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Reduction of Lunchroom Noise and Other Behaviors Using Feedback and Group Contingent Reinforcement

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REDUCTION OF LUNCHROOM NOISE AND OTHER BEHAVIORS USING FEEDBACK AND GROUP CONTINGENT REINFORCEMENT

BY

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ABSTRACT

Reduction of noise levels in an elementary school lunchroom was examined as a function of feedback and feedback plus reinforcement using group contingency procedures. Feedback consisted of signals from a traffic light with green indicating acceptable levels, yellow indicating slightly higher levels and red indicating unacceptable levels. Other behaviors, running, hitting, pushing and kicking, were measured incidentally. Results indicate that feedback plus reinforcement was effective in reducing noise levels. Feedback alone was also effective, but to a lesser degree. No response - response relationship was found to exist between noise level and the other behaviors.

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INTRODUCTION

There exists a need for efficient and economical means of managing excessive sound level and other disruptive behaviors when large groups of students come together such as in school lunchrooms and auditoriums. Interviews with principals of elementary schools revealed that behavior management in lunchrooms is a common problem and one which many administrators feel they and their staff do not deal with effectively. While inappropriate behaviors such as running, hitting, throwing of food, pushing, etc. were mentioned as occurring, the problem behavior seen as being most resistant to management was the noise level generated by the large number of students present. It was generally felt that there was a linear relationship between the level of noise and the number of instances of other inappropriate behaviors.

Lunch time is a period of the day eagerly anticipated by most students. Whether they bring a sack lunch from home or buy a hot meal seems to be of little consequence. This is a brief period free from the structured atmosphere of the classroom and one of the few times available to students for socializing with peers. Because of this less structured atmosphere, some students use this time to

engage in behaviors not permitted in the classroom. Blackham & Silberman (1975) found various degrees of noise, roudiness, and disorder prevailing in lunchrooms.

As populations have shifted from rural to urban, schools have become larger and school populations are derived from wider areas. Safety, distance and other factors have almost eliminated the practice of students returning home for lunch. As more city elementary students eat their lunches at school, MacPherson, Candee & Hohman (1974) found that lunchroom problems became increasingly prevalent.

Traditionally, teachers have eaten with their students and had responsibility for student behavior in the lunchroom. However, the trend in recent years has been to allow teachers a lunch period free from student supervision. Greater demands placed on school budgets make it incumbent upon school administrators to manage the school lunchroom with the smallest number of personnel possible with the result that all students in the cafeteria at any one time are under the supervision of only one to two monitors. Since the average cafeteria will seat approximately 200-225 students, these monitors are faced with a monumental task in behavior management.

The many and varied duties of the monitors usually include the following:

1. Observe behavior of students at all times.

2. See that students enter and leave in an orderly manner.
3. Indicate where a class is to sit and give signal for arising on dismissal.
4. Be alert to undesirable behaviors such as pushing, hitting, leaning back in chairs, inappropriate handling of food, and improper clearing of tables.
5. Observe hand raising, answer questions, give special permission for bathroom, etc. when necessary.
6. Give special help with opening uncooperative lunchboxes, food containers and milk cartons.
7. Reprimand or otherwise discipline students who engage in inappropriate behaviors.
8. Maintain a suitable noise level.
9. See that students empty trays and place them in the proper place.

Subjective observations of methods of controlling inappropriate behaviors revealed many similarities in approach. Students were usually dealt with individually but loudly. A description of the inappropriate behavior was followed by punishment or threats of punishment. When noise level was judged to be too high, lowering of lights, blowing loud whistles and loud shouts were used to gain

the attention of students. These were followed by accusations, admonitions, punishments or threats of punishment. MacPherson et al. (1974) indicate that other methods of managing lunchroom behavior include counseling, parent conferences, student council programs, adult lecturing, and controls such as detention after school, suspension of lunch privileges, and physical punishment. Often these methods fail to produce lasting effects. Strang and George (1975) suggest that such procedures are ineffective and/or damaging to the student's positive regard for himself and for the teacher. Examination may also show that it lowers teacher's positive regard for himself.

Another disadvantage of the use of adversive consequences is the misconception of their effect. When verbal statements such as threats, reprimands, warnings, disapproval and "no" are used, they may function as positive reinforcers and increase the frequency of behaviors they are employed to suppress (Kazdin, 1975). Undesirable side effects, such as modeling of these behaviors, may result from such controlling tactics that are based upon aversive control rather than positive reinforcement (Skinner, 1953).

Many factors affect the actual noise level in the lunchroom. Among these are the acoustical design of the building, type of flooring, number of students in the room, and noises that enter through openings such as those from

the cooking area. In addition, there may be certain situations that are more likely to occasion noisy behavior. One principal observed that the sound level in his lunchroom seemed to be higher on days when the weather was inclement, when the lighting in the lunchroom was more intense, and immediately preceding vacations or holidays.

Most of us speak with enough volume to be heard by those with whom we are communicating and in most instances are unaware of the sound level we generate. As the number of people in a room becomes greater, the level of sound increases, and the higher the sound level, the louder one must speak in order to be heard above the noise (Knudsen & Harris, 1950). In the lunchroom where the number of people increases, the tendency is for individuals to unconsciously raise their voices to a level to be heard above the general noise level generated by the group. Thus a cycle is established where students talk louder to be heard, producing a higher noise level which necessitates speaking even louder in order to be heard.

The perception of sound level all too often is inaccurate and is affected by a number of factors. One lunchroom monitor admitted to perceiving higher noise levels when she had a headache or was otherwise indisposed or nervous and upset about some completely unrelated experience. Moods, tension, the weather, and our degree of

tolerance can affect our perception of noise level and intensity. Relatively low levels may be annoying to one person while much higher levels will go unnoticed by others. The same person may perceive the same sound level as being different on two different occasions, depending on the presence or absence of the above mentioned factors.

In all the lunchrooms observed, talking was permitted. Difficulty arose, however, in deciding when a noise level was sufficiently high to be called inappropriate was reached. Readings were taken in three different lunchrooms at one-half minute intervals on a General Radio Corporation sound level meter type 1565-A. Notations were made when the monitor indicated by his or her usual method to the students that the noise level was too high. Sound level readings ranged from 68 to 82 decibels (hearing damage can occur at levels above 85 decibels) with monitors indicating that the noise level was too high at almost every point in between. These decisions were not made in any consistent manner although later questioning revealed that the monitors thought they had been very consistent. This is not to be interpreted as a lack of conscientiousness or caring on the part of the monitors, but merely points out the subjectivity involved in measuring sound levels without an instrument.

Since it was generally felt by both administrators

and lunchroom monitors that sound level is a more monumental problem than other behaviors, and that excessive sound levels correlate with increases in other undesirable behaviors, it would seem desirable to achieve a more consistent sound level. If subjectivity in estimating sound level could be eliminated, both monitors and students could adjust their behavior in a more consistent and desirable manner. Furthermore, if a method can be devised that will allow students to monitor their own noise level and keep it within acceptable limits, monitors can be freed from this task, allowing them to divert more energy to helping students in other ways.

Although much research has been conducted in relation to reducing noise levels in classrooms, a search of the literature received little information concerning reduction of noise levels with such large groups of students as are found in lunchrooms. MacPherson et al. (1974) established modification procedures for lunchtime behaviors in elementary school. The target behaviors were talking while the aide speaks, out-of-seat, and quarreling. Overall noise level was not considered a target behavior.

Sherman (1973) effectively used behavior modification procedures to alter lunchroom behavior in 100 first and second grade students. Reducing talking to normal conversational levels, as determined subjectively by

teachers, was one of the stated objectives. Using a class competition system, the classes were judged each day on criteria set in advance. Winners were announced each day after lunch period and the winning class was awarded a star on a chart in the cafeteria. Also the winning class was awarded a plaque to hang on the outside of their door. At the end of the month, a special prize was awarded to the class with the most stars.

Muller, Hasazi, Pierce and Hasazi (1975) used group contingency procedures to reduce running, loitering and aggressive behaviors in a combination elementary and middle school lunchroom. Simultaneous recording of frequencies of noise level exceeding 80 decibels revealed that as the frequency of disruptive behaviors decreased, sound level also decreased. They suggested that if noise and other inappropriate behaviors exist in response-response relationships, one might be able to control large classes of such behaviors by applying contingencies to noise levels.

Two of the above mentioned studies effectively used group contingency procedures for administering reinforcement. Additional research will be cited later, establishing the efficacy of this procedure.

The present study was designed to investigate the hypothesis that group reinforcement can be used effectively to reduce sound to acceptable levels in an elementary

school lunchrooms, and as the sound level is reduced, frequencies of other disruptive behaviors such as running, hitting, pushing and kicking will also be reduced. Automatic sound monitoring equipment with visible and auditory feedback of sound level (to be described later in the method section) will be used to set objective criteria and to establish reliable and consistent measurement. A multi-element baseline research design as used by Ulman and Sulzer-Azeroff (1975) will serve to measure effectiveness of procedures and control for extraneous variables.

REVIEW OF LITERATURE

This section deals with a review of pertinent literature pertaining to various aspects of the proposed research. Since an abundance of material is available on some of these, only the more recent studies which have pertinence for the parameters of this investigation will be included.

Group Contingencies

Many behavior management programs have been designed to reduce excessive talking and other undesirable behaviors in a classroom setting. However, until recently, they dealt primarily with behaviors of only one or a few students in the room. These programs involved counting frequencies of behaviors and planning and administering contingency management systems. These types of programs are most effective when only a small number of subjects is involved and the ratio of subjects to administrators is high because of the physical involvement demanded in observing behavior, determining frequencies and dispensing backup reinforcers. Also considerable cost may be involved, depending on the type of reinforcer used. Sulzer & Mayer (1972) suggest that when decisions for

large numbers of students need to be made without expending considerable time and effort, and where extrapolation to the individual is not essential, an individualized approach would be inefficient.

The lunchroom situation in the present research presents some differences from these situations and requires a different approach. The ratio of students to administrators is approximately 200 to one which precludes dispensing tokens or giving reinforcement on a one to one basis. The cost of reinforcers, if given individually, would also be prohibitive. Determining which students were not contributing to the overall noise level would be a very difficult task. Many recent studies indicate that it may be more economical in terms of time, money and effort, to change behaviors of entire groups using group contingency measures. In this situation, all students in the group either receive or do not receive reinforcement based on whether the group, rather than individuals within the group meet some specified criteria.

Group contingencies can be used to either increase appropriate behaviors or decrease inappropriate behaviors. "The group contingency method is one in which all children in a classroom receive positive or negative consequences as a result of the behavior or performance of one, several or all members of the group" (Snow & Brooks,

1974, p. 202). Depending on the situation, it can be useful when it is not practical to give individual reinforcement.

Wilson and Hopkins (1973) used music contingent on appropriate noise levels as an effective response cost procedure to reduce classroom noise with junior high students. In a relatively unstructured home economics class, a radio tuned to a popular station was allowed to be on when the noise level in the group stayed below 76 decibels as assessed by a sound level meter. When noise exceeded this level, the radio was automatically switched to off and remained off for 20 seconds or until the noise level was again reduced to 76 decibels. They point out that it may be inconsequential if problem noise is produced by one student or many as long as a practical procedure is available to remedy the situation.

Schmidt and Ulrich (1969) also found that group contingencies were effective in controlling classroom noise. They rewarded the entire class with additional minutes of gym time after maintenance of a 10-minute quiet period as measured on a decibel meter. More noisy members of the class became the object of peer consequences in the form of threatening gestures, arm moving, and facial expressions.

In two special education classes for the mentally

retarded, Axelrod (1973) compared individual versus group contingencies to control undesirable behaviors described as out of seat and disturbing others. He found that the two systems were equally effective in controlling misbehavior. Since both systems were effective in controlling undesirable behavior, the author indicated that the choice of the method would depend on situational factors such as convenience of application. He found record keeping procedures and administration of reinforcers to be simpler in group contingency procedures and found a greater variety of reinforcers available for use with this procedure.

Grandy, Madsen and deMersseman (1973) also compared group and individual contingency mangement systems and found them to have equally impressive effects on decreasing out of seat and talking out behaviors. However, they state that since the individual contingency preceded the group contingency with the same subjects, this may have contributed to the effectiveness of the group contingency.

Koch and Breyer (1974) used group contingencies to effect changes in talking, off-task and inattentive behaviors in a fifth grade classroom. These behaviors were successfully reduced in all but three students who did not respond to the program. The authors attributed this to the inability of the students to perform the requisite behaviors, as well as the fact that they may

have found subversion of the program to be reinforcing.

In a comparison of group and individual contingencies as they affected changes in appropriate behavior, time on task and disruptive behavior in an inner city seventh grade class of 32 blacks, Long and Williams (1973) found that group contingencies maintained slightly higher levels of desirable behavior and greater day-to-day stability within and between subjects than did individual reinforcement. They also reported that group procedures made fewer demands of the teacher's time and seemed to be a simpler procedure to implement.

Ascare and Axelrod (1973) successfully used group contingency measures to increase "working on assignment" behavior in an open classroom situation. The students could earn extra recess time for themselves and for their classmates depending on whether they were attending to their assignments when checks were made.

Drabman, Spitalnik and Spitalnik (1974) investigated the effects of four types of token economies on disruptive behavior. The four types were individual reinforcement, group reinforcement determined by the most disruptive child in the group, group reinforcement determined by the least disruptive child in the group and group reinforcement determined by a randomly chosen member of the group. All systems were equal with respect to efficiency of

behavior change.

Eleftherios, Shoudt, and Strang (1972) used a group contingency procedure to control out of seat behavior in a rural first grade classroom. A mechanical apparatus was used as token reinforcement. This device consisted of a bank of 8 horizontal lights and 6 vertical lights. A horizontal light was lit automatically for each 30 second interval in which no out of seat behavior occurred. When the 8 horizontal lights were on, the children had earned one vertical light. Any out of seat behavior during any 30 second interval caused a resetting at zero of the horizontal lights. The experimental procedures effected a 97.5 percent decrease in out of seat behavior.

Packard (1970) increased attending time in elementary students through the use of group contingency management. A hand operated timer measured total attending time of the class. When the class was not attending, the timer was stopped. This automatically turned on a light that served as feedback. He found rules plus feedback plus reinforcement more effective than rules alone.

Barrish, Saunders and Wolf (1969) used group contingencies to reduce disruptive talking and out of seat behavior using "The Good Behavior Game." Students in a classroom were divided into competing groups and neither, either, or both groups were awarded special privileges

depending on whether that group had fewer than a specified number of incidences of the behaviors for the day. This technique was found to be effective in reducing these behaviors.

A replication of this technique by Harris and Sherman (1973) was equally effective. Removing the consequences for winning the game reduced its effectiveness. Direct feedback in the form of marks on the blackboard did not seem to effect the occurrence of disruptive behavior.

In a first grade classroom where students were expected to work independently in learning centers, Simmons and Wasik (1973) used group contingencies to effectively reduce out-of-seat behavior. The group was given free time at the end of the day if none of its members left the centers more than the specified number of times.

Long and Williams (1973) found that feedback via tokens did not produce high levels of desirable behavior. Group and individually contingent free time, however, did produce substantially higher levels of appropriate behavior, with group reinforcement procedures being the most effective.

The above reports of excellent control of a diversity of undesirable behaviors across a wide variety of situations and populations give credence to the probability that group contingencies could be used as the contributing

element in reducing the noise level in the lunchroom. While each situation is different in some respects to others with which it is compared, the overwhelming evidence that group contingencies are effective cannot be discounted. The use of group contingencies has proved to be more practical in terms of results, reducing the undesirable behaviors even more effectively than individual management in most cases.

Feedback

Feedback refers to knowledge of results of one's performance without necessarily including additional events which may be reinforcing in their own right. While feedback is implicit in the delivery of any reinforcer because it indicates appropriateness or desirability of responses, feedback can be employed independently of explicit approval or other reinforcers.

Greenwood, Hops, Delquardri and Guild (1974) investigated the effects of rules plus feedback, and rules plus feedback plus group and individual consequences on appropriate behavior in three elementary classrooms. Feedback was provided by a clock light consisting of an ordinary electric alarm clock and a 15-W white light connected in a series circuit with a hand held remote switch. A 15 foot cord from the light to the switch allowed teacher movement about the room. During intervention, the light

was turned on when all students were emitting appropriate behavior. Simultaneously the clock measured the duration of the proper response. The light served as a discriminative stimulus to inform the students when behavior was appropriate or inappropriate. Intervention consisted of three conditions: Rules alone produced no systematic improvement in appropriate behavior; rules plus feedback increased appropriate behavior in two of the three classrooms; and rules plus feedback plus reinforcement produced systematic changes in levels of appropriate behavior in all three classrooms.

Salzberg, Wheeler, Devar and Hopkins (1971) used classroom management techniques to teach writing in kindergarten children with feedback only and feedback plus reinforcement as variables. They found feedback only to be ineffective in changing behavior, but when feedback was paired with contingent reinforcement (playtime) responding improved.

Packard (1970) used a red light activated by the teacher to serve as feedback indicating that the class was not attending. He then paired reinforcement with feedback. He found that feedback alone had mixed effects. There was marginal improvement in two classes. In two other classes, feedback only produced immediate and significant improvements but the improvement decreased

quickly toward baseline performance. Feedback plus reinforcement dramatically increased attending.

Long and Williams (1973) found feedback via tokens to be ineffective in changing inappropriate classroom behaviors. Feedback plus reinforcement, however, produced significant changes in classroom behavior. The subjects were a group of highly disruptive students in an inner-city seventh grade class.

The indications from research cited are that feedback only is very limited in the amount of change it produces in behavior. When change does occur, it seems to be of short duration with a decline to baseline levels.

Strang and George (1975) used completely automated equipment to affect changes in noise level in a classroom. The device consisted of a monitor sender and a receiver programmer console. The monitor sender contained a voice-operated relay that could be adjusted to operate at and above whatever level of sound a teacher deemed noisy. This relay activated a radio transmitter that sent a wireless signal to the receiver programmer. Equipment within the console transduced received radio signals into electrical commands that (1) during baseline operated a lapse-time clock within the unit and (2) during intervention activated a clock and controlled lights displayed on a clown's face on the outside of the console. The pattern of lights

simulated the teeth, eyes and nose on the clown's smiling face and 5 additional lights simulated buttons on his coat. During intervention a button lit every 20 seconds if the noise remained below pre-set limits. When all 5 buttons were lit, an additional 20 seconds of quiet earned illumination of a light on the clown's face. When a facial light was earned all button lights went out and the process started over. If noice occurred before the next facial light was earned, the clown emitted a "gasp" and all accumulated buttons went out. The object was to earn all 8 facial lights. While backup reinforcement was given, this system of lights served effectively as feedback. The mean percent of noise dropped from 39.4 during baseline to 3.11 during intervention in a first grade classroom and from 44.0 to 10.3 in a third grade classroom.

Activity Reinforcers

Positive reinforcement may be defined as any event presented, contingent upon a response, which increases the probability that the frequency of the response will increase. Premack (1959) demonstrated that behaviors that have a high probability of occurring can reinforce behaviors with a low probability of occurring.

In applied behavioral research many types of events have been used effectively to increase probability of

accurance of behavior.

> For educators, the most appealing aspect of the reinforcement procedure in which the Premack principle is employed is probably the fact that potential reinforcers are already present in every classroom setting. There are always some behaviors in which students engage (even if they are sitting and "doing nothing") with greater frequency than others (Sulzer & Mayer, 1972, p. 36).

The literature reveals a wide variety of events that were used successfully in classroom settings. Muller et al. (1975) found an extra half hour of recess to be effective. Wilson and Hopkins (1973) used contingent music to increase quiet in secondary school classrooms. Packard (1970) used a variety of activities already available in the classroom to reinforce attending behaviors. The list of reinforcers varied from grade to grade and the students made up their own list of desirables. Included were use of private study booths, sitting next to a friend, use of a class typewriter, being a teaching assistant, and time in the gym or Fun Room. Long & Williams (1973) found free time to engage in conversations with friends, play games, work on other assignments, read magazines and comics, play records, or use the tape recorder effective in increasing desirable classroom behavior. Schmidt and Ulrich (1969) used additional gym time and free time as consequences for maintaining quiet periods.

Many of these events are available to most teachers and are used frequently in the classroom. Their cost is nil and they are easy to administer. The key to using them as reinforcers to increase desirable behavior is to administer them contingently.

Ethical Considerations

Behavior modification has come under attack on the basis that control of behavior is unethical. These attacks, for the most part, have centered around programs initiated in institutions where it was felt that the subjects did not freely enter the programs.

> Behavior therapy is sometimes accused of being impersonal, mechanical, manipulative and authoritarian. Some of this is no doubt due to the rather unfortunate terminology that derives from the psychological laboratory. Words like "control," "contingency," "schedule," "program," and "conditioning" do indeed sound prohibitive, but as soon as one substitutes "learning" for "conditioning," "planning" for "programming," and "handling" for "control," one finds that the concepts as such are not at all objectionable (Ross, 1967, p. 275).

These substitutions are commonly used and accepted by public schools. "Educators, like behavior modifiers, are often pragmatists; they are concerned with the practical consequences of a given procedure, rather than its theoretical implications" (Sulzer & Mayer, 1972, p. 256).

It must be recognized, however, that there are unethical practitioners in all fields, and there is

potential for abuse in any situation where control is indicated. We must not let potential cause abandonment of programs that, in the judgement of many, hold tremendous potential for creating a more humane society.

We must also recognize the concept expressed by Blackham and Silberman (1975) that when behavior is viewed as a function of its consequences, any change in behavior is a function of intentional or unintentional manipulation of the consequences. Control is exerted in some way on the behavior of everyone who interacts socially. Controlling agents such as teachers, employers, peers and spouses by accident or design provide consequences or fail to provide consequences for behavior (Kazdin, 1975). The question of the desirability and rightness of controlling behavior revolves around several positions, according to Blackham & Silberman (1975): What behavior should be changed? To what degree should it be changed? What methods are right? And finally, who should change the behavior?

Control was being exerted in the lunchroom for which the present research was designed although its effectiveness and side effects were questionable. "We cannot choose a way of life in which there is no control. We can only change the controlling conditions" (Skinner, 1974, p. 190). It seems desirable to institute measures

calculated to exert control that research has shown to be more effective. Applied behavioral research usually is conducted with individuals whose behaviors have been identified as problematic . . . in some way (Kazdin, 1975, p. 234). Ethical judgements have been made as to appropriateness of behavior before the behaviorist designs the management program.

Some additional ethical problems revolve around the use of group contingencies as opposed to individual contingencies. When the entire group of students is allowed access to reinforcement contingent on collective behavior of the group,it may be felt that some of the students are being penalized. It could be argued that those students who are usually quiet should be rewarded for this behavior individually. However, those students were not receiving the group contingencies before the intervention and in some instances the quiet student may be directly reinforcing the noisy behavior of another by smiling or otherwise showing interest in the student who is noisy. Whaler (1967) asserts that procedures which allow control of peer social attention contingencies as well as those provided by adults might be most effective in dealing with the child group situations. Having reinforcement contingent on the quiet behavior of the entire group exerts pressure on the quiet members to use their contingent reinforcement

to strengthen different behaviors in the loud student. This indeed, may seem unethical, but the crucial question revolves around whether it is more unethical than allowing peers to reinforce undesirable behavior. A teacher who is convinced that independent accomplishments best serve the goals of education may be quite comfortable using group contingencies, according to Long & Williams (1973). However, most teachers use group contingencies unconsciously and without the label. Often dismissal at the end of the day is delayed because one or a few students have not left their area in proper order. No students are awarded the reinforecment until all students meet criteria.

Recognizing the objections to behavior modification and recognizing the concern generated in regard to experimenting with humans, this proposed research was reviewed by the Human Subjects Committee in the Psychology Department at Florida Technological University. Affirmation that outlined procedures were ethical was granted before the program was implemented.

METHOD

Subjects and Setting

Subjects consisted of all 487 students currently attending South Lake Elementary School in Titusville, Florida. The student body consists of grades K through five with ages ranging from 4 to 12 and are divided into 20 groups by grade level. The school is integrated with approximately one-fourth of the population being black. While the majority of the subject population is relatively homogeneous in terms of family socioeconomic status, the total student body ranges across a rather wide spectrum of economic and intellectual backgrounds.

The building is of modern construction with self-contained classrooms and outside corridors. The lunchroom, located at one end of the complex, is attractively decorated, with a stage on one end. It serves both as a cafeteria and auditorium. The tables are arranged in nine rows of five tables with chairs on both sides of the tables. Students from one classroom sit together along both sides of a row of tables, forming one group, and usually occupy the same table each day. When entering the lunchroom, each student picks up his tray from the serving alcove located just outside the door and proceeds

to his seat. When leaving, each student removes his tray from the table and walks to another alcove on the opposite side of the lunchroom where he deposits any uneaten food, milk cartons, etc., in a receptable and places his tray on a counter. Those students who bring a lunch from home follow the same procedure except for picking up the tray. Students are accompanied to and from the lunchroom by their teacher, where she leaves them under the supervision of monitors.

Lunch period begins at 11:15 and ends at 12:45 with a different class entering at approximately three minute intervals. Each class is in the room for 30 minutes each day, and the number of students in the lunchroom at any one time varies from 20 to approximately 200.

Students are expected to clean any spills that occur with either a cloth or mop provided at a station on the side of the room. In grades one through five, a student is chosen from the group by their teacher to clean the tables after the group has left. The monitor cleans the tables for the kindergarten classes.

The lunchroom is monitored by two physical education teachers, the music teacher and librarian. One physical education teacher and the music teacher are on duty during the first 30 minutes. The kindergarten students eat at this time and it is felt that they require more

supervision and help. Each of the other two teachers takes a 30-minute turn alone. Duties of the monitors include keeping noise at an acceptable level, seeing that general order is maintained, punishing those who misbehave, and being helpful when problems arise.

Design

A multi-element baseline design (Ulman & Sulzer-Ayeroff [1975] and [Sidman, 1960]) was used which consists primarily of repeated measurements of a behavior under alternating conditions of the independent variable. Baseline conditions were measured on five consecutive days prior to instituting experimental conditions. The independent variable consisted of three conditions: 1) feedback alone where the traffic light was operating but no reinforcement was given, 2) feedback plus reinforcement where the traffic light was operating and reinforcement was given to those classes which met criterion, and 3) return to baseline conditions with no feedback and no reinforcement. Experimental conditions were alternated in the following random pre-selected order:

Baseline Days 1, 2, 3, 4, 5

Feedback Only Days 7, 10, 11, 16, 18, 20, 22, 24

Feedback plus Reinforcement Days
6, 9, 13, 15, 19, 23

Return to Baseline Days 8, 12, 14, 17, 21, 25

Equipment

A Realistic Omni-Directional Electret Condenser Microphone, catalog number 33-1044A, was used to pick up the sound in the lunchroom. This was placed on a podium located on the stage at the front of the lunchroom. The height of the mike was above head level of students when they were standing. The microphone was directed toward the center back of the room.

A Pioneer amplifier, model SX 1500TD amplified the sound from the microphone and fed a signal into a lamp readout VU meter (Cohen, 1974) which was used to monitor the sound level. The meter was equipped with one green, one yellow and one red pilot lamp jewel that were adjusted to come on at pre-selected increasing sound levels. During the week preceding baseline, the sound level in the lunchroom was monitored daily with a sound level pressure meter. Readings were taken at 30 second intervals and the monitors indicated by a pre-arranged signal when they thought the sound level had reached undesirable levels. By mutual agreement of the four lunchroom monitors, the following settings were chosen for the sound levels at which each of the jewel lights would be set to come on: 1) The green light will be on at all times; 2) the yellow light will come on when the sound level reaches 73 decibels; and 3) the red light will come on when the sound

level reaches 76 decibels. A General Radio Company Sound-Level Meter, type 1565-A with a Cs weighting, was used for all sound monitoring and for setting the levels for operation of the VU meter. Calibration of the lights was checked daily.

A relay attached to the yellow and red pilot lamp jewels caused corresponding lights in a traffic light, visible to the students, to come on. When the red light came on, a bell also rang and continued to ring until the sound level diminised to below 76 dB.

The traffic light was made of opaque plexiglass with three compartments, each 8"x6"x6" containing a 60 watt bulb. A transparent circle on each of the four sides of each compartment, with a diameter of 4 inches, was coated with either red, yellow or green glass stain to allow visibility of the bulbs and give them proper color. This device, which resembles a standard traffic light, was placed on the center front edge of the stage. This height allowed visibility from all points in the room.

During the baseline period and on return to baseline days during the experimental phase, the VU meter only was in operation and an experimenter counted the total number of times the red light came on. Each time the red light came on, regardless of its duration, was considered one instance. During feedback only and feedback plus

reinforcement phases of the experimental period, instances of red light with simultaneous ringing of the bell were counted with no regard to duration.

Rewards

Group contingency procedures were used with each class considered a group. A group received its reward based on the noise level of all the classes in the lunchroom during its thirty minute lunch period. Teachers were asked to cooperate in the project by helping the students choose rewards for reinforcement days and to administer the reinforcement immediately following lunch period. To avoid incurring costs, teachers were encouraged to utilize activities already available in the classroom as reinforcers. This also made reinforcement more acceptable to the teachers. As Tomlinson (1972) has pointed out, the teacher is less likely to object to a reinforcement approach if it closely approximates the social responses and activities already used by the teacher.

Among rewards used were access to learning centers, extra recess time, gummed stars, listening to a story and listening to records. Teachers were asked to explain the program to the students by reading the following memo to them:

> We know that boys and girls are not always aware of how loud their voices are just as adults are not always aware how loud they are talking. We think lunch time can be more pleasant for everyone if the noise level is kept within certain limits. There will be a traffic light on the stage in the cafeteria. The green light will be on when your noise level is O.K. The yellow light will come on when you are getting too loud. If the red light comes on and a bell rings, this means everyone is making too much noise and should lower their voices. We hope you will be able to keep the noise at a level that will keep only the green light on.
>
> On some days you will be rewarded when you return to your classroom if the red light did not come on more than 13 times while you were in the lunchroom. On other days you will not be rewarded, but we hope you will keep your noise level on those days also low enough that the red light does not come on more than 13 times. If the traffic light is not working, do your best to keep your noise level as low as you do on days when it is working. You will be told prior to going to lunch whether or not you can earn a reward.

Lunchroom monitors also explained the procedure as the students entered the lunchroom. Criteria for earning reinforcement were arbitrarily set at 13 or fewer instances of the red light being on during the time the class was in the lunchroom. The figure was 10 instances in the pilot study where the range of sound level allowed was greater.

The cards collected by the experimenter were marked each time the red light on the VU meter or the red light and bell on the traffic light came on, as was a tally card for the day. Teachers and students were not made aware

that other behaviors were being monitored.

A set of 20 cards was made for each teacher to be used on the 20 days of experimental conditions. Each card contained the name of the teacher, the date, and the experimental condition for that day. A student from each classroom gave the card for that day to the experimenter as his class entered the lunchroom. On reinforcement days a child also took the card from the experimenter as the class left the lunchroom. The experimenter indicated on the card whether the class had earned its reward. Rewards were administered on that day in the regular classroom by the teacher.

Instances of running, hitting, pushing and kicking behaviors were monitored by two trained observers. One was designated the primary observer and observed behaviors on all days of the experiment. The second observer served as a reliability check. Agreement on what constituted each behavior was arrived at by the observers prior to baseline by reading the following definitions plus actual observations of the behaviors in the lunchroom with mutual agreement on the constitution of each. Running was defined as foot propelled movement of the body that advances one to another position in the room at a faster rate of speed than is usual in the circumstance, hitting as any swinging motion of the arms that results in body contact with

another person, pushing as physical contact with any part of one's body with another person that results in that person's moving involuntarily, and kicking as a swinging motion of the leg resulting in contact with another person.

The first two tables in each row were observed as representative of the entire row. The rows were numbered and when two observers were present, the primary observer indicated which row was to be observed in any given time period. The rows were alternated in a random fashion after a series of six 10-second observation intervals. Thompson, Holmberg and Baer (1974), in analyzing time-sampling methods found that sampling behavior briefly but repetitively over the time available gave a more representative picture of the behaviors being sampled. Lines of students either entering or leaving the lunchroom were also included in these observations.

A tape recording with an audible bell tone, alternating between 5 and 10 second intervals, with instructions to either observe or record, and a color code corresponding to that on the recording sheets ensured that each observer was recording in the proper time block. Two sets of head phones were attached to the same tape recorder via a Y connector so that both observers heard the recording simultaneously. The head phones were separated by a 10 foot length of wire which allowed

sufficient distance between observers to ensure independent but simultaneous rating. Inter-rater reliability was determined by dividing the number of agreements by the number of agreements plus the number of disagreements and multiplying by 100.

RESULTS

Figure 1 and Table 1 show changes in noise levels under baseline, feedback, feedback plus reinforcement, and return to baseline procedures. A One Way Analysis of Variance, ($F[3,21]=36.35$, $p<.01$), shows these differences to be significant. A Fisher Least Significant Differences Test shows that noise levels were reduced significantly under feedback only conditions, ($t[21]=26.443$, $p<.01$), and under feedback plus reinforcement conditions, ($t[21]=27.129$, $p<.01$). The difference in the reduction under feedback plus reinforcement conditions is significant when compared to feedback only conditions, ($t[21]=3.7725$, $p<.01$).

Inter-rater reliability, determined by dividing the number of agreements by the number of agreements plus the number of disagreements ranged from 89.0 to 99.2 with a mean of 95.48.

Figure 2 and Table 2 show changes in instances of running behavior under baseline and experimental conditions. A One Way Analysis of Variance shows no significant differences in this behavior across conditions, ($F[3,21]=1.273$, $p<.01$).

Figure 3 and Table 3 show changes in instances of hitting behavior. An Analysis of Variance shows that these

changes are not significant, ($F[3,21]=1.2237$, $p<.01$).

Figure 4 and Table 4 show changes in instances of pushing behavior. When subjected to an Analysis of Variance these changes were found to be not significant ($F[3, 21]=.7912$, $p<.01$). Figure 5 and Table 5 show changes in instances of kicking behavior across baseline and experimental conditions. An Analysis of Variance shows no significant differences in these changes, ($F[3,21]=.986$, $p<.01$).

While changes in behavior other than noise level are not significant, when comparing decrease in noise levels with changes in other behaviors, it can be seen that under feedback only conditions, noise level decreased, running increased, hitting increased, pushing decreased, and kicking decreased. Under feedback plus reinforcement conditions noise level decreased, running increased, hitting increased, pushing increased and kicking decreased. This suggests that behaviors are not operating in any consistent response-response relationship with noise levels.

On the first day of reinforcement 7 of the 20 classes reached criteria; on the second day, 16; on the third day, 10,; on the fourth day, 10; on the fifth day, 9; and on the sixth day, 4. Although some classes did not meet criteria on any of the reinforcement days, their level of noise was substantially reduced. Those classes falling in this group

were in the lunchroom during the middle one-third of the lunch period when the greatest number of students was present. The monitor for this period demonstrated the greatest tolerance for noise during the period preceding baseline when sound level readings were taken to establish upper bounds for setting the lights. On the last day of feedback only, all classes reached criterion and would have received rewards had that been a reinforcement day.

Table 1

Instances of Red Light on Per Day

Baseline	Feedback Only	Feedback & Reinforcement	Return to Baseline
276	10	98	263
284	68	29	202
295	144	55	198
341	118	36	260
338	123	94	384
	133	87	338
	110		
	125		
Mean 306.8	103.87	66.5	274.166

Table 2

Instances of Running Per Day

Baseline	Feedback Only	Feedback & Reinforcement	Return to Baseline
13.5	23	12	3
9	7	49	3
7.5	45	41.5	50.5
15.5	63.5	35.5	37
29	17	81.5	91
	44	71	64
	71		
	65		
Mean 14.9	41.93	38.41	49.92

Table 3

Instances of Hitting Per Day

Baseline	Feedback Only	Feedback & Reinforcement	Return to Baseline
3.5	5	9	0
1.5	1	4.5	2
5.5	3	5	10
1.5	11	3	9
3	11	8.5	7
	5	10.5	7
	2		
	6.5		
Mean 3	5.56	6.75	5.83

Table 4

Instances of Pushing Per Day

Baseline	Feedback Only	Feedback & Reinforcement	Return to Baseline
0	5	0	.5
1.5	.5	0	.5
0	0	9	6
3	1.5	2.5	3
1.5	0	1.5	3
	0	.5	5
	2		
	2		
Mean 1.2	.81	2.25	3

Table 5

Instances of Kicking Per Day

Baseline	Feedback Only	Feedback & Reinforcement	Return to Baseline
.5	5	11	.5
9.5	3.5	20.5	3
1	0	12	2
2.5	0	9	2
32.5	14	0	17
	6	7	0
	3		
	8		
Mean			
9.2	4.93	9.91	4.08

Lunchroom Noise Level Under Different Feedback Conditions

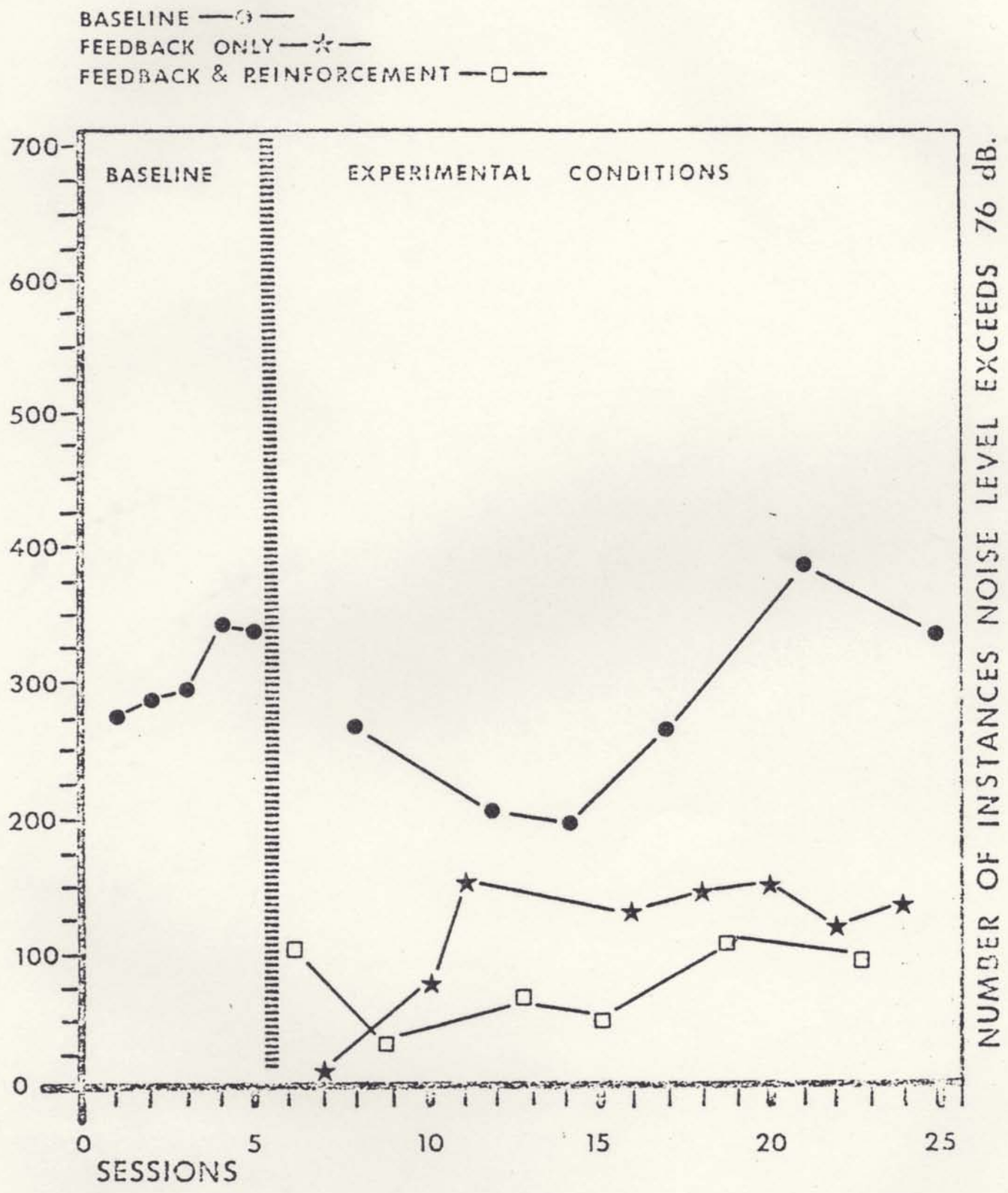

FIGURE 1

Running In Lunchroom Under Different Feedback Conditions

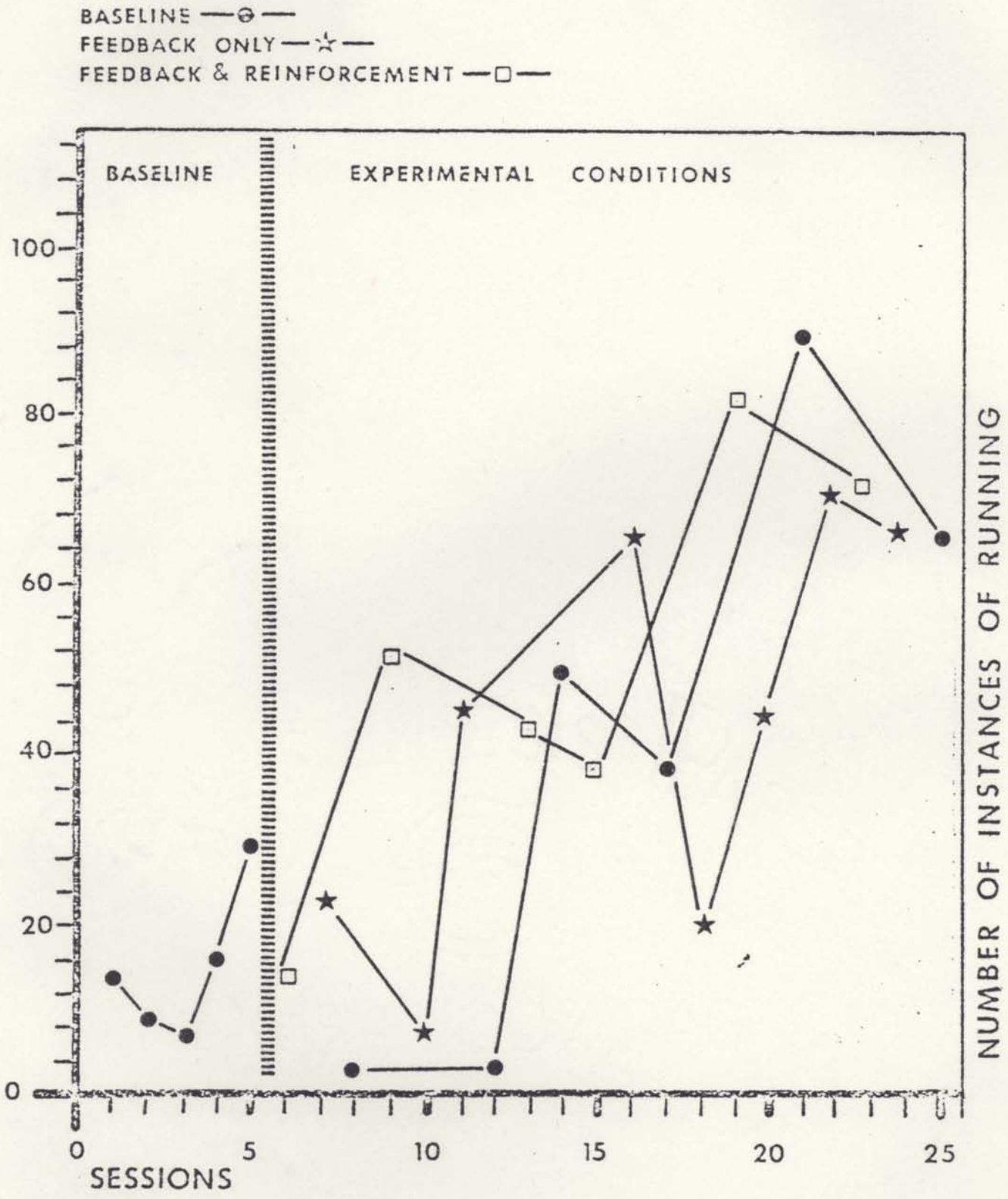

FIGURE 2

Hitting In Lunchroom Under Different Feedback Conditions

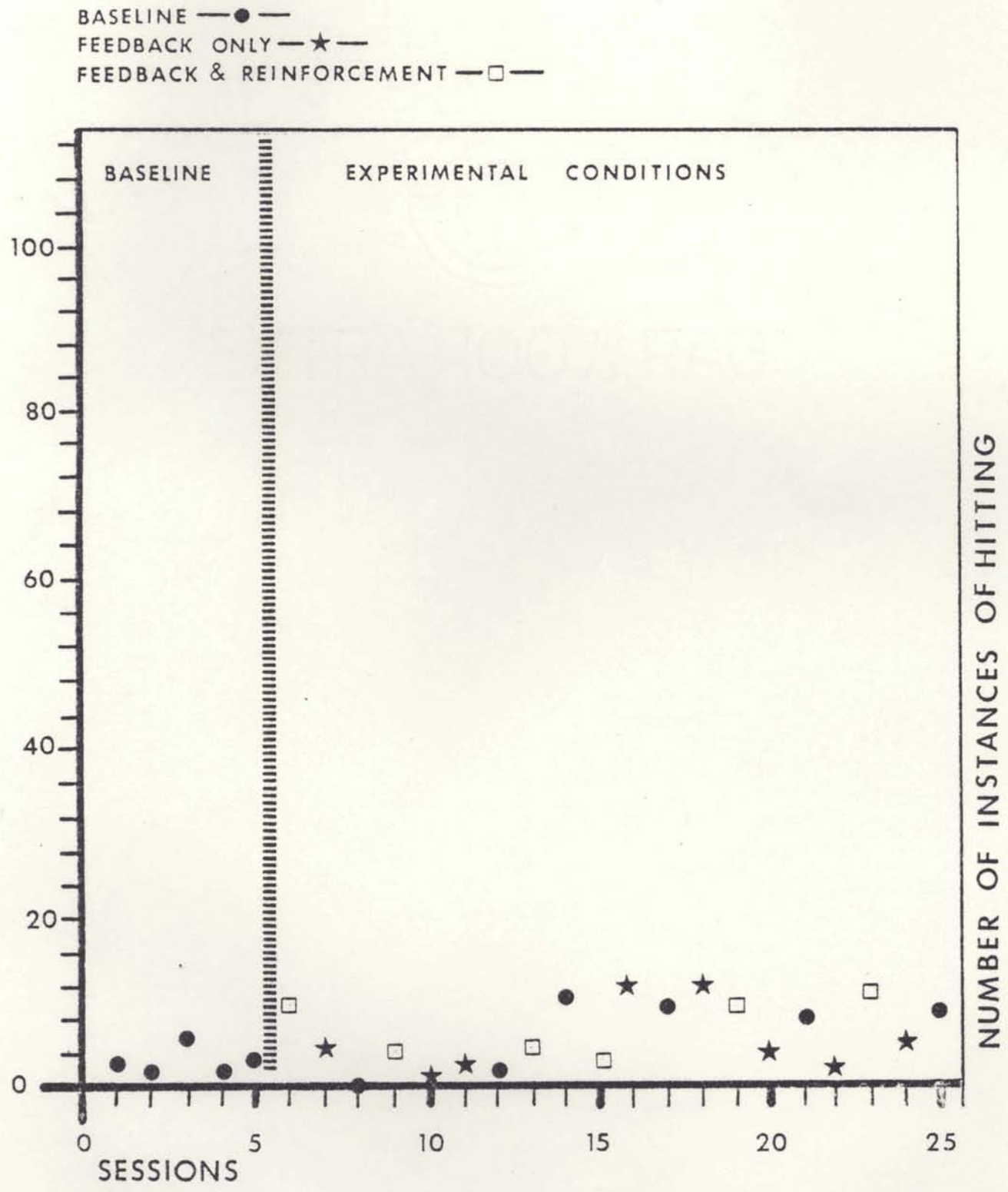

FIGURE 3

Pushing In Lunchroom Under Different Feedback Conditions

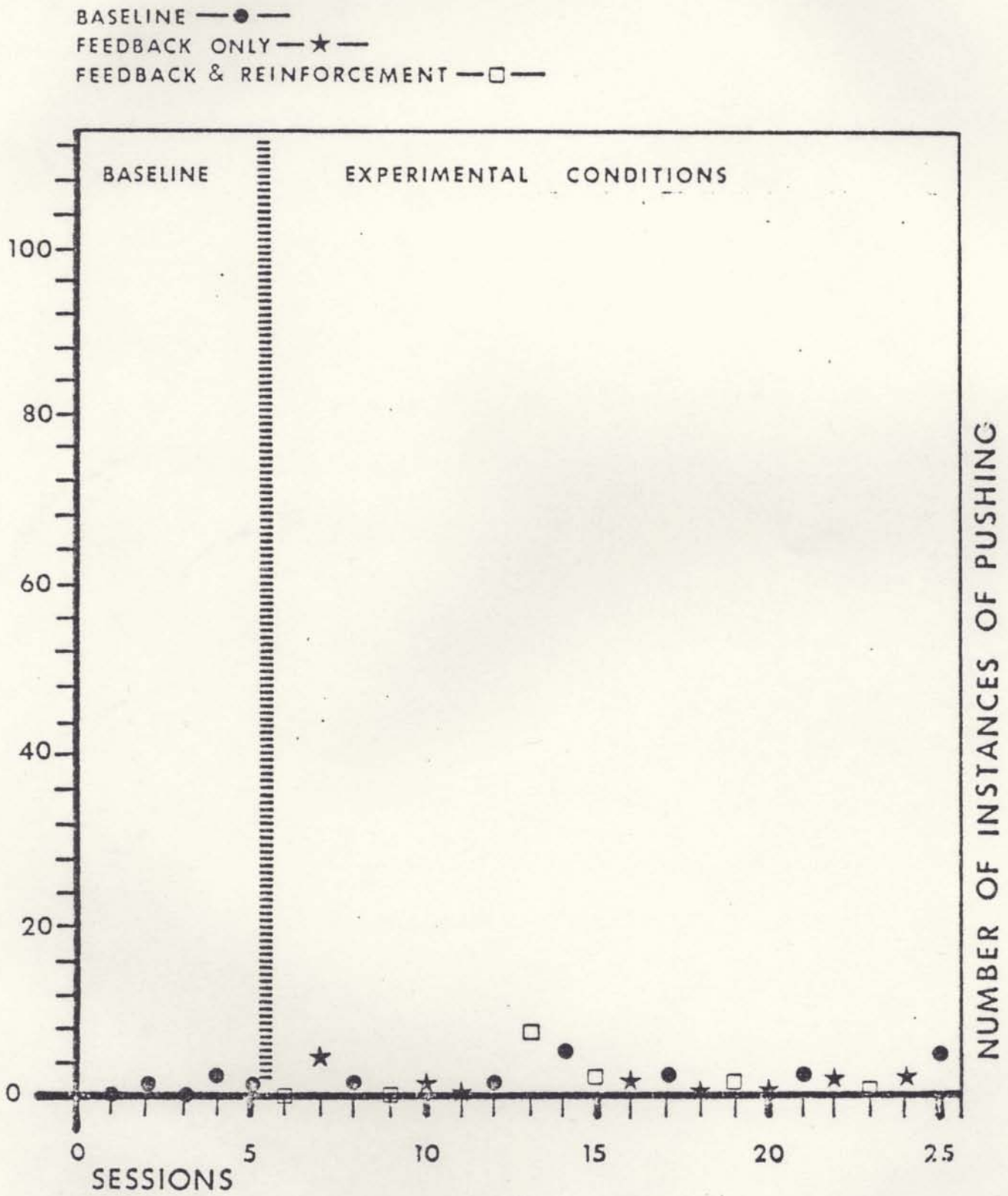

FIGURE 4

Kicking In Lunchroom Under Different Feedback Conditions

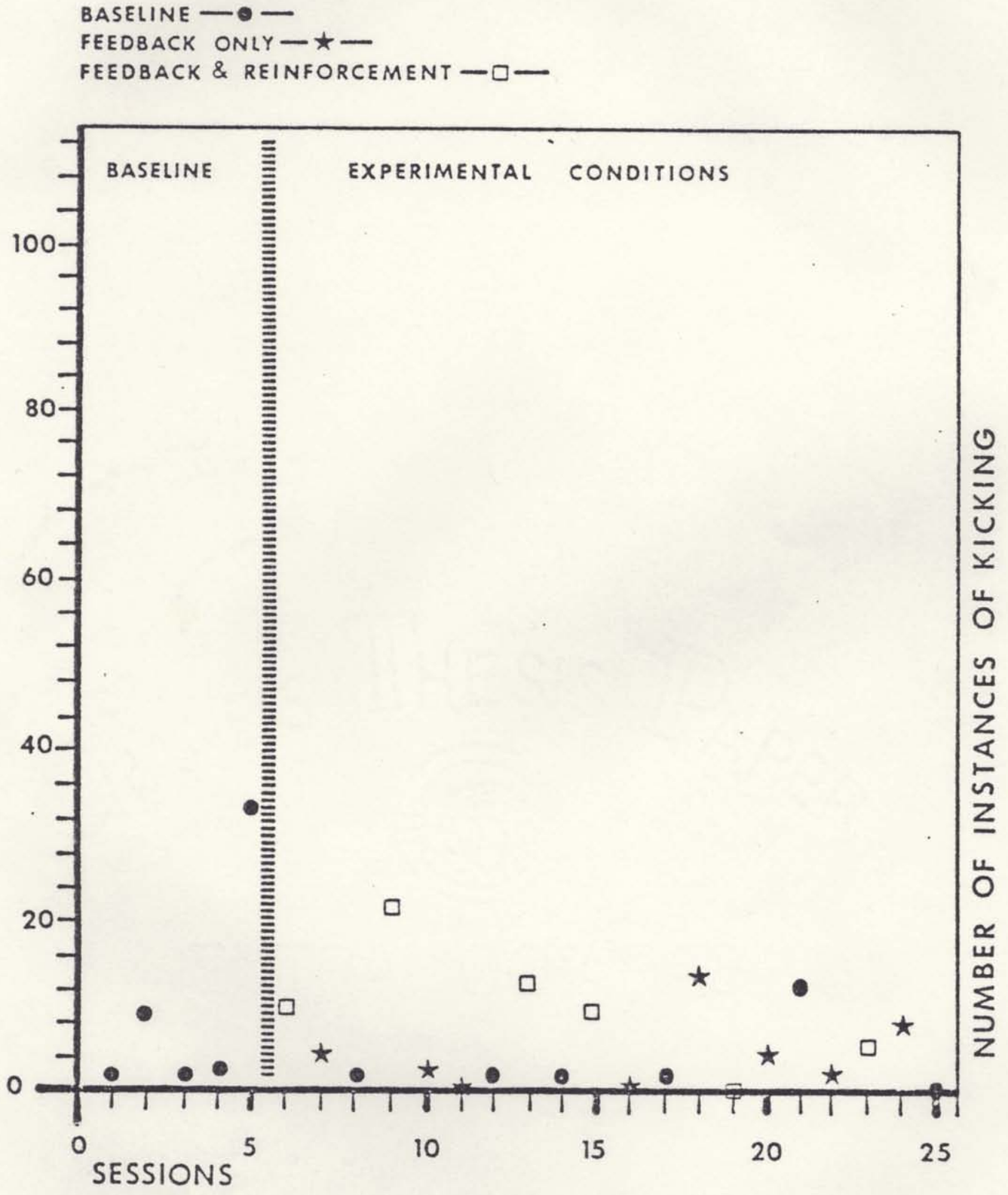

FIGURE 5

DISCUSSION

Results indicate that reinforcement procedures were effective in reducing lunchroom noise. Feedback only also brought about a reduction in noise level, but to a lesser degree. This finding is in agreement with results of the pilot study and the research of Packard (1970) and Harris and Sherman (1973).

Although the traffic light was located in a position where it was clearly visible to all students, it did not command their full attention. While on occasion, students could be heard informing others that the yellow light was on, generally they were more pre-occupied with their usual social interaction with each other. Consequently, the feedback gained from the color of the lights was less than optimal.

The bell could be heard above the noise being generated by the students and was quickly attended to by most. When the bell sounded, the noise level dropped immediately and the students focused on the traffic light until a green condition was in effect. When this condition was reached, student's attention again reverted to food and peers and the noise level often went up again quickly.

Primary aversive stimuli are those events which are

inherently aversive. The bell used in this study may fall in such a category. The lowering of noise level following this event may have constituted an avoidance paradigm where noise cessation was the result of reflexive avoidance reaction rather than desire to deliberately control noise levels.

Students in these schools are conditioned to hearing bells to announce beginning and ending of school and beginning and ending of lunch periods. However, these signals come on a regular frequency with great predictability. The bell on the experimental apparatus sounded in a random fashion.

Since a bell was paired with the red light, it cannot be inferred that the red light served as the discriminative stimulus for reducing noise level. Further research using the same equipment and the same reinforcement techniques, but without the bell, would be helpful in establishing the true identity of the discriminative stimulus.

Students are also conditioned to the green, yellow and red stimuli in the traffic light. While they do not drive because of age, most have encountered traffic lights as passengers in cars and as pedestrians. It was hoped that the usual conditioned reactions to this device would generalize to the lunchroom. The results obtained from the feedback only condition suggest that this may have

happened to some degree.

Most research using feedback only as an independent variable used some sort of pairing of feedback only with social praise. Token economies usually pair the giving of tokens with comments such as "good" which causes them to serve as reinforcement rather than purely feedback. Any such pairing had to come from generalization from past experience with similar stimuli in this research.

When students in a classroom are preparing to leave for lunch, they are preoccupied with putting away materials and may be observed to tune out what the teacher is saying. Thus some may have been confused as to whether the experimental condition for the day was feedback only or feedback plus reinforcement.

That the incidence of some of the behaviors being monitored increased (though not significantly) under experimental conditions is contrary to other research and to the data gathered in a pilot study. Since no controls were exerted directly on these behaviors and they defied to some extent the response-response relationship with noise levels, it may be concluded that some factor in prior reinforcement history affected this outcome. Further research is needed to determine if this phenomena is peculiar to this group of subjects. Examination of baseline and return to baseline conditions shows increased responding over time

for most behaviors. This may be explained as acclimation to experimenter presence. A longer baseline may have produced more stable responding and thus showed the expected response-response relationship between noise level and other behaviors.

The multi-element baseline design served as the control in this study. Levels of noise and incidences of other behaviors under return to baseline conditions approximated original baseline conditions indicating that contingencies were affecting behavior. Interspersing return to baseline conditions randomly among the other independent variables was very helpful in disclosing the effectiveness of the other independent variables on a continuing basis. Objections to a reversal design where conditions are allowed to return to pre-experimental conditions can be minimized if the multi-element baseline design is used initially to determine effectiveness of reinforcers and is followed by intervention with effective reinforcers.

Student reaction to the program was positive. They seemed eager to earn their rewards and smiles and happy faces followed the announcement that the reward had been won. Looks of disappointment followed contrary announcements. Peer pressure was evident within groups. Loud talkers were admonished by others in loud whispers. Generally students seemed to be relying on members of their

own group only to keep the noise level down. There was little interaction between groups.

Classroom teachers willingly cooperated in the reinforcement program. They helped students arrive at suitable rewards and reported that without exception, rewards were administered immediately when earned. Some of the teachers whose students failed to earn rewards felt that the group contingency procedure was unfair to their students and expressed concern about their students not having contact with students from other groups during the day, affording them the opportunity to exert peer pressure. One teacher held strong feelings regarding this matter. She reinforced her students when they met criteria and returned the card from the experimenter stating this. However, on days when the card indicated her class had not met criteria, she checked with the lunchroom monitor for confirmation. If in the opinion of the lunchroom monitor, her students had not been unduly noisy, she proceeded with reinforcement. From the experimenter's position on the stage, it was not possible to determine which classes were contributing what proportion of the noise. One teacher felt the system had worked so well with her students that she expressed a desire to have such a program in her classroom.

None of the teachers expressed objections when asked if they would consider a long term reinforcement procedure.

They recognized the difficulty of maintaining reasonable sound level within a group of this size and seemed willing to help to this degree.

Lunchroom monitors also accepted the program favorably. They considered maintaining appropriate noise levels to be their biggest behavior management problem. With the light as an objective referent, they became aware that their subjective measurement of sound level was less than accurate. The general feeling among monitors over all was that the experimental procedures were not effective. However, this view is not supported by the data.

Perhaps preliminary training in behavior modification principles could have enabled them to realistically assess the changes and relate them to experimental conditions. The multi-element baseline design with randomly alternating conditions does not allow for continued decrease in inappropriate behavior. There seemd to be expectations that noise level would abruptly decrease to whisper levels although this was not the criteria set at the beginning of the study. Dragman and Tucker (1974) pointed out the problem that school personnel may not notice changes in behavior because of the gradual accumulation of the change.

Where noise levels are excessively high during baseline and the objective is to reduce this substantially, a shaping procedure could prove effective. Reinforcement

criteria could be set at a high level initially with successive reductions after a stable rate was obtained.

The program was not viewed in a positive manner by all personnel in the building. This lack of regard was expressed rather succinctly by cutting the power supply wire to the red traffic light while it was in its usual storage place behind the stage between sessions. The discovery was made the following day when the apparatus was plugged in and turned on. It is surmised that this act was committed by an adult since the wire was six feet from the floor and very cleanly cut. A quick soldering job on the site repaired the cut and the experiment continued.

SUMMARY

Interviews with principals of elementary schools revealed a need for effective control of noise levels in lunchrooms. A search of the literature revealed much research dealing with behavior management procedures for controlling noise and other undesirable behaviors in the classrooms, but little dealing with behavior management with groups of students numbering 200 or more and even less dealing with specifically noise levels in lunchrooms.

Muller et al. (1975) used a behavior management program to effectively reduce incidences of running, hitting, pushing and kicking in an elementary school lunchroom. Concurrent readings taken with a sound level pressure meter showed a decrease in sound level. Based on this evidence it was suggested that these behaviors may exist in a response-response relationship.

The purpose of this research was to develop an effective means of dealing with noise levels in settings where large numbers of students come together. Using a multi-element baseline, a traffic light served to provide feedback to the students of the level of sound generated. This light was operated automatically by an electronic device that was pre-set to register three different levels

of sound. These sound levels were arrived at by taking readings with a sound level pressure meter and were designated as acceptable (green light), approaching unacceptable (yellow light), and unacceptable (red light). A bell also sounded when the red light came on, serving as an added stimulus.

This research was designed to test the hypothesis that group reinforcement can be used effectively to reduce sound to acceptable levels in a school lunchroom and as the sound levels are reduced, instances of other undesirable behaviors such as running, hitting, pushing and kicking will also be reduced.

Results of a pilot study done at Oak Park Elementary School showed a substantial decrease in sound level, running, hitting, kicking, and pushing under experimental conditions, when compared to baseline conditions. (See Appendix A, Tables 6-10 and figures 6-10.) While feedback plus reinforcement was more effective in reducing sound level, feedback only was slightly more effective in reducing the other behaviors.

Further research was done at Southlake Elementary School. Results showed a reduction of noise level under feedback only conditions with a greater reduction under feedback plus reinforcement. A higher number of instances of running, hitting and kicking was recorded during

feedback only than during baseline with instances of kicking slightly lower. During feedback plus reinforcement conditions, all four undesirable behaviors increased in frequency. For this population, at least, there does not seem to be a response-response relationship between sound level and instances of running, hitting, pushing and kicking behaviors.

APPENDIX A: PILOT STUDY DATA

Table 6

Number Instances of Sound Exceeding 80 Decibels Per Day

Baseline	Feedback Only	Feedback & Reinforcement	Return to Baseline
222	49	14	586
20	35	26	459
280	42	13	522.5
12		23	
Mean 133.5	42	19	522.5

Table 7

Number Instances Running Per Day

Baseline	Feedback Only	Feedback & Reinforcement	Return to Baseline
44	1	3	4.5
17.5	0	1	0
32	.5	5.5	2.25
19		0	
Mean 28.12	.75	2.375	2.25

Table 8

Number Instances of Hitting Per Day

Baseline	Feedback Only	Feedback & Reinforcement	Return to Baseline
7.5	0	0	0
2.5	0	0	0
9	0	.5	
2	0	0	
Mean 5.25	0	.125	0

Table 9

Number Instances of Pushing Per Day

Baseline	Feedback Only	Feedback & Reinforcement	Return to Baseline
18	1	2	8.5
9.5		1	2
19.5		0	
11.5		0	
Mean 12.48	.5	.25	.5

Table 10

Number Instances Kicking Per Day

Baseline	Feedback Only	Feedback & Reinforcement	Return to Baseline
.5	0	1	1
.5	1	0	0
2.5		0	
2		0	
Mean			
1.37	.5	.25	.5

Lunchroom Noise Level Under Different Feedback Conditions

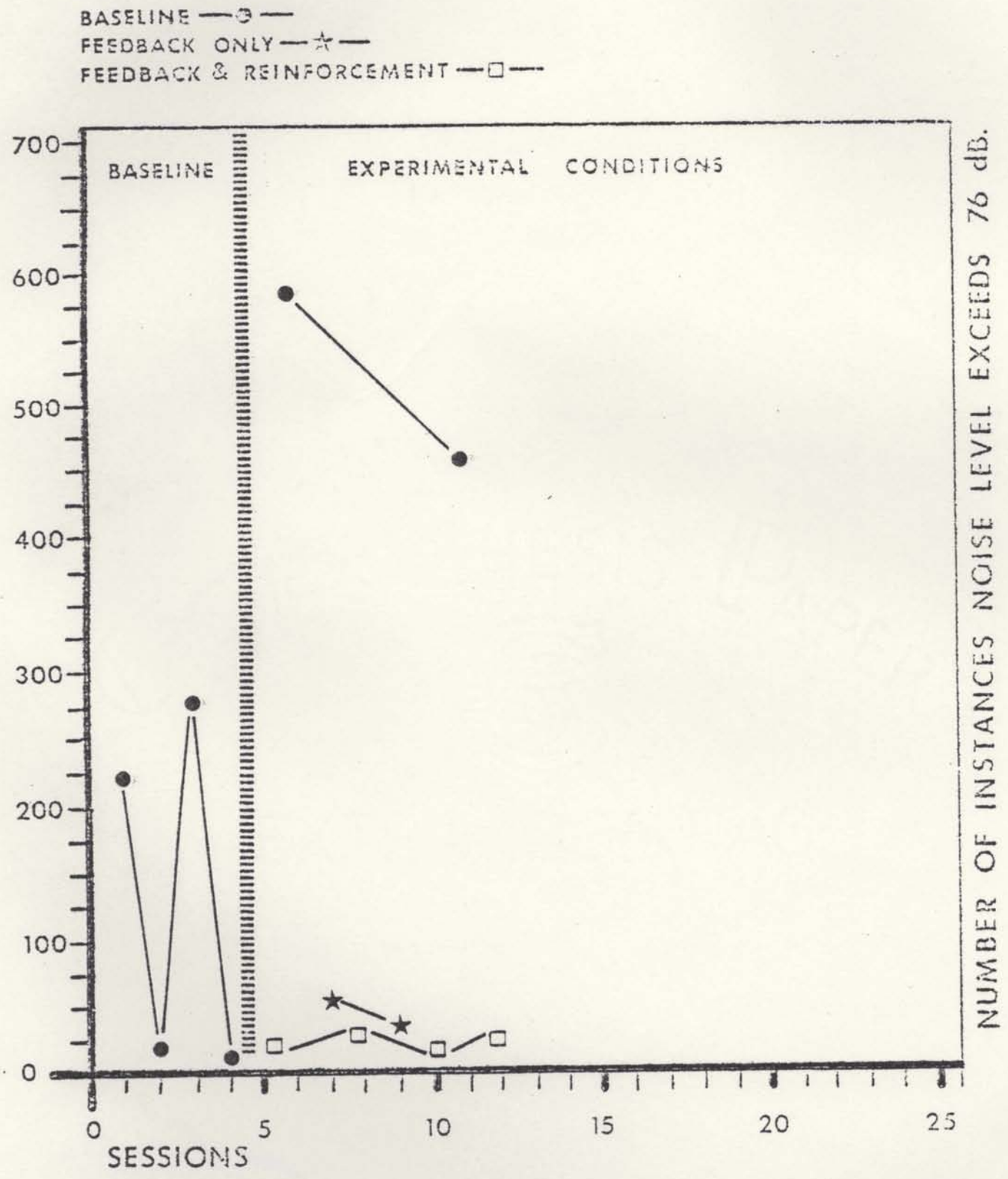

FIGURE 6

Running In Lunchroom Under Different Feedback Conditions

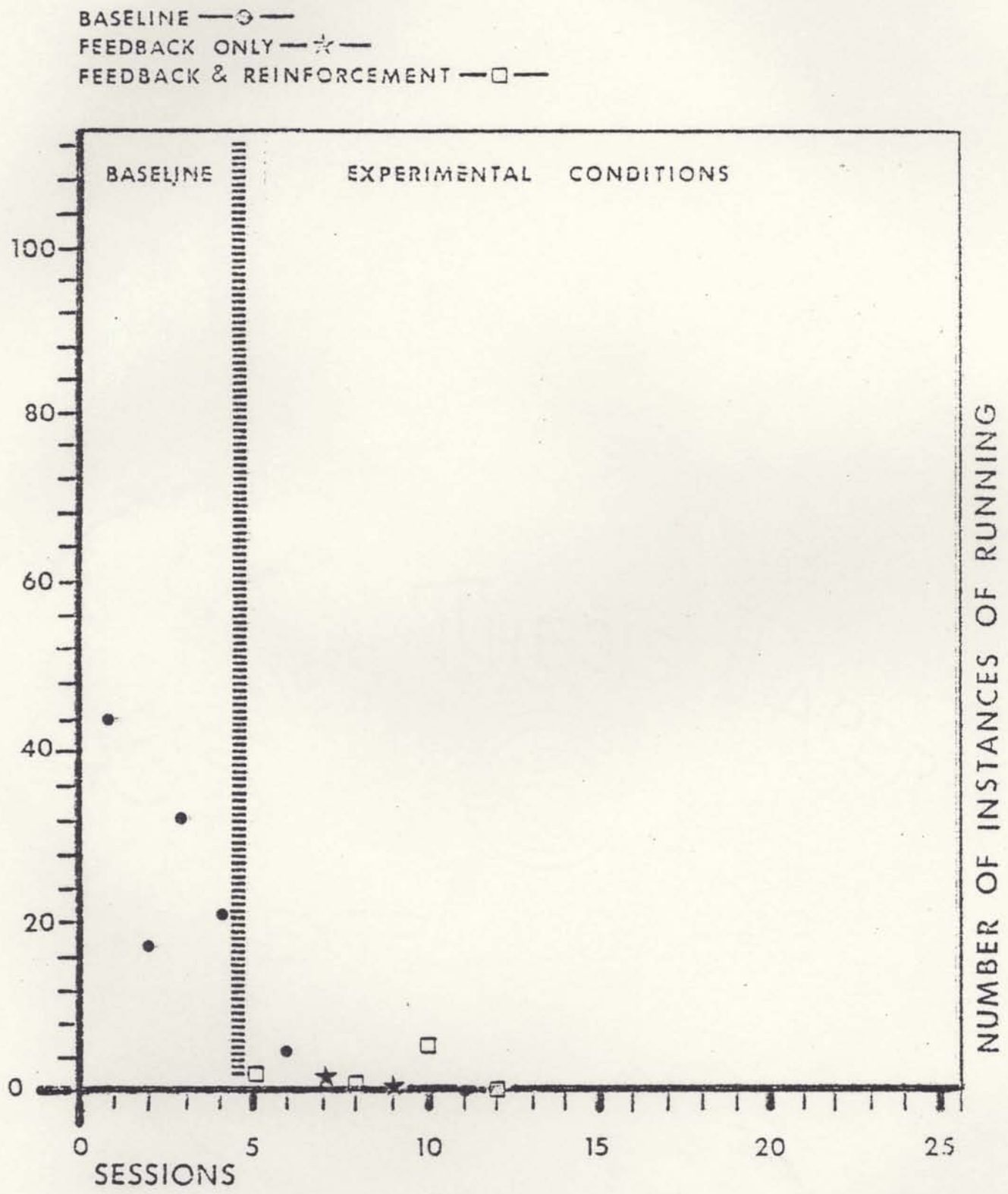

FIGURE 7

Hitting In Lunchroom Under Different Feedback Conditions

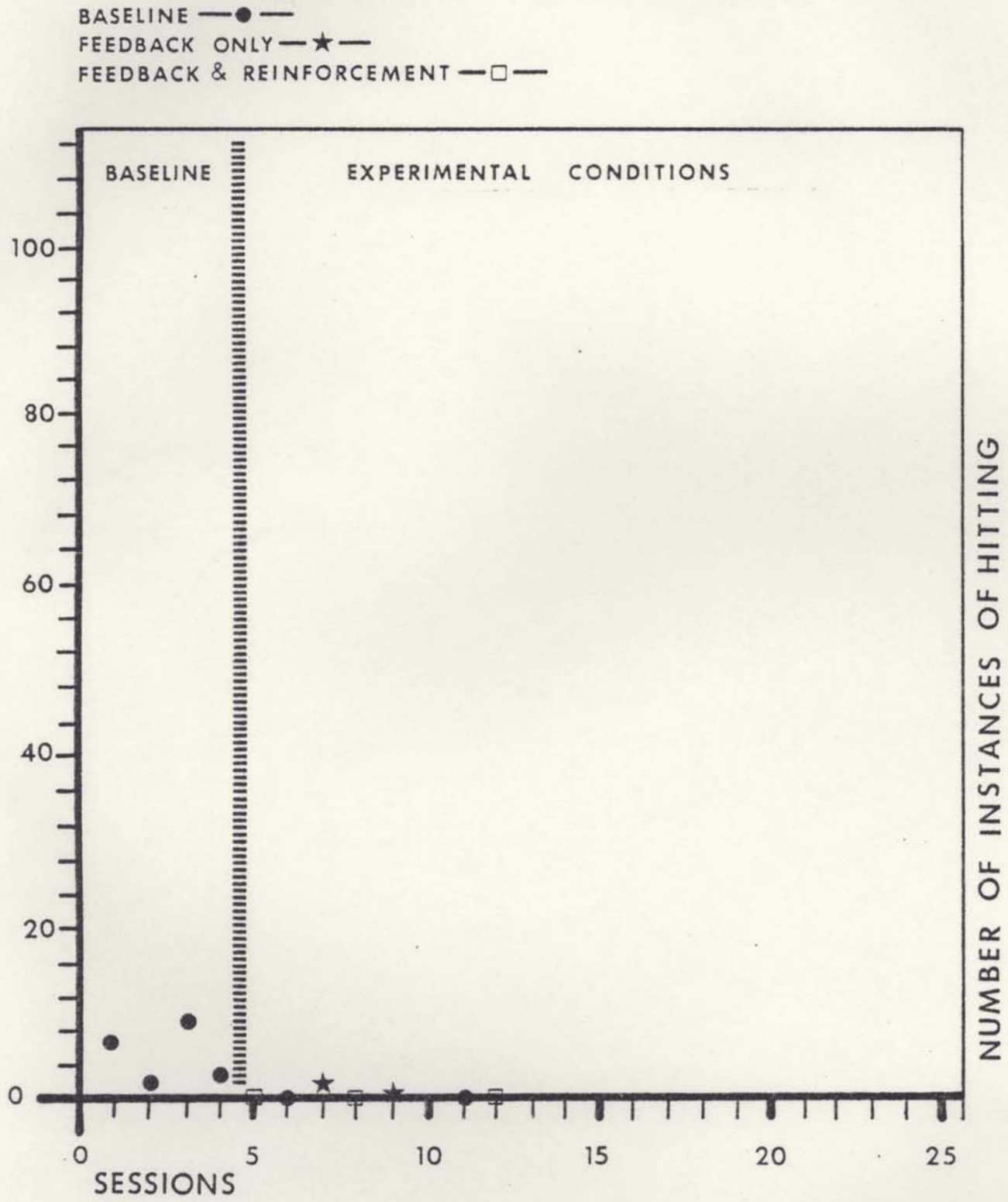

FIGURE 8

Pushing In Lunchroom Under Different Feedback Conditions

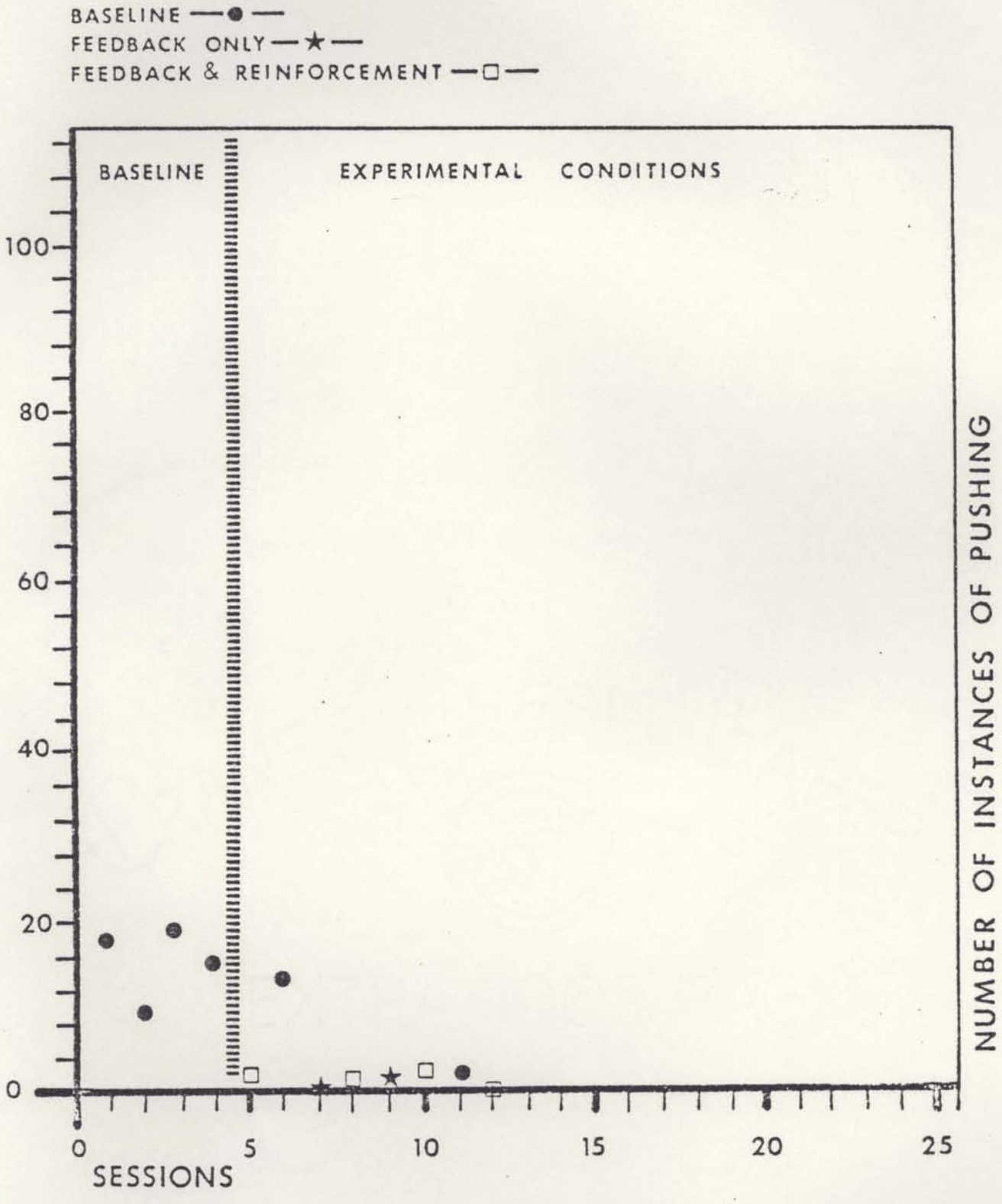

FIGURE 9

Kicking In Lunchroom Under Different Feedback Conditions

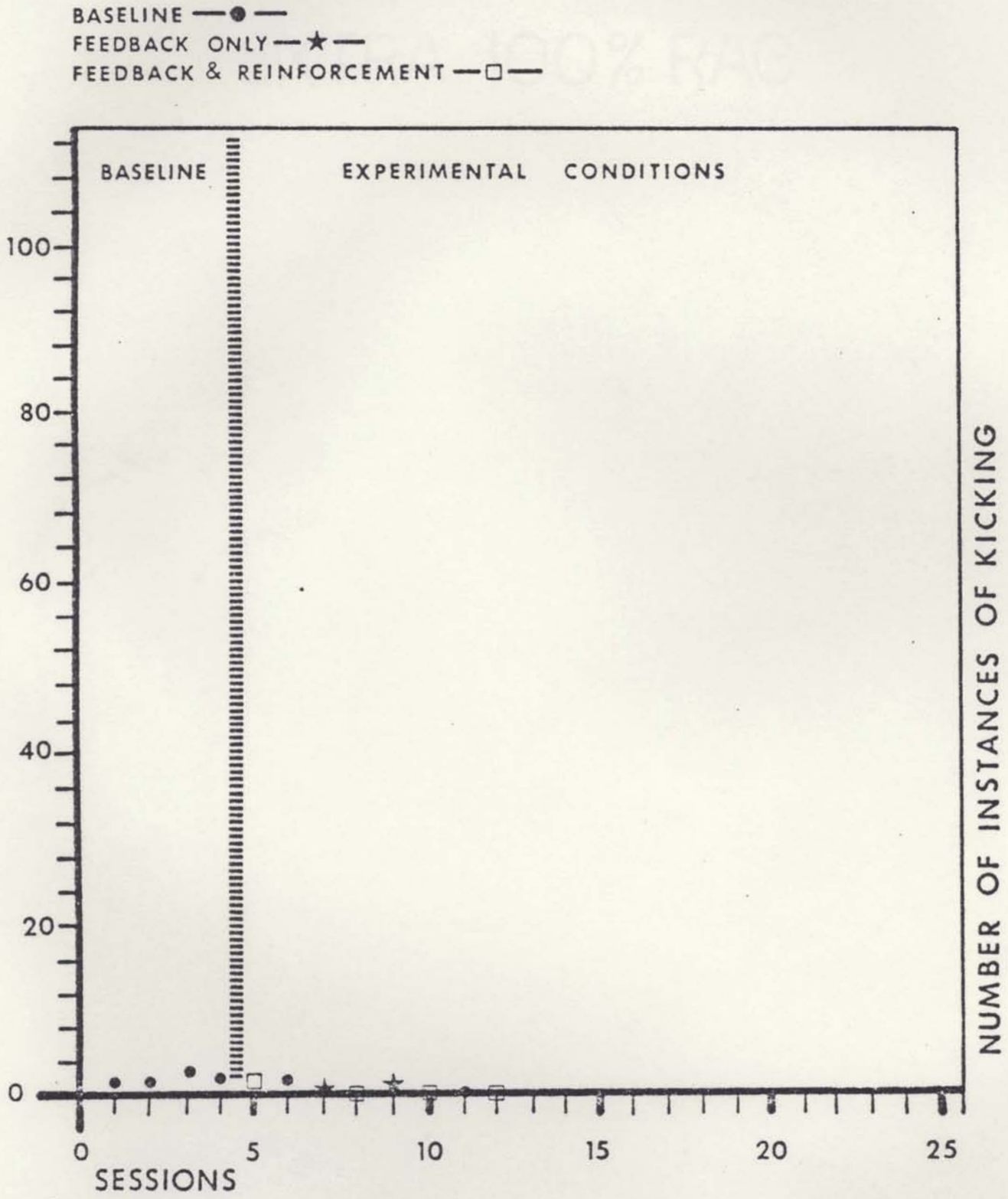

FIGURE 10

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