SELF-MONITORING OF ATTENTION AS A TREATMENT FOR A LEARNING DISABLED BOY'S OFF-TASK BEHAVIOR

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Abstract. **A 7-year, 11-month-old, learning disabled boy with attentional problems was taught to self-monitor his on- and off-task behavior by using an audiotape recorder to cue his self-recording. Using a combination of multiple baseline across responses (handwriting and math) and reversal designs, on-task behavior increased dramatically under treatment conditions for both handwriting and math. Academic response rate also increased for handwriting and, especially, math. In an attempt to "wean" the child from possible reliance on the external (tape recorder) signal to self-record, two other treatment conditions were added. The subject was first instructed to self-record without the aid of tape-recorded signals; then, self-recording was discontinued and he was simply to praise himself for being on task. Both conditions led to high levels of on-task behavior and academic output. A one-month followup for math after the experiment found a continued high level of on-task behavior. The relative efficacy of external reinforcement treatments versus more cognitively based approaches such as self-monitoring is discussed.**

According to Bandura and Perloff (1967) and Glynn, Thomas, and Shee (1973) the following four components form a conceptual base for self-control: (a) self-assessment, (b) self-recording, (c) self-determination of reinforcement, and (d) self-administration of reinforcement. Lovitt and Curtiss (1969), studying a 12-year-old behavior-disordered child, were among the first to demonstrate the efficacy of some of the above components. In this now classic study the authors found that self-determined contingencies led to greater academic response rates than teacher-determined contingencies.

Few investigators have studied the self-monitoring aspects of the above model. Particularly with regard to the dependent variable of attention, limited research has been conducted on the effects of self-monitoring, alone or in combination with other treatment techniques. Broden, Hall, and Mitts (1971) increased the attentional behavior of an eighth-grade girl by having her self-record whenever she thought about whether or not she was attending. Using a more structured approach Glynn and his associates had students self-

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record whether they were on or off task whenever they heard a randomly presented auditory signal played on an audio-tape recorder (Glynn & Thomas, 1974; Glynn et al., 1973). However, the latter two studies were not "pure" tests of self-monitoring *per se*, since treatment also consisted of backup reinforcement in the form of each on-task check being redeemable for one minute of free time.

Thus, except for the Broden et al. study (1971), no clearcut evidence has been found indicating that self-monitoring by itself increases on-task behavior. In addition, no study has attempted to determine the effects of self-monitoring attention on other behaviors, e.g., academic performance. Using a procedure similar to Glynn's, the present study was designed to investigate the effects of self-monitoring alone, on both on-task and academic behavior. The study was conducted with a learning disabled boy who had been identified as having attentional problems. Previous studies have not included children specifically identified as learning disabled. In fact, the use of self-monitoring cued by a tape recorder has only been used with second-grade and third-grade children in a regular classroom (Glynn & Thomas, 1974; Glynn, Thomas, & Shee, 1973), even if the study was conducted with the one-third of the class who were considered the most inattentive. In addition to self-monitoring sessions cued by the tape recorder, the final phases of the present study also included a noncued self-monitoring phase (similar to Broden et al.) and a self-praise phase. The latter two conditions represent systematic reductions in the amount of overt cuing to attend to task and were included in order to determine whether the child could be "weaned" from reliance on externally oriented, self-monitoring techniques. In addition, after completion of the study a one-month postcheck of on-task behavior was carried out.

METHOD

Subject and Setting

Edwin, the subject of the study, was a 7-year, 11-month-old boy from a middle-class family. Based on a WISC-R IQ of 121 and *Wide Range Achievement Test* scores, he was performing one year below expected grade level (based on mental age) in reading and one-half year below expected grade level in arithmetic. According to school district criteria he was considered learning disabled and, after referral because of attentional problems (thirty-three percent of the eligible learning disabled children were identified by teachers as having attentional problems), he was placed in a special class for the upcoming year. Shortly after the beginning of the school year, Edwin was tested with the *Woodcock-Johnson Psycho-Educational Battery*. He obtained an IQ score of 110 and achievement grade equivalents of 3.3 in reading, 3.4 in mathematics, and 3.4 in written language. Preliminary observations of his attention to assigned tasks revealed that he was on task approximately 57% of the time. The classroom was a self-contained setting in a public school staffed by a teacher and an aide.

Observations took place every day of the week during two different seatwork tasks - handwriting and math - that Edwin engaged in back-to-back. Each observation started at the beginning of the seatwork session and ended when Edwin had finished his assigned work or at the end of the period. Over the course of the experiment, the mean observation period was 15.44 minutes *(SD = 9.27)* for handwriting and 10.92 minutes *(SD = 6.73)* for math. The relatively large *SDs* were due to the fact that the observation periods decreased markedly in length as a result of Edwin's increased on-task behavior during treatment.

Dependent Variables

On-task behavior. This was defined as occurring when Edwin was sitting in his seat with his eyes focused on his work. The dependent measure was the percent of 6-second intervals during which he was on task.

Academic productivity. Measures were taken of Edwin's academic performance for each day. For handwriting seatwork, he was given a variety of short stories (mean length = 40.92 words, *SD* = 10.96) in manuscript which he was to copy. Since Edwin's major difficulty was in academic output (he rarely made errors), his academic responses were scored in terms of rate rather than percentage correct. His handwriting pro-

ductivity was defined as the number of correct words produced per minute. A word was considered correct when all letters in it were legible and in the correct order. For math seatwork, Edwin was given "times tables" (mean number of problems per day = 72.47, *SD* = 18.16) that the teacher felt were commensurate with his level of math achievement. For example, at the beginning of the study the teacher gave him a page of problems requiring knowledge of the "4 X - table". By the end of the experiment he was asked to compute, all on one page, problems requiring knowledge of the "9 X - table," "10 X -table," and "11 X - table." His math productivity was defined as the number of correct answers written per minute.

Observation Procedure

One observer was used throughout the study except on days when observer agreement checks were made. The observer used an interval scoring procedure in which she observed for six seconds. If no instance of inattention had occurred during the six seconds, she marked "on"; if the child had been off task for any portion of the six seconds the observer marked "off". She moved from one six-second interval to another with no break between intervals. The observer used a large-faced clock with a large sweeping second-hand. Six-second intervals were marked off by colored tape on the clock's face to cue her recording. At least one observer agreement check was made during all but one phase (the second self-monitoring with tape phase) of the study for a total of 14 checks (28% of the observations).

Experimental Design

The design was a combination of multiple baseline across responses and reversal designs. The study consisted of six phases (ABABCD), with the A phases being baselines and the B, C, and D phases representing different types of treatment. The introduction of the first B treatment for math lagged 7 days behind that for handwriting. Data were taken daily for the course of the study over a total of 49 school days. In addition, a followup for math seatwork was obtained one month after the conclusion of the experiment.

Baseline 1. The first baseline ran for the first 10 days of the handwriting session and 17 days of the math session. During this phase, as with all phases of the study, Edwin was told to sit in his seat and work on his handwriting and math assignments. During the entire experiment, the teacher occasionally praised him and others for being on task. During the course of the study, Edwin, like the other children, could earn a point for finishing his seatwork on time. However, the point was not redeemable for backup reinforcers.

Self-monitoring with tape 1. This phase lasted for 13 days for handwriting and 6 days for math. At the start of the phase the teacher took Edwin aside and told him that she wanted him to help himself by keeping track of when he was paying attention and when he was not. She showed him a 22 x 28 cm sheet of paper (self-monitoring sheet) which at the top contained a picture of a boy reading a book and the question in large capitals, "WAS I PAYING ATTENTION?" In two columns down the page were responses that could be checked "Yes" or "No." The teacher told Edwin that she was going to place a tape recorder beside him and that he would periodically be hearing a tone. Each time he heard a tone it was a signal for him to ask himself, "Was I paying attention when I heard the tone?" and then mark "Yes" or "No."

Basically, the self-monitoring training steps recommended by Mahoney (1977) were followed. First, the teacher gave explicit definitions and examples of paying attention and not paying attention. Second, she instructed Edwin in how to mark "Yes" or "No" on the self-monitoring sheet whenever he heard a tone. Third, she modeled the use of the device for him. Fourth, she asked him to repeat the definitions of paying attention and not paying attention as well as the self-monitoring instructions. The entire training procedure was accomplished in about 15 minutes on the first treatment day. The procedure was reviewed briefly on occasion, particularly following breaks in the routine due to teacher illness or holidays.

The tape consisted of tones spaced at random intervals ranging from as short as 10 seconds to as long as 90 seconds with a mean interval of 45 seconds between tones. The duration of the tones themselves averaged

about 2 seconds. They were loud enough so that they were barely audible to the observer who was seated approximately 4 m away. Because the intervals between tones were randomly determined and because the length of Edwin's seatwork sessions varied from day to day depending on how quickly he worked, there was no set number of signals that he heard. The number of tones he heard during handwriting ranged from 7 to 34 with a mean of 16.22; those during math ranged from 5 to 11 with a mean of 7.90.

At no time during this or any other phase of the study, was Edwin provided external rewards for completing his work except for the above mentioned nonredeemable point. The teacher occasionally praised Edwin and the other children. To ensure that the teacher did not suddenly become more socially reinforcing during treatment sessions, a frequency count of her praises was kept starting on the first day of the reversal phase of the experiment.

Baseline 2. For this period of 6 days, the tape recorder and self-monitoring sheet were withdrawn during both handwriting and math. The teacher gave the student no instructions to self-monitor.

Self-monitoring with tape 2. This five-day phase was identical to the first treatment phase.

Self-monitoring without tape. This seven-day phase involved self-monitoring without the aid of the taped signals. The teacher instructed Edwin to monitor himself by occasionally asking himself the question, "Was I paying attention?" and then checking "Yes" or "No" on the self-monitoring sheet.

Self-praise. For eight days Edwin was under instructions simply to ask himself occasionally the question, "Was I paying attention?" If the answer was "Yes" he was to say to himself, "Good job" or some equivalent. However, if the answer was "No" he was to tell himself, "I better start paying better attention" or some equivalent. Thus, in addition to the absence of the tape recorder, the self-monitoring sheet was withdrawn.

Followup. One month after the completion of the study, Edwin was observed during math seatwork and his on-and off-task behavior was recorded. It was not possible to observe him during handwriting because the teacher had discontinued his handwriting seatwork assignments since she felt he no longer needed them. Also, no data were taken on the rate of his math performance because he was now involved in problems of a substantially different nature (double-digit multiplication and long division).

RESULTS

Observer Agreement

A total of 14 agreement checks were carried out, seven during handwriting and seven during math. A reliability estimate was obtained by dividing the number of intervals for which the two observers agreed by the total number of intervals x 100. The median percent agreement was 94% with a range from 92% to 100% for handwriting and 87% for math with a range from 71% to 98%.

On-Task Behavior

Figure 1 depicts the on-task behavior for each phase of the study for both handwriting and math. Table 1 presents the mean percent on-task behavior and mean percent correct academic responses per minute for each phase of the study for both handwriting and math. As can be seen from both Figure 1 and Table 1, within the multiple-baseline-plus-reversal portion of the experiment (ABAB), the *Self-Monitoring with Tape 1* and *2* produced a substantial increase in on-task behavior over *Baselines 1* and *2* for both handwriting and math. Further strengthening the reliability of this effect was the finding that lagging the treatment for math in a multiple-baseline fashion resulted in the appropriate delay in increase of on-task behavior for math. The final two treatment phases—*Self-Monitoring without Tape* and *Self-Praise*—resulted in a continued high degree of on-task behavior. Furthermore, the one-month followup for math revealed a level of on-task behavior well above baseline levels and well within the range of on-task behavior during the treatment phases of the experiment. In addition, with the exception of one data point during *Self-Monitoring without Tape*, the treatment phases of the study generally resulted in less variable levels of on-task behavior from day to day than those of the baseline sessions.

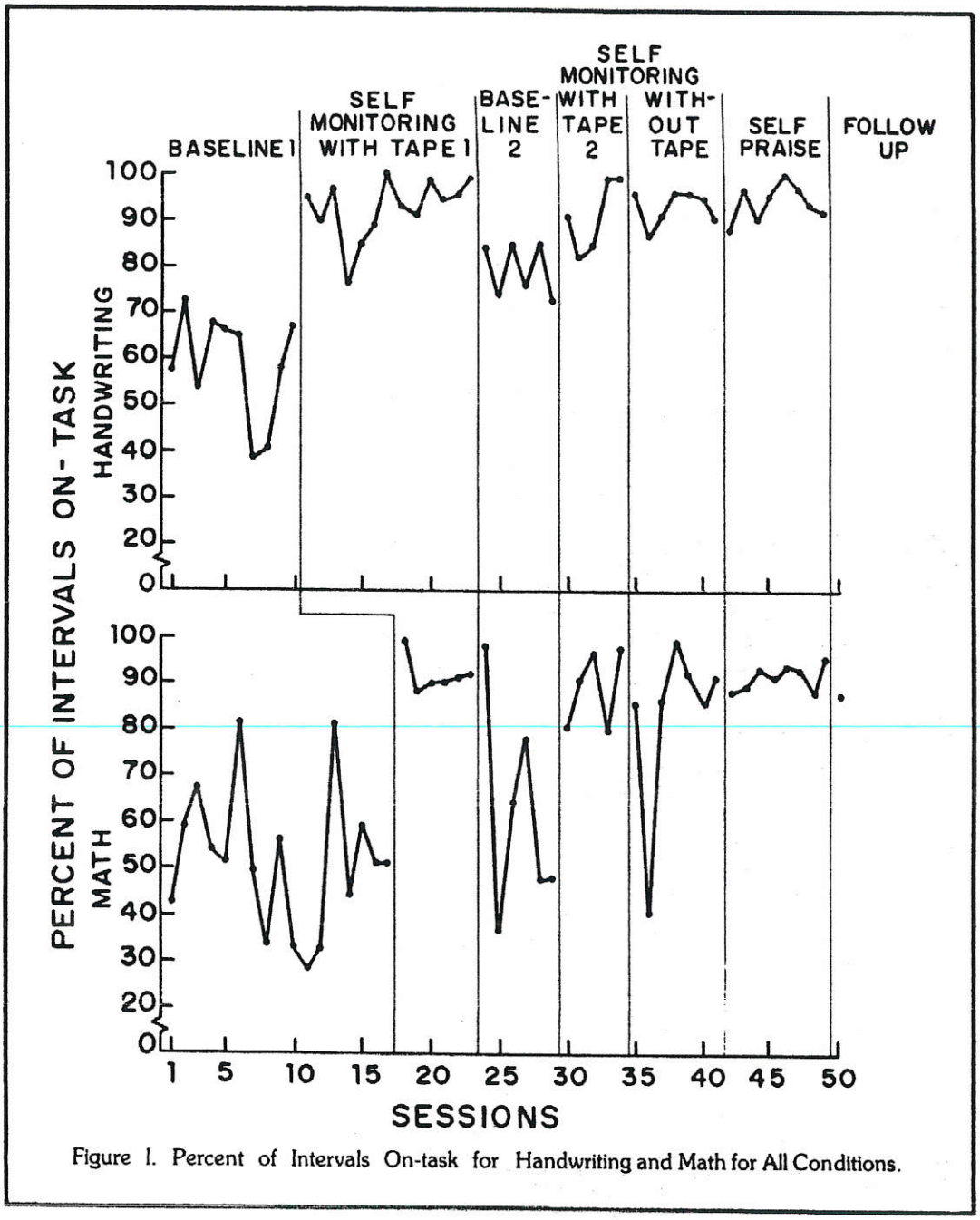

Figure 1. Percent of Intervals On-task for Handwriting and Math for All Conditions.

Academic Productivity

As can be seen from Figure 2 and Table 1, the multiple-baseline-plus-reversal portion of the experiment (ABAB) resulted in a dramatic increase in math productivity for *Self-Monitoring with Tape 1* and *2* compared to *Baseline 1* and *2*. The final two treatment conditions—*Self-Monitoring without Tape* and *Self-Praise*—also resulted in math productivity at levels higher than baseline sessions. The *Self-Praise* phase, however, evidenced a rapidly decelerating curve.

For handwriting treatment effects were not as dramatic although both the mean levels

of productivity (see Table 1) and the trends within phases (see Figure 2) suggest better performance under *Self-Monitoring with Tape 1* and *2* than under *Baseline 1* and *2*. The *Self-Monitoring without Tape* and *Self-Praise* conditions resulted in continued high levels of handwriting productivity.

Unlike the results for on-task behavior, the academic productivity data did not reveal an increase in stability for the treatment sessions compared to the baseline sessions. The graphs in Figure 2 and the *SDs* in Table 1 reveal a generally higher level of instability for math than for handwriting performance.

In order to estimate the degree of relationship between on-task behavior and academic productivity, Pearsonian *rs* were computed. The correlation between on-task behavior during handwriting and handwriting productivity was .72 ($df = 47$), $p<.01$, while that between on-task behavior during math and math productivity was .76 ($df = 47$), $p<.01$.

Teacher praises were not substantially different during the four recorded conditions (*Baseline 2, Self-Monitoring with Tape 2, Self-Monitoring without Tape,* and *Self-Praise*). The mean number of praises per minute were .20 for *Baseline 2,* .13 for *Self-Monitoring with Tape 2,* .17 for *Self-Monitoring without Tape,* and .20 for *Self-Praise.*

Self-Monitoring Accuracy.

Edwin's on-task attention estimates were consistently slightly inflated compared to the ratings of the independent observer. During the *Self- Monitoring with Tape 1* sessions, his mean on-task estimate was .98 versus .91 for the independent observer. During *Self-Monitoring with Tape 2,* Edwin's mean of .93 again exceeded the .89 rating of the independent observer.

DISCUSSION

Previous studies have indicated the efficacy of using a tape recorder-cued, self-

TABLE 1

Means and Standard Deviations for Each of the Conditions for Percent On-Task Behavior and Academic Productivity for Handwriting and Math

	Baseline 1	Self-Monitoring With Tape 1	Baseline 2	Self-Monitoring With Tape 2	Self-Monitoring Without Tape	Self-Praise
On-Task Behavior Handwriting						
M	58	92	80	91	93	94
SD	12	07	06	08	04	04
Math						
M	51	92	63	88	83	92
SD	16	04	22	08	20	03
Academic Productivity Handwriting						
M	1.71	2.63	3.02	3.37	4.19	4.60
SD	.41	.74	.40	.56	.30	.77
Math						
M	4.09	9.97	6.55	11.32	11.77	13.79
SD	1.68	2.34	3.70	3.12	4.38	5.54

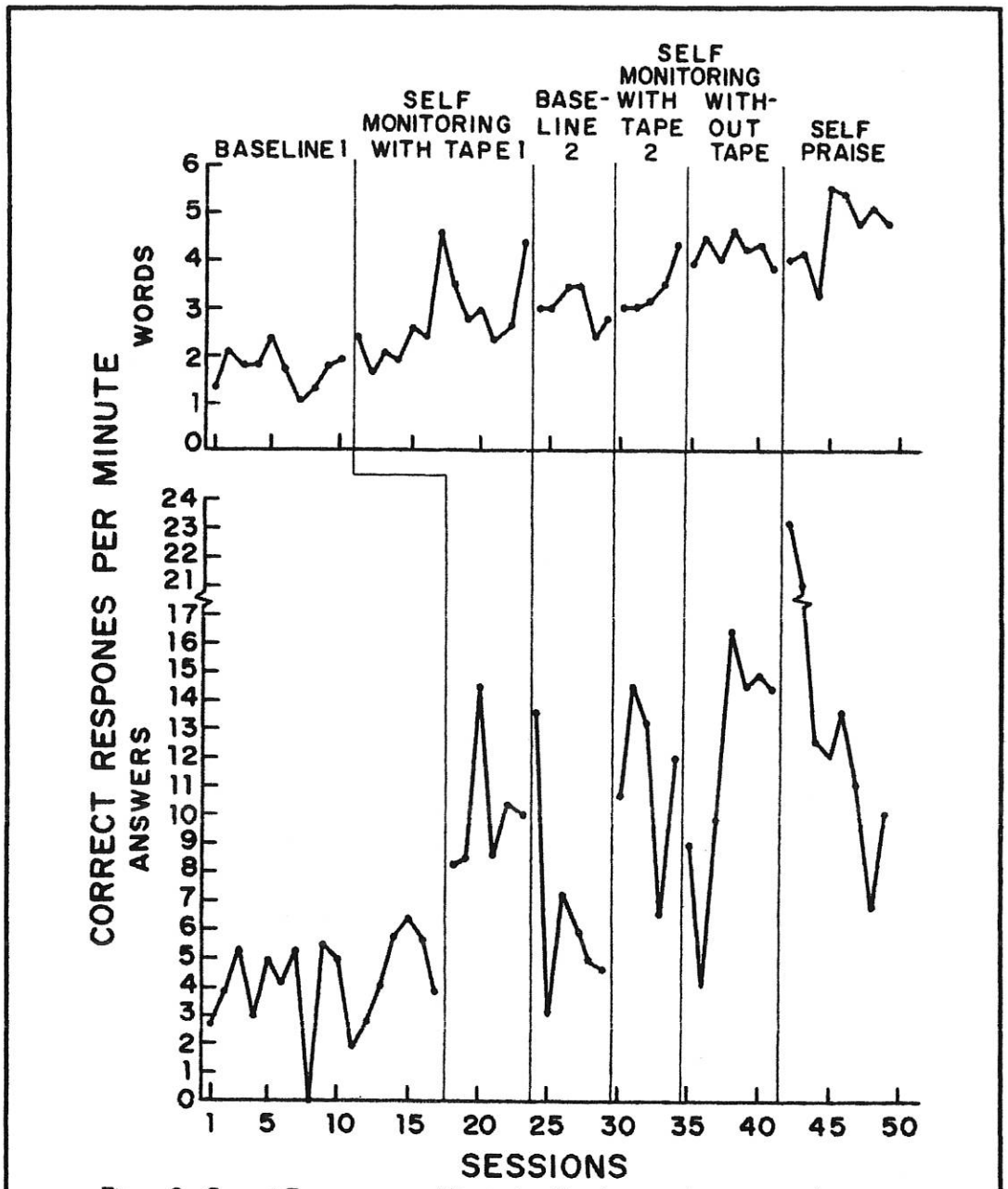

Figure 2. Correct Responses per Minute for Handwriting (correct words written) and Math (correct answers written) for All Conditions.

monitoring procedure combined with backup reinforcers to increase the attentional behavior of second- and third-grade children in regular classes (Glynn & Thomas, 1974; Glynn, Thomas, & Shee, 1973). The present study demonstrated the effects of this procedure, without a strong program of backup reinforcement, on the on-task behavior of a highly inattentive, eight-year-old, learning disabled boy during both handwriting and math seatwork. The level of on-task behavior was nearly doubled for the *Self-Monitoring with Tape* sessions over the original baseline condition. Furthermore, in spite of the rather

stringent on-task criterion used, Edwin's on-task behavior during treatment (mean for *Self-Monitoring with Tape* sessions for both handwriting and math was 91%) was actually above levels reported for normal children (Patterson, Cobb, & Ray, 1972).

The fact that the only backup reinforcer used with Edwin (a nonredeemable point if he finished his work) was a relatively mild one which was also available during baseline conditions, is of considerable theoretical and practical interest. In previous studies (Glynn & Thomas, 1974; Glynn, Thomas, & Shee, 1973) using tape recorder-cued, self-monitoring of attention, it has not been possible to determine the effects of self-monitoring independent of reinforcement because the two components have always been combined. While the present results will obviously need replication before definitive conclusions can be drawn regarding the necessity for external reinforcement, it is encouraging for the study of self-monitoring *per se* that effects were found without heavy reliance on backup reinforcers.

Also pointing to the influence of self-monitoring rather than reinforcement was the finding that no apparent differences obtained in the rate of teacher praise during the baseline and treatment phases. Previous studies of tape recorder-cued, self-monitoring of attention have not recorded the variable of teacher attention and, consequently, it has been difficult to rule out the possibility that the teacher, knowing that the treatment condition was in effect, may inadvertently have administered more social reinforcement.

Because of the multiple-baseline aspects of this study, the failure to obtain a complete reversal for on-task behavior during handwriting does not detract appreciably from the strength of the results. Additionally, further extension of *Baseline 2* was not in the best interests of the student. However, what baseline data were obtained allow some speculation about the persistence of the *Self-Monitoring with Tape* procedures. Like cognitively based self-monitoring, one of the expected values of self-control treatments is improved maintenance of effects because once the treatment is "in the child's head" it may be more difficult to reverse it. Although there are other differences between the two measures of attention to task (e.g., handwriting is primarily a motor task while math involves more cognitive operations), attention to task during handwriting was in treatment during the first phase of this study for over twice as long as attention to task during math. Since attention during handwriting was the behavior that did not reverse completely, it may be that this was due to the longer treatment duration. Certainly, further study is required to determine the relationship between the duration of self-monitoring treatment and the persistence of treatment effects.

Previous studies of self-monitoring of attention have been limited to the dependent measure of on-task behavior. Whether or not changes have also occurred in academic behavior has been left open for conjecture. An increase in attention does not always lead directly to an increase in academic responses as evidenced in literature on the effects of two different types of treatments—reinforcement and cubicles (Hallahan & Kauffman, 1976). The present study does, however, suggest that self-monitoring of attention holds promise for also increasing academic productivity. First, a strong correlation between academic performance and attention obtained for both handwriting (.72) and math (.76). Second, as depicted in the first four phases of Figure 2, the implementation of the *Self-Monitoring with Tape 1* and *2* favorably influenced academic productivity, especially for math. Any attempt to conclude why the treatment was more effective for math than handwriting productivity would only be speculative. An attempt was made to keep the math problems of approximately the same relative difficulty level from day to day by having the teacher gradually provide Edwin with problems of greater difficulty as she felt he could handle them. Such was not the case with handwriting, however. Since the absolute difficulty level of the handwriting task remained about the same from day to day, the task probably became easier each day as Edwin gained proficiency in handwriting skills. Thus, it may be that any treatment effects for handwriting performance were masked to a certain degree by the invariant difficulty level throughout the experiment. Nevertheless, close inspection of

Figure 2 for handwriting does reveal a slight, but definite, change in the slopes suggesting the positive influence of *Self-Monitoring with Tape 1* and *2* over the *Baseline* phases.

Self-monitoring of attention may have resulted in academic behavior changes due to the particular role Edwin's attentional problems played in his academic difficulties. Edwin's primary difficulty appeared to be one of attention rather than academic ability. One can speculate that the more a child's poor school performance is due to inattention *per se*, the higher the degree of carryover to academics if one increases the child's attention. On the other hand, the more the child lacks academic ability as well as capability to focus attentionally, the more the teacher will have to instruct the child in addition to influencing him to attend. For the latter type of child, improvement of attention may be a necessary but not a sufficient condition for learning.

The present study revealed that Edwin tended to overestimate his on-task behavior compared to the assessment of an external observer. However, this lack of correspondence was not as pronounced as differences noted by Kazdin (1974) in self-monitoring research in general and as found by Broden et al. (1971) with self-monitoring of attention. This finding, thus, offers some support of previous research indicating that a high level of accuracy in self-monitoring is not necessary for behavioral change.

The present study also suggests the utility of a sequence of treatments *(Self-Monitoring with Tape, Self-Monitoring without Tape, Self-Praise)* that apparently gradually "weans" the child from reliance on external controls to reliance on more internal ones. However, the design of the present experiment does not allow one to draw conclusions regarding sequence effects. It may be, for example, that *Self-Praise* or *Self-Monitoring without Tape* would have been just as effective as *Self-Monitoring with Tape* even if the latter had not been instituted at all. Realizing that no one study answers all possible questions, the present experiment was designed to answer the question of whether *Self-Monitoring with Tape* was more effective than baseline conditions. In addition, it was of interest whether this effect could be maintained through a theoretically and practically logical sequence moving the child toward greater internal control of his behavior. The results strongly indicate that the *Self-Monitoring with Tape* procedure was, indeed, highly effective and that the effect was maintained after conditions involving less external control were instituted.

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FOOTNOTES

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