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EVALUATION OF REINFORCER PREFERENCES FOR PROFOUNDLY HANDICAPPED STUDENTS

DAVID P. WACKER, WENDY K. BERG, BARBARA WIGGINS, MARY MULDOON, AND JACK CAVANAUGH

THE UNIVERSITY OF IOWA AND DES MOINES PUBLIC SCHOOLS

Five students classified as profoundly/multiply handicapped were trained to use microswitches to indicate reinforcer preferences. The students were trained to emit a designated motoric response (raise arm or raise head) which in turn activated a microswitch. The microswitches were connected to battery-operated toys and devices, and served to provide immediate, contingent consequences to the students for their motoric responding. The results of the investigation were evaluated within a multiple baseline (across students) with alternating treatments (potential reinforcers) design. During baseline, the students were provided with the switches and devices, but the switches were not connected to the devices. During the training conditions, the switches activated the devices. Evaluation of the devices was conducted by recording the cumulative frequency and duration of the students' responses. When the microswitches activated the devices during training, a substantial increase in the duration of motoric responding occurred for all students. In addition, some students performed differentially across devices, suggesting that they had reinforcer preferences.

DESCRIPTORS: reinforcer selection, microswitches, profoundly handicapped

The limited response repertoires of students with profound/multiple handicaps often result in unreliable assumptions regarding the students' preferences toward various stimuli. Frequently, any response displayed by the student is regarded as an indication that the stimulus (toy, activity, or food item) is reinforcing. Once a stimulus is thought to be reinforcing, the student is then exposed to the stimulus intermittently throughout the school day in a noncontingent fashion. As a result, the student may be provided with aversive stimuli rather than reinforcing stimuli (Fehr, Wacker, Trezise, Lennon, & Meyerson, 1979).

A major need for these students is to develop systematic procedures for evaluating potential reinforcers. Whitman, Scibak, and Reid (1983) reported that identifying stimulus events that serve as reinforcers for students with severe handicaps is a critical component of any behavior modification program. However, the task of identifying reinforcers for these students can be very difficult (Campbell, McInerney, & Middleton, 1982). The purpose of our investigation was to evaluate a procedure using microswitches to determine the reinforcer preferences of students with profound/multiple handicaps.

Microswitches appear promising as a method for assessing a student's response to various stimuli because they can be activated by very small or subtle motor movements. One type of microswitch, mercury switches, activate battery-operated or electrical devices when a prespecified movement by the student causes mercury to flow to one end of a container, thus completing an electrical circuit (Burkhart, 1982; Campbell et al., 1982).

Potential uses of microswitches in educational and rehabilitative programs for persons with severe

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Requests for reprints should be sent to David P. Wacker, Division of Developmental Disabilities, The University of Iowa, Iowa City, Iowa 52242.

Table 1
Description of Participants

Name	Chronological age	Approximate mental age*	Sensory impairment	Upper limb status	Lower limb status	Medical diagnosis	Behavioral description
Rhonda	13 years	5 months	None	Good range of motion	Dependent in wheelchair	—	Frequent verbal outbursts
Anne	13 years	6 months	None	Poor range of motion	Dependent in wheelchair	Cerebral palsy, spastic quadriplegia	Smiles frequently, makes eye contact
Russ	14 years	3.6 months	None	Good range of motion	Dependent in wheelchair	Uncontrolled grand mal seizures	Frequent stereotypic behavior
Karen	13 years	5 months	None	Poor range of motion	Dependent in wheelchair	Cerebral palsy, spastic quadriplegia	Eating disorder
Sally	18 years	6 months	Deaf/blind	Good range of motion	Dependent in wheelchair	—	Unresponsive to others in environment

* Based on the most recent intellectual or developmental assessments contained in the students' records.

handicaps have been discussed previously in the literature (Burkhart, 1982; Campbell et al., 1982; Fehr et al., 1979). However, few controlled investigations have been conducted to document their effectiveness in defining reinforcers. Of the few investigations reported, most have used microswitches to activate sensory stimuli as reinforcers for individuals with multihandicaps (Bailey & Meyerson, 1970; Fehr et al., 1979; Murphy & Doughty, 1977). In general, the findings from these investigations have been positive.

In our investigation, the efficacy of using mercury switches to define reinforcers for profoundly/multiply handicapped students was evaluated. The mercury switches were used to provide contingent sensory stimuli to the students immediately following the occurence of a designated motoric response (raising arm or head). In addition, all students received a minimum of two different potential reinforcers in a counterbalanced order to determine if the students demonstrated a preference for one stimulus over another.

METHOD

Students

The participants were five students who attended two public school classrooms at the same secondary school. The students were all classified as profoundly mentally retarded and multiply handicapped, and ranged in chronological age from 13 to 18 years. More complete information on the individual students is provided in Table 1.

Settings, Target Behavior, and Materials

Baseline and training were completed in the students' classrooms within the natural context of classroom activities. The students participated in the project in either their wheelchairs with attached lap trays, or while positioned in a chair at a table.

The target behavior (raise arm or head) was defined by the classroom teachers based on two criteria: (a) the student emitted the behavior independently, but on an infrequent or inconsistent basis, and (b) the behavior was routinely required for active range of motion exercises.

The students' frequency and duration of responding were recorded for each behavior. Frequency data consisted of the cumulative number of times a switch was activated (as measured by the activation of a tape player during baseline or a potential reinforcer during training). Duration of responding was recorded as the cumulative number of seconds a student activated a device. Although both types of data were recorded, duration was considered to be the more important behavior because the objective of the investigation was to increase a sustained response (e.g., head-raising) rather than the frequency of that response.

The mercury switches consisted of small glass tubes surrounded by black plastic (3.5 cm × 1.5 cm). The devices evaluated as potential reinforcers for the students were placed in front of the students on their lap trays with two exceptions (Karen and Sally). The devices were placed in Karen's lap because she had very poor head control, and would have otherwise been unable to see the device. For Sally, who was deaf and blind, the devices were placed in her lap so that she could feel them move. When the fan was used with Sally, it was located next to her head.

Reliability

Reliability probes were conducted during six sessions for baseline, and during seven sessions for training 1 and 2. Reliability data were collected on both the frequency and duration with which a student activated a microswitch. Reliability data were not recorded for sessions (three sessions during baseline) in which no responding occurred. At least one reliability session was conducted for each student during baseline and training.

During reliability sessions, two observers simultaneously but independently recorded the responses. The observers consisted of the experimenters, the classroom teachers, and the teacher associates who worked in the respective classrooms.

For the frequency data, a response was scored each time a device was activated. A tape player which contained a blank tape was activated during baseline sessions, and a potential reinforcer was activated by the switch during training sessions.

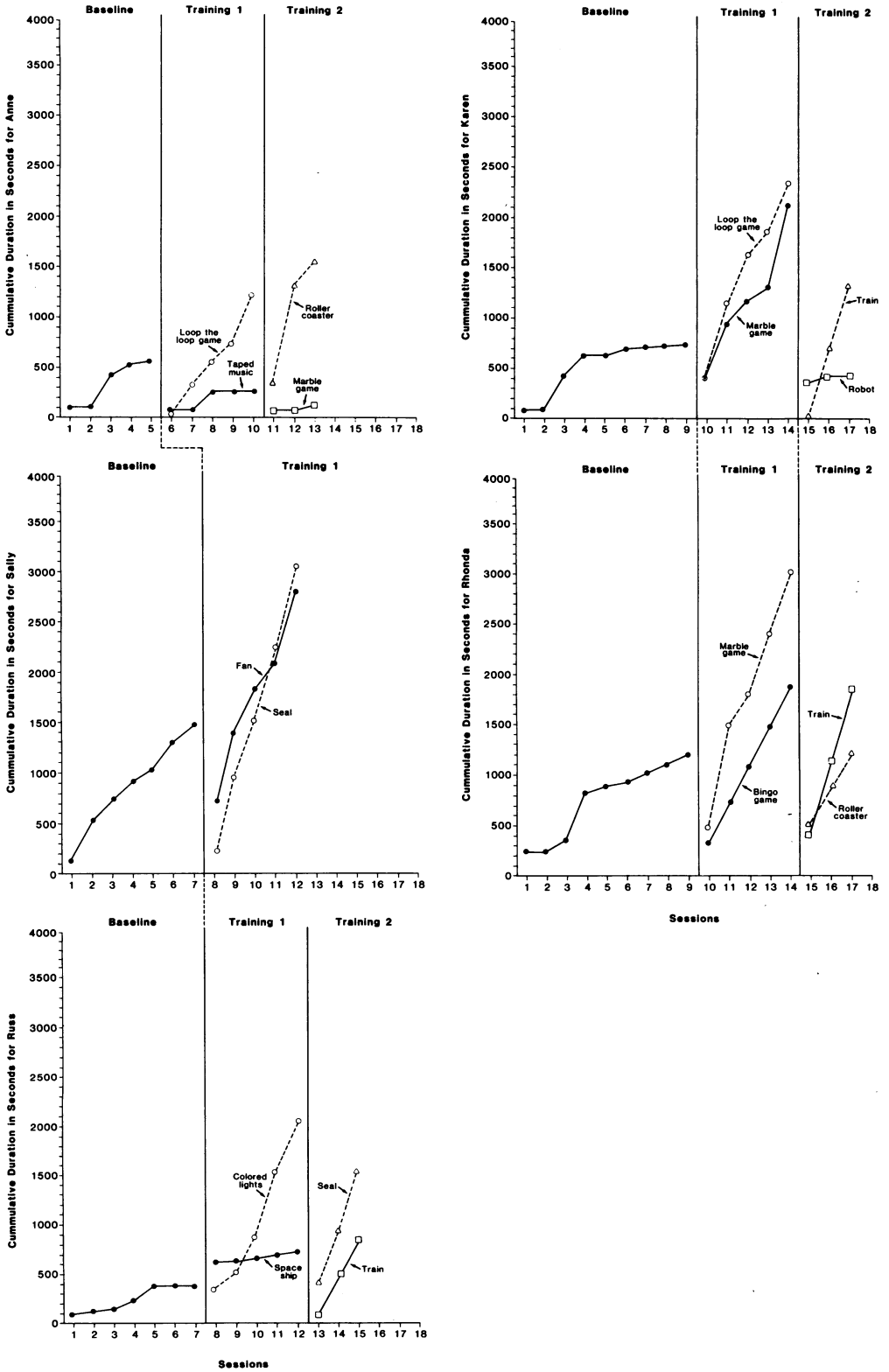

Figure 1. Cumulative duration of the lifting response for each student.

Reliability was computed by dividing the smaller frequency by the larger frequency and multiplying by 100. No disagreements occurred for the baseline sessions. The number of responses occurring within sessions ranged from 2 to 6. For training 1 and 2, the average reliability was 90% and ranged from 88% to 100%. The number of responses within sessions ranged from 2 to 17.

Duration of responding was recorded when a device (or blank tape) was activated, and continued until the device or tape was discontinued. In this case, both observers used stopwatches to record the number of seconds a response occurred. Reliability was computed by dividing the smaller duration by the larger duration and multiplying by 100. For baseline, average reliability was 98% and ranged from 95% to 100%. For training, reliability was 98% and ranged from 88% to 100%. Length of duration recorded during baseline ranged from 11 to 448 seconds, and ranged from 188 to 756 seconds during training.

Design

A multiple baseline (across students) with alternating treatments (Barlow & Hayes, 1979) design was used to evaluate the results. Number of baseline sessions ranged from 5 to 9.

Procedure

Baseline. During baseline, the students were positioned in their wheelchairs or at a table, and the switches were attached to them. One of the potential reinforcers (alternated across sessions) was also placed in front of the students (or in their laps). The switches were connected to a tape player containing a blank tape.

At the beginning of the session, the student was verbally instructed to emit the desired response (e.g., "Russ, hold your head up"). After approximately a 2-s delay, the student was physically guided through the response (this was always necessary), and then praised.

The verbal prompt-delay-physical guidance-praise sequence was repeated every 5 min during a session if the student did not emit the desired behavior during the interval between prompts. Otherwise, no other prompting or reinforcement occurred to produce the desired response. If the student engaged in the desired behavior, the tape player with the blank tape was activated. If a student continued to engage in the desired response immediately following the prompting sequence (e.g., continued to hold his or her head up), then the experimenter delayed 5 s before beginning to record the data.

Each session continued for 20 min, with up to three sessions completed during a day. Most often, one session was completed for a student within a given day, and three sessions were completed during each week.

Training 1 and 2. Training 1 and 2 were the same as baseline, except that the switches were connected to the potential reinforcers. Two potential reinforcers were evaluated for each student during training 1, with five sessions provided for each device. Presentation of each device was counterbalanced across sessions, with each device presented for a maximum of two consecutive sessions. Training 2 was the same, except that two different potential reinforcers were evaluated, with three sessions provided for each device.

RESULTS

The cumulative duration of the lifting response is presented in Figure 1. During baseline, Sally demonstrated consistently high durations of responding across sessions, and Rhonda displayed high but less consistent durations. The remaining three students all demonstrated relatively low durations.

During training conditions 1 and 2, four students demonstrated preferences between the devices, with Anne and Rhonda each displaying a preference during both conditions, and Russ and Karen each displaying a preference during one of the conditions. All students demonstrated substantial increases in their durations of responding between baseline and training 1 with respect to at least one of the devices. This pattern of performance continued to occur during training 2, when new devices were evaluated.

DISCUSSION

The results of the investigation can be summarized as follows: (a) reinforcers were quickly determined for all students, who demonstrated markedly different levels of performance between baseline and training, and (b) several students demonstrated consistent preferences between devices based on their cumulative durations of responding.

Two aspects of the results are especially noteworthy. First, the procedures were easily implemented, and used only inexpensive equipment and materials. The students responded quickly to the procedures, and did not require any additional intervention to engage in the desired responses. The total training time needed to define reinforcers during training 1 was only 200 minutes.

Second, several of the students displayed consistent preferences between devices, with some of the students showing little change in their responding compared with baseline levels. This is an important finding because these students frequently engage in only very low levels of responding. Systematic efforts to define reinforcers for individual students must become a standard procedure in habilitative settings. The results of our investigation, and those of Fehr et al. (1979), indicate that these individuals can self-schedule the delivery of potential reinforcers when given the opportunity and the needed manipulanda.

A potential limitation of our study concerns the responses trained and the reinforcers selected. Although the lifting responses were determined to have had therapeutic value for the students, none of the responses was directly related to long-term educational goals. However, the levels of responding produced by many of the students following training may constitute an active leisure skill. At the completion of the investigation, the students were actively and independently engaged in behaviors that produced desired effects for them. In this sense, the students were performing a leisure skill.

The behaviors trained might also be considered as the first step toward increasing the participation of the students in self-help skills. For example, by independently raising an arm or head, the student can actively assist in dressing or feeding programs.

Following the completion of the investigation, the use of microswitches became a common procedure in several of the classrooms at the school. The switches are used primarily to select reinforcers for individual students. Once defined, these reinforcers are used as a part of other training programs. In addition, the parents/guardians of these students have been shown how to use, and in some cases to make, the switches. As a result, the students can practice their skills at home, or be given switches and devices as presents from their parents.

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