JOURNAL OF APPLIED BEHAVIOR ANALYSIS 1981, 14, 13-24 NUMBER 1 (SPRING 1981)

# "DO I HAVE TO BE GOOD ALL DAY?" THE TIMING OF DELAYED REINFORCEMENT AS A FACTOR IN GENERALIZATION

SUSAN A. FOWLER AND DONALD M. BAER

UNIVERSITY OF KANSAS

Delayed reinforcement, sometimes delivered just after the setting in which the critical behavior had occurred (Early), and sometimes delivered only after several further settings had been encountered (Late), was used to improve a variety of behaviors in seven preschool children, and to control their generalization. Performance of those behaviors was measured in two classroom settings: the Contingent setting, within which performance of the specified behavior determined the later (Early or Late) reinforcement, and the Generalization setting, in which there were no experimental contingencies, immediate or delayed, for the performance of the same behavior. Performances by all children in the Contingent setting were controlled by delayed reinforcement, whether Early or Late. All children showed consistent generalization from the Contingent setting to the Generalization setting during the Late condition, when reinforcement was delivered at the end of the school day. Generalization did not occur during the Early condition, when reinforcement was provided immediately after the Contingent setting (prior to the Generalization setting), unless that condition had been preceded by a Late condition (as it was for $S_6$ and $S_7$). The results suggest that the Late timing of delayed reinforcement was an effective and efficient generalization-promotion technique for performances that did not generalize spontaneously.

DESCRIPTORS: generalization, reinforcement delay, sharing, praise, preschool children

Social and economic factors often limit the frequency and immediacy with which behaviors, once established, can be reinforced. Thus, the ability to tolerate inconsistent schedules of reinforcement and delays in reinforcement often becomes critical for maintenance of specific behavior changes, as well as for generally successful functioning in society. Delayed reinforcement is not an efficient method for changing behavior, but it can be an effective procedure for maintaining it (cf. Kazdin, 1977; Renner, 1964). Furthermore, and perhaps most important, delayed reinforcement may facilitate generalization, probably by preventing discrimination of the settings in which the reinforcement contingencies actually operate (e.g., Schwarz & Hawkins, 1970; Stokes & Baer, 1977, p. 358).

Applied researchers have demonstrated that even young children can maintain various behaviors under conditions of delayed reinforcement, when the delay is mediated by events that clarify the contingencies (e.g., Israel, 1973; Israel & O'Leary, 1973; Risley, 1977; Risley & Hart, 1968). Frequently, physical cues have functioned as mediators to signal the occurrence of the behavior and to indicate that reinforcement has been earned, even though it is not

This report was based on a doctoral dissertation submitted by the first author to the Department of Human Development, University of Kansas. It was supported in part by grant MH-20410 from the National Institute of Mental Health and by grant USOE-300-77-0308 from the Bureau for the Education of the Handicapped. Appreciation is expressed to Trudi Rowbury, laboratory supervisor for her encouragement and support, to Miriam Baer and Wilma Bodine for invaluable research assistance, to Liane Cano, Kate Pound, and Enid Samuel for data collection, and to Ann Rogers-Warren for her comments on a draft of this paper. Reprints may be obtained from S. A. Fowler or D. M. Baer, Department of Human Development, University of Kansas, Lawrence, Kansas 66045.

immediately available (e.g., Holman & Baer, 1979; Meichenbaum, Bowers, & Ross, 1968; Surrat, Ulrich, & Hawkins, 1969). In other instances, the mediating events have been verbal or written agreements (contingency contracts) that specified in advance the conditions under which performance of specific behaviors would eventually be reinforced (e.g., Rogers-Warren & Baer, 1976).

Typically, programs using delayed reinforcement have specified the reinforcement behaviors, as well as the settings and times in which the behaviors were to be performed. This delineation of the contingencies was thought necessary to the success of these programs (cf. Renner, 1964). However, such careful clarification may have functioned to restrict performance to those conditions in which the contingencies actually operated. Stokes and Baer (1977) have suggested that generalization might be enhanced if the contingencies were at least partly indiscriminable. For example, a behavior might generalize across several similar settings if the relevant setting for its reinforcement was not discriminable, i.e., was not identified by the timing of reinforcement or by a mediator.

The suggestion that generalization may result from indiscriminable contingencies is logical. Previous research has indicated that intermittent reinforcement also promotes generalization, when the contingencies are not predictable (e.g., Kazdin & Polster, 1973; Peterson, 1968). Likewise, researchers have demonstrated that noncontingent reinforcement can promote generalization when the *lack* of contingency is not discriminable (e.g., Koegel & Rincover, 1977).

Further research is required to determine if delayed reinforcement can promote generalization effectively, and if a completely discriminable contingency is a factor in producing generalization. Earlier research by Schwarz and Hawkins (1970) may have demonstrated generalization resulting from delayed reinforcement used in the treatment of a school-aged child. Unfortunately, their experimental design did not include a comparison between delayed and nondelayed reinforcement and thus did not provide a causal analysis of the factors promoting generalization. Thus, the present study examined the effects of two reinforcement timings (Early and Late) in promoting generalization of various social behaviors across classroom settings by seven preschool children. Early reinforcement, delivered immediately after the setting in which the critical behavior had occurred, was compared with Late reinforcement, delivered only after several further settings had been encountered.

## METHODS

### *Subjects and Settings*

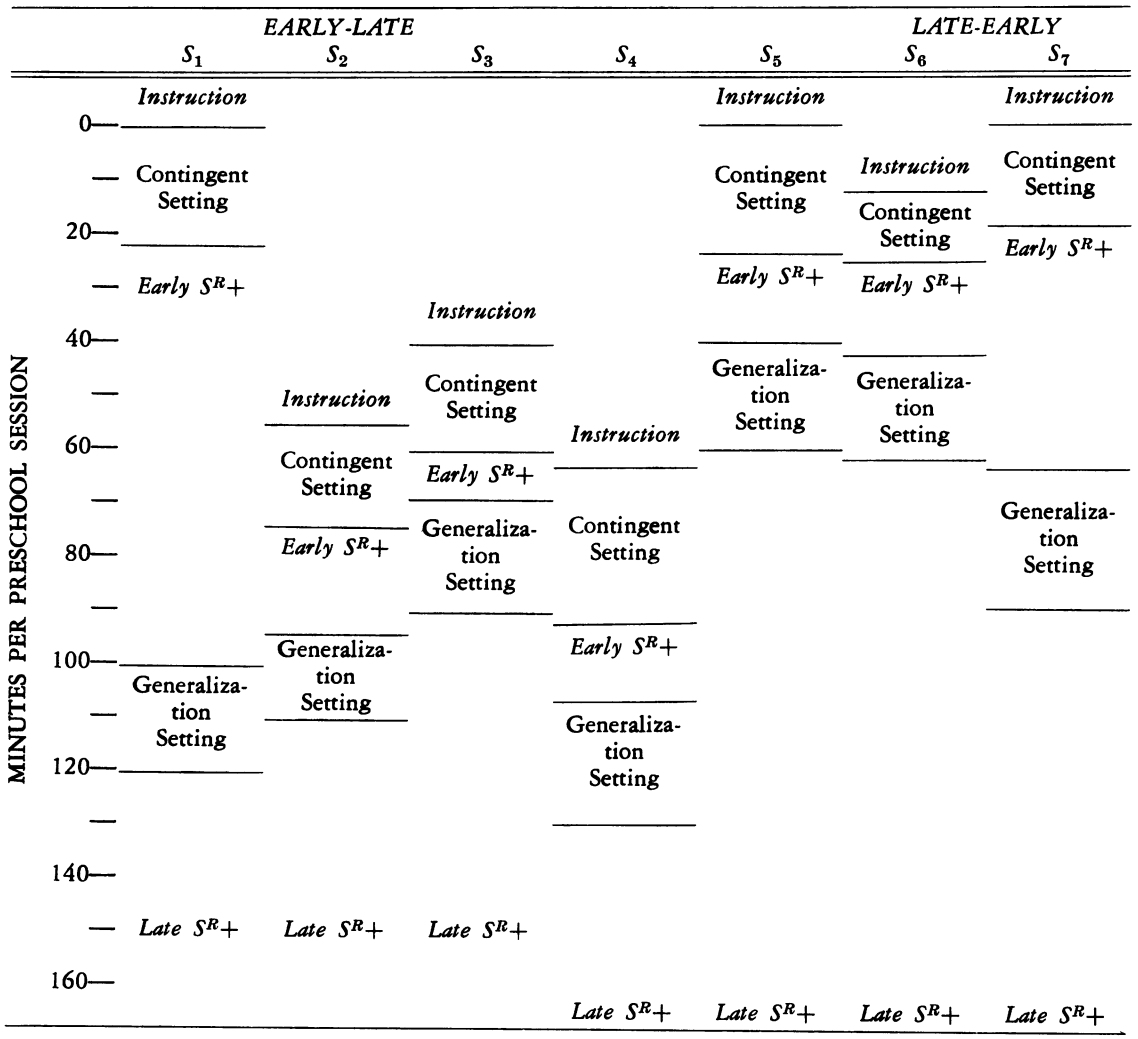
Seven children ranging in age from 4 years, 6 months to 5 years, 8 months participated in the study; four of these students ($S_1$, $S_4$, $S_5$, and $S_6$) were girls and three ($S_2$, $S_3$, and $S_7$) were boys. The students attended preschool classes at the Edna A. Hill Child Development Laboratory in the Department of Human Development at the University of Kansas. Five of the children were considered normal. They attended classes that typically contained 15-18 children and were conducted by three to five teachers. Two students ($S_5$ and $S_6$) exhibited behavior problems in the form of general noncompliance and tantrums. These children attended a special class for children with learning and behavior problems. The class contained eight to ten children and was conducted by three or four teachers.

The study was conducted in each child's preschool classroom and in an adjacent experimental room. Classroom observations for six of the children were conducted during two 10- to 20-min free play activities. The remaining child, ($S_6$), was observed during two 15-min preacademic sessions.

The first observation session was referred to as the Contingent reinforcement session; the second observation period was considered the Generalization session. The time between these two observations was constant for each child, but varied across children, ranging from 15 to

Table 1

Daily Observation and Training Schedule for Each Child




45 min. Table 1 summarizes each child's observation schedule and location.

During intervention conditions, each child also participated daily in two brief (1-5 min) training sessions in an experimental room. The first training session was conducted immediately before the first classroom observation (Contingent session); the second training session occurred either after the first observation or at the end of the day. Classroom observations and training sessions were conducted Monday through Thursday of each week.

*Response Definitions and Observations*

Only one behavior was modified per child; different behaviors were changed in different children. Each behavior change was selected to meet the individual needs of the students, and to examine the generality of the experimental effects across responses. The target behaviors and their definitions were as follows:

1. *Peer-directed offers to share play materials and/or to play cooperatively:* This behavior

was scored whenever $S_1$, $S_3$, or $S_4$ verbally suggested that a peer have, take, touch, manipulate, trade, or cooperatively use a material from the available activities or from the children's lockers. Offers also were recorded whenever the observed child invited a peer to join an activity or task. In both instances, peer-accepted offers had to be followed by material exchanges or by joint use of the materials, to be scored as offers. A subset of offers was modified for $S_2$; he exhibited a high rate of sharing and conversing with girls, but an extremely low rate with boys. Thus, only offers to boys by $S_2$ were manipulated.

2. *Activity praise:* This behavior was recorded whenever $S_5$ verbally expressed satisfaction, approval, or admiration of any activity or material, either currently or previously available in the classroom. Examples of such statements were, "Painting is fun" and "I like to jump."

3. *Appropriate study posture:* This behavior was recorded whenever $S_6$ was seated in a chair with her head up, her body oriented toward the table, and her feet and chair legs resting on the floor.

4. *Conversation to target peers:* This behavior was scored whenever $S_7$ spoke to any one of five classmates specified in advance by the experimenter. The target peers (four girls and one boy) were children with whom $S_7$ never or rarely interacted during baseline. Direction of conversation was determined by use of the peer's name, by facial orientation, by physical contact, or by statement content.

Two teacher behaviors, prompts and praise for the target behavior, also were recorded. Teachers were instructed not to prompt or praise the target behaviors of the seven students. They were not informed about condition changes, and all but two teachers were naive to the nature of the study. (The informed teachers taught in the classroom of $S_5$ and $S_6$.) Prompts were defined as follows: (a) *Prompts for offers:* A prompt was scored for $S_1$, $S_2$, $S_3$, or $S_4$ whenever a teacher suggested that the observed child (or group containing the child) offer, share, trade, exchange, or pass materials; (b) *Prompts for activity praise:* A prompt was recorded for $S_5$ whenever a teacher made a statement which might elicit an activity praise, (e.g., "Do you like to paint?"); (c) *Prompts for study posture:* A prompt to $S_6$ was scored whenever a teacher specifically instructed or requested that $S_6$ sit appropriately or cease inappropriate posture; and (d) *Prompts for conversation to target peers:* A prompt to $S_7$ was recorded whenever a teacher directed $S_7$ (or a group of children containing $S_7$) to initiate verbally with a peer or group of peers. Both direct prompts (such as, "Why don't you ask Mike to play?") and indirect prompts (such as, "Carla needs someone to talk with her on the phone") were included.

Praise was defined as follows: (a) *Praise for offers:* Praise for $S_1$, $S_2$, $S_3$, or $S_4$ was recorded whenever a teacher expressed approval over an action or a statement regarding an action in which a material was shared, offered, traded, exchanged, or passed; (b) *Praise for activity praise:* Praise was scored for $S_5$ whenever a teacher made a statement that confirmed or expressed approval of $S_5$'s activity praise; (c) *Praise for appropriate posture:* Praise was scored for $S_6$ whenever a teacher specifically commented on her appropriate posture or a behavior related to her appropriate posture (e.g., "Your feet are quiet"); and (d) *Praise for conversation to target peers:* Praise was recorded for $S_7$ whenever a teacher made an approving comment regarding his verbalizations to the target peers.

The observers were undergraduate university students, equipped with a stopwatch and data sheets. They recorded child and teacher behaviors in continuous 10-sec intervals. Observations of the five normal children were conducted in their classrooms. The children with behavior problems, $S_5$ and $S_6$, were observed through a

one-way mirror from an observation booth adjacent to their classroom. Wireless microphones transmitted the child's voice to an FM receiver-recorder in the booth.

A second observer (sometimes the experimenter) simultaneously and independently recorded child and teacher behaviors, at least once during each condition, in both classroom observation periods. Occurrence and nonoccurrence agreements were computed separately for each behavior. Interobserver agreement was calculated by dividing the sum of observer agreements about occurrence (or nonoccurrence) by the sum of observer agreements plus disagreements about occurrence (or nonoccurrence), and multiplying by 100. In general, mean agreement by condition for the occurrence of each measured child behavior ranged from 80% to 100%, and mean agreement for nonoccurrence ranged from 89% to 100%. Mean agreement for the occurrence of teacher prompts and praise ranged from 60% to 100%. (The lower reliability of recording teacher behaviors was attributed to their very low rates of occurrence: three occurrences of praise and seven occurrences of prompts for target behaviors in a total of 129 reliability observations.)

*General Procedure and Design*

A comparison of two feedback-and-reinforcement timings was conducted in two multiple-baseline designs across children. In the first multiple baseline, $S_1$ through $S_5$ entered an Early feedback-and-reinforcement condition. This condition subsequently was followed by a Late feedback-and-reinforcement condition. The order of conditions was reversed for $S_6$ and $S_7$ in a second multiple-baseline design.

*Baseline.* The standard two daily classroom observations were conducted; the children did not attend training sessions. The number of baseline sessions ranged from 4 to 18.

*Early feedback-and-reinforcement.* Two daily training sessions were introduced for each child. The first session was conducted immediately prior to the first classroom observation (the Contingent setting), and was typically 2 to 5 min in length. During this session, the child and experimenter briefly rehearsed the target behavior (e.g., offers to share) and the experimenter reminded the child to perform the behavior the criterion number of times in the classroom. The experimenter never specified the time span during which the behavior was to be performed.

The second daily training session served as the feedback-and-reinforcement session. It occurred immediately after the Contingent setting during the Early condition. The observer provided the experimenter with a copy of the data from which the experimenter could confirm and supplement child reports relating only to the Contingent setting. Incorrect claims by a child were gently corrected or ignored. Each child who had performed the requested behavior during the Contingent setting earned a sticker or point. The initial criterion level for reinforcement of the target behavior in the Contingent setting was one or more occurrences for $S_1$ through $S_5$. For better social effectiveness, this criterion was increased to two or more occurrences on Day 7 for $S_1$, Day 6 for $S_2$, Day 14 for $S_4$, and Day 15 for $S_5$. Likewise, an increasing criterion was applied to the percentage of appropriate study posture exhibited by $S_6$. Her criterion increased gradually from 30% to 50% in the first Late condition, to 60% on Day 30 during the Early condition, and to 70% on Day 34 during the second Late condition. Similarly, the percentage of peers with whom $S_7$ was to converse increased from 20% to 40% on Day 23 of the Early condition.

The stickers and points earned during the feedback-and-reinforcement session could be exchanged immediately for a small toy, or could be saved until several stickers were earned (e.g., 4 to 8) and then exchanged for a larger toy. One sticker per day was available for six of the children. The fifth child, $S_5$, earned one point for each occurrence of the target behavior (activity praise); 20 to 40 points were required for her toy exchange. This point system was selected

for $S_5$ in order to encourage high rates of activity praise. (High rates of offers would not have been appropriate.)

*Late feedback and reinforcement.* Procedures for this condition were identical to the procedures in the Early condition, except that the feedback-and-reinforcement session occurred at the end of the school day. Because classroom observation schedules varied across children, the amount of time between the Contingent setting and the Late feedback-and-reinforcement session also varied, ranging from 90 min to 2.5 h. (The time between the Generalization setting and the Late feedback-and-reinforcement session thus ranged from 30 min to two h.) As in the Early feedback-and-reinforcement condition, only reports about behavior that had occurred in the Contingent setting were confirmed and reinforced. Statements regarding behaviors produced during the Generalization setting or during other classroom activities, as well as incorrect claims about behaviors in the Contingent setting, were met with either noncommittal statements such as "Oh, really?" or with mild corrections such as "I am not sure you did that, so we can't count it," or were ignored.

## RESULTS

The target behavior rates for $S_1$ through $S_5$ are presented as 2-day means in Figure 1. During the Early condition, behavior rates increased over baseline levels in the Contingent setting (represented by the shaded bars) but not in the Generalization setting (represented by the line graph) for four of the five children. The exception, $S_4$, demonstrated a possible initial increase in rate in the Generalization setting which was not maintained. Subsequent introduction of the Late condition produced immediate rate increases for all children in the Generalization setting. (Perhaps $S_4$ and $S_5$ were declining in performance late in the Generalization setting; the condition was too brief to be sure.)

Immediate generalization during the Late condition also was demonstrated by $S_6$ and $S_7$,

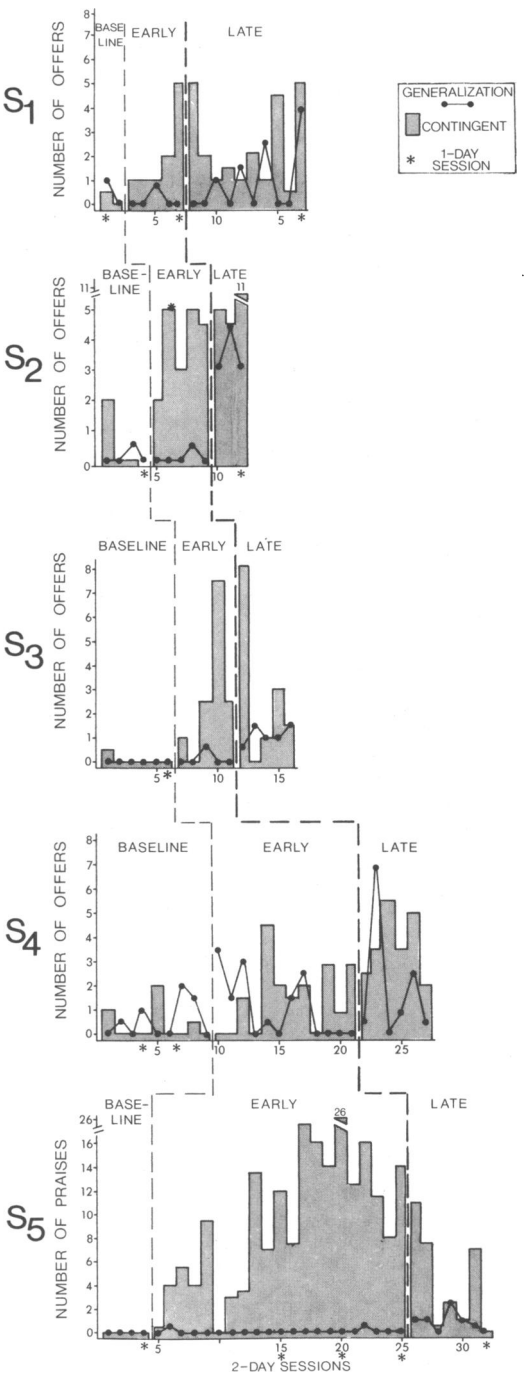



Fig. 1. Rates of target behavior during Generalization (line graph) and Contingent (shaded bars) sessions for $S_1$ through $S_5$, the children in the Early-Late condition sequence. Data are presented in two-day means. Asterisks mark sessions for which only one day's data were collected, due to condition changes or to absence.

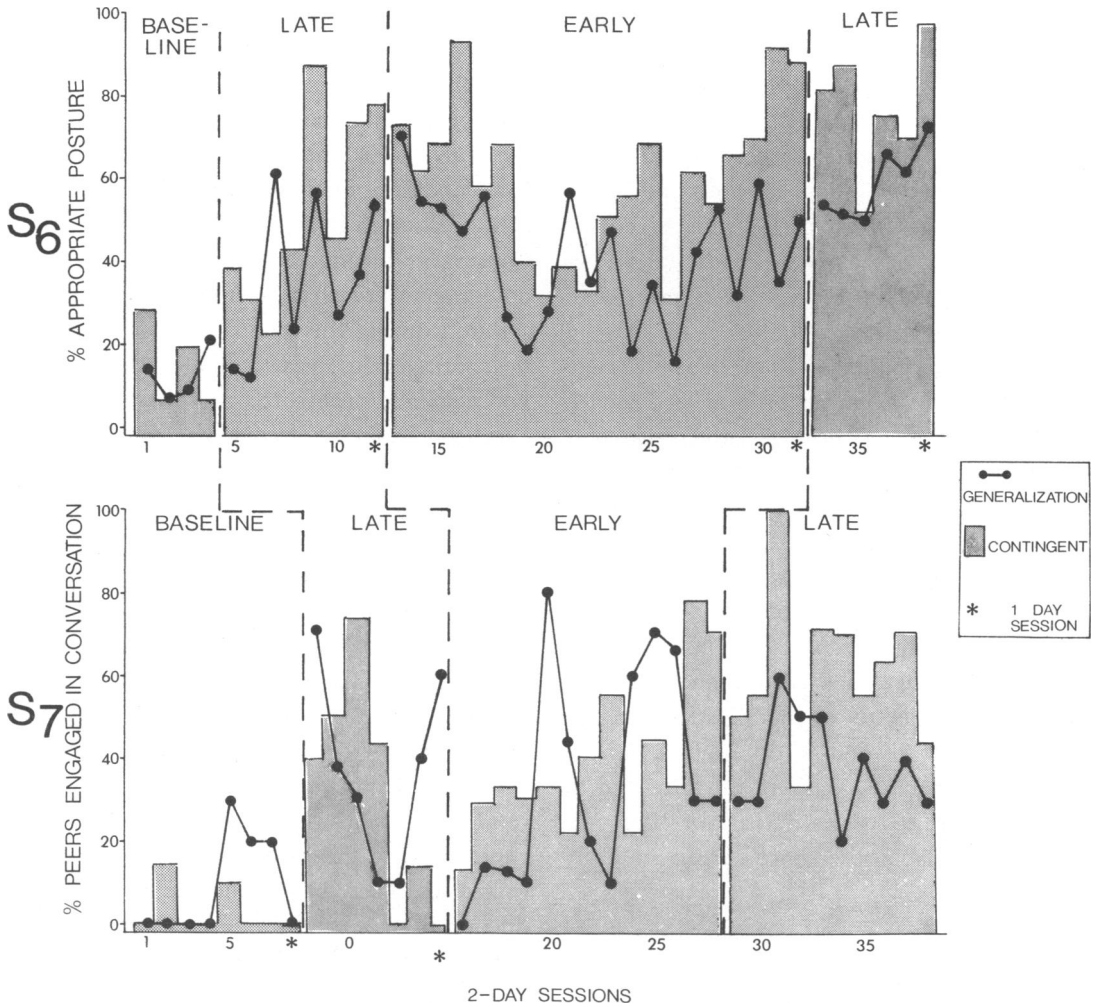



Fig. 2. Percentage of target behavior during Generalization (line graph) and Contingent (shaded bars) sessions for $S_6$ and $S_7$, the children in the Late-Early condition sequence. Data are presented in two-day means. Asterisks mark sessions for which only one day's data were collected, due to condition changes or to absence.

whose target behavior rates are presented as 2-day means in Figure 2. $S_6$ and $S_7$ entered the Late condition prior to the Early condition. Their high behavior rates produced during the first Late condition, although variable, were maintained through subsequent shifts to an Early condition and once again to a Late condition. Thus, changing the timing of reinforcement did not result in lower rates in the Generalization setting for $S_6$ and $S_7$. Rates during the Contingent setting were slightly higher than rates in the Generalization setting throughout the three experimental conditions for $S_6$, however, and throughout the final Late condition for $S_7$.

Teacher behaviors in the form of prompts and praise were measured to determine if the teachers might have coincidentally influenced the generalization of the children's target behavior. At the beginning of each condition, teachers were requested not to prompt or praise the target child behaviors. The teachers typically followed this request: Prompts and praise occurred at a very low rate. Examination of the teacher behavior in the Generalization setting revealed only two occurrences of child behavior attributable to teacher prompts. On Day 10 of the Late condition, $S_1$ made one offer to share immediately after a teacher prompt to share. Similiarly,

on Day 13 of the Early condition $S_6$ exhibited appropriate posture for 1 min following a teacher prompt. No other occurrences of target behaviors were recorded for the seven children within 5 min following a teacher prompt.

In the Contingent setting, the total number of prompts directed toward each child per condition also was quite low. None of the target behaviors performed by $S_2$ or $S_7$ was prompted. One offer by $S_3$ on Day 12 and by $S_4$ on Day 23 was prompted. $S_6$ exhibited 40 sec of appropriate posture following a teacher prompt on Day 14. $S_1$, who received the most prompts, also performed the largest number of prompted behaviors: one offer on Days 4 and 13 and eight offers on Day 8.

Teacher praise for the target behaviors occurred at a lower rate than prompts. $S_1$, $S_3$, and $S_5$ were never praised for target behaviors. $S_4$ and $S_6$ were praised for performance of their target behaviors in the Generalization setting: $S_4$ once on Day 23 and $S_6$ on Day 12. In the Contingent setting, $S_2$ was praised once and $S_4$ and $S_7$ were praised twice during the Late condition; $S_7$ was also praised once during the Early condition.

## DISCUSSION

The results show that the Late form of delayed reinforcement was an effective generalization-promotion technique for children whose behavior did not generalize spontaneously. Generalized performance to a second setting was demonstrated by all children who received Late reinforcement, regardless of the condition sequence (i.e., Early-Late or Late-Early).

Why does the Late timing of delayed reinforcement-and-feedback promote generalization to the second setting? Stokes and Baer (1977) and Schwarz and Hawkins (1970) have suggested that delayed reinforcement can make contingencies indiscriminable regarding the time or setting when performance is to be reinforced. That is, the subject no longer can discriminate the time or setting in which performance must occur, in order to be reinforced later on the delayed schedule. The juxtaposition in time of the Early reinforcement-and-feedback session to the Contingent session, might well have signaled the true contingencies of this study. Once the Late condition was introduced and the reinforcement session was separated in time from the Contingent setting, however, the contingencies no longer were clear. Comments made by the children during the Late condition suggest that the contingencies in fact became indiscriminable. For instance, during the first few days of the Late condition, $S_5$ frequently complained: "I don't like saying happy things (i.e., activity praise) all day." On several occasions $S_1$ and $S_4$ specifically asked, "Do I need to share all day?" In addition, during the feedback session, five of the children ($S_1$, $S_2$, $S_3$ $S_4$, and $S_7$) reported target behaviors performed during the Generalization setting or in settings other than the Contingent setting, claiming them as reinforceable behaviors.

Several factors associated with the shift in reinforcement from Early to Late also may have contributed to the indiscriminability of the contingencies. These factors include: (a) a sharp reduction in opportunities to discriminate the lack of contingencies between reinforcement and performance in the Generalization setting; (b) an intermittent schedule of adventitious reinforcement resulting from the frequent correspondence between generalized performance and delivery of Late reinforcement; and (c) experimenter feedback, actually based on the contingent setting that adventitously described performance in the generalization setting, due to the increased similiarity of performance in the two settings. Each of these factors and its potential influence on performance will be discussed.

1. *Discrimination opportunities:* Discrimination of the reinforcement contingencies was likely only when performance between the two settings differed clearly—i.e., when the behavior occurred in the Contingent setting, but not in the Generalization setting, and reinforcement

was delivered; or when the behavior occurred in the Generalization setting, but not in the Contingent setting, and reinforcement was not delivered. Most such discrimination opportunities occurred on days when the target behavior was not performed in the Generalization setting; thus fairly consistent generalization in the Late condition restricted discrimination. The contrast in discrimination opportunities between Early and Late conditions was illustrated most vividly by $S_2$ and $S_5$. Roughly 90% of their Early condition sessions provided discrimination opportunities, whereas none of $S_2$'s Late condition sessions and only 25% of $S_5$'s Late condition sessions provided similar opportunities, due to their consistent rates of generalization. The other children generalized during half or more of their Late condition sessions, thus also allowing only limited and sporadic opportunities to discriminate the fact that Late reinforcement was delivered only for performance in the Contingent setting.

It is not clear whether the lack of discrimination opportunities and resultant indiscriminability of the reinforcement contingency was a product of generalization or a producer of generalization. Future research might well examine the degree to which children attend to differences in their performance between settings, and whether children can relate these performance differences to the presence or absence of delayed reinforcement. Specifically, research might examine what would happen if children's questions regarding the reinforcement contingencies were answered, such as those questions posed by $S_1$ and $S_4$.

2. *Adventitious reinforcement:* The late timing of delayed reinforcement may have produced a schedule of reinforcement seemingly contingent on the second setting, thus promoting and maintaining generalization throughout the Late condition. As previously noted, reinforcement for performance in the Contingent setting often corresponded with generalization to the second setting. The correspondence was 100% for $S_2$ and 50% or higher for the other four subjects in the Early-Late sequence. Likewise the correspondence was strong for both subjects in the Late-Early sequence: 65% and 100% respectively for $S_7$ in his two Late conditions and 70% for $S_6$ in her second Late condition (following a lower correspondence of 25% in her first Late condition). Again, the degree to which the correspondence between generalization and receipt of delayed reinforcement was a result of the generalization or a maintainer of generalization is not clear. Previous researchers have demonstrated that noncontingent reinforcement in a generalization setting can facilitate and maintain generalization, if that schedule is similar to the schedule available in the treatment setting (e.g., Koegel & Rincover, 1977). The Late reinforcement may have functioned in a similar manner. An interesting topic for future research might examine whether noncontingent delayed reinforcement might be as effective as contingent delayed reinforcement in maintaining performance and promoting generalization.

3. *Clarity of feedback.* Experimenter feedback that described performance in the Contingent setting sometimes also described performance in the Generalization setting, potentially prompting maintenance of generalization. Most of the children demonstrated either similar rates of behavior in the two settings, or produced responses in both settings that were similar in topography (e.g., offers were directed in both settings to at least one peer who was the same). The influence of feedback on the promotion of generalization is not clear, however. All children generalized during the Late condition, regardless of a high correspondence ($S_4$), a low correspondence ($S_1$, $S_2$, $S_5$), or a lack of correspondence ($S_3$) between feedback and generalization. Specifically, the Late feedback to $S_1$, $S_2$, and $S_5$ potentially described performance during both settings in approximately 16% of their sessions. The percentage was higher for $S_6$ and $S_7$, who received potentially ambiguous feedback in 30% and 45% of their sessions, and highest for $S_4$, who received feedback appropriate to both settings in 80% of her sessions. Experimenter

feedback described $S_6$'s percentage of appropriate posture rather than discrete occurrences of appropriate posture; therefore, her feedback may have had little effect in clarifying the reinforcement contingencies. Self-reports by $S_6$ indicated that she could not accurately estimate her percentage of appropriate posture, except on those occasions that her appropriate posture was very high or very low. $S_3$ was the only subject whose feedback regarding the Contingent setting did not correspond in rate or topography to performance in the Generalization setting. Once again, however, the feedback that adventitiously described generalized performance may have been an artifact of generalization or a contributor to generalization. Further research might well investigate whether the content or the specificity of feedback affects generalization.

In summary, indiscriminability of the reinforcement contingency and resultant adventitious reinforcement seem to be the most likely promoters of generalization during conditions of Late reinforcement. The instructional properties of the daily training session, however, may have contributed to the initial establishment and subsequent generalization of the target behaviors. The training session, conducted before the Contingent setting, provided a daily reminder to engage in the target behavior in the classroom and implicitly during the Contingent setting. Shifting the feedback and reinforcement session from the end of the Contingent setting to the end of the day may have extended the instructional effect to the Generalization setting. Thus, the Late timing of the feedback and reinforcement session may have functioned as a setting event for performance in the Generalization setting and as a noncontingent or adventitious reinforcer for performance in that setting. The likelihood that the instructional properties of the feedback and reinforcement session alone could have maintained the generalized changes is slim. However, the potential influence of instructions should be considered in future research examining the generalization-facilitating effect of delayed reinforcement.

Although the Late timing of reinforcement is a critical factor in promoting generalization, timing may not be important once generalization is established. $S_6$ and $S_7$ maintained their generalization in spite of a shift in reinforcement timing from Late to Early. It is possible that natural reinforcers (e.g., peer attention) may have sustained their performance in the Generalization setting following the shift in reinforcement timing. Several previous investigations have demonstrated that behavior initially produced and controlled by experimental consequences can be maintained later by natural consequences (e.g., Baer & Wolf, 1970; Baer, Rowbury, & Goetz, 1976; Goetz & Baer, 1973; Strain & Timm, 1974; Wahler, 1967). In the current study, $S_7$'s conversation with peers potentially was reinforced by their positive responses and $S_6$'s improved posture may have enhanced her physical comfort.

A second explanation for the promotion and maintenance of generalization by $S_6$ and $S_7$ during the Early condition also should be considered. Generalization may have been spontaneous, occurring independent of reinforcement timing. Although spontaneous or unprogrammed generalization is not a common finding, it has been reported in a variety of applied investigations (cf. Stokes & Baer, 1977). In fact, two children, whose data were not included in this study, demonstrated spontaneous generalization to the second setting during an Early reinforcement condition, without prior exposure to a Late condition. These children likewise might have generalized immediately if the Late condition had been the first experimental condition. The fact that some children will generalize across settings regardless of the timing of reinforcement, complicates any conclusion regarding the generalization produced by $S_6$ and $S_7$. However, the effectiveness of the Late timing in promoting generalization by $S_1$ through $S_5$ and its apparent effectiveness with $S_6$ and $S_7$ strongly suggest that timing is an important factor in facilitating generalization.

An Early-Late-Early condition sequence

would determine whether generalization established by the Late contingencies can be maintained in the absence of Late contingencies. If, within this sequence of conditions, generalization is produced only after exposure to the Late condition, but is maintained during the subsequent Early condition, generalization during the second Early condition can most parsimoniously be attributed to prior exposure to the Late condition. This analysis was not possible during this investigation, due to the children's departure at the end of the school year.

Finally, the type of behavior selected for manipulation may have contributed somewhat to the daily variability in rate exhibited by several children in this study. Offers to share, the target behavior for four of the children in the Early-Late sequence, appeared to be influenced by the nature of the activities present and by the availability and receptivity of peers participating in those activities. As a result, natural limits in the form of peer refusals and appropriateness of materials for sharing existed that, in part, may have affected daily rates of the behavior. Warren, Rogers-Warren, and Baer (1976) have demonstrated that peers will support only low rates of offers (i.e., approximately two to three per 10-min play sessions). In addition, in this study, only two offers were required for receipt of reinforcement during the Late condition. This low requirement, in combination with the possible natural limits, may have produced the low and variable rates of generalization. However, in spite of these possible limits, five children in the Early-Late sequence generalized on approximately 55% of the days in which they already had performed the criterion number of target behaviors in the Contingent setting, thus performing more than the required number of target behaviors for that day.

It is not clear what influence such natural or experimental limits may have had on generalization. Low experimenter limits were not imposed on $S_5$ (activity praise) or on $S_6$ (appropriate posture). Generalization by $S_5$ was weak; generalization by $S_6$ was strong and stable. Likewise, generalization by $S_7$ was stable, yet his behavior potentially could have been influenced by natural limits (accessibility to the target peers for conversation and their receptivity to his initiations) as well as by low experimental requirements (conversation to one or two target peers). Future research might examine the degree to which generalization facilitated by delayed reinforcement is influenced by requirements of low rates (e.g., one to three occurrences) compared to requirements of higher rates.

In conclusion, a very practical implication may be drawn from the results of this study, regarding the administration of behavior change programs in general, and the education of young children in particular. Reinforcement delays should be considered routinely for teaching programs, both for maintaining appropriate social behavior, as demonstrated in this study, and for maintaining academic performance (such as on-task behavior and correct responses). The procedure can be effective in maintaining behaviors once they are established, and, with proper timing, can be effective in generalizing behaviors. The economic benefits of this procedure should have wide appeal, particularly to school personnel involved with classrooms containing low teacher-student ratios. Teachers often object realistically to behavior change programs that require implementation across many class periods of the day. Given other classroom responsibilities, some teachers do not have the time, patience, or skill to monitor and reinforce target child behaviors throughout the day. Monitoring one period, and delivering reinforcement at the end of the day for that period, may be more palatable, and may be equally effective both in maintaining behavior and producing generalized changes. Future research should continue to concentrate on identifying and developing other behavior maintenance procedures that can function simultaneously as generalization-promotion devices. The success of future behavior programs may be gauged not on the extent of behavior change alone, but on the facility with which behavior change both endures and generalizes.

## REFERENCES


Baer, D. M., Rowbury, T. G., & Goetz, E. M. Behavioral traps in the preschool: A proposal for research. In A. D. Pick (Ed.), *Minnesota Symposia on Child Psychology* (Vol. 10). Minneapolis: University of Minnesota Press, 1976.

Baer, D. M., & Wolf, M. M. The entry into natural communities of reinforcement. In R. Ulrich, T. Stachnik, & J. Mabry (Eds.), *Control of human behavior: Volume 11.* Glenview, Ill.: Scott, Foresman, 1970.

Goetz, E. M., & Baer, D. M. Social control of form and diversity and the emergence of new forms in children's block-building. *Journal of Applied Behavior Analysis,* 1973, **6,** 209-218.

Holman, J., & Baer, D. M. Facilitating generalization of on-task behavior through self-monitoring of academic tasks. *Journal of Autism and Developmental Disorders,* 1979, **9,** 429-446.

Israel, A. C. Developing correspondence between verbal and nonverbal behavior: Switching sequences. *Psychological Reports,* 1973, **32,** 1111-1117.

Israel, A. C., & O'Leary, K. D. Developing correspondence between children's words and deeds. *Child Development,* 1973, **44,** 575-581.

Kazdin, A. E. *The Token Economy: A review and evaluation.* New York: Plenum Press, 1977.

Kazdin, A. E., & Polster, R. Intermittent token reinforcement and response maintenance in extinction. *Behavior Therapy,* 1973, **4,** 386-391.

Koegel, R. L., & Rincover, A. Research on the difference between generalization and maintenance in extra therapy responding. *Journal of Applied Behavior Analysis,* 1977, **10,** 1-12.

Meichenbaum, D. H., Bowers, K. S., & Ross, R. R. Modification of classroom behavior of institutionalized female adolescent offenders. *Behaviour Research and Therapy,* 1968, **6,** 343-353.

Peterson, R. F. Some experiments on the organization of a class of imitative behaviors. *Journal of Applied Behavior Analysis,* 1968, **1,** 225-235.

Renner, K. E. Delay of reinforcement: A historical review. *Psychological Bulletin,* 1964, **61,** 341-361.

Risley, T. R. The social context of self-control. In R. B. Stuart (Ed.), *Behavioral Self-Management: Strategies, techniques, and outcomes.* New York: Bruner-Mazel, 1977.

Risley, T. R., & Hart, B. Developing correspondence between the nonverbal and verbal behavior of preschool children. *Journal of Applied Behavior Analysis,* 1968, **1,** 267-281.

Rogers-Warren, A., & Baer, D. M. Correspondence between saying and doing: Teaching children to share and praise. *Journal of Applied Behavior Analysis,* 1976, **9,** 335-354.

Schwarz, M. L., & Hawkins, R. P. Application of delayed reinforcement procedures to the behavior of an elementary school child. *Journal of Applied Behavior Analysis,* 1970, **3,** 85-96.

Stokes, T. F., & Baer, D. M. An implicit technology of generalization. *Journal of Applied Behavior Analysis,* 1977, **10,** 349-367.

Strain, P. S., & Timm, M. A. An experimental analysis of social interaction between a behaviorally disordered preschool child and her classroom peers. *Journal of Applied Behavior Analysis,* 1974, **7,** 583-590.

Surrat, P. R., Ulrich, R. E., & Hawkins, R. P. An elementary student as a behavioral engineer. *Journal of Applied Behavior Analysis,* 1969, **2,** 85-92.

Wahler, R. G. Child-child interactions in free-field settings: Some experimental analysis. *Journal of Experimental Child Psychology,* 1967, **5,** 279-293.

Warren, S. F., Rogers-Warren, A., & Baer, D. M. The role of offer rates in controlling sharing by young children. *Journal of Applied Behavior Analysis,* 1976, **9,** 491-497.


*Received March 5, 1980*
*Final acceptance August 19, 1980*