APPLYING "GROUP" CONTINGENCIES TO THE CLASSROOM STUDY BEHAVIOR OF PRESCHOOL CHILDREN¹

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A group of 12 children were enrolled in a preschool class. During the first experimental stage they participated in special events contingent on token earning. Tokens were acquired by engaging in a variety of study behaviors. After a level of study behavior was established under this contingency, the special events were provided noncontingently. Study behavior declined throughout the noncontingent stage. Reestablishing the original contingencies produced an immediate return to the initial level of study behavior. Noncontingent special events reduced the amount of independent study, group participation, and cooperative study. The study behavior of each child was altered in the same direction, though differences in the magnitude of effects from child to child were observed.

The experimental analysis of behavior has concentrated on the examination of responses emitted by a single subject. Recently, extensions of this research have begun to deal with groups of individuals. Behavioral research with adult psychiatric patients (Ayllon and Azrin, 1965), and retarded children (Birnbrauer, Wolf, Kidder, and Tague, 1965) has indicated that certain operant techniques can be applied effectively well beyond the "artificial" conditions of the experimentally isolated subject.

In most group situations it is not practical to program individually special contingencies for the responses of each group member. Uniform criteria must be designed according to which a number of individuals are to be rewarded or punished. Schools, prisons, hospitals, business, and military organizations all maintain systems of response contingencies which are quite similar for all the individuals of a certain category within the organization.

The objective of this research was to determine whether operant techniques may be applied to a group of individuals with effects similar to those expected when a single subject is under study. The specific behavior under analysis was the study behavior of a group of preschool children.

The dependent variables were behaviors such as attending quietly to instructions, working independently or in cooperation with others as appropriate, remaining with and attending to assigned tasks, and reciting after assignments had been completed. Counter examples are behaviors such as disrupting others who are at work, changing an activity before its completion, and engaging in "escape" behaviors such as trips to the bathroom or drinking fountain, or gazing out the window. To the extent that the first constellation of behaviors is present and the second is absent, a student might be classified as industrious, highly motivated, or conscientious; in short, he has good study habits.

METHOD

Children and Setting

The subjects were 12 children enrolled in a summer session. Three other children were not considered in this report because they did not attend at least half of the sessions due to illness and family vacations. Four of the 12 children were 3-yr old, two were 4-yr old, five were 5-yr old, and one was 6-yr old. These 10 girls and two boys would be described as mid-

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dle class; all had been enrolled in the preschool the preceding spring semester, all scored above average on standardized intelligence tests, and all had experienced some form of token system during the previous semester.

Classes were conducted from 12:45 to 3:30 p.m., five days a week for seven weeks. A large room adjoining the classroom afforded one-way sight and sound monitoring of the class. The program was directed by two head teachers who were assisted for 25 min each day by a specialist who conducted the Spanish lesson. All of the teachers were undergraduates.

Daily Program

Data were collected in three phases during the first 75 min of each of the last 20 class days of the summer session. During the first 20 min, individual activities were made available to the children for independent study, and the amount of social interaction, student-student or student-teacher, was very slight. The next 25 min were devoted to Spanish instruction. The interaction pattern during this period was much like that of a typical classroom, with the teacher at the front of the assembled children sometimes addressing a specific individual but more often talking to the entire group. The remaining 30 min were given over to "study teams", with the children paired so the one more skilled at a particular task would teach the less skilled. Composition of the groups and their tasks varied from day to day according to the developing skills of the children.

Following this 75 min, a special event was made available to the children. Special events included: a short movie, a trip to a nearby park, a local theater group rehearsal, an art project, a story, or a gym class. The special event was always 30 min long and was always conducted outside the regular classroom. The children were not told what the activity would be for the day until immediately before it occurred.

Token Reinforcement

The tokens, colored plastic washers about 1.5-in. in diameter, served as a monetary exchange unit within the classroom. As the children engaged in individual activities, Spanish, and study teams, the teachers moved about the room giving tokens to those who appeared to

be actively working at their various tasks, but not to those who were not judged to be attending to the assignment at the moment.

To minimize unproductive talking about the tokens, the teachers avoided mentioning them. Tokens were never given when requested. If a child presented a piece of work and then asked for a token, the request was ignored and additional work was provided if needed. Similarly, the presentation of tasks was never accompanied by any mention of tokens, such as, "If you do thus and so, I will give you a token." The tokens were simply given out as the children worked and, where possible, the presentation was accompanied by such verbal statements as "good", "you're doing fine, keep it up", "that's right", etc. The teachers avoided a set pattern in dispensing the tokens so that their approach would not become discriminative for studying. They would watch for appropriate behavior, move to that child, present a token and encouragement, then look for another instance not too nearby. During Spanish, the two teachers were able to present tokens for appropriate responding to the children who were assembled in front of the Spanish teacher. During study teams the teachers presented tokens as they circulated from group to group, and also at a checking session at the end of the period. Here, the student-learner recited what had been learned and both children were given tokens according to the performance of the learner. Each teacher distributed from 110 to 120 tokens during the 75 min.

The tokens could be used to purchase the special-event ticket. The price varied from 12 to 20 tokens around an average of 15 each day so the children would not leave their study activities as soon as they acquired the necessary amount. Children who did not earn enough to purchase the special-event ticket remained in the classroom when the others left with the teachers. There were no recriminations or admonishments by either the teachers or the students, and the one or two children left behind typically found some toy or book to occupy themselves until the rest of the class returned. After the special event, additional activities enabled the children to earn tokens for a 3:00 p.m. snack of cookies, ice cream, milk, or lemonade, and a chair to sit on while eating. Tokens could be accumulated from day to day.

As tokens became more valuable, theft, borrowing, lending (sometimes at interest), hiring of services and a variety of other economic activities were observed. No attempt was made to control any of these except theft, which was eliminated simply by providing the children with aprons which had pockets for the tokens.

Observation and Recording Procedures

The four principal observers were seated in an observation room. Each wore earphones which enabled audio monitoring of the class and also prevented inter-observer communication. On a signal at the beginning of each 5-min period, each observer looked for the first child listed on the roster and noted that child's behavior on the data sheet, then looked for the second child on the list and noted its behavior; and so on for each child. All observers were able to complete the total observational cycle in less than 3 min. During the 75 min of observation, the children's behavior was described by noting what the child was looking at, to whom he was talking, and what he was doing with his hands. Fourteen daily observations of each child by each observer produced 672 items of data each day.

Criteria were established by which each behavioral description on the data sheets could be coded as either "S", indicating study behavior, or "NS", indicating nonstudy behavior. Behaviors such as writing, putting a piece in a puzzle, reciting to a teacher, singing a Spanish song with the class, and tracing around a pattern with a pencil were classified as "S", if they were observed in the appropriate setting. Descriptions of behaviors such as counting tokens, putting away materials, walking around the room, drinking at the fountain, looking out the window, rolling on the floor and attending to another child, were classified as "NS". Singing a Spanish song was scored "S" if it occurred during the Spanish period when called for, but "NS" if it occurred during an earlier or later period. Similarly, if one child was interacting with another over instructional materials during the study teams period, the behavior was labeled "S", but the same behavior during another period was classified "NS".

If a given child's behavior was described 14 times and eight of these descriptions were coded "S", then the amount of study time for that child was $\frac{8}{14}$ for that day. The amount

of study behavior for the entire class on a given day was the sum of the 12 individual scores.

Time-Sampling Validity Check

Time-sampling assumes that, in a given situation, the behavior observed at fixed spacings in time adequately represents the behavior occurring during the total interval. To check the validity of this assumption, a fifth observer described the behavior of only three children much more frequently. At the beginning of each 15-sec interval an automatic timing device beside the fifth observer emitted a click and flashed a small light. The observer then described the ongoing behavior of the first of the three target children of the day, noting essentially the child's looking, talking, and hand behaviors. The procedure was repeated for the second child, then the third. At the onset of the next 15-sec interval, the sequence was repeated. The tape ran continuously. Consequently, during the same interval when the principal observers made 14 observations, the fifth made slightly more than 300 observations of each of the three children. This procedure was used during nine of the 20 experimental sessions, and the three children chosen for this type of observation varied.

The data sheets completed by the four regular observers and the tapes recorded by the fifth observer were coded each day by the four principal observers who assigned either an "S" or "NS" to each description. Coding was accomplished independently by each observer without consultation. The fifth observer did not participate in classifying any of the tape descriptions.

Design

The study, a within-group design, consisted of three stages. During the first stage, participation in the special event was contingent upon the purchase of the necessary ticket with tokens. After nine days under these conditions, participation in the special event was made noncontingent. During the seven days of the noncontingent stage, the children were presented with special-event tickets and snack tickets as they arrived for school. Tokens and verbal statements of praise and encouragement were still given for the same behaviors as during the first phase, but the tokens no

longer had any purchasing power. All the privileges of the classroom were available to every child regardless of how much or how little study behavior he or she displayed.

The decision to continue dispensing tokens but devalue them by providing everything free was made in order to retain all of the original procedures except the contingent special event. Had the tokens been given on a non-contingent basis at the beginning of each session, or eliminated entirely, this might have altered the behavior of the teachers toward the children throughout the remainder of the session.

After the sixteenth day of the study, the

aprons containing the accumulated tokens were "sent to the cleaners" and all of the tokens were removed. As the children arrived the next day and asked where their tickets were, they were told they would have to buy them. When the children noted that they couldn't because they had no tokens, the teachers responded by saying: "Perhaps you can earn some. Your (activity-name) is over there." Thus, for the final four days, the last days of the summer session, the initial conditions were restored with special-event and snack tickets again being made contingent upon tokens acquired by the students for study behavior.

Fig. 1. Mean per cent of 12 children's study behavior over 20 school days. Vertical lines indicate the range of scores obtained by the four observers each day.

RESULTS

Figure 1 shows that study behavior was influenced by whether or not the special event was contingent upon it. During the first nine-day stage, offering the special event contingent on study behavior resulted in an average score for the class as a whole of 67%. During the noncontingent stage, the observed study behavior declined 25 percentage points over seven days to a low of 42%. Restoring the original contingencies on Day 17 was associated with a 22% increase in study behavior over that of the previous day.

Because the study behavior data were derived from observational measures, a number of checks were made to establish the reliability of the procedures. First, the total class score obtained by each observer for each day was compared to the scores of the other three observers. The vertical lines at each point in Fig. 1 describe the range of group scores obtained by the four observers each day. Inspection of these lines indicated that the same pattern was described even if the summary class score for any given day was drawn at random from the four available scores. Indeed, the data of any one, or any combination, of the four observers presented the same pattern with respect to the effects of contingent reinforcement upon study behavior.

The fact that the behavior descriptions of each day were coded within a few hours after they were obtained might have been an additional source of error. A description might have been coded "NS" on Day 15 and "S" on Day 19 simply because the observer expected study behavior to increase during the final contingent stage. To check for such effects, four new coders were empaneled nine months after the study was completed. These new coders had no knowledge of the details of the original investigation. They were trained to read behavioral descriptions like those appearing on the original data sheets and assign an "S" or "NS" to each according to the criteria outlined in the previous section. Once they agreed within 5% on the independent scoring of a given data sheet, they were each given nine of the original sheets.

The data sheets given to the new coders were in scrambled order with all dates and other identifying marks obscured so they had no way of determining which stage a sheet

came from even if they understood the significance of the experimental conditions. Sheets from Days 3, 4, 5, 12, 13, 14, 18, 19, and 20 (three from each stage) were recoded in this fashion. The procedure guaranteed that the expectations of the coder would not influence the scores obtained. The comparison of the original scores and those obtained by the new coders are shown in Fig. 2.

As a further check on coding bias, two of the original observers were recalled after a nine-month interval to recode one set of four data sheets from each of the three stages of the study, 12 sheets in all, also presented in random order. These two observers each recoded the descriptions of one of the other observers and their own data sheets completed at the time of the original study. The results are also shown in Fig. 2 for Days 2, 11, and 17. These points, marked Δ , indicate that the results obtained by having the original observers recode their own and someone else's data do not differ from those obtained when newly trained coders score the original data. In all cases the scores obtained described the effects of contingent and noncontingent reinforcement in the same way.

The comparison of the total score for the three target children obtained by the regular method and the tapes is shown in Fig. 3 and

Fig. 2. Mean study behavior scores obtained by original observers compared with scores obtained by a panel of coders nine months after the completion of the study. Δ indicates scores obtained by two of the original observers who recoded the original data sheets nine months after the completion of the study.

Fig. 3. Mean study behavior of various trios of children based on taped observations each day compared with written time-samples during the same period.

supports the validity of the 5-min time-sampling technique.

The data describing the effects of the different contingencies upon each of the three in-

structional styles (individual activities, group instruction, teams), failed to demonstrate that this was an important dimension in the present study. Day-to-day variability was greater for these smaller periods than for the entire session, but in all cases the proportion of study behavior dropped similarly in the absence of the contingent special event and rose during the final four days.

Just as the day-to-day variability increased as the analysis moved from the whole class to periods within each day's class, individual study behavior was more variable than the aggregate data for all 12 children. It is to be expected that students of different age, sex, and educational background will perform differently in comparable settings, but all 12 records shown in Fig. 4 indicate that non-contingent reinforcement was less effective in sustaining study behavior than contingent reinforcement. There was no case in which an individual student displayed more study behavior during the second stage of the study than was displayed during the first and third stages.

Fig. 4. Per cent of each individual child's behavior classified as study behavior under all conditions. Dotted lines without points indicate absence.

DISCUSSION

The results indicate that the contingent special event controlled much of the study behavior. In the time available it was not possible to continue the noncontingent stage until study behavior stabilized. With such an extension, study behavior might have gone lower.

A token system has much to recommend it from a practical standpoint, for there are many school activities (recess, early dismissal, extra-curricular events) which might be employed to develop and maintain higher levels of study behavior. Further, the classroom teacher responsible for the behavior of many students can manage a token system, but faces some difficulty in relying solely on verbal praise and attention as reinforcers. Behavior modification with social reinforcement requires constant monitoring of the subject's responding (Baer and Wolf, 1967). This can be done only on a very limited scale in a classroom by a single teacher.

The day-to-day variability in individual records requires further study. At first glance it would appear that the individual fluctuations could indict the smoother curve of the group as resulting from the canceling effect of numerous measurement errors at the individual level. However, the several measurement checks suggest that other factors may have been more important in explaining the variability. For example, the practice of allowing the children to accumulate tokens from day to day may have produced some variability. It

allowed the children to work hard and lend one day, and loaf and borrow the next; work hard and save one day, loaf and spend their savings the next. This would tend to produce a smooth curve for the group, since not everyone could lend at the same time nor could all borrow at once. The present practice in the preschool is to remove all tokens from the children's pockets after each day's session.

The next approximation toward a useful classroom observational technique will require additional measures to determine the effects of the students' changing behavior on the attending and helping behavior of the teachers. This work is now in progress.

It may be concluded that: (1) practical reinforcement contingencies can be established in a classroom; (2) the effects of various contingencies can be ascertained by direct observational techniques where the use of automated recording equipment is not practicable.

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