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EFFECTS OF SELF-INSTRUCTIONAL TRAINING ON SECOND- AND THIRD-GRADE HYPERACTIVE CHILDREN: A FAILURE TO REPLICATE

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Bornstein and Quevillon (1976) demonstrated generalization from a 2-hour self-instructional training session to on-task behavior in the classroom with 4-year-old overactive children. In an attempt to replicate this work with older children, eight 7- and 8-year-old hyperactive children were assigned to either a self-instructional training group or an attention-practice control group. On-task behavior in the classroom and performance measures in reading and arithmetic were assessed. The level of difficulty of these tasks was varied. The results of Bornstein and Quevillon's (1976) study were not replicated, although the subsequent introduction of a token program significantly increased on-task behavior.

DESCRIPTORS: self-management, tokens, on-task behavior, academic behavior, hyperactive children

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Self-instructions are verbalizations that cue, direct, or maintain behavior. More concretely, spellers self-instruct when they recite, "*I* before *e* except after *c*"; children who have read *The Little Engine That Could* learn to say, "I think I can, I think I can," in challenging situations.

Laboratory research has demonstrated that self-instruction is a skill that can be taught and that can produce more adaptive behaviors in children. Bem (1967) established that 3-year-old children who did not possess the mediational skills necessary to solve a particular problem could be taught to self-instruct and consequently could solve the problem. Meichenbaum and Goodman (1971, exp. II) showed that after self-instructional training, impulsive children increased the latency of their responses on Kagan's Matching Familiar Figures (MFF) test. K. D. O'Leary (1968) and Hartig and Kanfer (1973) demonstrated that self-instruction was effective in increasing "moral" behavior of children.

The effectiveness of self-instructional training may depend on the type of task employed. For example, the relationship between frequency of self-instructions and level of task performance was high when simple motor behaviors were used (Hartig & Kanfer, 1973; Monahan & K. D. O'Leary, 1971) but absent when the tasks involved complex cognitive or perceptual-motor responses that the children had not yet learned (Robin, Armel, & K. D. O'Leary, 1975; Higa, Note 1).

The evidence that self-instructional training produces generalization is mixed. Meichenbaum and Goodman (1971) found generalized performance gains for hyperactive 7- to 9-yr-old children on the Picture Arrangement subtest of the WISC but not on Block Designs or the Coding subtests. While increased response latency was noted on the Matching Familiar Figures test, the number of errors committed did not change. Training had no impact on classroom behavior. Subjects were trained on tasks almost identical to those which reflected change, a fact which limits conclusions regarding the generalization

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that was observed. Also, Jackson (Note 2) and Combs (Note 3) failed to find generalization of self-instructional training to dissimilar tasks.

In contrast to Meichenbaum and Goodman's 1971 findings, Bornstein and Quevillon (1976), using a 2-hr self-instructional package similar to Meichenbaum and Goodman's with three overactive 4-yr-olds, demonstrated generalization to classroom on-task behavior. An aspect of the training package designed to enhance generalization was having the children imagine that their teacher and not the experimenter was telling them to perform the training tasks. Arnold and Forehand (1978) provided partial support for Bornstein and Quevillon's procedure with a similar population.

The existing data suggest that self-instructional training may be a particularly valuable means of treating hyperactive children. While a variety of external contingency programs are effective in reducing the disruptive behaviors of these children in the classroom (K. D. O'Leary, Pelham, Rosenbaum, & Price, 1976; Rosenbaum, K. D. O'Leary, & Jacob, 1975) and enhancing academic performance (Ayllon, Layman, & Kandel, 1975), the effects of these programs often do not remain after withdrawal of the program and do not generalize to different situations and behaviors (Bornstein & Hamilton, 1975; Kazdin & Bootzin, 1972, K. D. O'Leary & Kent, 1973).

The present study was designed to replicate Bornstein and Quevillon's (1976) procedure using a clinically hyperactive group of 7- and 8-yr-old children. In addition to on-task behavior, the children's performance on easy and hard math and reading tasks was assessed. Self-instructional training was predicted to have more impact on easy tasks. Teacher attention was held constant through the use of monitoring and feedback.

EXPERIMENT I

METHOD

Subjects

The subjects were four second-grade and four third-grade nonmedicated hyperactive children enrolled in the Point of Woods Laboratory School of the State University of New York at Stony Brook. Their mean score on the Conners' Abbreviated Teacher Rating Scale (Conners, 1973) was 2.2, which is 3.4 standard deviations above the mean of a normative sample (Werry, Sprague, & Cohen, 1975). Their mean score on the Conduct factor of the Peterson Quay Behavior Problem Checklist (Quay, 1975) was 13.9, which is 1.4 standard deviations above the mean of a nonclinic population (Speer, 1971). The seven boys and one girl ranged in age from 6 yr 10 mo to 8 yr 10 mo, with a mean age of 7 yr 7 mo.

Two groups were formed, each consisting of two second-graders and two third-graders matched on reading and math achievement test scores, on-task behavior, and accuracy on classroom reading tasks. A coin flip determined which group received the self-instructional training package and which group served as a control for attention and practice.

Treatments

Self-instruction I. The experimental subjects were seen individually for one 90-min session. The self-instructional training was the same as that described by Bornstein and Quevillon (1976) and consisted of six steps beginning with the experimenter performing a task while talking aloud and ending with the child performing the task while covertly self-instructing.[1]

The self-instructions included: (a) questions about the task ("What does the teacher want me to do?"), (b) answers to these questions in the form of cognitive rehearsal ("The teacher wants me to copy that picture"), (c) self-instructions which guide through the task ("First I draw a line"), and (d) self-reinforcement ("I'm finished

[1]The present training session was 10 minutes shorter than that of Bornstein and Quevillon, who trained for 2 hours with a 20-minute rest period. In addition, M&Ms were not employed in this package because the children were attentive and cooperative during the training without them.

and I did a good job"). The experimenter also modeled making errors and correcting them.

Training tasks of increasing difficulty were adapted from the Stanford-Binet, Wechsler Intelligence Scale for Children, and the McCarthy Scales of Children's Abilities. The tasks paralleled those used by Bornstein and Quevillon but were adjusted for the age of our subjects.

Attention-practice control I. The control subjects had one 90-min session with an experimenter during which the experimenter modeled performance without self-instruction on the training tasks and then asked the children to perform the tasks. The control intervention differed from the experimental program only in the absence of self-instructions.

Subsequent to this intervention, the classroom behavior of the experimental and control subjects was observed for an average of 10 days. Based on the results of these observations, a second intervention was implemented for both the experimental and control subjects.

Self-instruction II. Each experimental child received a 40-min training session each day on 2 consecutive days. The training tasks were assignments from the child's "hard" reading workbook. The training followed the same steps previously described. The experimenter also pointed out the child's typical errors, i.e., skipping problems, drifting away from the task, and wrong answers.

To cue the children to use self-instruction, bright orange gummed labels were given to the children with the instructions, "These labels are to remind you to talk to yourself." The experimenter modeled use of the labels, and the children were told to place these labels on their classroom work as a reminder to talk to themselves.

Attention-practice control II. Control subjects spent the same amount of time with the experimenter working on their hard reading workbook problems. The therapist modeled problems, mistakes, and the use of labels on each page of work without any self-instructional verbalization. Children were given gummed labels and told, "Place a label at the top of each page of your work." The classroom behavior of the experimental and control subjects was observed for an average of 8 days following this intervention.

Tasks

Four classroom tasks were employed—easy reading, hard reading, easy math, and hard math—to assess generalization of self-instructional training to classroom academic performance. *The Sullivan Reading Program* (Behavioral Research Laboratories, 1972) and *Elementary School Mathematics* and *Investigating School Mathematics* (Addison-Wesley, 1973) were used. "Easy" reading or math was defined as that level text which was 6 mo below a child's achievement test grade-level score. "Hard" reading or math corresponded to the child's achievement test grade-level score.

PROCEDURE

The children worked for 10 min on each of the four tasks, with 5-min breaks between tasks. These tasks were presented in random order. Each child was given feedback on his/her previous day's work based on the percentage of problems he/she answered correctly. Teacher behavior was observed daily, and feedback was given whenever her attention to any child deviated from a prebaseline range.

Baseline measures were obtained for 2 wk. Children were observed for approximately 2 wk following Self-instruction I and for 2 wk following Self-instruction II.

Dependent Measures

1. *On-task behavior.* Children were observed through a one-way mirror in 15-sec intervals (10-sec observe, 5 sec record). The children were considered on-task when they worked on their assigned task for 7 consecutive sec. Each of four observers rated the on-task behavior of one of the four pairs of children. Each child was observed during alternate minutes for all four of the 10-min tasks. Reliability, as determined by dividing the number of agreements by the num-

ber of agreements plus disagreements, was checked at least once per week during the course of the experiment by an independent rater, and ranged from .88 to .95, with a mean of .91. Reliability as determined by Kappa coefficient, was .77.

2. *Academic behavior.* The following measures were obtained daily for each child on each task:

$$\% \text{ Accurate} = \frac{\#\text{ correct}}{\#\text{ correct} + \#\text{ incorrect}}$$

$$\text{Quantity (reading only)} = \#\text{ correct} + \#\text{ incorrect} + \#\text{ skipped}$$

$$\% \text{ Skipped (reading only)} = \frac{\#\text{ skipped}}{\text{quantity}}$$

3. *Teacher attention.* An observer recorded the presence or absence of teacher approval, disapproval, and suggestions directed toward each child in each 15-sec interval during the experimental hour. Reliability was checked twice per week, computed by dividing the number of agreements by the number of agreements plus disagreements for each category, and ranged from 70.0 to 98.8 with a mean of 83.1.

Results

Four $3 \times 2 \times 2 \times 2$ analyses of variance were performed with repeated measures on the first three factors (Baseline vs. Self-instruction I vs. Self-instruction II $\times$ Easy vs. Hard $\times$ Math vs. Reading $\times$ Experimental group vs. Control group). In addition, analyses of teacher behavior were conducted.

Task Validity

Several indices of task validity were available from these four main analyses. Significant main effects were found for the Hard-Easy dimension. On-task behavior was significantly greater for Easy ($\bar{X} = 53\%$) than for Hard ($\bar{X} = 47\%$) tasks ($F = 3.85$, $df = 1{,}6$, $p < .02$). Similarly, accuracy was greater for Easy ($\bar{X} = 90\%$) than for Hard ($\bar{X} = 85\%$) tasks ($F = 11.36$, $df = 1{,}6$, $p < .02$). The quantity of Easy reading ($\bar{X} = 75.4$) problems completed was greater than that of Hard reading ($\bar{X} = 41.4$) problems ($F = 74.72$, $df = 1{,}6$, $p < .001$). (There was no quantity measure for math tasks.) The difficulty of the task had no effect on the amount of skipping (Easy $\bar{X} = 4\%$, Hard $\bar{X} = 16\%$, $F = 2.74$, $df = 1{,}6$, $p < .15$), although the means were in the predicted direction.

Social and Academic Behavior

None of the predicted treatment effects was observed for quantity, skipping, or on-task behavior (Table 1). The Experimental group's accuracy on Easy math increased significantly following Self-instruction I. The effect was present only for the three children whose accuracy scores were unusually low during Baseline ($\bar{X}$'s = 66%, 77%, and 76% for Baseline and 95%, 94%, and 94% for Self-instruction I). Because the two groups were not matched on math performance (they were matched on achievement test scores in reading and math, on-task behavior, and accuracy on reading tasks), a regression explanation cannot be ruled out.

Teacher Attention

Four 3×2 (Baseline vs. Self-instruction I vs. Self-instruction II $\times$ Experimental vs. Control) analyses of variance were performed to determine whether disapproval, approval, suggestions, and total teacher attention (the sum of the first three scores) were indeed held constant. No interaction or main effects for disapproval, suggestions, or total attention were found. A significant intervention by groups interaction ($F = 4.17$, $df = 2{,}12$, $p < .04$) was observed for the number of approvals given, with the frequency of approvals during Self-instruction II decreasing for the Experimental group and increasing for the Control group (Table 2). The nature of this interaction indicated that teacher approval did not function to enhance the effects of the self-instructional interventions.

Individual Patterns of Response

With the exception of the Experimental group's improved accuracy on Easy math, indi-

Table 1

Experimental and control group means for the four tasks on the four dependent measures during Experiments I and II.

	Task[a]	% On-Task		% Accuracy		Quantity		% Skipped	
		Exp.	Control	Exp.	Control	Exp.	Control	Exp.	Control
EXPERIMENT I									
Baseline	ER	61	56	91	90	83.6	79.6	8	3
	HR	56	51	85	89	50.4	43.0	36	14
	EM	40	37	77	94				
	HM	44	34	89	98				
Self-Instruction I	ER	62	62	91	92	62.0	61.8	5	4
	HR	59	57	90	88	48.1	41.3	7	5
	EM	53	49	94	92				
	HM	50	37	86	80				
Self-Instruction II	ER	59	64	90	89	83.0	82.2	5	1
	HR	51	44	91	89	35.9	29.9	32	3
	EM	49	42	87	88				
	HM	48	38	61	81				
EXPERIMENT II									
Baseline	ER	58	51	86	89	58.3	47.7	10	7
	HR	57	48	84	86	50.7	48.6	12	10
	EM	33	44	91	82				
	HM	35	34	80	84				
Tokens	ER	75	78	92	91	63.0	64.8	8	5
	HR	75	81	91	88	53.2	50.3	10	10
	EM	72	70	88	84				
	HM	60	56	92	82				

Note. No quantity or skipping scores were available for math tasks.
[a]ER = Easy Reading, HR = Hard Reading, EM = Easy Math, HM = Hard Math.

vidual children's mean as well as daily scores on all measures showed no systematic changes which could be related to self-instructional training. This was true even for the day immediately following intervention.

EXPERIMENT II

Because of the lack of significant results with self-instructional training, a second experiment was conducted to determine whether these chil-

Table 2

Mean frequency of teacher attention per child per day during the daily 1-hour observation period for the experimental and control groups for Experiments I and II.

	Teacher Behavior							
	Disapproval		Approval		Suggestion		Total	
	Exp.	Control	Exp.	Control	Exp.	Control	Exp.	Control
EXPERIMENT I								
Baseline	2	4	7	5	11	10	20	19
Self-instruction I	1	2	7	5	14	14	22	21
Self-instruction II	2	3	5	6	14	12	21	21
EXPERIMENT II								
Baseline	3	3	7	6	12	18	22	17
Tokens	1	2	3	2	14	12	18	16

dren's behavior could be modified using a token program that rewarded on-task behavior.[2] A 1-wk baseline was instituted, using the same tasks and the same observation methods as in the previous experiment. An array of candies of varying appeal was displayed in a treasure chest at the front of the classroom. After each of the four tasks, the teacher rated all children in the class on a scale of 1 to 5, according to how well they were attending to their work. At the end of the hour, points were summed and children who earned 15 to 20 points were rewarded with candy. Teacher attention was not held constant. This program was in effect for 2 weeks.

RESULTS

Social and Academic Behavior

Four 2 × 2 × 2 × 2 analyses of variance were carried out (Baseline vs. Tokens × Easy vs. Hard × Reading vs. Math × Self-instructional Training vs. Control)[3].

A main effect for treatments ($F = 96.58$, $df = 1,6$, $p < .0001$) showed that Tokens increased on-task behavior from a Baseline mean of 46% to 71% for the Experimental group and from 44% to 71% for the Control group, indicating that the on-task behavior was amenable to change (Figure 1). Reliability for on-task behavior as computed by percentage agreement was .89 and by Kappa was .79. All eight children responded dramatically to the token program. The tokens had no effect on any of the academic measures for any of the children (Table 1).

Teacher Attention

Reliability for teacher attention as computed by percentage agreement was .85. Four 2 × 2 (Baseline vs. Tokens × Self-instruction vs. Control) analyses of variance were performed to assess the effect of the token program on teacher attention. The number of disapprovals per child decreased during the token program from $\bar{X} = 3$ to $\bar{X} = 1.5$ ($F = 6.6$, $df = 1,6$, $p < .05$). The number of approvals also decreased from $\bar{X} = 6.5$ to $\bar{X} = 2.5$ ($F = 2.5$, $df = 1,6$, $p < .05$). The token program produced no significant change in the number of suggestions given each child (although there was a nonsignificant increase) or in the total amount of attention given (Table 2). The decrease in the amount of disapprovals is consistent with the findings of Buckley and Walker (1973); the decrease in the number of approvals conflicts with their results. In the present study, the effect of the token program was to decrease verbal evaluation of students without producing change in overall verbal attention, as though the token evaluation took over the role of social evaluation.

DISCUSSION

This replication of Bornstein and Quevillon's (1976) self-instructional procedure did not generally produce changes in either academic or on-task behavior, yet on-task behavior was shown to be susceptible to modification by a token program. The only exception was improved Easy math accuracy for three of the experimental group children following Self-instruction I. This finding was consistent with the hypothesis that self-instructional training would have the greatest impact on skills which were mastered but were not being optimally performed and consistent with the notion that training generalizes to tasks most similar. During Self-instruction I, training materials did not involve reading but did resemble beginning math problems (i.e., copying geometric forms, conceptual grouping of objects, and puzzle solving).

Two differences between the present study and Bornstein and Quevillon's may account for the discrepant outcomes. First, Bornstein and Quevillon did not assess teacher behavior and acknowledged that their results may have been

[2]On-task behavior was the dependent variable on which Bornstein and Quevillon's effects were demonstrated.

[3]Although all of the children received the token intervention, the data were analyzed as though there were two groups, Self-instructional Training and Control, based on their prior experience in Experiment I.

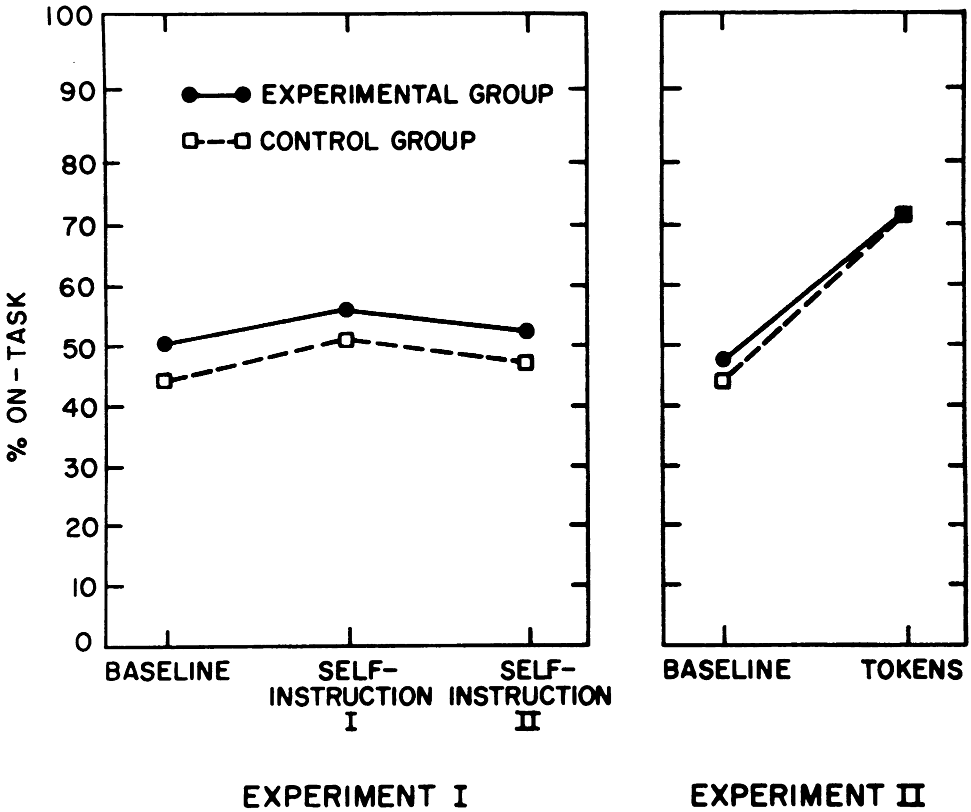

Fig. 1. The mean percent of time spent on task for the experimental and control groups during Experiment I (Baseline, Self-instruction I, Self-instruction II) and Experiment II (Baseline, Tokens).

influenced by increases in positive teacher attention and the consequent enhancement and maintenance of treatment effects. In the present study, attention was monitored, thus removing the possibility of a desirable "behavior trap" (Baer & Wolf, 1970). Second, Bornstein and Quevillon's subjects were considerably younger than the children in the present study. This age difference coupled with the fact that the Bornstein and Quevillon attention-practice control procedure did not control for reinforced compliance with instructions may explain the differential effectiveness of the program. The experimental procedure required the children to practice imagining: (a) a teacher giving instructions and (b) complying with those instructions. This practice might benefit 4-yr-olds for whom compliance in a school environment is not yet a salient factor. This same brief practice in reinforced compliance would not be expected to modify the behavior of older subjects who have a long history of failing to comply with instructions even though they are aware that compliance is considered appropriate classroom behavior.

While self-instructional procedures have demonstrated effectiveness in laboratory situations, the usefulness of such procedures in applied settings with clinical populations will depend on refinements (see Kendall, 1977) of self-instructional interventions. Three factors seem particularly pertinent to consider. First, the child should be helped to determine which behaviors are problematic and he/she should indicate a desire to change those behaviors. In the present study (Self-instruction II), the experimenters made a brief attempt to acquaint the children with their ineffective strategies. The children seemed especially interested in this aspect of the procedure, often laughing in recognition when the experimenter modeled gazing off into space or giving up in frustration. Second, particularly with older children, existing maladaptive or idiosyncratic self-statements should be identified and altered. For example, Thorpe, Amatu, Blakey, and Burns (1976) showed that practice in identifying maladaptive self-statements was effective in reducing the speech anxiety of high school students. Finally, children should learn to recognize when a self-control strategy could be appropriately implemented (Wilbur & Thoreson, Note 4), and the experimenter or clinician should determine whether the children actually used the self-instructions (a determination which was not made by either Bornstein and Quevillon or the present authors). Teaching children why and when to use self-instruction, and ensuring that they do, may be as important as teaching them how to self-instruct.

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