DOCUMENT RESUME

ED 065 195 PS 005 748

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| AUTHOR | Bolstad, Orin D.; Johnson, Stephen M. |
| TITLE | Self-Regulation in the Modification of Disruptive Classroom Behavior. |
| PUB DATE | 72 |
| NOTE | 32p. |
| AVAILABLE FROM | Orin S. Bolstad, Psychology Clinic, 1679 Agate, University of Oregon, Eugene, Oregon |
| JOURNAL CIT | Journal of Applied Behavior Analysis (in press) |
| EDRS PRICE | MF-$0.65 HC-$3.29 |
| DESCRIPTORS | *Behavioral Science Research; Behavior Change; Child Development; Child Psychology; *Classroom Observation Techniques; Comparative Analysis; *Discipline Problems; Early Childhood; Experimental Groups; Individual Development; Personality Development; Primary Grades; *Problem Children; Self Concept; *Self Control; Social Development |

ABSTRACT

This study compared self-regulation and external regulation procedures in the treatment of children's disruptive classroom behavior. Following the collection of baseline data, three of the four most disruptive children in each of 10 first and second grade classrooms were reinforced by the experimenter for achieving low rates of disruptive behavior. The fourth child served as a control subject throughout the experiment. Two of the three experimental subjects were then taught to self-observe their own disruptive behavior. In the final reinforcement period, these subjects were given control over dispensing reinforcers to themselves, based on their self-collected behavioral data while subjects in the other experimental group continued with the externally managed reinforcement. In extinction, reinforcement was discontinued for all subjects, but one of the self-regulation subjects in each classroom continued to overtly self-observe. Results indicated that both reinforcement programs produced a considerable reduction in disruptive behavior. The self-regulation procedures were slightly more effective in reducing disruptiveness than was the external regulation procedure and this advantage persisted into extinction. These results suggest that self-regulation procedures provide a practical, inexpensive, and powerful alternative in dealing with disruptive behavior in children. (Author)

In press, JABA, 1972.





# SELF-REGULATION IN THE MODIFICATION OF DISRUPTIVE CLASSROOM BEHAVIOR

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1972

ED 065195

PS 005748


Abstract

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SELF-REGULATION IN THE

MODIFICATION OF DISRUPTIVE CLASSROOM BEHAVIOR[1, 2]

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Disruptive classroom behavior has often been the target of behavior modification technology. Many studies have demonstrated that rates of disruptive behavior can be substantially reduced by the systematic application of externally managed contingencies (e.g., Allen, Hart, Buell, Harris, & Wolf, 1964; Patterson, 1965; Homme, DeBaca, Devine, Steinhorst, & Rickert, 1963; Schmidt & Ulrich, 1969; Wasik, Senn, Welch, & Cooper, 1969; O'Leary, Becker, Evans, & Saudargas, 1969; Thomas, Becker, & Armstrong, 1968). However, few attempts have been made to explore the utility of self-managed contingencies in affecting desirable behavior changes in the classroom setting.

Lovitt and Curtis (1969) have recently demonstrated the potential of self-regulation for increasing a student's academic response rate. They found that higher academic rates occurred when the pupil arranged the contingency requirements than when the teacher specified them. In another classroom study, Glynn (1970) found that self-determined reinforcement was as effective as experimenter-determined reinforcement in increasing academic response rate and that differential token reinforcement experience influenced subsequent rates of self-determined reinforcement. Several other studies conducted in laboratory settings have further suggested the potential utility of self-monitoring and self-reinforcement in the modification of behavior. The results of studies on self-administered reinforcement have consistently demonstrated that behavior may be modified and maintained as well with a self-administered token reward system as with an externally managed reinforcement system. Marston and Kanfer (1963) found that self-reinforcement procedures were effective in maintaining previously learned verbal discriminations. Also, it was demonstrated by Bandura and Perloff (1967) that self-managed reinforcement was as effective as externally managed reinforcement in maintaining effortful motor behavior with children. Furthermore, there is evidence which suggests that behaviors maintained by self-reinforcement may be more resistant to extinction than those maintained by external reinforcement (Kanfer & Duerfeldt, 1967; Johnson, 1970; Johnson & Martin, 1971). Johnson and Martin (1971) have suggested that these results may be due to the conditioning of self-evaluative responses as secondary reinforcers. They proposed that the secondary reinforcing properties of positive self-evaluation served to maintain children's attention to task in the absence of token rewards.

The present study represents an attempt to apply self-regulation procedures to reduce disruptive behavior in the classroom. Within this context, the study was designed to test the relative effectiveness of self- and externally managed reinforcement systems during reinforcement and extinction.

Baseline observations on the frequency of three disruptive behaviors (talking out, aggression, and out of seat behaviors) were collected on the four most disruptive children in each of ten classrooms. Following baseline, three of the four most disruptive children in each class were reinforced by the experimenter for achieving low rates of disruptive behavior (external regulation). The fourth child served as a no regulation (NR) control subject. Two of the three experimental subjects were then taught to accurately self-observe their own disruptive behavior. In the final reinforcement period, these subjects were given complete control over dispensing reinforcers to themselves (self-regulation, SR), based on their self-collected data. Subjects in the other experimental group (ER) continued with the externally managed reinforcement system. In extinction, reinforcement was discontinued for all subjects, but one of the self-regulation subjects in each classroom continued to overtly self-observe.

Based upon the research cited above, it was hypothesized that self-regulation procedures would be as effective as externally managed procedures in maintaining low rates of disruptive behavior. It was also predicted, in light of Johnson (1970) and Johnson and Martin (1971), that the reduction in disruptive behaviors achieved through self-regulation procedures would be more resistant to extinction than that achieved through external regulation. The act of recording disruptive behaviors in the self-regulation procedure might be expected to have acquired conditioned aversive properties since rates above criteria levels have been previously consequated by response cost punishment (see Weiner, 1962), or the loss of a token reinforcer. On the other hand, recording rates below criteria levels might set the occasion for positive self-evaluation by virtue of its association with the receipt of token reinforcers. In extinction, the conditioned aversive or reinforcing properties of self-monitoring and self-evaluation were presumed to continue in the absence of primary reward. These conditioned properties (aversive or reinforcing) were assumed to provide the mechanism by which the self-regulation procedures would retard extinction.

In order to increase the likelihood that self-monitoring and self-evaluation would occur during extinction, one of the two SR subjects in each class was asked to overtly self-observe during extinction. It was predicted that this group of subjects (Group $SR_1$) would demonstrate even greater resistance to extinction than the other SR subjects (Group $SR_2$) who were not required to overtly self-monitor in this phase. Without previous training in self-observation, it was expected that the ER group would show the least resistance to extinction of the three experimental groups. The predicted direction, then, of resistance to extinction was $SR_1 > SR_2 >$ ER. All three groups were expected to have lower rates of disruptive behavior than the NR control group.

## Method

### Subjects

This experiment required the initial selection of disruptive students. Ten teachers of combination first and second grade classes in two schools were asked to pre-select six to eight of their students who typically emitted high rates of disruptive behavior. This group was observed for six days and, on the basis of the resulting data, the four most disruptive students in each class were selected. The four subjects in each classroom were assigned to one of four groups. Restricted randomization procedures were used in assigning subjects to conditions in order to maximize the similarity of baseline averages.

Experimental Setting

This experiment was conducted in five classrooms in each of two elementary schools of similar middle class socio-economic representation. A single observer was situated in each classroom in a position from which he could clearly see and hear each subject. An additional observer rotated among the five classes at each school to obtain observer-agreement data. All observers were uninformed regarding the hypotheses of the study and the assignment of subjects to conditions.

The experimental setting was defined by the situation in which the student was sitting in his desk and working independently on his assignment. Periods during which subjects were receiving individual attention from the teacher, or were involved in assigned activities which deviated from the experimental setting as defined, were not included in the sample. The experiment was conducted on the basis of one 30 minute session per day for a period of eight weeks.

Procedure

An initial pre-baseline period of six sessions served both as a subject selecting device and as a period of adaptation to the observers' presence. Phase I of the experiment constituted the measure of a baseline of disruptive behavior for subjects in all four groups. Prior to the 5 baseline sessions, all subjects were informed that observers would be counting the frequency of certain of their behaviors which were then specified to them. Disruptive behaviors included:

1. Talking, whispering, or making inappropriate noise without the permission of the teacher.

2. Hitting or physically annoying other students.

3. Leaving desk to do unassigned or inappropriate activities.

Pre-baseline analyses revealed that observers were capable of simultaneously observing each of the four subjects in their classrooms on these salient categories of behavior. Observers continued to count the frequency of disruptive behaviors for all subjects throughout the experiment.

Any subject who did not emit .40 disruptive behaviors per minute or more during the baseline phase was subsequently dropped from the study. Also, subjects who were absent four or more successive days or more than a total of six days during the study were not included.

The present experiment involved four phases beyond the baseline period. Some part of the treatment program was systematically changed in each phase for one or more groups. An outline of procedures for each phase is presented in Table 1.

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Insert Table 1 about here

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Phase II of the experiment, lasting six sessions, immediately followed the baseline period and involved external regulation procedures for all three experimental groups. External regulation was defined as an external source evaluating behavior and dispensing reward contingent upon that evaluation. In this ER condition, three arbitrary levels of disruptive behavior were designated:

1. Less than five disruptive behaviors.

2. Less than ten disruptive behaviors.

3. More than ten disruptive behaviors.

Subjects were instructed that if their behavior were at Level 1 during the session, they would receive 8 points; if their behavior were at Level 2, they would receive 4 points; if their behavior were at Level 3, they would receive no points. Points were redeemable for rewards dispensed by the experimenter. Reinforcements were of a school related nature and included pencils, erasers, notepads, etc. These rewards were placed in three boxes. With four points, a subject was allowed to choose out of a box labelled "4," which contained the least expensive rewards (less than 7¢). Eight points earned the choice of a prize from a box labelled "8," with slightly more expensive prizes (7¢ to 15¢). Subjects were also allowed to save points to earn children's readers (25¢) from a "12" point box. Subjects chose prizes immediately after each session and picked them up after school each day.

In Phase III, lasting 7 sessions, two of the three experimental groups began training in self-regulation procedures. Self-regulation is here defined as the case in which the individual evaluates his own behavior and dispenses his own rewards contingent with previously learned criteria. The two SR groups were given self-observation cards and instructed in recording their own behavior within the three disruptive behavior categories. At the end of each session in Phase III, the SR group's subjects' observation cards were matched against the observers' data to check on the subjects' accuracy. If a subject's self-observation rating was within a range of three disruptive behaviors above or below the observer's score, the subject received the equivalent number of points as dispensed in Phase II under the ER condition. If, however, a subject rated himself beyond the range of three disruptive behaviors above or below the observer's rating, the subject received two points less than he would have received for the coder's rating. These measures were added to improve the accuracy of self-observation. The ER and NR groups continued in Phase III with the same treatment as in Phase II.

In Phase IV, lasting 7 sessions, both SR groups self-regulated independently, without checking accuracy with the observers. In this phase, the self-observation data constituted the sole determinant of the number of points received, irrespective of the observers' ratings. Both ER and NR groups continued as before.

In Phase V, lasting 7 sessions, subjects in all groups underwent extinction. Subjects in the experimental groups were informed by the experimenter that prizes were no longer obtainable. One SR group ($SR_1$) was asked to continue to self-observe their frequency of disruptive behaviors on the self-observation cards.

An additional control group (Group 5) was added to the study when the experiment was conducted in the second school. This group was distinguished from the initial control group by having all its subjects in a single classroom. That is, there were no experimental subjects present in the Group 5 classroom.

## Results

The dependent variable in this study was the frequency of disruptive behaviors per minute. Observer agreement on this variable was measure by the correlation between the recorded frequencies of the regular observers and the observers who alternated between classes. The average Pearson Product Moment correlation over all five phases was .93.

Figure 1 shows the mean number of disruptive behaviors per minute for each group in each of the five phases[3].

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Insert Figure 1 about here

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As will be clear from the ensuing presentation of these results, the group data reflects rather well the direction of change for the individual case.

Results were analyzed separately for each phase. In all phases beyond baseline, one-way analyses of variance were performed on the raw scores for that phase. Orthogonal comparisons were made between the three experimental and two control groups and between the two self-regulation groups and the one external regulation group.

One-way analyses of variance were also performed on difference scores at each phase beyond baseline which reflect change from the initial baseline level. Summaries of individual subject data are also presented which provide a perspective on the magnitude and breadth of change.

Difference score analyses were deemed necessary in this study in addition to raw score analyses because of the large between-subject variability in rates of disruptive behavior. This problem is a recurring one in behavioral rate data and for purposes of statistical examination of results, difference score analyses seem to be among the most appropriate methods for dealing with it. Both forms of analyses are presented to give the reader as complete a picture as possible of the findings.

Phase I: Baseline

A one-way analysis of variance on the mean rates of disruptive behaviors per minute across all five days of baseline revealed no significant differences between groups ($\underline{F} < 1$, $\underline{df} = 4{,}33$). Thus, all groups were essentially the same in their display of disruptive behavior prior to the introduction of the experimental procedures.

Phase II: External Regulation

Analysis of raw score data in this phase showed a significant groups effect ($\underline{F} = 6.35$, $\underline{df} = 4{,}33$, $\underline{p} < .01$). The orthogonal comparison between the three experimental and two control groups revealed a significant difference in favor of the experimental groups ($\underline{t} = 4.75$, $\underline{df} = 33$, $\underline{p} < .01$). The difference score analysis, where the data points become the difference between Phase I and Phase II means, also corroborated this finding ($\underline{t} = 4.84$, $\underline{df} = 33$, $\underline{p} < .001$). In this phase, 96% of the experimental subjects reduced their rate of disruptive behavior in this phase and 76% reduced their rate to less than one-half of their baseline level.

There was a noticeable reduction from the baseline in the number of disruptive behaviors for Control Group 4 in this and all subsequent treatment phases. In Phases II, III, and IV, the frequency of disruptive behavior for Group 4 was reduced from baseline by 28%, 38%, and 54% respectively. This finding might partially be accounted for by the fact that 23% of the disruptive behaviors of these control subjects during baseline involved interactions with the experimental subjects in the same classroom.

In the subsequent phases, however, only 7% of the disruptive behaviors in Group 4 involved interaction with subjects in the experimental groups. The subjects in Group 5 were all in a separate classroom in which no experimental subjects were present. This group did not show the same reduction from baseline level as did subjects in Control Group 4. Multiple comparisons using Duncan's New Multiple Range Test showed that Group 4 emitted a significantly lower rate of disruptive behaviors than Group 5 ($p < .05$) in this phase. There were no significant differences between these two groups in the previous baseline phase.

Phase III: Self-Regulation-External Regulation

One-way analysis of variance revealed a significant groups effect in Phase III ($F = 12.49$, $df = 4,33$, $p < .01$). Again, an orthogonal contrast demonstrated that the three experimental groups had significantly lower rates of disruptive behavior than the two control groups ($t = 6.88$, $df = 33$, $p < .001$). Difference score analyses, where the data points become the difference between Phase I and Phase III means, corroborated this superiority of the three experimental groups. In this phase, 96% of the experimental subjects decreased their rate of disruptive behavior to less than one-half of their baseline level. And, 84% reduced their rates to less than one-third of baseline level.

An orthogonal comparison of the self-regulation and external regulation groups yielded no significant difference ($t = .88$, $df = 33$). That is, in Phase III, subjects who continued to receive ER treatment did not differ significantly in the raw score analysis from subjects who, in this phase, received training in SR procedures. Nonetheless, it was found that only

33% of the subjects in the ER condition decreased their disruptive rate from their Phase II level whereas 88% of the subjects in the SR condition decreased their rate from the previous phase. This suggests that the difference score analysis might be more appropriate. An orthogonal comparison on the differences between baseline and Phase III did reveal a significant difference between the external and self-regulation groups ($t = 2.50$, $df = 33$, $p < .05$). That is, the subjects who received SR training in Phase III reduced their rate of disruptive behavior relative to baseline more than did the subjects in the ER condition.

The subjects who received SR training were checked as to the accuracy of recording their frequency of disruptive behaviors. In Phase III, it was found that 75% of the subjects' self-observation ratings fell within the permissable range of plus or minus three disruptive behaviors as recorded by the experimenter. The median discrepancy between the subjects' ratings and the experimenter's was 2.07 disruptive behaviors. Forty-four percent of the discrepancies were in the direction of underestimation by the subjects; 28% of the discrepancies represented overestimation, and 27% of the accuracy checks showed the subjects and the experimenter to be in perfect agreement.

Group 4 continued to emit a significantly lower rate of disruptive behaviors than Group 5 in this phase ($p < .01$), as revealed by Duncan's New Multiple Range Test.

<u>Phase IV: Self-Regulation-External Regulation</u>

Analysis of variance for means in Phase IV revealed a significant groups effect ($F = 17.73$, $df = 4,33$, $p < .01$). As in the previous two phases, an orthogonal comparison indicated that the three experimental groups differed significantly from the two control groups ($t$ = 7.22, $df$ = 33, $p$ < .001). Likewise, difference score analyses, Phase IV subtracted from baseline, reflected a superiority for the three experimental groups. An orthogonal contrast comparing the raw score means of the self-regulation and the external regulation groups revealed no significant difference ($t$ = .98, $df$ = 33). However, an orthogonal comparison on the difference score analysis, Phase IV subtracted from baseline, revealed that the two SR groups reduced their rate of disruptive behaviors more relative to their baseline level than did the ER group ($t$ = 2.32, $df$ = 33). An additional orthogonal comparison for the experimental groups was also performed on the difference scores, Phase IV subtracted from Phase II. This comparison measures the degree to which the two SR groups reduced in frequency of disruptive behaviors relative to the ER group during the two phases of differential treatment. It was found that the two SR groups reduced their rate of disruptive behavior more than the ER group during the self-regulation treatment, but not at a significant level ($t$ = 2.00, $df$ = 33, $p$ < .06).

It can readily be seen from Figure 1 that all three experimental groups maintained the same rates of disruptive behavior in Phase IV as they had in Phase III. Again, 96% of the experimental subjects continued to maintain their rate of disruptive behavior in Phase IV at a level less than one-half of their baseline rate; and, 80% maintained at a level less less than one-third of their baseline rate. The breakdown of these experimental groups in Phase IV revealed that 89% of the ER subjects reduced their rate of disruptive behavior to less than one-half of baseline level;

67% reduced their rate to less than one-third of baseline level. In the SR groups, 100% of the subjects reduced their rate to less than one-half of baseline levels and 92% less than one-third baseline levels.

Although the subjects in the two SR groups were neither informed of nor rewarded for self-observation accuracy in this phase, 71% of the subjects' self-observation ratings fell within the range of plus or minus three disruptive behaviors as recorded by the experimenter. The median discrepancy between the subjects' ratings and the experimenter's was 1.75 disruptive behaviors. As in the previous phase, the majority of the discrepancies were in the direction of underestimation of disruptive behavior by the subjects. Forty-five percent of the discrepancies represented underestimation, 21% represented overestimation, and 34% of the accuracy checks showed perfect agreement between observers and subjects.

Multiple comparisons using Duncan's New Multiple Range Test again revealed that control Group 4 emitted significantly fewer disruptive behaviors than control Group 5 ($p < .001$).

Phase V: Extinction

An additional observer was introduced in each school in this phase. This observer also alternated between classes to provide additional observer agreement data. This observer was totally naive as to the previous four phases and thereby had no opportunity to infer hypotheses or establish bias. The average Pearson Product Moment correlation between the rates obtained by the naive observers and the regular observers was .93 in Phase V. An average correlation between the regular alternating observers and the observers who remained in the same class was .98 in this phase.

During Phase V, the predicted direction of resistance to extinction was $SR_1 > SR_2 > ER$ and, it was predicted that all three experimental groups would have lower rates of disruptive behavior than the NR control condition. A trend analysis on this predicted direction obtained significance ($t = 3.17$, $df = 33$, $p < .01$).

A significant main effect for groups was obtained in Phase V in the raw score analysis ($F = 4.11$, $df = 4,33$, $p < .01$). Three orthogonal comparisons were performed on these Phase V raw score results. The first comparison revealed that the three experimental groups continued to be lower in rate of disruptive behavior than the two control groups even in the absence of reinforcement ($t = 2.99$, $df = 33$, $p < .01$). The second comparison indicated that the two SR groups were not significantly lower in raw score disruptive rates than the ER group during extinction ($t = 1.31$, $df = 33$). The third comparison showed that Group 2 ($SR_1$), whose subjects continued to self-observe during extinction, was not significantly lower than Group 3 ($SR_2$).

An analysis of variance was performed on the difference scores of the experimental groups, with Phase V subtracted from Phase I, to show which groups maintained the lowest rate of disruptive behavior relative to their baseline levels. Two orthogonal comparisons revealed, again, that the three experimental groups were significantly lower in rate relative to baseline than the two control groups ($t = 3.58$, $df = 33$, $p < .01$), and, more importantly, that the two SR groups were lower in rate than the ER group relative to baseline ($t = 2.49$, $df = 33$, $p < .05$). A third orthogonal comparison showed no differences between the two SR groups in reduced rate relative to baseline ($\underline{t}$ = .04, $\underline{df}$ = 33).

While the analyses given above test the significance of observed differences in the extinction period, they do not test differences in resistance to extinction. The following analyses were performed to analyze that question.

Two orthogonal comparisons were performed on the difference scores derived by Phase IV subtracted from Phase V. These analyses revealed that there were no significant differences between the ER group and the two SR groups in terms of increased rate of disruptive behaviors from the last phase of treatment to extinction ($\underline{t}$ = .85, $\underline{df}$ = 33) and that there were no significant differences between the two SR groups ($\underline{t}$ = .80, $\underline{df}$ = 33).

Repeated measures analysis of variance performed across the seven days of Phase V, with the mean of Phase IV as the starting point, provided a measure of resistance to extinction for the three experimental groups. This analysis revealed a significant trials effect ($\underline{F}$ = 2.39, $\underline{df}$ = 7,154, $\underline{p}$ < .05), reflecting extinction over trials but no main effects for groups ($\underline{F}$ = 1.18, $\underline{df}$ = 2,22) or for groups by trials interaction ($\underline{F}$ = .74, $\underline{df}$ = 14,154). The three experimental groups, then, did not extinguish differentially during extinction.

During extinction, 56% of the ER subjects maintained their reduced rate of disruptive behavior at less than one-half of their baseline level whereas, for the subjects in the two SR groups, 69% maintained at or below one-half of their baseline level. Only 22% of the subjects in the ER group maintained their reduced rate at less than one-third their baseline level while 56% of the subjects in the two SR groups maintained at or below one-third of their baseline level.

The superiority of control Group 4 over Group 5 was maintained at a significant level ($p < .01$) in this phase (Duncan's New Multiple Range Test).

## Discussion

In all phases after baseline, the experimental groups exhibited significantly lower rates of disruptive behavior than the control groups. Clearly, both the external and self-regulation procedures were effective in establishing and maintaining substantial reductions in disruptive behavior.

The results of difference score analyses and summaries of the individual subject data clearly indicate that the self-regulation procedures were somewhat superior to the external regulation procedures from their introduction in Phase III through extinction in Phase V. In general, however, the raw score analyses of the ER-SR differences do not corroborate this conclusion. The three forms of data analyses were included in this report to give the reader as complete a view as possible of the findings. The fact that the three methods of analyses do not converge on the same conclusion makes the interpretation of the findings somewhat more difficult. It seems to the authors, however, that there is solid evidence for some superiority of the self-regulation procedures when the problem of between-subject variability in rate data is accounted for by the difference score analyses and in the summaries of individual subject data. However, it should be noted that the difference score analyses are complicated somewhat by the fact that the two SR groups emitted slightly higher rates of disruptive behavior during baseline than the ER group and thus had a greater range for improvement. This problem was, however, substantially reduced by the external regulation procedures used in Phase II and reductions after that point would seem to be little affected by any initial differences (see Figure 1).

The magnitude of the superiority of the self-regulation procedures over the external regulation procedures also appears important. In conditioning phases III and IV, the average rate of disruptive behavior was 40% less than in the ER group. During extinction, the SR group children were 39% less disruptive than children in the ER group. Furthermore, the SR children who continued to self-monitor in extinction displayed less than one-half the disruptive behavior shown by the ER group in this phase.

Obviously, the processes which operated to produce this effect are not known and are open to speculation. Perhaps the most apparent differences between the ER and SR groups in conditioning was the fact that the SR group children had more loss of reinforcement signals with greater immediacy than did the ER subjects. In other words, when the SR subjects recorded a disruptive behavior, they were giving themselves another point toward the loss of a reinforcer. Presumably, this would serve as a punitive consequence for the preceding disruptive behavior. Furthermore, such a consequence would be delivered with a shorter time lag than the eventual loss of the reinforcer which both groups of subjects would experience. Thus, the self-regulation procedures may have yielded more punishment with greater immediacy than the external management procedures. If this were the only process accounting for the difference, an external regulation procedure equating the number and immediacy of these "loss of reinforcement" signals should eliminate the differences.

On the other hand, there may have been something in the self-monitoring itself which contributed to this difference. As has been suggested elsewhere, self-monitoring may result in better discrimination of reinforced or punished behavior than external monitoring (Johnson, 1970; Kanfer & Phillips, 1970; Johnson & Martin, 1971). In addition, self-monitoring may set the occasion for self-evaluative responses which serve a reinforcing or punitive function. Both McFall (1970) and Johnson and White (1971) have demonstrated the reactive effects of self-monitoring.

An alternative hypothesis for this difference should be entertained for the SR training period only. In this phase, subjects were fined for inaccuracy. And, accuracy was easier to achieve at lower rates of disruptive behavior. It is unlikely, however, that the delivery of fines for inaccuracy in Phase III contributed differentially to ER and SR groups to any substantial degree. There were no significant differences between the ER and SR groups in terms of number of points received in Phase III ($\underline{t}$ = 1.04, $\underline{df}$ = 23). An average of 6.1 points per day was obtained by SR subjects which is contrasted by an average figure of 6.4 points that could have been earned had fines not been imposed. As such, the subjects in the SR groups received only 5% less points than they would have without the two-point fine for inaccuracy.

A more serious potential confound merits consideration in Phase IV. In this phase, subjects in the SR condition exercised control over dispensing points to themselves. These subjects, unlike the subjects in the ER condition, had the opportunity to award themselves more points than they deserved. The previous literature on self-reinforcement suggests that when subjects take over the task of dispensing their own reinforcements, only minimal average increases in reinforcement delivery occur (Kanfer and Duerfeldt, 1967; Johnson, 1970; Johnson & Martin, 1971). In light of these findings, the decision was reached that it would not be necessary to incorporate a strategy which yokes or matches the amount of reward delivered to the ER subjects with the amount that SR subjects dispensed to themselves. Another consideration contributing to this decision was the liklihood that ER subjects, receiving yoked reinforcement, might learn that the amount of reinforcement they received was unrelated to their actual behavior. The confounding influence of this operation was viewed as far more serious than the anticipated minor differences in receipt of token points.

The expectation of minimal differences in reinforcement magnitude was not entirely realized. It was found that the SR subjects awarded themselves an average of 7.4 points per session whereas their rates of disruptive behavior merited only 6.4 points. That is, SR subjects received an average of 16% more points than they deserved. An examination of the individual subject data indicate, however, that this discrepancy was accounted for by less than half of the subjects involved. More specifically, 9 of the 16 SR subjects consistently awarded themselves exactly the number of points they deserved. Two subjects tended to over-reward themselves by approximately one point per day, while 5 others awarded themselves considerably more points per day than were earned (2.5 points or more).

If the data is examined only for those 9 subjects who rewarded themselves with complete accuracy, the superiority of the SR group is maintained. This suggests that the magnitude of reward differences does not explain the effect in question. The possibility of subject selection must be considered, of course, in verifying this argument, but there is no evidence that these nine accurate subjects were significantly less disruptive than their peers in the baseline period ($t$ = 1.14, $df$ = 14). However, in Phase IV, the 9 accurate SR subjects obtained significantly lower rates of disruptive behavior than the 7 inaccurate subjects ($t$ = 2.61, $df$ = 14).

A final point to consider regarding the problem of differential magnitudes of reward for the SR and ER conditions is that this potential imbalance could not have contributed to the superiority of the SR groups in the preceding phase, during which the SR subjects did not have the opportunity to award themselves more points than they deserved. Although fines for inaccuracy of self-observation may have contributed to the superiority of the SR groups in Phase III, evidence previously cited suggests that such an influence was only minimal. It is interesting to note that the SR subjects did not evidence higher rates of disruptive behavior in Phase IV, relative to Phase III, when they were given the opportunity to award themselves points independent of their actual behavior.

Thus, while the discrepency of points earned and awarded in the SR groups is problematic, it is clear that the excessive reward for SR subjects was not a consistent finding across the entire group and that it could not have contributed to the effect for the 9 accurate subjects who demonstrated low rates of disruptive behavior. Even though the one-point difference does not appear to be of sufficient magnitude or consistency across subjects to account for the superiority of the SR procedures, the confounding influences of this factor cannot be completely discounted. It is obvious, nevertheless, that this average one point per day error in reinforcement delivery is inconsequential for purposes of application.

While the lack of all the necessary control groups makes the explanation of these ER-SR differences open to speculation, the effects of these self-regulation procedures when considered as a treatment package appear to be somewhat superior to the effects of the external regulation procedure.

It was predicted that the reduction in disruptive behaviors achieved through self-regulation would be more resistant to extinction than that achieved through external regulation. Even though the groups were alligned in the predicted direction in the extinction period with $SR_1 < SR_2 < ER$ and the difference score analyses yielded significant superiority of the SR groups, greater resistance to extinction was not clearly evident from this data. It appears that the superiority of the SR groups in extinction can be accounted for almost entirely by their superiority in the two former periods. This interpretation is substantiated by the nonsignificant findings in the repeated measures analysis of the extinction data.

It was also hypothesized that the group continuing overt self-monitoring in extinction would demonstrate greater resistance to extinction. The $SR_1$ group did show less disruptive behavior than did the $SR_2$ group and this superiority does not appear to be due to any appreciable prior advantage. Furthermore, the significance of the directional prediction lends some support to this prediction even though the difference between these groups was not significant upon direct comparison. These findings seem to lend very weak support to the hypothesis. For purposes of application, however, it seems clear that continued self-monitoring after conditioning would do no harm and might have some beneficial effects.

The resistance to extinction predictions were based on assumptions about the conditioned aversive and reinforcing properties of both overt and covert self-observation and self-evaluation during extinction. It was believed that children in the self-regulation groups would continue more overt ($SR_1$) and covert ($SR_2$) self-observation and self-evaluation than would children in the ER group and that these behaviors would have the effect of retarding extinction. While there appears to be no support for this line of reasoning in the comparison of the ER groups with the combined SR groups, there may be some weak support for it in the comparisons of the two SR groups. The SR children who continued to overtly self-monitor in extinction displayed 23% less deviant behavior in extinction than those who were not asked to continue self-monitoring. While this difference was not of great magnitude nor statistically significant on direct comparison, it appears to be a noteworthy finding consistent with the conditioned reinforcement hypothesis.

It is of interest to note that this study provides somewhat less persuasive support for the superiority of self-control procedures in retarding extinction than have previous studies (Johnson, 1970; Johnson & Martin, 1971). In evaluating this, it should be recognized that the present study employed a self-controlling response which could presumably be self-punishing whereas the former studies employed a self-reinforcing response. While the present study was aimed at decreasing the frequency of certain responses, the former were directed toward the increase of certain responses. In addition, the present study was conducted in a naturalistic setting as opposed to a laboratory analogue setting. Finally, the resistance to extinction findings in the former studies, although statistically significant, were not of great magnitude. Thus, it is not at all surprising that these earlier results were not replicated in a study using a different paradigm in a different setting.

It is an encouraging finding that most of the first and second grade children, deemed disruptive by their teachers and a screening procedure, were capable of self-observing their frequency of disruptive behavior with respectable accuracy. This is especially noteworthy in that the SR subjects did not receive immediate feedback as to their accuracy in training and no feedback during Phase IV and extinction. This relatively high degree of accuracy in self-observation for young children is congruent with other findings (Johnson, 1970; Johnson & Martin, 1971).

An unexpected finding in this study was the marked decline in disruptive behavior for the control subjects who were present in the same classrooms as the experimental subjects. One possible explanation is that when the disruptive behavior of three out of the four most disruptive students in a class is substantially reduced, this will have a dampening or a spread effect on the fourth student. Some evidence for this explanation was provided in that control subjects had fewer disruptive interactions with the experimental subjects during the treatment phases than they did during baseline. An alternative explanation is that the control subjects may have discovered that the other subjects in their classrooms were being reinforced at the end of the school day for low rates of disruptive behavior. This knowledge may have set the occasion for vicarious reinforcement or fruitless attempts to also earn reinforcement by emitting low rates of disruptive behavior. The interpretation that the reduction in Group 4 had something to do with the presence of treatment in the classrooms is born out by the comparison of Group 4 with Group 5 in which no such reduction was observed. The significantly lower rate of disruptive behavior for Group 4 represents an important finding in suggesting that the modification of disruptive children in the classroom may have suppressive effects on other disruptive children in the same classroom. Indeed, it is possible that the whole social system in the classroom is affected by intervention with selected children.

In general, the results of this and other investigations (Johnson, 1970; Johnson & Martin, 1971; Lovitt & Curtis, 1969; Glynn, 1970) are clear. Self-regulation procedures appear to be either equally effective or more effective than external regulation procedures in both establishing and maintaining desired changes in behavior. Furthermore, it appears that most children of this age are capable of self-monitoring their own behavior and applying designated contingencies. It is concluded that self-regulation procedures provide a practical, inexpensive, and powerful alternative to external regulation procedures.

Footnotes

1 The authors wish to express their gratitude to District 4J Schools in Eugene, Oregon, and especially to Willagillespie and Awbrey Park grade schools, for their cooperation and helpful suggestions. We also appreciate the dedicated work of our observers: Mike Dillon, Jeanne Bisenius, Don Christiansen, Joyce Christiansen, Diane Hillis, Laurie Harris, Jim Neely, Connie Sakamoto, Kathy Persinger, Jeanne Staples, and Rick Grant. Thanks also to Dr. G. R. Patterson for his advice and encouragement.

2 Reprints may be obtained from the authors, Psychology Clinic, 1679 Agate, University of Oregon, Eugene, Oregon.

3 Individual subject data can be obtained from the authors on request.

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TABLE 1

Experimental Design:

Treatment by Groups and Phases

| Groups | I | II | III | IV | V |
|---|---|---|---|---|---|
| ER | Baseline | ER | ER | ER | EXT |
| $SR_1$ | Baseline | ER | SR * | SR | EXT |
| $SR_2$ | Baseline | ER | SR * | SR | EXT** |
| NR | Baseline | NR | NR | NR | EXT |

* Monitored

** Self-observation continued