occurrence of appropriate sitting posture statements and correspondence were both 100%. There was also 100% agreement between raters in their scoring of math accuracy and work completed. Agreement for writing accuracy and writing work completed was 95% (range 81-100%).

Design

Posture was observed throughout all phase of the study during the math and writing periods. A multiple-baseline design across subjects was used. Following baseline, correspondence training was introduced in a sequential fashion during the math period across the four experimental children. Finally, a maintenance (reinforcement for verbal statements alone) and transfer (transfer of stimulus control to teacher) phase was introduced simultaneously to the four children, following correspondence training during the math period. No training intervention ever occurred during the writing period. The behavior of the two criterion-comparison students who never received training was probed throughout the study.

Procedure

Baseline. Sessions were held Monday through Friday from 8:35 a.m. to 9:25 a.m. Before each session, an announcement was made to the entire class by the teacher: "I want to see everyone sitting properly today. This means having (1) your feet flat on the floor, (2) your seat in your chair, (3) your back against the back of your chair, and (4) both hands on your desk. You'll find you'll do better work and look like good students if you sit this way." The teacher then gave brief instructions to the class concerning the math exercises to be completed. After 16 min, the teacher instructed the children to stop and turn in their math papers. This procedure was repeated approximately 30 min later for the writing task except no sitting instructions were given to the class during this period.

Correspondence training. The procedures used during the baseline condition were also in effect during the correspondence training phase. After the teacher gave the general sitting instructions, the children were removed individually from the classroom into the hallway and asked, "Do you remember how Mrs. Jones said you should sit? How are you going to sit today?" If the appropriate verbal response was not given, the children were prompted verbally until all four key statements were made. Prompts were gradually faded until the children independently voiced the appropriate sitting statement in response to the question. When the children responded correctly with the appropriate statement they were praised by the experimenter and told to return to their classroom.

At the end of the math and writing session, each child's percentage of proper sitting was calculated. Each child was removed from the classroom and given feedback. If the child had met the reinforcement criterion during the math period for that day, he was told, "You said you were going to sit properly today and you did. Your feet were still and flat on the floor, your hands were on your desk, your seat was in your chair, and your back was against the backrest. That's terrific but there's still room for improvement. I hope you'll do better tomorrow." The children were given tokens which entitled them to a library pass or access to a calculator upon presentation of the token to the teacher. If the reinforcement criterion was not met by the children the following type of feedback was given: "You said you were going to sit properly today, but you didn't. Your feet were off the floor X times. I hope you'll do better tomorrow by keeping your feet where they should be."

Maintenance and transfer phase. The procedure for this phase was similar to that in effect during the correspondence training phase. However, reinforcement was no longer contingent on correspondence between the children's appropriate statement about how they were going to sit and their actual posture during the math task, but only on their voicing the proper sitting statement. Thus, after completion of a session, each child was taken from the classroom and told, "You said you were going to sit properly today, that's great!" and a token was given to him without mention of his actual posture. After each child's behavior had been assessed for 2 wk (i.e., 10 sessions) under this new condition, the maintenance procedure was faded to the teacher. When transfer was completed, the teacher administered the questioning and reinforcement procedures and the experimenter no longer entered the school. These procedures, in contrast to the baseline procedures in effect during the follow-up condition in Experiment 1, constitute an active attempt to achieve program maintenance.

RESULTS

Correspondence

Cal and Jack displayed perfect (100%) correspondence between their verbal sitting statements and their actual sitting performance during the correspondence training and maintenance phase. That is, they verbalized the four key components that described appropriate sitting behavior and then proceeded to meet the predetermined sitting criterion for each session. Stan exhibited a near perfect pattern (96% correspondence), failing to reach criterion on only two sessions. In contrast, Dave achieved only a 72% overall correspondence level, failing to reach criterion on 13 different sessions.

Posture

Math. Figure 2 shows the percentage of 10-sec intervals in which appropriate posture behavior was displayed by the four experimental and two criterion-comparison students during the study. A marked increase in appropriate posture is seen for each of the experimental children during the correspondence training phase. These gains were sustained during the maintenance and transfer phases. Although all four children ultimately displayed very high levels of proper sitting posture, the slopes of improvement for two children, Cal and Stan, were more pronounced than those of Dave and Jack. No systematic change was noted during the study in the sitting behavior of the criterion-comparison children. Although these two latter children were selected prior to the initiation of this study on the basis of the classroom teacher's nomination and prebaseline behavioral assessments as being two of the "best sitters" in the class, their data suggest that their sitting posture was, initially, only slightly better than two of the experimental children, Dave and Stan. After treatment and during the content and transfer phases, the criterion-comparison students exhibited consistently lower levels of appropriate posture than all of the experimental students.

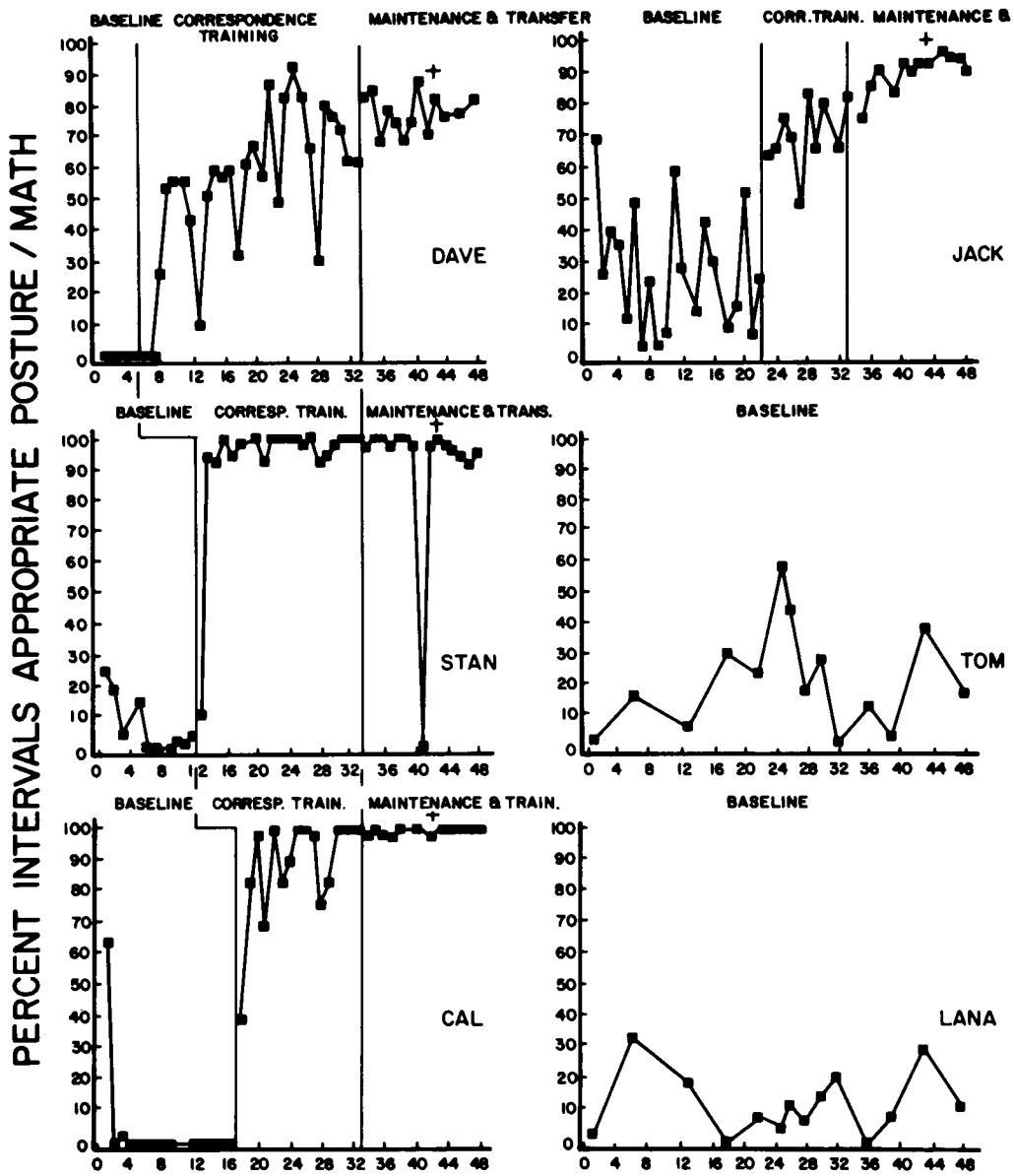

Fig. 2. Percent intervals in which experimental and criterion-comparison students displayed appropriate posture during math. (+ indicates point at which maintenance procedure was transferred to teacher.)

Writing. Figure 3 shows the percent intervals of appropriate sitting posture for all students during writing. Although correspondence training contingencies were never extended to this situation, the changes in sitting posture were virtually identical to those displayed during math. Specifically, two of the experimental children, Cal and Stan, showed rapid increases in appropriate sitting posture to ceiling levels during the correspondence training phase, while the other two experimental students, Dave and Jack, exhibited more gradual slopes of improvement. For all four children the gains were sustained during the maintenance and transfer phases.

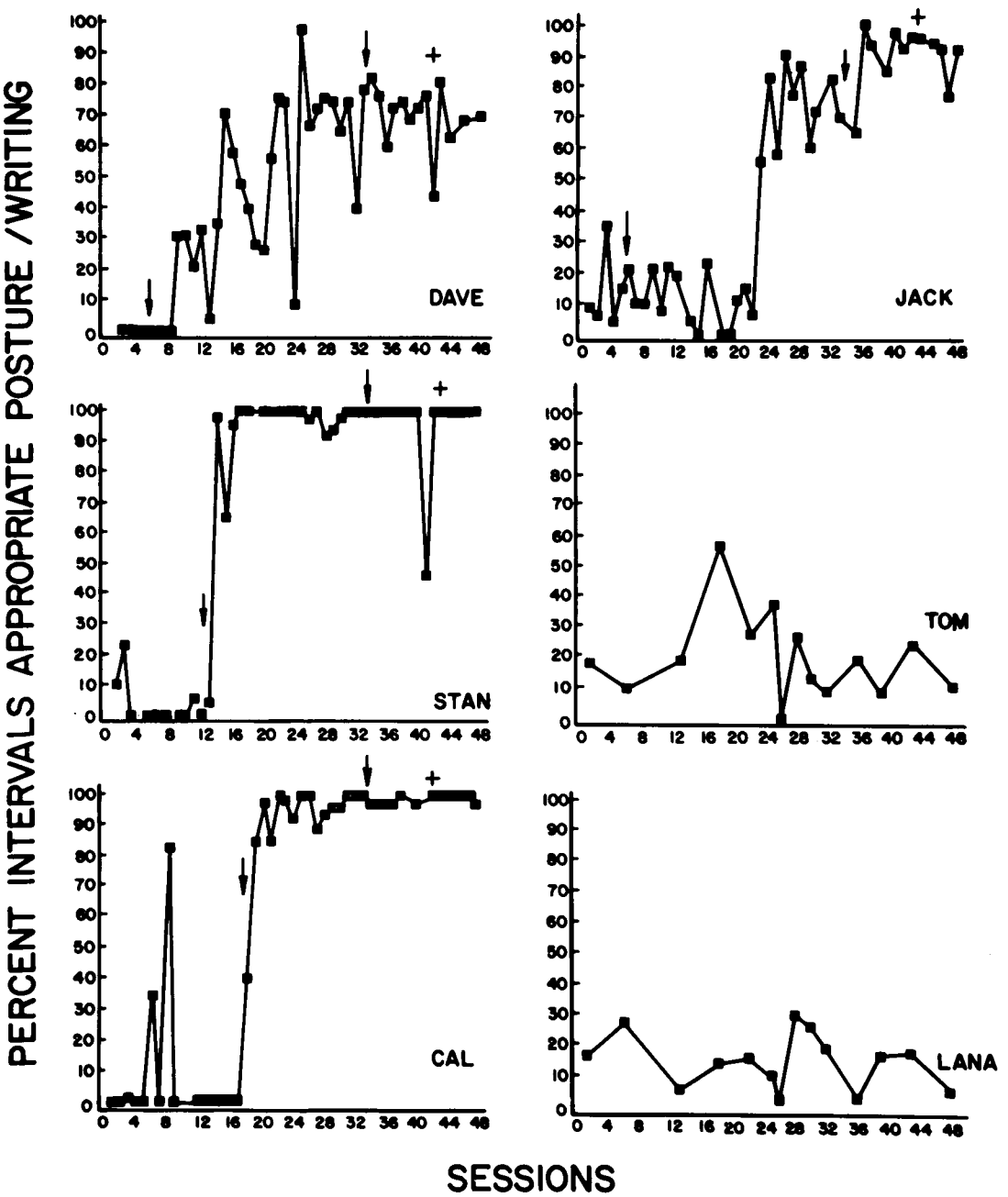

Fig. 3. Percent intervals in which experimental and criterion-comparison students displayed appropriate posture during writing. (Arrows indicate point of onset for treatment and maintenance conditions in math; + indicates point at which maintenance procedure was transferred to teacher.)

Moreover, during the training and the maintenance and transfer conditions, the experimental children sat more appropriately than the two criterion-comparison children, who showed no reliable change in their behavior in this situation.

Posture, Task Completion, and Accuracy

As indicated in Table 1, there was an overall mean increase in the amount of math and writing work completed by all experimental stu-

Table 1

Mean percent math problems and writing units completed by experimental students.

Task	Student	Baseline	Correspondence[a] training	Maintenance[a] and transfer
Math	Dave	25	39	35
	Stan	28	46	22
	Cal	32	43	46
	Jack	43	61	58
Writing	Dave	31	48	55
	Stan	38	43	51
	Cal	52	55	53
	Jack	29	36	39

[a]Headings refer to conditions in effect in math situation.

Table 2

Mean percent math and writing problems completed correctly by experimental students.

Task	Student	Baseline	Correspondence[a] training	Maintenance[a] and transfer
Math	Dave	73	53	67
	Stan	42	65	74
	Cal	63	73	68
	Jack	59	70	80
Writing	Dave	80	74	82
	Stan	81	85	89
	Cal	88	93	95
	Jack	89	92	93

[a]Headings refer to conditions in effect in math situation.

dents, although there were individual differences in the extent of change that occurred. With the exception of Dave, the greatest increases occurred in math. Only modest changes in Stan's, Cal's, and Jack's writing performances were seen. The increases across tasks were generally sustained during the maintenance and transfer condition with the exception of Stan, who showed a decrease in math work completed. Similar trends are seen in the accuracy data (See Table 2). With one exception, Dave, in math and writing, increases in students' accuracy were seen across conditions and tasks with the greatest changes occurring during math. As seen in Tables 1 and 2, there was considerable intra-student variability across tasks in the quantity and accuracy of work completed. To establish whether there was a correlation between postural behavior, problems (units) completed, and accuracy, product-moment coefficients were calculated for each child and task. Table 3 shows a consistent significant positive correlation between sitting posture and task completion across children for both the math and writing tasks, except for Cal where the correlations approached significance. These correlations indicate that as sitting posture improved, amount of work completed increased. There was a less consistent relationship between posture and task accuracy across students and tasks. Only the data for Jack and Stan, in math, and Cal, in writing, show a significant positive correlation between these

Table 3

Correlations between posture, work completion, and accuracy for experimental students during math and writing.

	Math			Writing		
Student	Posture with completed	Posture with correct	Completed with correct	Posture with completed	Posture with correct	Completed with correct
Dave	.3782**	−.0159	.3514*	.6042**	−.0603	−.5100**
Stan	.3952*	.4269**	.5141**	.2925*	.2494	.0331
Cal	.2814[a]	.1475	.6465**	.2821[a]	.6377**	.2393
Jack	.4487**	.4342**	.5725**	.4850**	.1367	.0336

[a]Correlations approach significance at the .05 level.

*$p < .05$.

**$p < .01$.

measures. These correlations indicate that as posture improved, accuracy of work increased. During math there was a consistent significant positive relationship between work completed and accuracy.

Discussion

The results of this study indicate that correspondence training is an effective procedure for increasing appropriate sitting posture in EMR children. Although the experimental children displayed inappropriate posture during most of the rating intervals in the math setting during baseline, all four children showed rapid and extensive increases in proper sitting posture during training. These changes were sustained throughout the maintenance and transfer period including after the teacher began applying this procedure. Moreover, the effects were found to occur to virtually the same extent in an untreated generalization situation, that is, during writing. Although three of the four experimental children were rated during a prebaseline condition as having the "worst sitting" posture in the class, they were, after training, considerably better in their posture than the criterion-comparison children. Finally, this study suggests that there is a direct and positive relationship among sitting posture, quantity of work completed, and accuracy. However, correlations between these measures were not significant for all students nor were the significant correlations near a 1.0 level. This suggests that although improved posture may be an important condition for increasing performance, it is not sufficient and other techniques for increasing the quantity and accuracy of work completed are needed.

The extent of the situational generalization effect obtained in this study was extremely surprising and intriguing, given the frequent reports in the behavior modification literature of failures to achieve generalization. Although the generalized change in posture in the writing situation was replicated across all four students, it may be that this effect is not a function of the correspondence procedure per se. Despite the fact that reinforcement was based on correspondence between the student's verbal and nonverbal behavior in the math situation, it was not administered to the students until both the math and writing tasks were completed. When reinforcement was given, the nature of the contingency that was in effect was not spelled out beyond the fact that it was for appropriate sitting. It is possible that because reinforcement was delayed in this fashion, the student was not able to discriminate completely why reinforcement was given. A similar interpretation of delay of reinforcement effects is presented by Fowler and Baer (1981), who systematically examined the effects of reinforcement delayed for different intervals.

This failure to discriminate may also account for the student's high levels of appropriate posture during the maintenance and transfer condition. During this last condition, reinforcement was contingent only on the student's specific verbal statement of intention to sit correctly. However, correspondence was consistently reinforced because proper sitting was at such high levels throughout this condition. The only discriminative stimulus available to the students to indicate a shift of contingency occurred during the feedback given at the end of each session. They were no longer told "You said you would sit properly today, and you did or didn't," but rather only "You said you would sit properly today; that's what I like to hear, good!" Given the positive implications of the results in this study for the development of a generalization technology, further research is needed to explain whether the strong maintenance effects that occurred were a function of verbal control of behavior being established, or due to student failure to discriminate reinforcement contingencies in effect, or some combination of these two factors.

EXPERIMENT 3

Traditional correspondence training procedures require that the subjects possess a certain degree of verbal ability (Israel, 1978). The sub-

ject must be able to comprehend questions asked about his or her intentions to behave in a certain fashion (say-do) or about the manner in which he or she behaved in the past (do-say) and he or she may, as in the previous study, have to repeat complete sentences. Thus, it is not clear whether these procedures can be used with language deficient individuals, such as severely mentally retarded individuals. If a retarded child's expressive language deficiency is so marked that he or she cannot articulate the appropriate verbal cues, it may be impossible to use correspondence training programs in a manner similar to that described in Experiment 2. However, it may be possible to provide functional cues by other than verbal means.

The purpose of Experiment 3 was to examine whether a correspondence training procedure could be implemented with nonverbal children in a special education program to increase and maintain attending behavior in a classroom setting. During correspondence training, rather than requiring extensive verbalizations, motoric cues were elicited from the children. Specifically, the children were required to demonstrate how they were going to attend in the classroom and they were reinforced if they actually did attend in that manner. That is, rather than having the child *say* during training what he or she was going to do, each child was required to *show* what he or she intended to do. An additional objective of the study was to determine whether attentional changes produced in such a manner could be sustained during a maintenance and transfer phase in which the students were reinforced only for showing what they were going to do. Throughout the study the students' academic performance, as well as their attentional behavior, was monitored to assess whether positive changes in classroom performance were associated with attentional changes.

METHOD

Students, Setting, and Task Materials

Four students with attentional problems from a combined TMR-EMR class participated in this study. Paul, age 11 yr, 6 mo, with an IQ of 56, had a marked expressive language deficiency and generally relied on a small number of phrases, which were not always appropriate, to communicate with others. Mary, age 10 yr, 2 mo, was untestable on standardized intelligence tests. Her expressive language repertoire was extremely limited, consisting of single, one-syllable words and pointing. Steve, age 10 yr, 8 mo, scored 68 on the Stanford-Binet. Despite his higher IQ, he was able to express himself in only very simple sentences. All three children, although also delayed in their receptive language, could follow simple instructions and were achieving academically at a first-grade level. These children were selected because of their marked expressive verbal deficits and because of teacher and prebaseline behavioral indications of attentional problems. When assigned an academic task to complete, they were generally off task, frequently glancing up from assigned seat work, turning to watch other children, and playing with objects on their desks.

To assist in assessing the effectiveness of the training procedure, a fourth child, Carol, age 13 yr, 5 mo, with an IQ of 64, was selected as a criterion-comparison student for social comparison purposes. Her verbal skills, both expressive and receptive, were generally good, in spite of some articulation problems. She was also chosen on the basis of teacher recommendations and prebaseline observations. Prebaseline observations indicated that she attended to her seat work better than any other student in the class.

The study took place in the special education classroom. There were 13 students in the class. The daily curriculum was aimed at developing basic math, spelling, and phonics skills. Sessions were conducted during the math and spelling periods. Task materials consisted of sheets of simple one-digit math problems and spelling exercises. During each math session, 140 addition and subtraction problems were given to the children, considerably more than any of them could complete. The spelling exercises required children to copy three- and four-letter words.

During each session, the students were asked to copy two pages of spelling words, each containing 16 words.

Response Definitions and Rating Procedure

The main target response was on-task behavior. To be considered on task, each child had to conform to the following response requirements: (a) their buttocks had to be touching the seat bottom of the desk with (b) their eyes oriented toward the task materials while (c) interacting manually with the task materials. Two of the three experimental children were observed simultaneously, on an alternating basis, that is, every 5 min a different pair of children was observed. Thus, during each 30-min session, each child was observed for a total of 20 min. The criterion-comparison child was observed separately, either before or after these rating sessions, once a week for 20 min.

A whole interval-rating system was used, with 10-sec observation intervals. Any break in eye or manual contact with the task materials or incorrect posturing resulted in that interval being scored as off task. The percentage of 10-sec intervals scored as on task constituted the major dependent variable. Other dependent measures included the percentage of 140 math problems completed, and percentage of attempted math problems correct. For the spelling task, the percentage of 350 letters completed, and the percentage of completed words spelled correctly were recorded.

Reliability checks were performed twice during each experimental condition by an outside observer, unaware of the condition in effect. Reliability for both occurrence and nonoccurrence of on-task behavior was computed on an interval-by-interval basis. The number of agreements was divided by the number of agreements plus disagreements, and multiplied by 100. Occurrence reliability ranged from 76% to 100%, with a mean of 93%. Nonoccurrence reliability ranged from 75% to 99%, with a mean of 88%. All reliability checks for the performance measures indicated perfect rater agreement.

Design

A multiple-baseline design across subjects was used to assess the effectiveness of the procedure. Following a baseline condition, a show-do correspondence training procedure was sequentially introduced across the three experimental students. For each student, the procedure was simultaneously enacted across the two tasks, math and spelling. After all children had received training, two of them were simultaneously switched to a maintenance condition. The third child was not included in this condition because he moved to another school. Throughout the study, the criterion-comparison child's attending behavior was monitored but was not treated.

Procedure

Five 30-min sessions were held each week. Two sessions were conducted each Tuesday and Thursday morning, with the second session starting 1 h after the first. One session was held on Friday afternoon. Each session consisted of two 15-min periods, during which each child was given in a sequential fashion the math and spelling tasks to complete. Task order was counterbalanced. Before each session, the teacher made the following general announcement to the class: "I want to see everyone paying attention to his or her work today. Here's how we pay attention to our work: We sit up straight in our chairs with our feet in front and our arms on the desk. Always look at your paper and try to do your best. Don't look around the room or get out of your seat."

Baseline. During baseline, only teacher instructions to the class were given. Attending behavior was then observed and recorded while the students worked on the math and spelling exercises.

Correspondence training. Each child was taken out of the room individually into an adjoining hallway and asked if he or she remembered each of the criteria making up the response definition of on-task behavior, as verbalized by the teacher. For example, the experimenter said:

"Do you remember what (Teacher's name) said about paying attention to your work? . . . about sitting straight in your chair? . . . about looking at your paper?" If the child remembered, he or she typically nodded or said yes. If a student answered negatively, he or she was asked, "Did she say to sit up straight in your chair and look at your paper?" When the children responded affirmatively, the initial question was repeated, "Now do you remember what the teacher said about paying attention?" Once an affirmative answer was given, each child was told to demonstrate the appropriate attending behaviors at a desk placed in the hallway. Specifically, the experimenter said, "Show me how you are going to pay attention to your work." If a child was not able to demonstrate on-task behavior correctly, he or she was verbally prompted, for example, to sit straight and/or to look at the paper. When appropriate on-task behavior was demonstrated, positive feedback was given. For example, the experimenter might say, "You're sitting straight in your chair, your feet are in front, your arms are on the desk, and you're looking at your paper. That's the way to pay attention to your work." During this demonstration period, each child was required to be on task for a 10-sec interval. After this occurred, the child returned to the classroom and was given the academic tasks to complete.

At the end of each 30-min observation period, each child was individually taken from the room in random order. For any particular session, a child was considered to have shown correspondence if he or she demonstrated what he or she should do to be on task and then if he or she subsequently met the on-task criterion for that daily session. A shaping procedure was used. The reinforcement criterion for on-task behavior and the changing of that criterion was calculated and established as in Experiment 2 with a terminal criterion of 80%. If the child had attended for the criterion number of intervals for a particular session, praise and nonverbal approval (e.g., patting, touching) were given along with specific feedback such as "That was very good; you sat straight and looked at your paper very well." If criterion was not reached, the experimenter gave the child the following verbal feedback: "You didn't really pay attention to your work. You looked around the room, got out of your seat, etc." Corrective feedback was also given, telling the child what he or she should have done. In addition, the child was shown visually what he or she did wrong and what he or she should have done.

Maintenance and transfer. The maintenance procedure was identical to that in effect initially during correspondence training sessions. The students were taken to the hallway, asked if they remembered the teacher instructions, and then told to demonstrate on-task behavior. Students were reinforced for appropriate demonstration of on-task behavior. No contact was made with them at the end of the session, irrespective of their on-task behavior. Transfer of control from the experimenter to the classroom teacher was accomplished by having the teacher gradually assume the administration of the maintenance procedure. During the last seven sessions, the teacher applied the procedure in the absence of the experimenter.

RESULTS

Correspondence

The level of correspondence exhibited by each student was uniformly high. Throughout the study, all three experimental children showed correspondence for every session, with only one exception.

On-Task Behavior

Figure 4 shows the percentage of 10-sec intervals the children were on-task during math and spelling in the baseline, correspondence training, and maintenance and transfer conditions. As can be seen in Figure 4, the pattern of on-task behavior for each child across tasks and conditions was virtually identical. A marked increase in on-task behavior was exhibited by all three experimental students after correspondence training

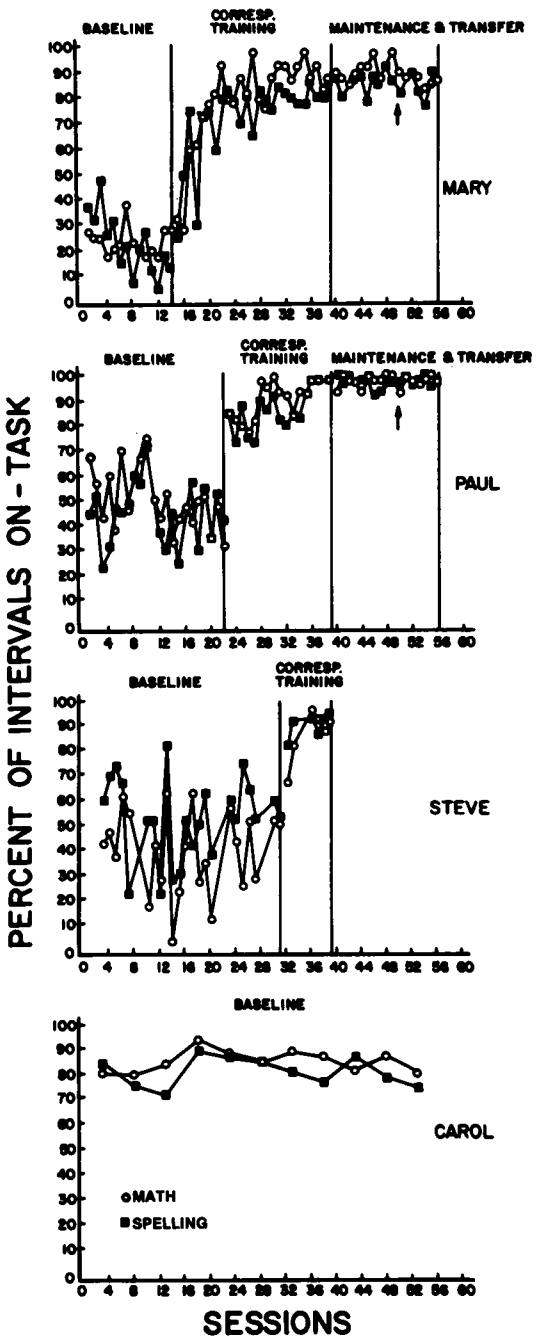

Fig. 4. Percent intervals in which experimental and criteria-comparison students displayed on-task behavior during math and spelling. (Arrow indicates point at which maintenance procedure was transferred to teacher.)

was introduced. The mean percent increases in on-task behavior during math were 57%, 40%, and 47% and during spelling were 51%, 41%, and 37% for Mary, Paul, and Steve, respectively. This level of performance remained stable throughout this condition once responding was at or above 80% on-task criterion, and was also sustained for Mary and Paul during the maintenance and transfer condition. In contrast to the changes evidenced by these students, there was no appreciable change in on-task performance for Carol, the criterion-comparison student. Carol showed approximately twice as much on-task behavior as the three experimental children during baseline. However, subsequently the experimental children approximated her level of on-task behavior during the correspondence and maintenance and transfer conditions.

Table 4

Mean percent problems completed during math and spelling.

Task	*Student*	*Baseline*	*Correspondance training*	*Maintenance transfer*
Math	Mary	31	62	65
	Paul	36	44	34
	Steve	39	33	—
Spelling	Mary	29	32	34
	Paul	25	30	23
	Steve	70	84	—

Work Completion and Accuracy

As indicated in Tables 4 and 5, Mary showed a mean increase in the percentage of math problems completed during treatment as well as a

Table 5

Mean percent problems correct during math and spelling.

Task	*Students*	*Baseline*	*Correspondence training*	*Maintenance and transfer*
Math	Mary	10	8	8
	Paul	10	18	35
	Steve	9	10	—
Spelling	Mary	53	63	71
	Paul	10	26	47
	Steve	86	92	—

mean increase in spelling accuracy. Paul showed a mean increase in both math and spelling accuracy. Finally, Steve displayed an increase in spelling work completed. Although other increases can be noted in Tables 4 and 5, only where the aforementioned mean increases occurred were there also significant overall positive correlations (product-moment) between performance changes and changes in on-task behavior.

Discussion

The results of this study clearly suggest that correspondence training is an effective procedure for increasing the on-task behavior of nonverbal retarded children in an academic setting. Consistent with the results of Experiments 1 and 2 and previous published research using conventional verbal correspondence training procedures (Karoly & Dirks, 1977; Risley & Hart, 1968), the show-do procedure in this study produced extensive and rapid changes in behavior.

Two of the children reached the 80% target level of on-task behavior during the first few treatment sessions, and the third was at that level by the end of the second week of treatment. Further, the results indicated that no decrement in on-task behavior occurred for the two children placed in the maintenance and transfer condition. The successful modification of the say-do to a show-do correspondence procedure in this study points out the flexibility of this technique and its general reliability and effectiveness across different subject populations. In this regard, although the procedures do not allow definitive conclusions to be made, the results suggest that a motoric nonverbal as well as verbal response can serve as an appropriate discriminative stimulus for mediating transfer to the classroom. Congruent with findings by MacMillan (1970) and Brown (1974), this investigation suggests that even retarded children with limited expressive language have mediational capabilities, if the mediators provided are relevant to the solution of the task. Finally, the study suggests that correspondence training procedures represent an effective alternative to traditional operant procedures for modifying on-task attentional behaviors (Iwata & Bailey, 1974; Kazdin & Klock, 1973; cf. Madsen, Becker, & Thomas, 1968) and that, consistent with previous studies (O'Leary, Becker, Evans, & Saudargas, 1969; Surratt, Ulrich, & Hawkins, 1969), increasing on-task behavior can yield concomitant changes in educational performance in curricula such as math and spelling.

GENERAL DISCUSSION

The results of the three studies reported here provide evidence that correspondence training can be used with educationally handicapped and mentally retarded children to decrease maladaptive behavior and to increase adaptive behavior. The results also suggest that correspondence training can produce not only direct but generalized changes in behavior. The social significance of these effects is highlighted in Experiments 2 and 3 by the fact that the experimental children achieved levels of appropriate behavior comparable with or exceeding those of the criterion-referent students.

The usefulness of this procedure is underscored by the durability of changes in the target responses during the maintenance and transfer sessions in Experiments 2 and 3. Consistent with suggestions by Stokes and Baer (1977), naturally occurring reinforcers, in the form of praise and earning privileges, were used to consequate the children's behavior. Further, during maintenance the procedure was transferred to the children's natural educational agent, their regular classroom teacher. The high levels of appropriate behavior which continued when reinforcement was contingent merely on "saying" or "showing" during the maintenance phase provide some indication that these responses were under stimulus control. In addition, the maintenance of these changes when behavioral control was transferred to the teacher suggests that continuous monitoring of the target nonverbal behaviors was not necessary to sustain the behavioral effects. Because the maintenance procedure was easy to

administer, the teacher was able to learn it quickly and to apply it without a great expenditure of time. Although the initial correspondence training procedure was not introduced during treatment by the teachers in these studies, they could have administered it without any significant expenditure of time on their part. Because of its simplicity and its ease of application, the potential for the use of correspondence training by paraprofessionals in various settings is great, and makes it possibly more valuable than traditional reinforcement procedures, which usually require more time to implement and maintain.

Although correspondence training typically assumes verbal facility by the subject, clinicians should not immediately rule it out as a viable treatment strategy for mentally retarded individuals. Experiments 2 and 3 present an explicit procedure for combining verbal and nonverbal strategy training procedures with correspondence training and for ensuring that stimulus control is achieved. Generally, the results of the present studies contrast with that of Brodsky (1967) and suggest that correspondence training can be used with educationally handicapped and retarded children even though they are less proficient in the use of language than other children. The findings are congruent with basic experimental studies that have suggested that although mentally retarded individuals have mediational deficiencies (cf. Brown, 1974; Jensen & Rohwer, 1965; Milgram, 1969), these deficiencies can be ameliorated. Turnure, Buium, and Thurlow (1976) have suggested that through specific and appropriate instruction, the teacher can assist retarded individuals in supplying the strategies necessary for improved performance in the classroom setting. This suggestion is also consistent with Risley and Hart's (1968) postulation that during correspondence training, changes in nonverbal behavior occur because verbal control over this behavior is established. However, agreement on this issue is not uniform. An alternative hypothesis, discussed by Rogers-Warren and Baer (1976) attributes correspondence training effects to a delayed reinforcement of nonverbal behavior, rather than to the reinforcement of true verbal reports. A third possibility, indirectly suggested by Redd (1969), is that the correspondence effects may be due to the observers serving as discriminative stimuli for the subjects' good behavior. Further research is needed to test these hypotheses.

Research is also needed in several other areas. Although correspondence did lead to increased in-seat, on-task, and correct postural behavior, the impact of these changes on the quantity and quality of academic work needs to be more extensively investigated. The results of Experiments 2 and 3 suggest that there is a definite interrelationship between posture and academic performance and on-task behavior and academic performance. However, the differences in the patterning of correlations across individuals in these studies indicate that these relationships are complex. It may be that these individual differences are a function of the basic skills the children brought into the task situation. Other research is needed to compare the responsivity to correspondence training of mentally retarded children differing in degree of deficit. Such studies will not only determine the type of children with whom correspondence training is most effective, but also can provide a test for Luria's (1961) and Vygotsky's (1962) developmental notions concerning the evolution of verbal control over nonverbal behavior. It should be stressed that although the show-do correspondence procedure used in Experiment 3 appears to be a promising technique for changing the on-task behavior of nonverbal retarded children, it needs more extensive evaluation before definitive conclusions concerning its efficacy with this population can be made. Other potential areas for research include investigating the effectiveness of correspondence training with subjects who are deaf or have other learning disabilities. Comparison studies should also investigate (with both retarded and normal children) the relative efficacy of correspondence training and tradi-

tional reinforcement procedures where only nonverbal behavior is reinforced. Finally, process and component analyses are needed to sift out the key components involved in correspondence training.

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