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THE EFFECTS OF FEEDBACK UPON  
" ATTENDING BEHAVIOR

A Thesis

Presented to  
the Faculty of the Department of Psychology  
Appalachian State University

In Partial Fulfillment  
of the Requirements for the Degree  
Master of Arts in Clinical Psychology

by  
M. Brooks Gallagher  
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THE EFFECTS OF FEEDBACK UPON  
ATTENDING BEHAVIOR

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#### ABSTRACT

An experiment was conducted to assess the effects of feedback (flashing a red light) upon the classroom attending behavior of an emotionally disturbed child. Whenever the child failed to attend to classwork, the red light was activated, providing feedback that he was not attending to classwork. Results indicate that feedback alone, without back-up reinforcement, was effective in increasing attending behavior. Results were maintained over a follow-up period.

#### ACKNOWLEDGMENT

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"Distractability," "hyperactivity," and "short attention span" are terms often used to describe children who display behaviors incompatible with paying attention. It is generally agreed that paying attention (attending, study, or on-task behavior) is a prerequisite to all classroom learning situations (Martin and Powers, 1967). Because of the importance of *attending behavior*, much research has already been devoted to the subject. Studies utilizing operant conditioning principles have demonstrated successful manipulation of attending behaviors using a variety of reinforcers. For example, primary reinforcers have been shown effective in increasing attending behavior (Patterson, 1965; Patterson, Jones, Whitter, and Wright, 1965; Krop, 1971). Tokens have likewise been used extensively with positive results (Doubros and Danials, 1966; Cotler, Applegate, King, and Kristal, 1972), as has social reinforcement (Allen, Henke, Harris, Baer, and Reynolds, 1967; Kirby and Shields, 1972).

Of major importance in conditioning attending behavior (or any behavior) is the mode of reinforcement presentation. Because orientation to delivery of reinforcement would appear to be incompatible with attending to classwork, many researchers (Patterson, 1965; Walker and Buckley, 1968; Colman, 1970) have sought to minimize this problem. For example, visual (flashing a light) or auditory (a click or buzzer) cues have been used to provide feedback to a subject that he is attending and

receiving reinforcement. After initial pairing with reinforcement, visual or auditory cues theoretically take on properties of learned or secondary reinforcers (Eleftherios, Shoudt, and Strong, 1972). Delivery of the primary reinforcing agent can therefore be delayed and given intermittently. The subject's attention can be directed to the task rather than the receipt of reinforcement.

All operant studies utilizing a mechanical apparatus to provide feedback for classroom attending behaviors have also used back-up reinforcers. The effects of informative feedback alone upon classroom attending behavior are therefore unclear. There is some literature documenting the effectiveness of feedback alone in dealing with other problematic behaviors. O'Brian and Azrin (1970) report that feedback alone (buzzer) could produce change in postural control. Wincze, Leitenberg, and Agras (1972) reported that feedback in the form of visual cueing (colored lights) was effective in reducing delusional talk in a schizophrenic population in about 50% of the cases. Still another study demonstrated the effectiveness of feedback (verbal) in increasing duration of exposure to phobic stimuli (Leitenberg, Agras, Thompson, Wright, 1968). Whether similar results could be obtained in a classroom setting is presently unknown. Furthermore, the extent of maintenance or generalization of behavior produced by feedback alone is unclear. An assessment of response generalization was reported only by Wincze *et al.*, (1972). The target behavior did not generalize outside the stimulus situation.



From the preceding studies it would appear that additional information concerning the role of feedback on behavior change would be helpful. This study was an attempt to (1) assess the effects of feedback (knowledge of performance) in the conditioning of classroom attending behavior, and (2) to assess the durability of any change in attending behavior due to such feedback procedures.

#### Method

##### *Subjects*

One child, a 10 year old emotionally disturbed male, served as the subject (*S*) for the study. The *S* was enrolled in residential treatment in the Marshall I. Pickens Hospital Children's Program, Greenville, South Carolina. Admitting diagnostic impressions were: (1) Withdrawing Reaction of Childhood and (2) Adjustment Reaction of Childhood. At the onset of the study, the *S* had been hospitalized two months. Reported intellectual functioning was in the dull normal range of general intelligence with a Full Scale WISC IQ of 85 (Verbal IQ 86, Performance IQ 86). The classroom teacher at the hospital school reported *S* to have poor attending skills, often "daydreaming or fidgeting" at his desk. These behaviors reportedly resulted in very erratic classroom performance in terms of quality and quantity of work.

##### *Apparatus*

The device used to signal nonattending behavior consisted of two small plywood boxes. The signal box (30cm X 15cm X 15cm) was mounted with a standard electrical wall receptacle. An

adapter socket was placed in one outlet, this held a red light bulb (60 watts). The light box receptacle connected to a toggle switch mounted on a smaller plywood box control panel (15cm X 15cm X 9cm) and connected by an eight foot segment of insulated electrical cord. The control panel was located behind a two-way observation mirror. Electric power to the apparatus was supplied by a standard 120V wall receptacle in the observation room. The red light could be activated from inside the observation room via the toggle switch.

##### *Procedure*

The study took place over a two and one-half month period. Attending behavior was observed while the *S* was working independently on language arts programmed workbook assignments (English, phonics, spelling, reading). The order of these assignments varied daily. Only one observation was made during any given day. Observations were initiated between 9:00 and 9:30 a.m. since independent desk work on these subjects was routinely scheduled approximately 9:00 - 10:00 a.m., Monday through Friday. Due to field trips, vacation, and necessary time constraints placed upon the Experimenter (*E*) (who also functioned as an observer) observations were not made on a daily basis. However, an effort was made to conduct a minimum of at least two observations per week ( $\bar{X} = 3.4$ ).

Prior to initiation of the study the *S*'s desk was positioned in front of and facing the observation mirror. This seating arrangement gave the observer an unobstructed view of *S*. Adjacent to the desk and to the *S*'s immediate right



(approximately 45cm from *S*) was a counter top extending the length of one wall. Classroom supplies and the light box apparatus were on the counter top. Since the box had been positioned there for some months preceding the study its presence was not novel.

#### *Observational Categories and Procedures*

Clipboards, stopwatches, and data collection sheets were provided for the observers. Behaviors were defined and categorized as attending or nonattending behavior. *Nonattending* was defined as (1) eyes directed at anything other than workbook assignments while seated at desk (e.g., play with pencil or objects on desk or floor); (2) raising hand for help, accompanied by termination of eye contact with task; (3) gross motor rocking in seat, regardless of eye orientation; (4) talking to peers, regardless of eye orientation; (5) out of seat except to sharpen pencil. *Attending* was defined as: eyes oriented toward workbook assignment on desk in front of *S*.

Teacher/*S* interaction was not recorded in either category. When such interaction was initiated recording was terminated and reinstated only at the end of such interaction. This was done in an attempt to limit confounding produced by the teacher's presence.

Attending and nonattending data were coded and recorded in 15 sec intervals using continuous interval recording. Observation periods lasted 20 min in Baseline 1 and 30 min in all other conditions. Since it was possible for both attending and nonattending behavior to occur within the same 15 sec

interval, the behavior category which was displayed for 8 sec (more than half of the time during an interval) took priority in recording. Therefore, to receive an *attending* score in any given interval it was necessary for that behavior to be displayed a *total* of at least 8 sec during the interval, but not necessarily 8 sec consecutively. In questionable intervals the two observers were instructed to estimate which behavior category was dominant. However, with this particular *S*, mixed behavior categories within a given 15 sec interval were minimal due to individual attending "style". A single behavior category generally dominated several consecutive intervals. The same type of scoring was utilized for treatment as well as baseline conditions.

#### *Experimental Design*

A reversal design was employed using the following experimental sequence.

*Baseline.* Nine, 20 minute baseline observations recording attending and nonattending performance were conducted over a period of 18 classdays. While *S* was aware of the *E*'s presence in the observation room the situation was not novel since the *E* and other observers usually occupied the room during class hours. Classroom teachers were instructed to continue the normal routine. They were told the *S* was being observed so that a program could be devised to increase attending behavior.

*Phase B - Treatment.* In this phase the *S* was given the following instructions:



"Claude, you have had trouble finishing your school work. Because of this we are going to do something to help you finish your work. See this light box (referring to the light box which was now placed on the end of the counter top approximately 45cm from S's eyes)? Whenever you do not pay attention to your work I will switch on this red light. This will remind you to get back to work and not mess around. When you go back to work I will switch the red light off."

Three rapid, consecutive flashes of the red light signaled the beginning and termination of each 10 min treatment session.

During Phase B, fourteen treatment sessions were conducted over a period of 20 classdays. All sessions lasted 10 min. Attending and nonattending data were recorded as before. With the exception of the first treatment session (10 min, treatment only), two additional 10 min observations were made. One was conducted immediately preceding treatment, the other immediately after. In effect, observations during each treatment phase were 30 min in duration. Each consisted of three segments (10 min pre-treatment observation, 10 min feedback, 10 min post-treatment observation). This design allowed for assessment of generalization of treatment effects on attending for 10 min following treatment, plus maintenance of effects to the 10 min period prior to the next treatment.

*Baseline.* This return to baseline phase consisted of informing the S that he had "...worked with the light long enough," and it was "...time to try it on your own without help from the light."

During this phase seven observations of 30 min each were made over a period of 9 classdays. This reversal phase was interrupted by Thanksgiving holidays after only two consecutive days of observation. The holidays constituted a four day break from classes. The remaining four observations were made over a period of 6 classdays following the holidays.

*Follow Up.* Observations in the return to baseline phase terminated and six classdays (eight calendar days) were allowed to elapse. These data were collected 20 classdays and 29 calendar days after termination of treatment. Follow up consisted of five observations, 30 min each, conducted over a 7 day period.

#### *Observer Reliability*

Reliability checks were conducted from inside the observation room. Observers were positioned approximately 3' apart and 4' from the S. Independent observational recordings were made by the two observers using separate stopwatches. They interacted only to reset and restart stopwatches for continued observation following a teacher/S interaction. This synchronization was to insure that data were being recorded in corresponding intervals. A total of 10 reliability checks was conducted across the entire study. Inter-observer reliability checks ranged from 90 to 100 percent and was computed by dividing the number of interval agreements by the number of agreements plus disagreements (total number of observation intervals).

#### *Results*

Data clearly indicate feedback conditions alone (without



the use of backup reinforcers) were effective in producing a significant increase in attending behavior during treatment. Also, this behavior change was maintained over a follow up period.

Attending behavior was computed as a percentage. This percentage was arrived at by dividing the number of intervals scored as *attending* by the number of intervals in each observation. During the first Baseline phase mean attending behavior was 45 percent. Figure 1 shows that attending ranged from 74 to 17 percent of the observation intervals. When the feedback contingency was applied a marked increase in attending behavior occurred. Mean attending for the 10 min treatment sessions was 98 percent. Attending behavior stabilized considerably during this phase. Ten of the treatment sessions yielded 100 percent attending. For the combined 10 min pre-treatment and 10 min post-treatment observations during Phase B, mean attending was 76 percent (See Figure 1) as compared to a mean of 84 percent for the entire 30 min sessions (10 min pre-treatment + 10 min treatment + 10 min post-treatment). Figure 1 also shows that mean attending for the pre and post-treatment observations increased across the treatment condition (excluding observation #19). The tenth treatment observation (Observation #19) was conducted the morning after a Halloween party which lasted until 11:30 p.m. the previous night. *S* was noticeably fatigued during the observation and complained throughout the day of being tired from the previous night's activities and lack of sleep. While the feedback contingency did increase attending behavior to

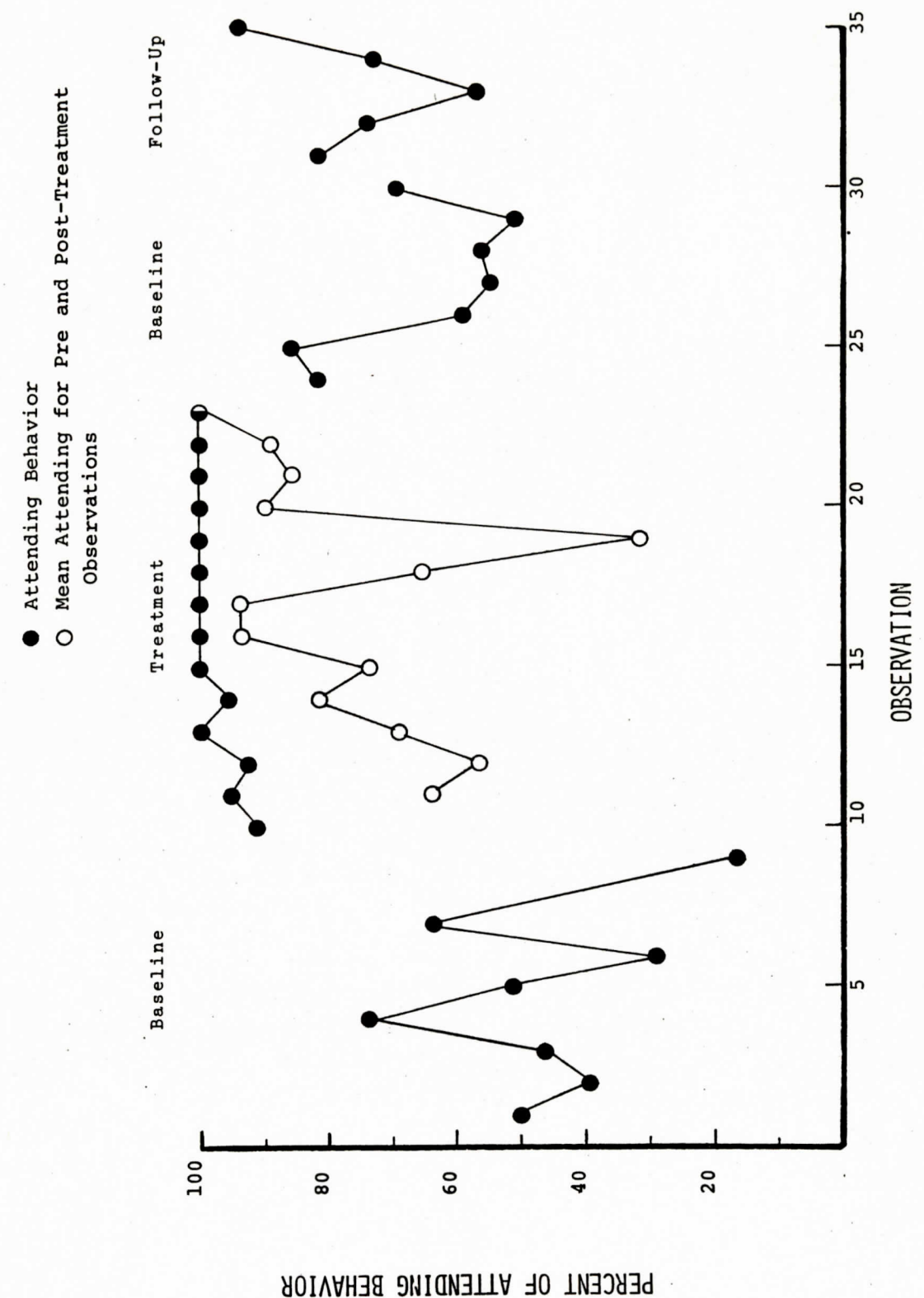


Fig. 1. Percent of intervals scored as attending.



100 percent on this day, these data are not considered representative.

Reversal conditions (return to baseline) resulted in a mean of 65 percent attending behavior. Although this was a lower percentage than in the feedback condition, reversal phase performance was 20 percent higher than during initial baseline observations. Day-to-day variability increased during reversal as compared with feedback condition with a range of 82 percent to 50 percent attending behavior. This range was, however, a decrease in variability as compared with initial baseline observations. An attempt was made to further analyze return to baseline data. Each 30 min observation was broken down into three 10 min observations so that attending during this phase could be more closely compared to the attending data of the treatment phase. Such comparisons produced no positive relationships between the three, 10 min observations of treatment and that of the return to baseline phase.

The follow up phase produced a mean of 76 percent attending behavior, ranging from 94 to 57 percent. The mean rate in this phase was actually higher than in the return to baseline phase.

Of the thirteen, 10 min pre and post-treatment baseline observations (Figure 2) in condition B: seven showed an increase in attending behavior from pre-treatment to post-treatment; five showed a decrease in attending during post-treatment from that in the pre-treatment condition; one resulted in both pre and post observations being equal, 100 percent attending behavior.

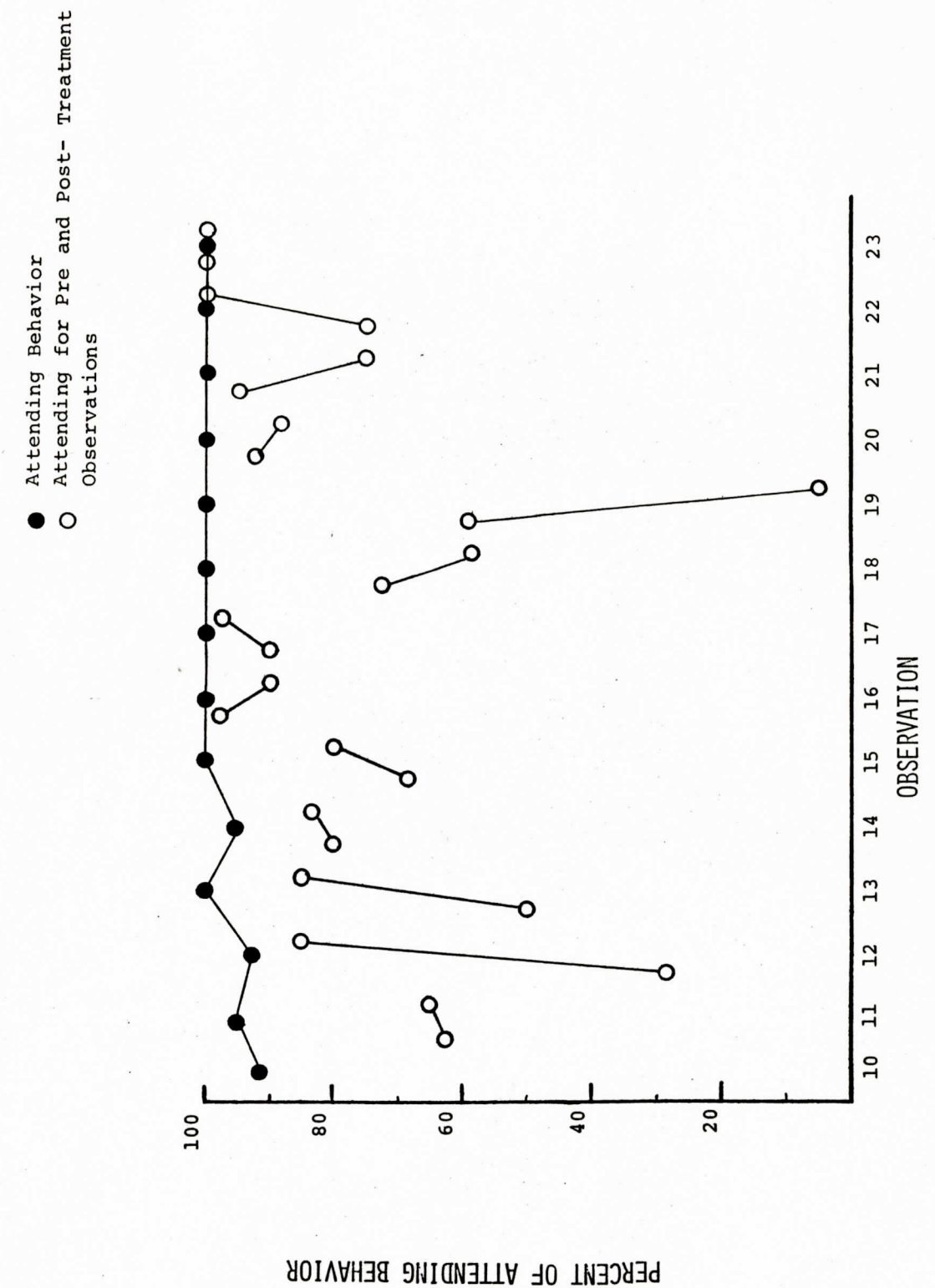


Fig. 2. Percent of intervals scored as attending during treatment phase.



### Discussion

While generalization of the results from the single *S* study is limited, comparisons between these and other findings are warranted.

Results support other studies (Leitenberg *et al.*, 1968; O'Brian and Azrin, 1970; Wincze *et al.*, 1972) in that feedback alone produced behavior change during conditioning trials. However, Annett (1969) concludes there is some danger in comparing the effects of feedback when different behaviors are being conditioned. Behaviors may differ in complexity and therefore in susceptibility to conditioning. For example, conditioning postural control (O'Brian and Azrin, 1970) might actually involve conditioning several different chains of responses. These responses may be totally different from those involved in conditioning attending behavior.

At least one review article (Geis and Chapman, 1971) dealing with the role of feedback in the learning of programmed materials concludes that feedback does not enhance learning of programmed material. Comparisons between learning of programmed material and the learning of attending behavior may again be limited due to the possible inequality of the behaviors being conditioned.

Several explanations for the obtained effects of feedback upon attending behavior are possible. First, it is concluded by some that feedback may serve, in itself, as a reinforcer. It may supply the *S* with information concerning the correctness of his response (Skinner, 1968; Annett, 1969). Using this explanation, the possibility exists that the red light received

for nonattending behavior functioned as a negative reinforcer creating an escape paradigm; attending behavior being the response which terminated the light. Perhaps a more tentative argument may be that the feedback served to cue the *S* of the *E*'s presence, the red light serving to cue negative social reinforcement of attending behavior.

A third explanation is that the red light functioned as punishment for nonattending behavior. Several studies dealing with discrimination learning have concluded that punishment may, indirectly, serve to increase attending and facilitate learning in a discriminative task (Penny, 1967; Stevenson, Weir, and Zigler, 1959; Witte and Grossman, 1971). The difference between an explanation of punishment and one of negative reinforcement would simply be a matter of focusing upon increasing or decreasing a behavior. All three of the above explanations have merit and are sound theoretical accounts for the results.

As to maintenance of the attending behavior, the results are in direct opposition to the findings of Wincze *et al.*, (1972) in which results produced by feedback were reportedly not maintained. A seemingly more powerful feedback condition used a combination of feedback (tokens without back-ups) plus praise (Sulzer, Hunt, Ashley, Koniaraki, and Krans, 1971). This study concluded that even such a feedback combination was ineffective in maintaining academic behaviors. In fact, after extensive review of the literature the author was unable to locate any study reporting maintenance of behavior conditioned by feedback



conditions alone. Therefore it is concluded that this study produced results which are in opposition with previous research finding and for this reason quite significant.

One explanation for maintenance of attending behavior in this study may lie in the scheduling of the conditioning sessions. Conditioning sessions were conducted necessarily on a variable basis throughout the week. This schedule which often resulted in skipping days between treatment sessions may have produced behavior more resistant to extinction.

An additional explanation offered is that attending behavior may have been maintained through a combination of environmental or intrinsic reinforcers (i.e., completion of work yielding more playtime, etc.).

Another interesting aspect of the study involved generalization of attending behavior to the 10 min pre and post-treatment baseline conditions. These baselines clearly demonstrated a trend toward increasing generalization of attending behavior on a day-to-day basis (excluding observation #10), giving a picture of the progressive development of generalization effects (See Figure 1). An accurate picture of generalization cannot be obtained, however, due to the fact that generalization and fatigue were confounded. Also, while fatigue or rest periods immediately following treatment might have been expected to occur just the opposite results were obtained. Improved or equal performance was noted in eight of thirteen treatments (Figure 2).

From the research and review presented, several points are clear. First, very little is known about the role of

feedback in producing change in classroom attending or other behavior. Second, theoretical accounts as to the nature of feedback are just that and are in need of further clarification. Third, further research is needed to clear up contradictions and questions concerning feedback. As for this study, an extended replication would appear to be needed to help clarify the role of feedback in behavior change. For example, a future study on a larger *N* might concentrate upon comparison of such variables as feedback for appropriate vs inappropriate behavior, as well as controlling schedules of feedback sessions. Thorough assessment of generalization of attending across *S*'s and across situations might also provide useful knowledge. A future study might also attempt to clarify the theoretical function of feedback.

Finally, and perhaps most important is the question of practical implications of these findings. First, this study would appear to provide additional support to the idea that attending behavior may be manipulated through operant techniques. Second, further support was provided for the idea that positive change can be produced through use of a simple and inexpensive apparatus. This apparatus might be coupled with an already available and inexpensive reinforcer - social reinforcement. Third, and perhaps most significant, is that behavior change can be produced without the use of back-up reinforcers, which are unavailable or impractical in some situations. A final point is that actual treatment sessions in this study lasted only 10 min each, and could be conducted with very little sacrifice to teacher or other personnel time.



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I. \_\_\_\_\_ IV. \_\_\_\_\_  
 II. \_\_\_\_\_ BEHAVIORAL OBSERVATION V. \_\_\_\_\_  
 Form #1  
 III. \_\_\_\_\_ VI. \_\_\_\_\_  
 SUBJECT \_\_\_\_\_ CA \_\_\_\_\_ GRADE \_\_\_\_\_ TEACHER \_\_\_\_\_  
 DATE \_\_\_\_\_ TIME OF OBSERVATION \_\_\_\_\_ TOTAL TIME \_\_\_\_\_  
 OBSERVER \_\_\_\_\_ ACTIVITY \_\_\_\_\_

I. \_\_\_\_\_ II. \_\_\_\_\_ III. \_\_\_\_\_ IV. \_\_\_\_\_ V. \_\_\_\_\_ VI. \_\_\_\_\_

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APPENDIX: DATA COLLECTION FORM