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Schedule Effects and Interim Activities in Two Retarded Subjects

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SCHEDULE EFFECTS AND INTERIM ACTIVITIES
IN TWO RETARDED SUBJECTS

by

Raymond G. Miltenberger

A Thesis
Submitted to the
Faculty of The Graduate College
in partial fulfillment of the
requirements for the
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Fixed interval (FI), fixed time (FT), and fixed ratio (FR) schedules of reinforcement were implemented with two retarded subjects and the effects on operant responding and interim activities were evaluated. One subject responded under FI 1 min, multiple FI 1 min, and multiple FI 1 min extinction schedules. Three interim activities were observed to occur under each schedule. The second subject responded under FI 1 min, FI 3 min, FR 20, FR 25, FR 35, multiple FR 35, FT 1 min, and multiple FR 35 extinction schedules. Two interim activities occurred, primarily in the FI and FR schedules. Both subjects' responding under FI and FT schedules developed a pause and response pattern, and subject 2 showed a characteristic pause-and-run pattern in FR schedules. Only one of the interim activities of one subject conformed to the characteristics of an adjunctive behavior.
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Raymond G. Miltenberger
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## TABLE OF CONTENTS

ACKNOWLEDGEMENTS.................................................. ii

LIST OF FIGURES .................................................. iv

Chapter

I. INTRODUCTION .............................................. 1

II. METHOD ....................................................... 6

   Subjects ...................................................... 6

   Apparatus .................................................. 6

   Procedure ................................................ 8

III. RESULTS .................................................... 13

IV. DISCUSSION ................................................ 29

BIBLIOGRAPHY .................................................. 34
LIST OF FIGURES

Figure 1. Responses per minute and the percent duration of the two interim behaviors for Paul. ................. 15

Figure 2. Responses per minute and the percent duration of the three interim behaviors for Brian .............. 17

Figure 3. Sample cumulative records for Paul. .......... 20

Figure 4. Sample cumulative records for Brian ....... 23

Figure 5. Percent occurrence of each interim behavior in thirds of the inter-reinforcement interval for both subjects. 25

Figure 6. Diagram of the apparatus. ............... 27
CHAPTER I

INTRODUCTION

Non-human subjects responding under certain intermittent schedules of food reinforcement often show excessive levels of certain behaviors in addition to the behavior which is reinforced. This phenomena was first clearly articulated by Falk (1961) who studied food deprived rats responding on VI schedules for food delivery and observed a large increase in water consumption in the periods between food deliveries. The water consumption was far in excess of the physiological needs of the organism. This excessive drinking (polydipsia) was referred to as a schedule-induced (adjunctive) behavior and was subsequently shown to occur with squirrel monkeys, chimpanzees, pigeons, and doves (Falk, 1971).

Schedule-induced polydipsia is engendered by certain time-based schedules of reinforcement include fixed-interval (e.g., Falk, 1966a), variable-interval (e.g., Falk, 1966b, 1967), fixed-time (e.g., Mendelson & Chillag, 1970), and fixed-ratio (e.g., Gentry, 1968). The important feature is the periodicity of food deliveries on these schedules. Induced drinking occurs in the interim between the periodic food deliveries.

In addition to polydipsia, a variety of other behaviors also occur in a schedule-induced fashion under periodic schedules including: pica in Rhesus monkeys (Villarreal, 1967), wheel running in rats (Levitsky & Collier, 1968), air licking in rats (Mendelson & Chillag, 1970),
1970), and aggression in pigeons (Azrin, Hutchinson, & Hake, 1966). For reviews of the literature on adjunctive behavior, see Falk (1971, 1977) or Staddon (1977).

In order for a behavior to be classified as adjunctive, it needs to display several characteristics. First, adjunctive behavior is more probable during periods of intermittent reinforcement than when reinforcement is not available (Falk, 1966a; Richards & Rilling, 1972). Second, the adjunctive behavior is more likely to occur in the period immediately after reinforcement and decreases in probability as the time since reinforcement increases (Allen, Porter, & Arazie, 1975; Killeen, 1975; Richards & Rilling, 1972). Third, the rate of adjunctive behaviors varies as a function of inter-reinforcement time (Brown & Flory, 1972; Cherek, Thompson, & Heinstad, 1973; Falk, 1966a). For example, polydipsia increases then decreases as the values of a fixed-interval are increased from 20 seconds to 180 seconds. Fourth, adjunctive behaviors occur during both response-dependent and response-independent schedules (Cherek et al., 1973; Flory, 1969; Staddon & Simmelhag, 1971). Fifth, the opportunity to emit adjunctive behavior can be used to reinforce another behavior (Falk, 1966b; Cherek et al., 1973).

Adjunctive behavior has been studied with humans, though less extensively than with other species. Kelly and Hake (1970) and Frederickson and Peterson (1974) reported the occurrence of adjunctive hitting with humans during extinction components of multiple FR EXT, and a multiple CRF EXT, respectively. An increase in drinking and pacing was found in humans responding under FI schedules ranging from
15 seconds to 120 seconds (Kachanoff, Leveille, McLelland, & Wayner, 1973). Other researchers have also reported the occurrence of physical movement with adjunctive characteristics (Clark, Cannon, Hughes, Keogh, Singer, & Wallace, 1977; Wallace, Sanson, & Singer, 1978; Wallace & Singer, 1976). Yund (1979) reported more eating when a periodic schedule of television viewing was imposed than during continuous viewing.

A study by Muller, Crow, and Cheney (1979) provided a convincing demonstration of adjunctive behavior with humans. The subjects in that study emitted behavior during fixed schedules which conformed to four of the five characteristics defining adjunctive behavior. They manipulated FI 2 minute and FT schedules ranging from 16 seconds to 140 seconds, and reported the occurrence of locomotor behavior in the intervals between token deliveries. They did not investigate whether the opportunity to engage in locomotor behavior could be used to reinforce another behavior. Both college students and retarded adolescents served as subjects. It remains to be seen how robust a phenomenon adjunctive behavior is with humans and the range of behaviors which are schedule-induced.

The present study investigated the occurrence of interim\(^1\) behaviors in two retarded subjects performing under response-dependent (FI, FR) and response-independent (FT) reinforcement schedules. The study differed from previous studies in that no a priori assumption was made regarding the topography of any interim behaviors, and

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\(^1\)Interim is used here, and throughout the study, to refer to behaviors occurring within the intervals between food deliveries, but which are not part of the response-reinforcer relationship arranged in the schedules of reinforcement.
a wider range of schedules was investigated. Subjects were exposed to a variety of schedule conditions. Behaviors which were not required for food delivery, but nevertheless frequently occurred, were measured. In this way possible adjunctive behaviors were not excluded if they differed from topographies previously reported in the literature. This inductive approach seems to circumvent a problem cited by Yund (1979). While studying food-seeing responses as an adjunct to television viewing, he anecdotally observed other motor behavior to occur in an adjunct-like pattern. Given the relatively crude understanding of the factors which determine the topography of adjunctive behavior with humans, it seems most appropriate to measure the response classes which may emerge in particular reinforcement schedules rather than limit our assessment categories with a priori assumptions about the topography of adjunctive behavior.

In addition to the identification of adjunct-like behavior patterns, the present study also sought to characterize the response patterns of retarded subjects under FI, FT, and FR schedules. Knowledge of response characteristics on these schedules could have practical value for programming reinforcement schedules in a workshop or classroom setting. Knowledge of the response patterns engendered by each schedule would also be of interest to compare with patterns produced in other humans and non-humans responding on similar schedules. In particular, it would be of interest to see if the FI's produced a "scalloped" response pattern found in non-humans, but not in previous studies with humans (Lowe, 1979), and whether the FR's would produce the characteristic pause-and-run pattern found in non-humans and
humans (Orlando & Bijou, 1960). The present study also sought a comparison of response rates on the response-dependent FI and response-independent FI schedules.
CHAPTER II

METHOD

Subjects

Two students from the Kalamazoo Valley Multihandicap Center served as subjects. Paul was a 23-year-old, moderately retarded, highly verbal (i.e., he followed instructions, made requests, conversed with staff) subject with slight physical limitations. He was receiving 30 mg mellaril each day at the time of the study. Brian was a 16-year-old, severely retarded, deaf student with a very limited receptive and expressive sign language repertoire. He had no physical limitations. Both subjects engaged in self-stimulatory behaviors which interfered with classroom and workshop activities at times. For Paul, self-stimulatory behaviors consisted of mumbling and repetitive hand movements (hand wringing) near his head. Brian exhibited repetitive hand movements and vocal sounds similar to grunts and groans.

Apparatus

The experimental room was 8 ft x 12 ft, with a table placed against one wall which held the response panel and the reinforcement dispenser. The subject sat in a chair at the table during sessions. To the subject's left were shelvescontaining classroom supplies. To the subject's right against the opposite wall was a large metal cabinet. Two cameras were mounted in the room, one to the subject's right
which provided a close-up view of the subject as he responded on the apparatus, and one to the subject's left which provided a wide angle picture of the entire room. The observer viewed the session on monitors located in a room adjacent to the experimental room.

The response panel (see Figure 6) was a 2 ft x 2 ft box which contained a row of five 2 in x 2 in response keys. Each key was a different color and each had a light above it. A television monitor, on which the picture from the camera to the subject's right could be displayed, was inset in the panel above the response keys. Red and green lights located on either side of the monitor signalled which component of the multiple schedule was in effect. The dispenser (R. Gerbrands, model 70) was located to the left of the panel and dispensed objects into a tray on the table.

Responses on the yellow key (fourth from the left) were recorded electromechanically on a counter and with a cumulative recorder (no model number). Each response produced an audible click and a brief flash of the light above the key. The operation of the dispenser produced an audible sound and a flash of the light above the center key. The visual stimuli were programmed because of Brian's deafness.

An observer recorded the behaviors which were targeted and defined for each subject by depressing one of three telegraph keys connected to an event recorder (R. Gerbrands, model P266) for the duration of the response. The telegraph keys were also wired to timers so that the cumulative duration of each behavior was recorded.

Each schedule of reinforcement investigated was programmed on electromechanical equipment.
Procedure

Initial Training

Subjects were trained to respond on the apparatus through the use of physical guidance and modeling. No verbal instructions were given. After a brief period of continuous reinforcement for key-pressing, subjects were exposed to a FI schedule of reinforcement which was gradually lengthened until the subject was responding under an FI 1-minute. The initial training lasted two 30-minute sessions. Except for training sessions, the subject was alone in the experimental room.

Each reinforcer involved the delivery of two pieces of a sweetened breakfast cereal, and a white or red plastic object (a 1-in by \( \frac{1}{2} \)-in by \( \frac{1}{2} \)-in piece of plastic). The subject was required to sort the object into one of two bins on the table according to the color of the object. The sorting task was added to the experiment since it was relevant to workshop activities which were part of each subject's individualized educational program (IEP).

Dependent Variables

Behaviors other than the key-press response, which was observed to occur during FI 1-minute sessions, were categorized and defined for each subject. For Brian, three behaviors other than the key-press were recorded. They were:

Brick manipulation. This behavior occurred when Brian got out of his seat, walked to the corner where the brick was placed, picked it up, held it for a period of time, and put it back down. This behavior was recorded from the time he left his seat in the direction of the brick to when he returned to his seat.
Sorting behavior. This behavior occurred when Brian dumped the two trays full of plastic parts on the table and sorted them back into the appropriate trays. It was recorded from when he dumped the trays until he had replaced the trays on the table with the objects correctly resorted in the trays.

"Other" behavior. This behavior consisted of any manipulative behavior involving objects in the environment other than brick manipulation and sorting behavior. Occurrences included playing with the television monitor dials; unscrewing and rescrewing light bulb domes on the apparatus; opening and closing the dispenser door; twiddling the trays in front of his eyes; and walking to the shelves, picking up the trays, and exchanging them for the trays he was using. This category was recorded from the onset to the offset of any behavior in the response class.

For Paul, only two behaviors were observed and recorded. They were:

Mumbling. This response class was scored when any vocal sounds were audible to the observer, or when mouth movements accompanying vocalizations were visible to the observer.

Hand movements. This behavior was recorded when one or both hands engaged in repetitive movements above the plane of the table surface.

Schedule Manipulations

The sequence of schedule manipulations for Brian and Paul, respectively, proceeded as follows.

**FI 1-min:** After the initial training, Brian's performance was maintained under a fixed-interval one-minute (FI 1-min) for 34 sessions. Session length was set for a predetermined period of time, either 20 or 30 minutes.

**Mult FI 1-min FT 1-min:** For 22 sessions, Brian responded in a multiple fixed-interval one-minute, fixed-time one-minute (mult FI
1-min FT 1-min). A green light was associated with FI and a red light was associated with FT. Each component of the multiple schedule was in effect for 15 minutes, for a total session time of 30 minutes. The order of presentation was random. Under the FT schedule, a food delivery occurred every minute independent of responding on the key. Under the FI 1-min, the first response after one-minute had elapsed from the previous reinforcement delivery was followed by the delivery of food.

Mult FI 1-min EXT: For the remaining 10 sessions, Brian responded under a multiple fixed-interval one-minute, extinction schedule (mult FI 1-min EXT). The FI 1-min was in effect when the green light was on; EXT was in effect during the red light. Each component was in effect for 15 minutes with a random order of presentation across sessions.

FI 1-min and FI 3-min: After initial training, Paul responded on a fixed-interval one-minute (FI 1-min) for 8 sessions. This was followed by 9 sessions of fixed-interval 3-minutes (FI 3-min). Session length was set for a predetermined period of time, either 20 or 30 minutes.

FR 20, FR 25, FR 35: Paul responded under a fixed-ratio 20 (FR 20) for 8 sessions, followed by 15 sessions of fixed-ratio 25 (FR 25), and 17 sessions of fixed-ratio 35 (FR 35). Session length was determined by the number of reinforcers or maximum time limit of 30 minutes. The number of reinforcers for FR 20 and 25 was set at 33, and for FR 35 at 25.
Mult FR 35 FT 1-min: For 14 sessions, Paul responded in a multiple fixed-ratio 35 fixed-time one-minute (mult FR 35 FT 1-min). The green light was associated with FR and the red light was associated with the FT schedule. The FR component was in effect until 15 reinforcers were delivered and the FT was in effect for 15 minutes (15 deliveries). The order of conditions alternated randomly across sessions.

Mult FR 35 EXT: For the remaining 4 sessions, Paul responded under a multiple fixed-ratio 35 extinction schedule (mult FR 35 EXT). The green condition light was on during FR and the red light was on during extinction. FR was in effect until 15 reinforcers were earned and the extinction component was in effect for 15 minutes (sometimes 12 reinforcers and 12 minutes). The order of components was alternated randomly across sessions. (The number of sessions under this schedule was limited because Paul was transferred to another school with little notice.)

Interobserver Agreement

A second observer independently recorded one of the interim behaviors each week for each subject to allow a measure of interobserver agreement to be calculated. When the second observer recorded, he used one of the telegraph keys and the primary observer recorded with the other two keys. Consequently, once per week for Brian, data were not collected on one of the three behaviors. This was not a problem for Paul since only two behaviors were being recorded for him.
The second observer was trained in practice observation sessions in which he recorded the behaviors for each subject and was given immediate feedback on the accuracy of his recording. After two training sessions, he started the weekly observations.

Percentage agreement was calculated by dividing the smaller duration by the larger duration and multiplying by 100. The percentage agreement was high, with an overall average of 93.5% and a range of 70 to 100%.
CHAPTER III

RESULTS

Figures 1 and 2 show the percent of session duration of each behavior for each session. This percentage was calculated for each session by dividing the duration of each behavior by the total session duration. Also shown is the operant response rate in number of key presses per minute.

For Paul (Figure 1) hand movements and mumbling were extremely variable within each schedule condition and across conditions. Overall, hand movements were more prevalent than was mumbling. In the two multiple schedules at the end of the study, both behaviors occurred less than in the earlier schedules, with mumbling almost dropping out completely. In the multiple FR FT, hand movements occurred most in FT, and in the multiple FR EXT, hand movements occurred most (almost exclusively) in extinction. Hand movements occurred with roughly the same probability across FI 1-min and 3-min and across FR 20, 25, and 35. As stated, both were extremely variable across and within schedules.

Figure 1 indicates that Paul's rate on the response key was also extremely variable. During the FI and FR schedules, the rate varied from 6 responses per minute to 66 responses per minute. FR produced higher rates overall than FI, but within each schedule the rate fluctuated widely. The response rate varied inversely with the occurrence of hand movements and mumbling. During both multiple
Figure 1. Responses per minute and the percent duration of the two interim behaviors for Paul.
Figure 1
Figure 2. Responses per minute and the percent duration of the three interim behaviors for Brian.
Figure 2
schedules, the rate was higher than in earlier schedules. In the multiple FR FT, response rate was consistently higher in the response-independent FT. In the multiple FR EXT, response rates were roughly comparable for FR and EXT.

Figure 3 shows sample cumulative records for Paul responding under the FI, FR, and multiple schedules. No consistent response pattern emerged in FI. In FR, a pause-and-run pattern was shown consistently. In both FT and EXT, the rates were high but did not conform to any identifiable pattern.

Figure 2 shows the percent of session duration of the three behaviors recorded for Brian: brick manipulation, sorting behavior, and "other" behavior. Under the FI 1-min schedule, all three behaviors occurred in each session. The occurrence of the brick manipulation and sorting behavior decreased slightly and "other" behavior increased over consecutive FI sessions. Brick manipulation was the least variable and "other" behavior abruptly increased to 85% of the session. This transitory change in the level of each occurred when the cinder block brick broke at the end of session 14 and the characteristic patterning of each response was disrupted as a result. This transitory period lasted only three sessions, and Brian went back to manipulating the broken brick.

In the multiple FI FT, the duration of brick manipulation and sorting behavior was higher in FI than in FT and the duration of "other" behavior was higher in FT than in FI. In the FI, the three behaviors developed a temporal pattern with respect to food deliveries; after food was delivered brick manipulation occurred, followed by
Figure 3. Sample cumulative records for Paul.
"other" behavior. Responses on the key typically occurred between each of the three behaviors. (Note the stair-step pattern of responses for Brian under FI in Figure 4.) In contrast, during FT, Brian did not always observe the non-contingent food deliveries and the three interim behaviors did not develop a consistent pattern with respect to food deliveries, since Brian did not eat the food each time it was delivered. As a result, the level of "other" behavior with respect to brick manipulation and sorting behavior increased from the level in FI. In the FT, although food delivery was periodic, food consumption was not.

In the multiple FI EXT, a clear separation was seen in brick manipulation and sorting behavior. Brick manipulation dropped to zero in EXT and occurred within a range of 6 to 16% of the session during FI. "Other" behavior dropped to between 0 and 4% of the session in EXT, while in FI it ranged from 4 to 16%. "Other" behavior, however, was consistently higher in EXT than in FI.

Brian's key pressing showed relative stability throughout the FI (note the transitory drop around session 15). Figure 4 shows sample cumulative records indicating that a "scalloped" pattern of responding was not obtained. Rather, a stair-step pattern emerged in which Brian responded in response bursts between episodes of the three interim behaviors occurring in each session. During the multiple FI FT, Brian's rate increased slightly in both FI and FT relative to the level under FI 1-min. During the multiple FI EXT, the rate decreased slightly relative to the previous condition, yet occurred about equally in both FI and EXT (see Figure 2).
Figure 4. Sample cumulative records for Brian.
Figure 4
Figure 5. Percent occurrence of each interim behavior in thirds of the inter-reinforcement interval for both subjects.
Figure 5
Figure 6. Diagram of the apparatus.
A sample of the event records from each schedule for Paul and Brian were analyzed to determine the temporal location of the interim behavior in the intervals between food deliveries. Each inter-food interval was divided into three equal sections so it could be determined what proportion of each behavior occurred in the first third of the interval, the second third, and the final third of the interval. Event records were sampled at random from each different schedule condition for both subjects.

Brick manipulation was the only behavior for either subject which was most probable immediately after food deliveries. Figure 5 shows that for the majority of sessions sampled, the largest percentage of brick manipulation occurred in the first third of the inter-food interval. None of the other behaviors for Brian or Paul showed this characteristic.
CHAPTER IV

DISCUSSION

The present study demonstrated that certain behaviors, not included in the programmed response-reinforcer relation, reliably occurred in the interval between reinforcer deliveries for two subjects. To be considered adjunctive, such interim behaviors should possess five characteristics as described earlier. The brick manipulation exhibited by Brian: (1) was more probable in fixed schedules than in extinction; (2) occurred in both response-dependent and response-independent schedules (although more in the former); and, (3) occurred with the highest probability in the period immediately after each food delivery. The fourth and fifth characteristics, an increase followed by a decrease in the behavior as the inter-food interval increased, and the opportunity to engage in the behavior demonstrated as a reinforcer, were not investigated. Thus, based on data available from the present study, it appears as though brick manipulation may have occurred in an adjunctive fashion.

The sorting behavior exhibited by Brian conformed to the first two characteristics, but was not shown to be most probably immediately after food deliveries. Neither the "other" behavior of Brian nor the two interim behaviors exhibited by Paul conformed to any of the four characteristics except that they occurred in both response-dependent and response-independent schedules. None of the three behaviors was more probable in fixed schedules than in extinction and none developed
a pattern of high probability of occurrence immediately after reinforcement.

The sorting behavior for Brian displayed several adjunctive characteristics. In most intervals after food deliveries, Brian immediately manipulated the brick. However, he typically started the sorting behavior immediately after the brick manipulation as if the two behaviors were components of a response chain. Thus, even though sorting behavior was not most probable in the first third of the interval, it reliably occurred after the brick manipulation which immediately followed food deliveries.

An inspection of Paul's data indicates that both mumbling and hand movements decreased to low levels in both components of the multiple FI FR and multiple FR EXT. Discussion with Paul's teacher revealed that at session 58, when the multiple FI FR was starting, Paul was given rules regarding mumbling and hand movements which specified positive consequences if he refrained from engaging in those behaviors in the classroom. The behaviors decreased immediately in the classroom and there was a corresponding decrease during experimental sessions. It appears that the rules and contingencies in the classroom were related to the decrease in behavior during sessions.

Both subjects were chosen for this study because of self-stimulatory behaviors they exhibited. It was thought that the behaviors may have been adjunctive since the controlling variables for their occurrence could not be identified. It was of interest to see if the self-stimulatory behaviors conformed to the characteristics of adjunctive behaviors as a result of our schedule manipulations. For
Paul, when fixed schedules were implemented, self-stimulatory behaviors continued to occur, but did not appear to be adjunctive and no other behaviors emerged in the sessions. Paul's mumbling and hand movements might be conceptualized as concurrent behaviors which could occur across a wide range of circumstances (since they required no environmental support) and which resulted in an automatically reinforcing type of sensory stimulation (Rincover, Cook, Peoples, & Packard, 1979). When a more powerful contingency was placed on their occurrence in the classroom, they decreased. This decrease generalized to the experimental sessions.

For Brian, the self-stimulatory behaviors observed to occur at a high rate in the classroom did not occur in the experimental sessions. Rather, other manipulative types of behaviors reliably occurred and at least one developed the pattern of an adjunctive behavior. Although one, and possibly two, of the behaviors emitted by Brian did not appear to be adjunctive, we might explain their occurrence as concurrent operants also. These interim activities were readily supported by the environment of the experimental room (there were many objects that Brian could manipulate) and their occurrence probably resulted in a type of automatic reinforcement which results from manipulating aspects of the environment. In this response, they are functionally similar to self-stimulatory behaviors not involving objects.

While the phenomena are interesting, it is unclear what practical significance the classification of a given behavior as adjunctive or as a concurrent operant has for the management of that behavior. Possibly the fixed schedules could be replaced with variable schedules.

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which characteristically engender a higher steady rate of responding and lower rates of adjunctive behavior. With an undesirable concurrent operant, fixed schedules would also need to be eliminated in order to employ schedules with a higher reinforcement density which would produce a higher steady rate of responding. Trying to directly alter the reinforcement density resulting from the undesirable concurrents would be difficult if the behaviors involved manipulation or self-stimulation and the automatic response consequences which appear to act as reinforcers for such behaviors. In either case, with undesirable adjunctive behaviors or concurrent operants, the existing reinforcement schedules should be analyzed and dealt with accordingly.

In the present study, the response patterns for each subject in each of the schedules investigated were characterized by periods of responding alternating with pauses in responding. Figures 3 and 4 show sample cumulative records for Paul and Brian, respectively. In each schedule, Brian's responding showed a stair-step pattern. Under FI, consistent with the human data (Lowe, 1979) on FI schedules, no scallop pattern emerged. Rather Brian ran off a string of responses, followed by a pause in which he typically engaged in one of the interim activities, and then ran off another string of key presses. This pattern occurred under FI, FT, and EXT and the interim activities occurred reliably during the pauses. The pause length was directly related to the duration of interim behaviors. During FT and EXT, the pauses were typically longer than in FI, and a higher percentage of interim behaviors (predominately "other" behaviors) occurred in FT and EXT.
For Paul, the pause-and-run pattern characteristic of human and non-human responding under FR (Orlando & Bijou, 1960) was demonstrated. This pattern emerged in FR 20, FR 25, and FR 5. The length of the pauses varied dramatically across sessions. As a result, Paul's response rate varied from 5 to 75 responses per minute in the FR schedules.

Paul's responding also was characterized by a pause-and-respond pattern under the FI, FT, and EXT schedules. His behavior was obviously not under good schedule control as the response-independent FT and the EXT in both multiple schedules produced a higher response rate than the response-dependent FR.

For Paul, the interim behaviors, when they occurred, came during the pauses in responding on the apparatus. The length of pauses was directly related to the duration of interim behaviors. During both components of both multiple schedules, response rate increased, pause length decreased, and mumbling and hand movements decreased overall. As stated earlier, this appears to be related to the introduction of rules and contingencies to decrease the occurrence of mumbling and hand movements in the classroom.

Based on the data from the present study, a useful follow-up would be to manipulate variable schedules of reinforcement and observe their effect on response rate and interim activities. The current study never demonstrated a high, steady response rate in its subjects with fixed schedules. If pauses could be eliminated through a steady response rate, the opportunity to engage in undesirable interim activities would also be eliminated.
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