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ABSTRACT

This study examines the effects of using response cost in combination with positive reinforcement procedures in helping two second grade students with attention deficit hyperactivity disorder maintain their attention in the classroom. This involved the loss of reinforcers/points contingent upon inappropriate behavior in the classroom, in addition to earning them for appropriate behavior. The Conners Teacher Rating Scale was used to assess behavior. A small plastic box which contained a digital counter on its face and a red light on top was placed on each subject's desk, and each minute a point was automatically awarded to the child on the counter display. The teacher carried a transmitter and when the student was observed to be off-task, not working, or disruptive, the desk unit was signaled, the red light on the student's desk came on, and a point was deducted. Points could be exchanges for extra computer time, school store items, or a chance to be the teacher's helper. The results indicate that measures of hyperactivity for both subjects showed significant decreases from baseline to end of treatment phases. Significant decreases also occurred in measures of conduct problems and emotional indulgence for one child. (Contains 14 references.) (CR)

Running Head: FACILITATING ATTENTIVE BEHAVIOR

The Effects of a Response-Cost Program on the Classroom Behavior of Two Children with Attention Deficit/Hyperactivity Disorder

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Abstract

In a pilot study involving two second grade students with Attention Deficit/Hyperactivity Disorder, the efficacy of a response-cost program in decreasing off-task classroom behaviors was investigated. An ABA within-subjects design was utilized, revealing significant decreases in measures of hyperactivity for both subjects from the baseline to the end of the treatment phases. Additionally, significant decreases in the measures of conduct problems and emotional overindulgence for one student were revealed. The program was viewed by the classroom teacher as an effective and easily administered alternative to pharmacotherapy. The subjects appeared to enjoy the program and believed that it helped them pay attention in the classroom.

The Effects of a Response-Cost Program on the Classroom Behavior of Two Children with Attention Deficit/Hyperactivity Disorder

Attention Deficit/Hyperactivity Disorder is a developmentally disabling disorder of inattention, behavioral disinhibition, and the regulation of activity level to situational demands (Barkley, 1990). Its prevalence is estimated at 3 to 5 percent in school-age children (American Psychiatric Association, 1994; Diagnostic and Statistical Manual of Mental Disorders - Fourth Edition). Considering the impact of this disorder upon those who suffer from it and those who are involved in the teaching profession, viable treatment models must be developed. Over the years, there has been a variety of behavioral and pharmacologic treatments to address the sequelae of ADD/H, some of which have been very successful. Behavioral and cognitive/behavioral techniques, such as token economies and self-instruction have met with perhaps the most success among psychological approaches. However, according to O'Leary (1985), a neglected area in the research of ADD/H treatment is the usefulness of negative feedback in the classroom setting. In a series of studies, it has been demonstrated that negative consequences in the classroom setting are critical in maintaining appropriate behavior of hyperactive children; when negative consequences are totally withdrawn, a reliable and marked increase in off-task behavior occurs. In contrast, when positive

consequences are withdrawn, no change in off-task behaviors occur for a period of 5 days (O'Leary, 1985).

In a study conducted by Pfiffner and O'Leary (1987) examining the effects of an all-positive approach in the classroom setting, it was found that simply rewarding the children for on-task behavior tends to produce few positive changes, and that the addition of response-cost principles to such programs can greatly enhance their benefits. The response-cost approach involves the removal of a specified amount of reinforcer following a particular behavior (Martin & Pear, 1988). In a study involving the use of the response-cost paradigm and drug treatment (methylphenidate), Rapport et al. (1982) found that a cost program alone and a cost program combined with medication were effective in reducing off-task behavior and in increasing academic performance in two hyperactive children, ages seven and eight years. The authors further noted that the response-cost procedure was viewed by the teachers as practical and effective for use in the classroom setting, and that the subjects liked the cost system and believed that they completed more academic work when it was operative.

It is proposed in this pilot study that the use of response cost in combination with positive reinforcement procedures may be efficacious in helping students maintain their attention in the classroom. This type of program could be delivered systematically by the teacher during the time in which the

students experience the most difficulty attending to their schoolwork (e.g., independent work time). Since children with Attention Deficit/Hyperactivity Disorder tend to have their greatest difficulties within the large group situation, examining the effectiveness of such a program would be especially relevant to this population within the regular classroom setting. Moreover, while pharmacotherapy has been found to be very effective in the treatment of children with this disorder (Barkley, 1990), not all children respond favorably to drug treatment, thereby requiring consideration of alternative, non-medical approaches. With this in mind, the present study was conducted to examine the efficacy of a classroom-based, non-medical approach toward facilitating the attentive behavior of two children with Attention Deficit/Hyperactivity Disorder.

Participants

The subjects of this study were 2 elementary school children (Subjects A and B) enrolled in the second grade in a metropolitan Detroit area elementary school. Each student met the diagnostic criteria for Attention Deficit/Hyperactivity Disorder (Primarily Hyperactive-Impulsive Type) as outlined in the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 1994). These subjects were identified from school records indicating the ADD/H diagnosis, in addition to interviews with the subjects' teacher (second author) and parent(s). Due to parental rejection to pharmacotherapy, neither student received

medical treatment during the course of the study. Informed consent for participation in the study was obtained from the students' parent(s).

Design and Procedure

A baseline-treatment-reversal (ABA) within-subjects design was used to evaluate the effects of the behavioral program. This design involved 1) a pre-treatment baseline phase during which each student's classroom behavior was assessed; 2) the treatment phase during which each student participated in the behavioral program; and 3) a reversal phase during which the behavioral treatment was withdrawn and a re-assessment made.

Many well-standardized behavior rating scales are available for determining the efficacy of behavioral treatment for the child with attention deficit/hyperactivity disorder. Review of the revised version of the Conners Teacher Rating Scale (Conners, 1985) has been favorable (Barkley, 1990); in particular, it has proven useful in assessing behavioral changes in hyperactive children as a function of stimulant medication and/or behavioral treatment (Barkley et al., 1988). For this reason, the Conners Teacher Rating Scale (CTRS-39) was chosen as the measurement device utilized in this study. The CTRS-39 assesses six broad-band areas of behavior: Hyperactivity, Conduct Problems, Emotional Indulgence, Anxious-Passive, Asocial, and Daydreaming-Attention. High scores (T-scores at two standard deviations above the mean of 50 or higher) obtained in any of

these areas contraindicate appropriate classroom behavior. Ratings on this scale were made by the child's classroom teacher 1) prior to initiating the behavioral program (baseline phase); 2) at the end of the behavioral program; and, 3) at the end of the reversal phase. The teacher was instructed to rate the child's behaviors according to how he/she is observed in the classroom only, since this was the setting targeted for behavior change.

A combined response cost/token system comprised the behavioral treatment used in this study. This involved the loss of reinforcers/points contingent upon inappropriate behavior in the classroom, in addition to earning them for appropriate behavior. Similar to reward-only token programs discussed earlier, this procedure is convenient and readily adapted to a variety of target behaviors and situations. In a study conducted by Gordon et al. (1991), the researchers utilized an apparatus to keep track of points earned and deducted contingent upon classroom behavior. This same method was adapted in the present study. The apparatus used for this purpose was the Attention Training System (ATS) (Rapport & Gordon, 1987). It is a small plastic box which contains a digital counter on its face and a red light on top. The teacher carried a transmitter, which when activated, signaled the desk unit by illuminating the red light. This apparatus was placed on each subject's desk with velcro to allow for tilting the desk top to obtain pencils, books,

and other necessary items. The teacher was provided instructions on how to use this system, as follows:

> The box will be placed on each student's desk and turned on at the beginning of the designated independent work period. Each minute thereafter a point is automatically awarded to the child on the counter display. If the child is observed to be off-task, not working, or disruptive during this period, you are to press the button on the transmitter, and the red light is triggered on the child's box. A point is simultaneously deducted on the counter display whenever you press the button on the transmitter.

An explanation of the system was provided individually to each subject by the first author in accordance with the instructions provided with the ATS system. Each subject was then guided through the operation of the apparatus, with demonstrations given as many times as necessary to ensure that they comprehended the system and what would be expected of them.

The reinforcement component of the treatment involved the attainment of points contingent upon the number of minutes remaining on the counter display of the students' desk modules after each session. These points were then exchanged for that which was determined to be reinforcing to the student, for example, extra computer time, items available at the school store (purchased exclusively for the students involved in this study), or a chance to be the "teacher's helper" during the last fifteen

minutes of the school day, etc.

Since previous studies (Gordon et al., 1991; Kistner et al., 1982) utilizing response-cost and token economies have documented short-term increases in off-task behavior following the initial application of treatment, it was believed that a three-week treatment period was sufficient to reliably observe treatment effects. M. Gordon (personal communication, March 21, 1996) agrees that for the purpose of this study, at least ten school days would be necessary for each student to derive any benefits from the program.

Results

Ratings obtained on the Conners Teacher Rating Scales for subjects A and B clearly reveal reductions in the measures of hyperactive behaviors from the baseline to the end of the treatment conditions. As shown in Table 1, teacher ratings of subject A for the Hyperactivity scale during the baseline phase indicate that significant difficulties (T=71) were present. Similarly, results of the Hyperactivity Index were significant (T=72) for this student. At the end of the treatment condition, ratings indicate that subject A's hyperactive behavior decreased well below the threshold of significance, with a Hyperactivity scale T-score of 48 and a Hyperactivity Index score of 49. For the reversal condition, it appears that the hyperactive behaviors of subject A increased, yet remained below the level of significance. Similar results were obtained for subject B, with

the baseline T-score of 76 on the Hyperactivity scale falling sharply to a score of 49 at the end of the treatment condition. Likewise, T-scores obtained on the Hyperactivity Index from the baseline (T=78) to treatment (T=47) conditions suggest dramatic behavioral change.

Ratings obtained for subject A on the Conduct Problem scale of the CTRS-39 did not reach significant levels across the three conditions. It is noteworthy, however, that the T-scores obtained on this scale decreased from the baseline (T=58) to the end of the treatment (T=45) conditions, and remained within the subclinical range at the reversal (T=47) rating. Ratings on this scale obtained for subject B reveal significant conduct difficulties (T=75) during the baseline phase. A sharp decrease in this score (T=48) is revealed at the end of the treatment phase, indicating a significant drop in misconduct. At reversal rating, the T-score (64) obtained on this scale is higher than that obtained during the treatment phase, yet remains below the threshold of significance.

As Table 1 illustrates, Teacher ratings for subject A on the Emotional-Indulgence scale were below the level of significance across all conditions. For subject B, however, a dramatic reduction in the T-scores from a significant baseline rating (T=73) to the end of the treatment phase (T=45) is revealed. For the reversal rating, the frequency of this subject's emotionally overindulgent behaviors remained below clinical significance.

On the Anxious-Passive scale of the CTRS-39, neither subject A nor subject B received significant ratings across the three conditions, which is not surprising considering the internalized nature of the behaviors measured on this scale. Likewise, the ratings suggest that asocial and daydreaming forms of behavior were not exhibited to a significant degree by either subject across the three conditions of the study.

A graphic illustration of the results is presented in Figure 1. Qualitative analysis reveals a downward trend, across all probands, in measures for both subjects from the baseline to the end of the treatment conditions. Consistent with what one might expect to occur in a study utilizing a reversal design, none of the measures decreased from the end of the treatment to the reversal ratings, rather, a dissipation in the treatment effects is suggested.

Discussion

The present data are consistent with previous studies (Gordon et al., 1991; Rapport et al., 1980, 1982) establishing the efficacy of response-cost programs as an alternative to pharmacotherapy in the management of attentive behaviors of children. Since most children with Attention Deficit/Hyperactivity Disorder experience their difficulties in the classroom where demands for sustained attention are greatest, it is important to consider classroom-based approaches which can be administered by the teacher in unobtrusive fashion. The

present study investigated such an approach, and found that measures of hyperactivity for both subjects decreased as an effect of the response-cost procedures.

In the Gordon et al. (1991) study, the ATS was combined with a reward system similar to that used in the present study. These researchers reported an immediate and powerful effect of the ATS system on the attentiveness in five of their six cases. In discussing their results, however, these researchers note the lack of generalizability of such findings from the clinic setting to the school environment. The present study addresses this concern, and the findings are consistent with those obtained in the clinic: It appears that the efficacy of the ATS, when woven into the context of reward, is also effective in reducing hyperactive types of behaviors in the classroom setting.

From the results of the present study it is not possible to determine whether any internalization of appropriate response patterns occurred in the subjects. The relatively brief duration of the reversal phase precludes this analysis. Future research in this area should address this issue, perhaps by extending the duration of the experimental phases or by utilizing longitudinal techniques.

Another issue not addressed in the present study is the effect of such programs on work quality and productivity. It would be interesting to determine the extent of impact of the response-cost technique on, for example, pre- and post-measures

of percent correct words on a spelling test, scores on a mathematics test, or meaningful journal writing. Since attentional difficulties can adversely affect any area of academic achievement, it is logical to assume that an improvement in attentional capacity during independent work time and instruction would facilitate growth in a wide range of academic skills. Determining this would be a worthwhile pursuit.

The goal of the present study, that is, to investigate the effects of a response-cost program on the classroom behavior of two children with Attention Deficit/Hyperactivity, has been realized. It appears that the Attention Training System, when used in conjunction with reward principles, is an effective classroom instrument for the maintenance of attentive behavior. The teacher involved in this study commented that the subjects appeared to enjoy the program and that they did not appear in any way to be stigmatized by their peers for their participation. The other children, after first being curious for a couple of days, soon forgot about the devices on their classmates' desks.

In conclusion, further research should be conducted in an effort to determine how the response-cost approach compares to other classroom-based methods in its practicality, affordability, and effectiveness. With estimates of as many as five percent of school-aged children suffering from significant attentional problems, it can be assumed that in a classroom of thirty children there may be two children who are not attending to

instruction on a daily basis. Response-cost, self-monitoring, and self-instructional programs can be directed toward these children, and a comparison made regarding which program is the most effective and feasible in the large-group situation, or which child responds best and under what circumstances. School professionals are in the best position to pursue this type of research and their students are ultimately the ones who would benefit from such endeavors.

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Table 1

Conners Teacher Rating Scale T-Scores as a Function of Baseline, Treatment, and Reversal Conditions

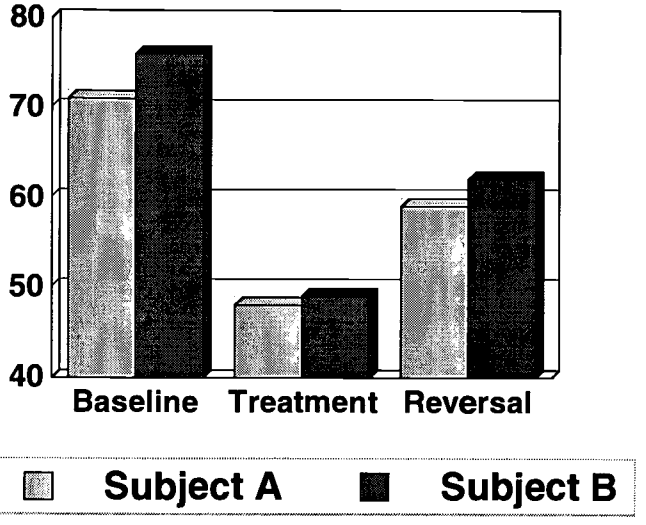
	Condition		
	Baseline	Treatment	Reversal
Subject A			
A. Hyperactivity	71*	48	59
B. Conduct Problem	58	45	47
C. Emotional-Indulgence	50	42	45
D. Anxious-Passive	45	42	47
E. Asocial	61	52	52
F. Daydream-Attn.	65	55	65
I. Hyperactivity Index	72*	49	60
Subject B			
A. Hyperactivity	76*	49	62
B. Conduct Problem	75*	48	64
C. Emotional-Indulgence	73*	45	55
D. Anxious-Passive	45	39	45
E. Asocial	61	44	61
F. Daydream-Attn.	60	41	50
I. Hyperactivity Index	78*	47	62

(* significant)

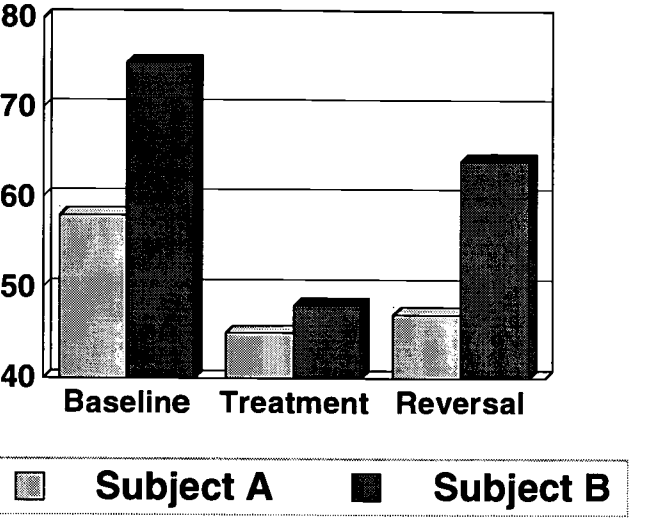
Figure Caption

Figure 1. Conners Teacher Rating Scale T-Scores across baseline, treatment, and reversal conditions.

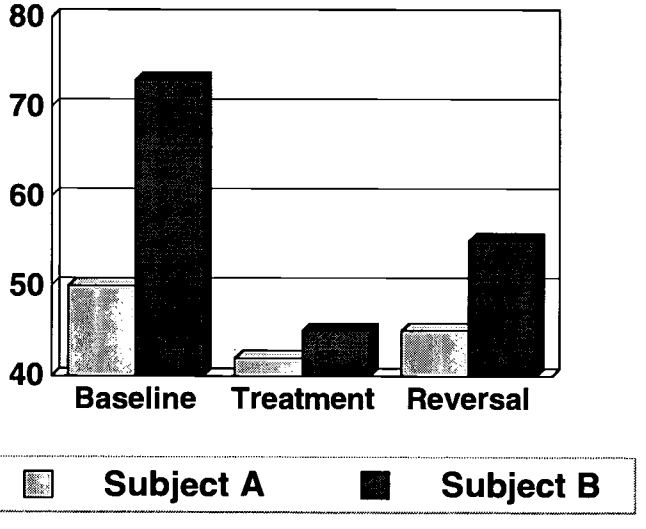
A. Hyperactivity



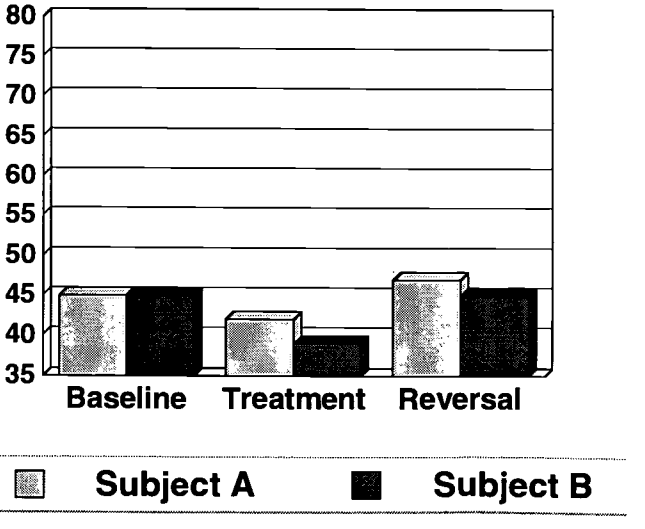
B. Conduct Problem



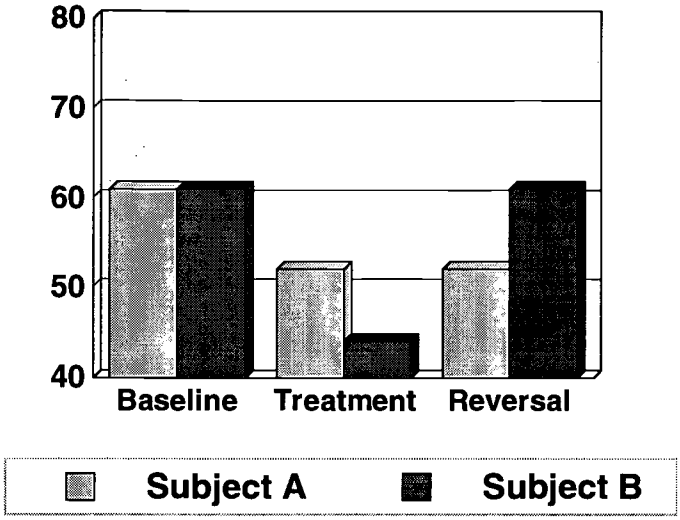
C. Emotional - Indulgence



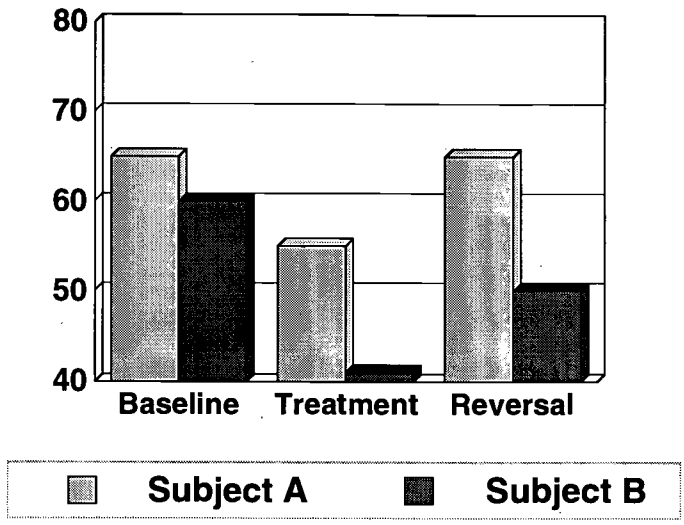
D. Anxious - Passive



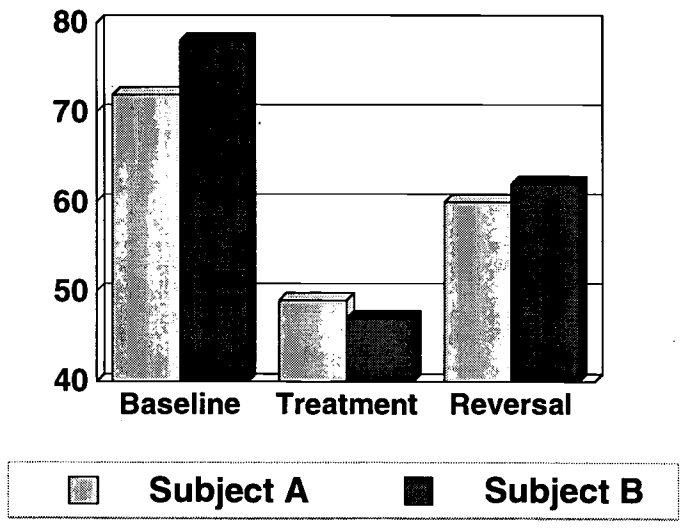
E. Asocial



F. Daydream - Attn.



I. Hyperactivity Index



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