*REDUCING TIME LIMITS:
A MEANS TO INCREASE BEHAVIOR OF RETARDATES¹*

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A common assumption in special education is that temporal limits for a task should be expanded so that ample time is provided for completing the work. This study describes the opposite strategy of restricting temporal limits to augment academic performance. Three educable retarded children received token reinforcement contingent on the number of correct math problems answered during daily sessions. A reversal design was used to assess the effects of an abrupt reduction in time limits (20-5-20 min) and a graduated sequence of reductions (20-15-10-5-20 min). The graduated sequence resulted in rate increases of correct responding ranging from 125% to 266% and these gains endured when temporal limits were again expanded. In contrast, the abrupt shift produced interfering emotional behaviors and rate decreases in academic performance of 25% to 80%. The findings indicate that systematically restricting temporal limits for an academic task can further enhance the performance of slow learners already maintained by a token system.

DESCRIPTORS: academic behavior, reducing time limits, education, maintaining performance, mathematics, response rate, tokens, retardates

A common view in the field of special education is that teachers must be realistic in their academic objectives and not press for goals unattainable by their students (Doll, 1968). Teachers therefore are generally advised to make the class structure flexible and readily modifiable so as to meet the needs of individual students. This conceptual approach is basically an effort to maximize the success each child experiences in the classroom and also enhance the acquisition of academic behaviors.

Consistent with the above philosophy, one technique that teachers use to facilitate the

academic performance of retarded students is to expand the temporal requirements for an assignment beyond what would normally be allotted in a regular classroom (Heidmann, 1973; Peterson, 1973). This permits additional time to complete academic work and also helps remove the "pressure" associated with rigid time limits. Such a tactic is especially relevant because many workers in the field believe that retarded children are more easily frustrated than other children (Goldstein and Seigle, 1971). This "frustration-proneness" may contribute to the unstable academic performance often seen with these children. Expansion of temporal limits thus seems appropriate because at least one defining characteristic of the retarded is their relatively slow acquisition of academic skills (Rothstein, 1971). Procedurally, larger segments of time must be set aside for completion of work because the students are working at a slow rate. The following comment embodies the sentiment of many educators and parents of children with learning deficiencies: "A wise service is to help him set

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aside enough time to do each task, without pressures from deadlines . . ." (Brown, 1969).

The tactic of expanding temporal limits for the retarded has been largely commonsensical, rather than empirically based. But some data suggest that the opposite procedure of reducing temporal limits may increase rate of academic performance. Hopkins, Schutte, and Garton (1971) demonstrated that when first and second graders were allowed to go immediately to a playroom after their papers had been scored, rate of printing increased. Later, when the time limits to complete the work and then play were gradually reduced, there was a correlated, progressive increase in rate of printing. Unfortunately, since the availability of reinforcement and the opportunity to engage in printing were manipulated simultaneously, it is not possible to determine which of these variables was responsible for the rate increase. Hopkins and his colleagues were not concerned with this issue because the main focus of their study was on the reinforcing properties of free-time activities, rather than the effect of time limits. However, their data indicate that graduated temporal restrictions may lead to increased rates of academic performance.

Rather than altering temporal limits for completing a task, a behavioral approach to the retarded has typically advocated the use of contingent rewards. This strategy often takes the form of a token economy and has been used successfully to develop and maintain a higher level of performance in slow learners than achieved with other methods (*e.g.*, Birnbrauer, Wolf, Kidder, and Tague, 1965; Thompson and Grabowski, 1972).

The present study attempted to integrate a token procedure with the systematic manipulation of temporal limits. Specifically, we wondered if the additional component of altering explicit temporal limits would enhance the academic performance of retarded children already achieved in a token system. Further, would such a combined procedure lead to academic performance of a stable and enduring nature?

METHOD

Subjects and Setting

Three students in a public school for the educable retarded participated in the study. Two were male, Ron and Charles, and the third female, Louise. They ranged from 10 to 12 yr of age and had I.Q. scores varying from 71 to 79 as measured by the WISC. These students had been referred by the regular classroom teacher because they were 2 to 3 yr behind in math skills.

The class was self-contained for the entire school day. There were two teachers in the classroom, both of whom were in their first year of teaching.

Response Definition

The target behavior measured was the number of correct math problems completed during a specified time period. The difficulty of problems given to each student depended on his/her competency as assessed by prior work in the regular classroom. The types of problems given were as follows: Charles—two- and three-column addition with carry; Ron—three- and four-column subtraction with carry; Louise—three- and four-column addition with carry. During the study, the teachers developed 20 new problems per session for each student.

Observer Agreement

Twice a week, the number of correct math problems was checked by one of the authors, and the obtained agreement score was 100% on each occasion for each child.

Token System and Back-up Reinforcers

A token reinforcement system similar to that used by O'Leary and Becker (1967) was implemented. One marble was placed in a plastic cup, which was taped to the top of each student's desk, for each problem correctly answered. Tokens were exchangeable for a variety of privileges later in the day. The back-up reinforcers ranged in price from one to 20 tokens and in-

cluded such items and activities as free time, hall passes, extra physical education, *etc.*

Procedure and Experimental Design

Each session was begun by the teacher announcing the number of minutes available for math work. For example, during the 20-min phases the teacher stated: "Today you have 20 minutes to complete your math assignment." A stopwatch was used to measure the time needed by each student to complete the 20 problems. If any student had not finished before the time limit, he or she was instructed to stop. At the end of each session, both teachers went to the students' desks to grade papers and give tokens and social praise for correct math work.

If a student completed the math assignment before the end of the specified time period, rate correct per minute was computed by dividing the total number correct by the actual number of minutes used. When a student needed the full period to complete the assignment, the denominator of the rate measure was the number of minutes associated with the particular phase.

The experimental treatment incorporated a reversal design to assess the effects of both an abrupt change in time limits and a graduated sequence of time reductions on academic performance. The first reversal was a standard ABA with corresponding time limits of 20-5-20 min. Following the first 20-min phase, baseline conditions were resumed after four, 5-min sessions. The second, graduated reversal constituted an ACDBA with corresponding time limits of 20-15-10-5-20 min. After the initial 20-min phase, 18 sessions were conducted in a graduated sequence before the return to baseline conditions.

RESULTS

An abrupt reduction in temporal limits led to a decrease in rate of correct math problems completed by the students. A series of graduated temporal shifts substantially increased rate for all three students.

Figure 1 shows the rates of correct math per-

formance during the abrupt and graduated reduction in time limits. Introduction of the first 5-min phase markedly decreased rate for both Ron and Louise and less so for Charles. Mean rates decreased from 0.5 correct per minute to 0.1 for Ron and Louise, while Charles' rate dropped from 0.4 to 0.3 correct per minute. Following the return to the 20-min phase, rates for academic performance returned to or slightly exceeded the previous baseline levels.

The mean correct problems per minute for Charles increased during each subsequent time reduction from 0.45 during the 20-min phase to 1.7 during the 5-min phase. Ron's performance

Fig. 1. Number of correct math problems per minute for three retarded children as a function of an abrupt and graduated reduction in time limits. Each point represents the number of correct problems per session divided by either the number of minutes associated with each phase or the number of minutes needed by each student, whichever was less. The 20-min phases designate baseline conditions and the first 5-min phase indicates the abrupt temporal reduction. The 15-min phase indicates the beginning of graduated temporal reductions.

rose in a similar fashion from 0.6 to 1.35 correct per minute over the same time limits. Likewise, the mean rate for Louise increased from 0.45 to 1.2 correct during the graduated reduction in temporal limits from 20 to 5 min. These figures represent rate increases in academic performance ranging from 125% to 266% for the three students.

The final return to a 20-min limit resulted in performance similar to that obtained during the 5-min phase of the graduated sequence. These data represent a marked increase in rate for all three students over the former 20-min phase and indicate the enduring nature of the effects correlated with the graduated reductions.

Figure 2 shows the mean number of correct math problems completed by Charles, Ron, and

Louise during the abrupt and graduated temporal shifts. The abrupt change in time limits greatly reduced the number of problems correctly answered from 8.9 to less than 1. It is also apparent that a return to baseline conditions, following the abrupt change, resulted in no academic gain when compared to the first 20-min phase.

However, when the same 5-min phase was reached through graduated temporal shifts, the number of correct problems rose dramatically to a level nearly seven times above that reached during the previous 5-min phase. In addition, when the final 20-min phase was re-instated the number of correct problems increased substantially when compared to the previous 20-min phase. The number correct rose from a mean of 8.8 to 13.5 following the graduated series of temporal shifts. Because it was possible for a child to complete his math assignment before the end of a temporal period (*e.g.*, 20 min), the rate correct may exceed one per minute but the mean number correct may fall below the 20 problems assigned each day.

DISCUSSION

The results demonstrate that gradually restricting temporal limits for completing a task increased rate of academic performance for the educable retarded. This supports and extends the findings obtained by Hopkins *et al.* (1971). Following a graduated sequence of reductions, children maintained their performance gains when temporal limits were returned to the former classroom routine. These results suggest that the commonsense approach of initially expanding temporal limits for a task may actually be counterproductive, at least for an educable retarded population. In addition, the findings indicate that systematically altering temporal limits in a graduated sequence further enhances the academic performance of slow learners already maintained by a token system of reinforcement.

Simply reducing time limits will not increase the rate of performance. The major variable appears to be whether the temporal shifts are

Fig. 2. Mean number of correct math problems as a function of the abrupt and graduated reductions in time limits. The bars summarize findings for the three students' performance during the designated temporal phases.

abrupt or graduated. The position not to restrict temporal limits held by many educators in special education is probably based on the deleterious effects associated with an abrupt change in temporal requirements. Besides the suppression of rate following the abrupt shift in the present study, other effects were apparent. The students exhibited emotional behaviors such as complaining that they "can't finish in that time". In addition, several cried and threw their pencils and paper on the floor when the restricted time limits were announced. For these reasons, the 5-min phase following the abrupt shift lasted only four sessions. When baseline conditions were re-instated, the students' academic performance returned to its previous level and the emotional behaviors were no longer in evidence.

In contrast, when the same 5-min temporal limit was reached through a graduated sequence of reductions, the students responded to each new temporal limit as a game similar to "Beat the Clock". They did not exhibit any negative emotional behavior during the graduated reductions as they had previously following the abrupt shift. When the 20-min phase was again presented, the students stated that they "don't need that much time", which was generally true.

It is not clear why graduated temporal reductions led to an increased rate of academic performance. One plausible explanation is that relative states of deprivation may set the occasion for more rapid responding, so that there will be little or no loss of reinforcement when compared to previously obtained levels. Since the students' only opportunity to earn token reinforcement each day was during the experimental math period, any decrease in the number of tokens earned as a result of having less time would represent a condition of relative deprivation. Therefore, an enormous increase in rate would have been necessary during the first 5-min phase to earn the same number of tokens as during the preceding 20-min condition. However, when the same 5-min temporal limit was reached in a graduated fashion, the rate increases needed to maintain the same amount of reinforcement

across successive temporal periods were much smaller.

It is conceivable that the rate increases obtained during the graduated reductions were in part a function of the students' developing academic skills. A more powerful demonstration of the effects of altering temporal limits would have incorporated a multiple-baseline design across subjects, that is, staggering each students' exposure to the reduction in time limits. Indeed, a multiple-baseline design was implemented in a related experiment and the results showed that rate increases in academic performance correlated highly with each reduction in temporal limits for each individual (Garber, *Note 1*). Unfortunately, those data were confounded in that the independent variable, temporal limits, and academic complexity were manipulated concurrently in one of the experimental phases.

The explanation for the maintenance of high-rate performance following a return to baseline conditions seems more apparent. Sidman (1962) suggested that irreversible increases in behavior may be due to changes in the topography of the behavior. There were several such topographical changes during the course of the present study, which might account for the enduring nature of the rate increases. For example, when the time limits were gradually decreased, the students performed their work with less and less reliance on counting with their fingers. Also, they were less disruptive and attended more closely to the task. In addition, certainly a contributing factor to the lasting nature of their academic behavior was the increased reinforcement associated with high-rate performance.

The present investigation makes available a procedure that augments the effectiveness of token economies designed to increase the academic performance of retarded children. This technique of systematically altering a class of antecedents in the form of announced temporal restrictions also appears to have practical advantages. Rather than increase the quality and cost of items that serve as back-up rewards to enhance the motivational level of students, educators now

have the option of adding the temporal component to obtain the same objective. In addition, the graduated sequence allows students to adapt more readily to new time limits, since the procedure essentially entails a shaping process with respect to temporal requirements. Also, the concurrent use of a token system probably aids in overriding any undue emotional behaviors that may accompany a graduated sequence of reductions.

The application of systematically reducing time limits to increase behavior need not be limited solely to academic behaviors. Ayllon and Haughton (1962) used the same tactic to develop in schizophrenics punctuality in arriving at a ward dining room. The effects correlated with temporal reductions should extend to other functional skills as well.

REFERENCE NOTE

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