ADAPTING ENVIRONMENTS TO ENHANCE LEISURE ACTIVITY FOR MULTIPLY HANDICAPPED INDIVIDUALS

A Thesis

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ABSTRACT

ADAPTING ENVIRONMENTS TO ENHANCE
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Providing leisure activities to profoundly retarded multiply handicapped individuals an on-going challenge to service providers. This study focused on the use of adaptive switches to improve the individual's access to leisure activity. The specific research questions were:

1. Can multiply handicapped individuals acquire the skills necessary to activate switches that produce activation of leisure materials?

2. How long will engagement with leisure materials maintain during extended time periods?

Six of the ten participants acquired the skill to engage in leisure activity at rates higher than that of baseline. Of these six, five participants had access to switches and leisure materials for long sessions (15-75 minutes). Throughout the long sessions, all five

participants responded at rates higher than baseline. Individual responding and possible uses for adaptive switches are discussed.

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DEDICATION

To my parents, Jack and Martha Dayvault, for their continuous love and support.

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Chapter I

INTRODUCTION

In the early 1970's, legislation began to establish mentally retarded individuals' "right to treatment" (Wyatt v Stickney, 1972; PARC v The Commonwealth of Pennsylvania, 1971). Initially, treatment programming focused on self-help, vocational, and academic skills. Structured habilitative programming for multiply handicapped individuals was futher advanced by the passage of PL 94-142 in 1975. Habilitative programming should include all aspects of daily living. Leisure time is an important area that can easily be overlooked while planning a program. Although leisure activities have been examined for mildly and moderately retarded individuals (Johnson & Bailey, 1977), autistic children (Koegel, Firestone, Kramme, & Dunlap, 1974), and ambulatory severely and profoundly handicapped students (Hopper & Wambold, 1978; Horner, 1980), the leisure activity of profoundly retarded, nonambulatory multiply handicapped individuals has only recently begun to receive due attention.

The importance of play activity in children is generally accepted, but there is disparity when defining this activity. A common view of "play" is the opposite of

"work." Play is activity which is nonproductive, unnecessary for survival (Ellis, 1973). This view of play and leisure activity overlooks the benefits that occur when the individual engages in this behavior. In normal children, play is recognized as a significant part of the developmental process, affecting social, cognitive and motor skills. The initiation of play behaviors generates differential reinforcing and punishing consequences. These consequences shape discrimination and build the behavior repertoire that eventually leads to learning more complex behaviors (Luckey & Shapiro, 1974).

Perhaps a better definition can be found within Ellis' arousal-seeking theory of play (Ellis, 1973). All organisms have a need for arousal. Ellis calls this need "sensoristasis" (Ellis, 1973, p.93). If arousal is not optimal, the individual will try to generate more arousal by interacting with the environment. Play is

> behavior that is motivated by the need to elevate the level of arousal towards the optimal ... pure play can occur only when all extrinsic consequences are eliminated and the behavior is driven on solely by intrinsic motivation (Ellis, 1973, p. 110).

Wuerch and Voeltz (1982) state that the development of leisure skills for multiply handicapped individuals may affect many areas of life. Leisure skill training has been related to increases in skills of other curricular areas (Nietupski & Svoboda, 1982), and decreases in inappropriate behaviors (Adkins & Matson, 1980; Wehman, Karan, & Rettie,

1976). The ramifications of engaging in play go beyond that of pleasure. Favell, Favell, Reid, and Risley (1983) discussed the effects of engagement versus non-engagement. The benefits of an engaging environment included both practical and preventive measures. In a non-engaging environment, insignificant events serve as reinforcers and may lead to bizarre behaviors. High engagement will lead to incidental teaching opportunities and incidental learning. Exploratory play and skill practice are often reinforced during high engagement periods.

Favell et al. (1983) also stated there are humanitarian reasons for providing the opportunity for engagement. Individuals have a right to live in an interesting environment. Most importantly, "engaging in enjoyable and preferred leisure time activities is perhaps essential to the quality of life" (Wuerch & Voeltz, 1982 p. 15) of handicapped individuals.

Although play is important for this population, many multiply handicapped individuals are not able to initiate basic play behaviors, due to the degree of retardation and physical handicaps. Many of these individuals are diagnosed as severely or profoundly retarded, with IQ scores falling four standard deviations below the mean and with significantly sub-average adaptive behaviors (Grossman, 1977). Extensive physical handicaps may also exist, such as deafness, blindness, contractures and spasticity. Bradtke,

Kirkpatrick, and Rosenblatt (1972) characterized this population as being unaware of self and environment, fearful of physical contact, and unresponsive to stimuli. The degree of these handicapping conditions makes initiation of any activity uncommon, even within environments which would normally be considered stimulating.

Extensive physical handicaps coupled with lack of self-initiation can result in the individual spending much unprogrammed time with no opportunity to engage in meaningful activity. This may be especially true for individuals living in large institutions for the mentally retarded. The institutional environment is often characterized by an abundance of leisure time, but a lack of staff and materials to provide the residents with leisure activity. Jones, Favell, Lattimore, and Risley (1984) found that multiply handicapped individuals residing in an institution spent 13.2% of the time actively engaged.

Because of the lack of opportunity to engage in play behaviors in multiply handicapped individuals, some type of intervention should occur (Wehman, 1977). Professionals must seek ways of modifying the environment so that the toys will be more accessible for the individual (Jones, 1980; Wehman & Schleien, 1981).

One possible method of increasing toy play involves the use of electrical engineering technology. Electromechanical devices and switches can be adapted to fit multiply

handicapped individuals' needs. With the correct switch, it may be possible for multiply handicapped individuals to activate leisure materials (e.g., toys, tape players, televisions, etc.). In this way, multiply handicapped individuals may practice skills in leisure time as developmently normal individuals do, and play may become a learning process.

Information is available on the techniques of adapting switches and equipment (Burkhart, 1980, 1982; Casby, 1984; Coker, 1984), but there is little information concerning the actual effects of using adaptive switches to enhance the play behaviors of individuals. This issue is significant, concerning the on-going debate over the trainability of multiply handicapped individuals. The time and intense effort involved in training persuades some professionals to argue that there are multiply handicapped students who are "untrainable." Kauffman and Krouse (1981) stated

> There are some children so severely handicapped that no program now available can be expected to produce significant improvement in their behavior. (p. 55)

The Professional Advisory Committee (1979) stated that intensive training, in an effort to be successful, may overlook the student as a person and become abusive. Bailey (1981) shares this view, and advocates stimulation programming, as opposed to teaching programming.

It is important to remember that students may be unresponsive, not because of their own limitations, but because of teachers' and technology's limitations. While many advances have been made in teaching methods, there are still areas where improvement is needed (Marshall & Marks, 1981). This is especially true for multiply handicapped individuals who have a variety of handicapping conditions.

The following study investigated these issues, under the specific research questions:

1. Can multiply handicapped individuals acquire the skills necessary to activate switches that produce activation of leisure materials?

2. How long will engagement with leisure materials maintain during extended time periods?

Chapter II

REVIEW OF LITERATURE

Multiply handicapped individuals residing in large facilities exhibit play behaviors at low rates. Jones et al. (1984) reported that profoundly multiply handicapped residents in an institutional setting actively and independently used play materials less than 13% cent of available time. In contrast, ambulatory, severely mentally retarded institutionalized persons engaged in appropriate toy play approximately 35% of available time (Favell & Cannon, 1977), and developmently normal individuals, 85% of available time (Montes & Risley, 1975). The discrepancy of these figures might have been increased if the definition of engagment was held constant across the studies.

The type of materials available may determine the behaviors exhibited. Bambara, Spiegel-McGill, Shores and Fox (1984) found that manipulative activity was greater with three severely mentally retarded subjects when the materials were reactive versus nonreactive. Reactive toys were defined as sustaining motion or producing feedback when manipulated. Favell and Cannon (1977) investigated material preferences with 11 severely retarded females. When preferred leisure materials were available, subjects were

idle approximately 25% of the time, versus 65% when less preferred items were available.

The availability of leisure materials is an important issue for this study. Horner (1980) emphasized enriching the environment with toys and structuring the environment to prompt and reinforce adaptive behaviors. The availability of toys was not enough to reduce maladaptive behaviors in profoundly mentally retarded ambultory females, but availability coupled with differential reinforcement may result in reduced maladaptive behaviors and increased adaptive behavior. Jones (1980) investigated the effects of toy density and found that toy engagement increased as toy density increased. With one profoundly multiply handicapped girl, modifying the toy to make it easier to manipulate significantly increased toy play engagements (Jones, 1980). Jarman and Reid (1977) found an open leisure room with various activities increased engagement for retarded individuals in a residential facility. As activities were taken out of the room, the number of residents participating dropped.

Literature concerning the use of switches is sparse. Hill (1980) used a switch and electromechanical equipment to increase purposeful arm movements with one profoundly handicapped student. By raising his arm, the student activated a visual cartoon box. Baseline consisted of typical leisure materials, such as magazines, books and

infant toys. During intervention, the student increased purposeful arm movements in a ten minute session from an average of five to an average of forty-five. In addition, the duration of his head-up behavior increased approximately seven minutes, from three minutes or less to almost ten minutes.

Macurik (1979) used a photosenser attached to the back of a wheelchair to provide contingent music for correct head position for severely retarded, nonambulatory individuals. All three subjects showed a maintained increase in correct head position; one subject increased as much as 50% over baseline. The photosenser not only increased head control, but provided a leisure activity which the subjects could control.

Wacker, Berg, Wiggins, Muldoon and Cavanaugh (1985) trained five profoundly multiply handicapped students to emit a motoric response which activated a microswitch. Switches were then used to determine reinforcer preferences by measuring duration of switch activation with a variety of leisure materials. Preferences were quickly determined for each student.

Switches have also been used to provide access to a computer for communication needs. Everson and Goodwyn (1985) taught three cerebral palsied students to use a computer to scan for symbols. Several switches and switch positions were tested, but reliable responses were dependent

on (a) optimal seating and positioning of subject, (b) mounting and positioning of switch, (c) quality and control of physical movement, and (d) motivation and co-operation of students.

McClure, Moss, McPeters, and Kirkpatrick (1984) employed two switches to reduce handmouthing of one profoundly retarded boy. When both switches were activated, a cassette player provided the subject's favorite music. Mouthing decreased without intensive intervention of a trainer.

There is a consensus in the literature that play behaviors are vital to the well-being of multiply handicapped individuals. Research shows that these behaviors are exhibited at low rates for this population. Switches have been used in many habilitative areas, but systematic research does not yet show that switches and adaptive materials are a viable alternative for leisure activity.

Chapter III

METHOD

Participants

The participants for this study were ten clients selected from two living units of a state residential facility for the mentally retarded. All were diagnosed as being profoundly mentally retarded, nonambulatory, and nonverbal. Table 1 provides additional descriptive information about the participants. Participants were selected for this study based on their need for developing leisure skills and lack of progress on previous training programs.

Setting

This study was conducted in a unit where 20 nonambulatory, multiply handicapped, profoundly retarded clients lived. Actual sessions were conducted in the unit dayroom where residents spent their day. The dayroom was a large open area having a television, a stereo, other leisure materials.

Materials

A variety of battery operated toys, a tape player, and video-cassette recording equipment (VCR) were leisure items used throughout this study. Materials were selected to be

Table 1

Descriptive Information on Participants

Participant	Age	Social Age (on Vineland)	Other Descriptors
Wayne	42	5.64 months	severe spastic quadriplegia, multiple flexion contractures.
Pierre	26	2.16 months	spastic quadriplegia, severe contractures, severe scoliosis and lordosis, hearing deficit.
Susie	26	6.36 months	cleft palate, congenital dislocation of right hip.
Ray	22	7 months	spastic quadriplegia, severe scoliosis, bilateral dislocation of hips.
Elizabeth	13	4.2 months	severe spastic quadriplegia, multiple contractures, dislocated left hip, subluxation of right hip.
Jeff	25	6.36 months	mild spastic quadriplegia with athetosis, scoliosis, strabismus.
Chris	18	3.6 months	dislocated left hip, multiple contractures, thoraric scoliosis.
Francis	32	9.24 months	spastic quadriplegia, Raynaud's phenomena.
Ricky	23	11.28 months	mild spaticity, scoliosis, moderate hearing loss and some loss of vision.
Neil	23	5.64 months	spastic quadriplegia, mild kyphosis.

used based on recommendations from staff, observed preferences by participants, reviewing each participant's yearly habilitation plan, and based on what was available at stores where purchases were made.

All materials were adapted so that they could be operated through the use of a variety of switches. Battery operated toys were adapted by using a battery interruptor (Casby, 1984). Other leisure materials which required direct current were adapted through the use of an accessory relay (Zuromski,1978).

Recording

Data were collected through the use of electromechanical equipment and an "Active Stimulation Programmer" (Zuromski, 1978). Each activation of a switch resulted in the counter advancing one digit. The equipment also controlled how long each stimulus item was activated and counted each activation of that leisure item. Prior to beginning a session, the equipment was tested to insure its reliability in counting responses, timing the duration of each leisure item, and in counting each activation of the leisure item. Responses per minute were calculated by the formula:

$$\frac{\text{Number of Responses Which Activated Leisure Item}}{\text{Session Time - Time Leisure Item Played}}$$

This formula was intended to adjust the rate of responding by counting only switch activations that resulted in seven

seconds of leisure material operating. Switch activations occurring during the seven seconds of leisure material operating are not represented.

Experimental Design

A reversal design (Baer, Wolf, & Risley, 1968) was used to assess response rates across each experimental condition. Baseline data were collected on each participant until stable or decelerating. Following baseline, the toy operative condition was implemented. Following improvements in response rates, there was a return to the baseline condition and a subsequent return to the toy operative condition.

Procedure

Each participant was informally assessed through direct observation and consultation with occupational therapist and direct care staff to determine what voluntary response movement the participant possessed. A switch was adapted, usually by positioning, to accommodate any purposeful movement. Based on this informal assessment and taking into consideration that participant's handicapping conditions, a switch was selected and positioned for use throughout this study.

Leisure materials used were not held constant for each particapant. Material changes occurred as items broke, new items were purchased, or as the experimenter deemed participant's interest in an item was diminishing.

Baseline

At the beginning of each baseline session, the participant was physically prompted through three activations of the switch. Although the leisure item was present, it did not operate when the switch was activated. No further physical prompts or verbal interactions were provided during sessions. Sessions lasted ten minutes. Baseline sessions were conducted until response rates appeared stable or were on a decelerating trend.

Toy Operative

Sessions conducted during this condition were identical to those during baseline with the exception that activation of the switch resulted in the leisure item operating for seven seconds. As in baseline, no additonal prompts or verbal interactions were provided during the ten minute session. The term "Toy Operative" is used despite the fact that materials other than toys (tape player and VCR) were used.

Baseline

Once the response rate showed an improvement over baseline levels, the baseline conditions were reinstated in order to determine if the participant had learned the contingency that activating the switch resulted in operation of the leisure item.

Toy Operative

Following the second baseline condition, the toy operative condition was reinstated to provide access to leisure materials.

Long Sessions

Once responding was re-established during the second toy operative condition, longer sessions were conducted which ranged from 15 to 75 minutes. This was done to evaluate how long engagement with the leisure materials would maintain during extended time periods. Each session was broken into five-minute blocks of time. Electro-mechanical equipment recorded responses during each five-minute block. Rate of responding for long sessions and for each block was calculated by dividing responses by time.

Chapter IV

RESULTS

The focus of this study was on the use of adaptive switches in providing access to leisure materials for multiply handicapped individuals. The first question was: Can multiply handicapped individuals acquire the skill necessary to activate switches that produce activation of leisure materials?

Six of the ten participants (Wayne, Pierre, Susie, Ray, Elizabeth, and Jeff) showed acquisition of the skill. Figure 1 shows the rate of responding for these six participants. All had low rates of responding during baseline. Introduction of the toy operative condition increased responding for all participants but Jeff. This pattern was followed in the return to baseline condition and the second toy operative phase. When the mean of responding was calculated, Jeff's data did not clearly show acquisition. However, the increasing trends found in both toy operative conditions indicated an increase in rate of responding.

Several days into the toy operative condition, Elizabeth began having access to leisure materials in two settings. She began the study by having access to materials

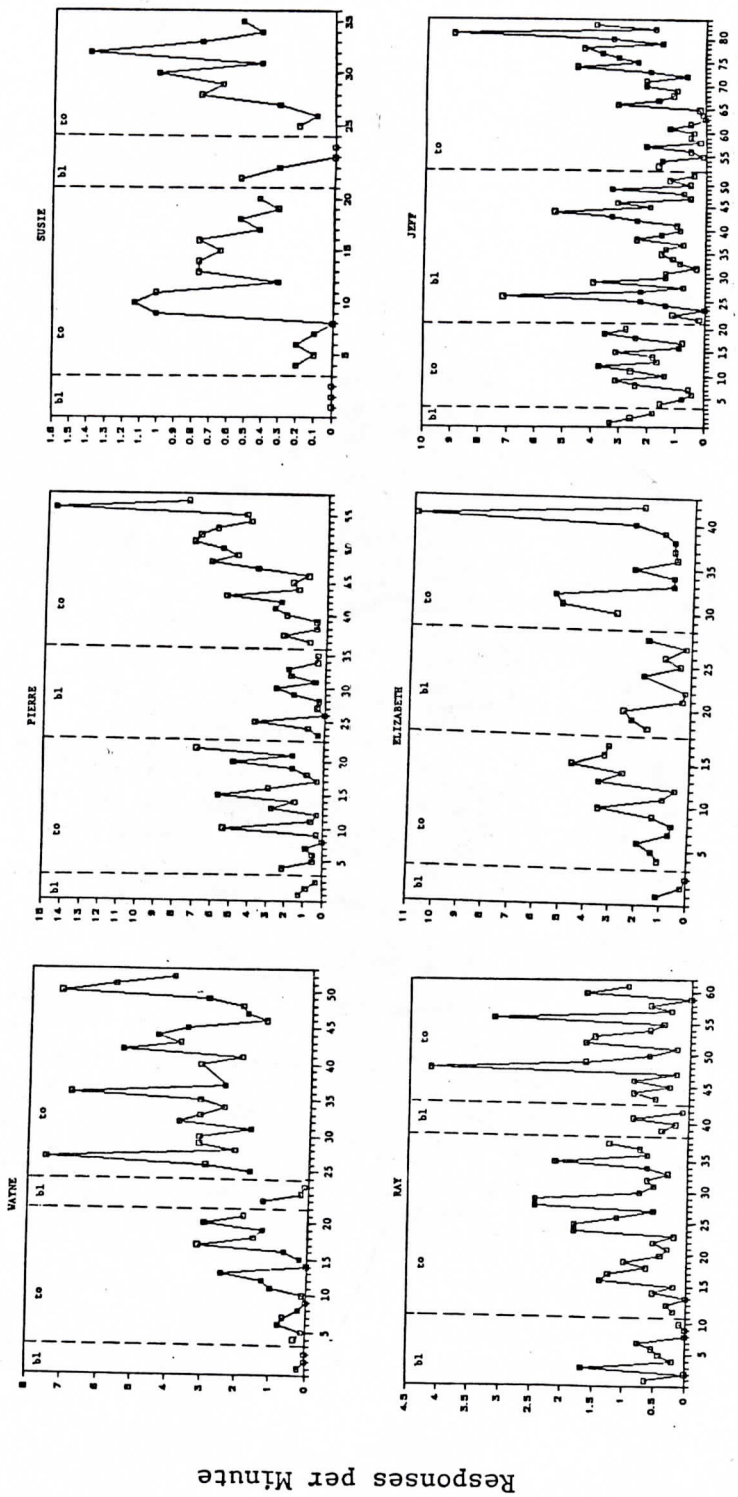

Figure 1. Responses per minute across conditions for participants who acquired skill.

while sitting in her wheelchair. Materials were made available while Elizabeth was lying on a mat table. Since Elizabeth was participating the second toy operative phase at the time, the same conditions were introduced on the mat (See Figure 2). Responding occurred, and a baseline condition was introduced. When responding stabilized at a low rate, the toy operative condition was reinstated.

Four participants did not acquire the skill of activating a switch to provide leisure materials (See Figure 3). Chris's responding did increase during the toy operative condition, but responses would sporadically drop to zero. A new, more sensitive switch was introduced during Session 39, and responses then begin to increase. Return to baseline shows a decrease in responding. Responding initially increased when the toy operative condition was reinstated, but dropped off. Frances also showed an increase in responding in the first toy operative condition, but did not respond after the second baseline. The high responding during the third baseline may have been due to an unintentional change in the switch position. Table 2 gives the mean response per minute for each of the ten participants in each condition.

Long sessions were conducted to evaluate the second research question: How long will engagement with leisure material maintain during extended time periods? Five participants who showed acquisition of the contingency had

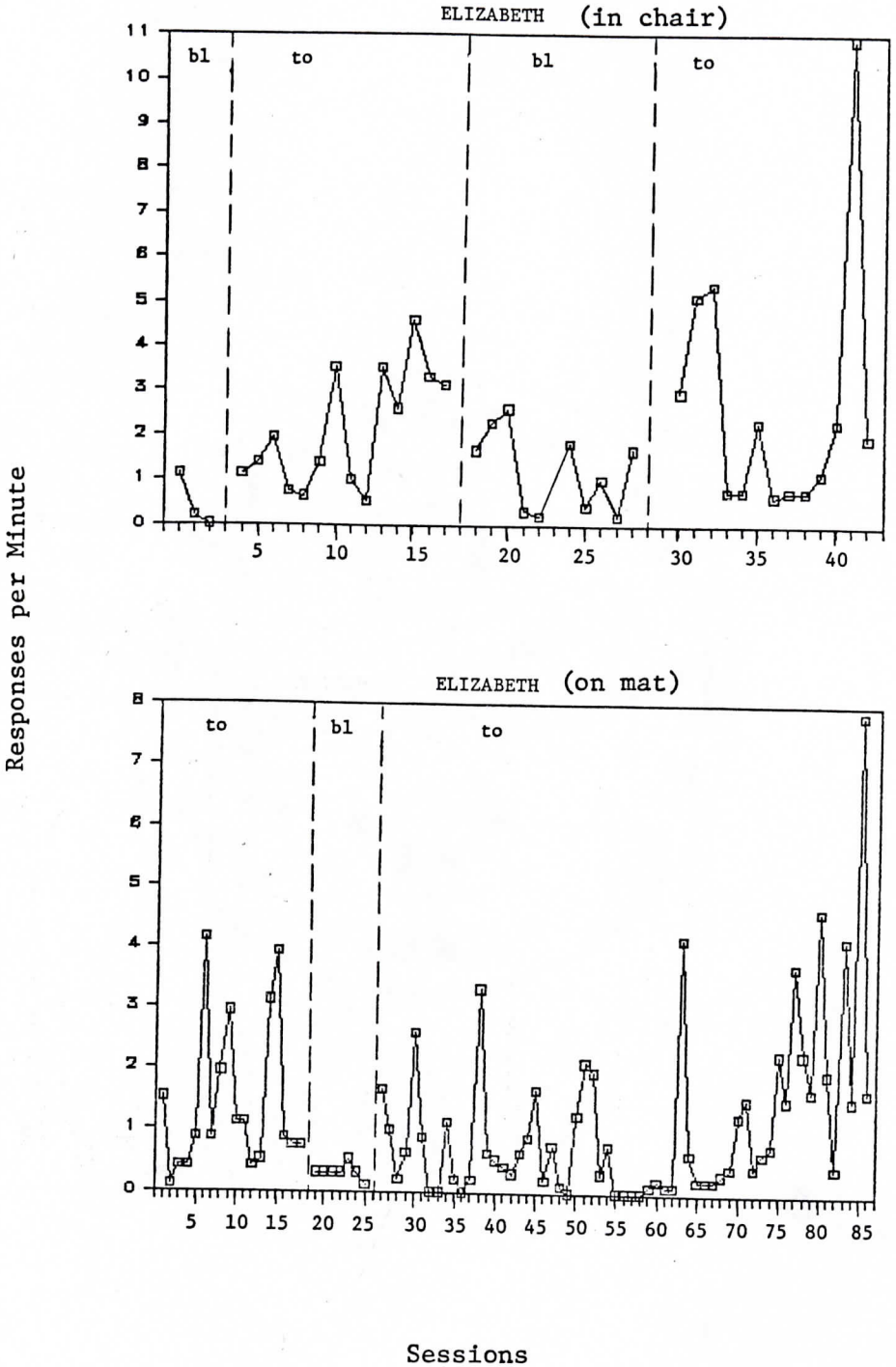

Figure 2. Response per minute for participant in different body positions.

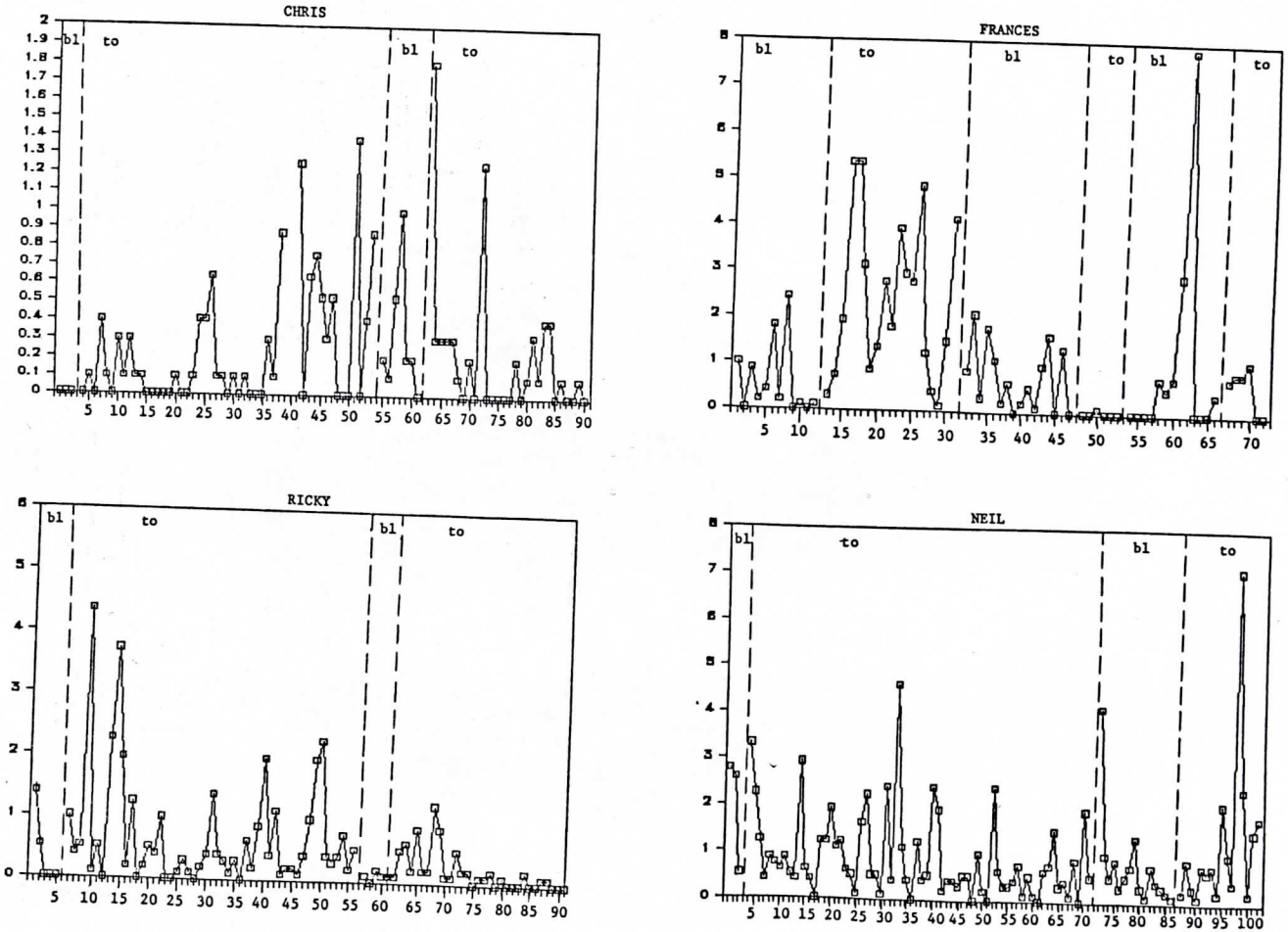

Figure 3. Responses per minute across conditions for participants who did not acquire skill.

Table 2

Participants' Means of Responding During Each Condition

Participant	BL	TO	BL	TO	LONG
Wayne	0.06	1.01	0.52	3.49	6.43
Pierre	0.82	2.09	1.16	4.19	2.63
Susie	0	0.45	0.21	0.59	0.35
Ray	0.43	0.89	0.40	0.91	3.33
Elizabeth					
chair	0.44	2.10	1.21	2.03	
mat		1.44	0.31	1.13	
Jeff	2.58	2.16	1.72	2.02	4.85
Chris	0	0.39	0.32	0.23	
Frances	0.60	2.41	0.75	0.02	
Neil	1.97	0.87	0.78	1.28	
Ricky	0.38	0.70	0.12	0.19	

access to leisure materials in sessions lasting over fifteen minutes. Figure 4 shows the rate per minute for each participant. Ray, Jeff, and Wayne responded at rates higher than the toy operating conditions. Susie and Pierre responded at rates lower than the toy operating condition, but higher than baseline.

Each session was broken into five-minute blocks of time (See Figure 5). The cumulative rate of responding for each five-minute block was calculated by dividing total number of responses by total number of minutes. Three participants show an initial increase of responding, then a gradual decrease followed by another increase. Pierre and Susie gradually show a decrease in responding, then show an increase.

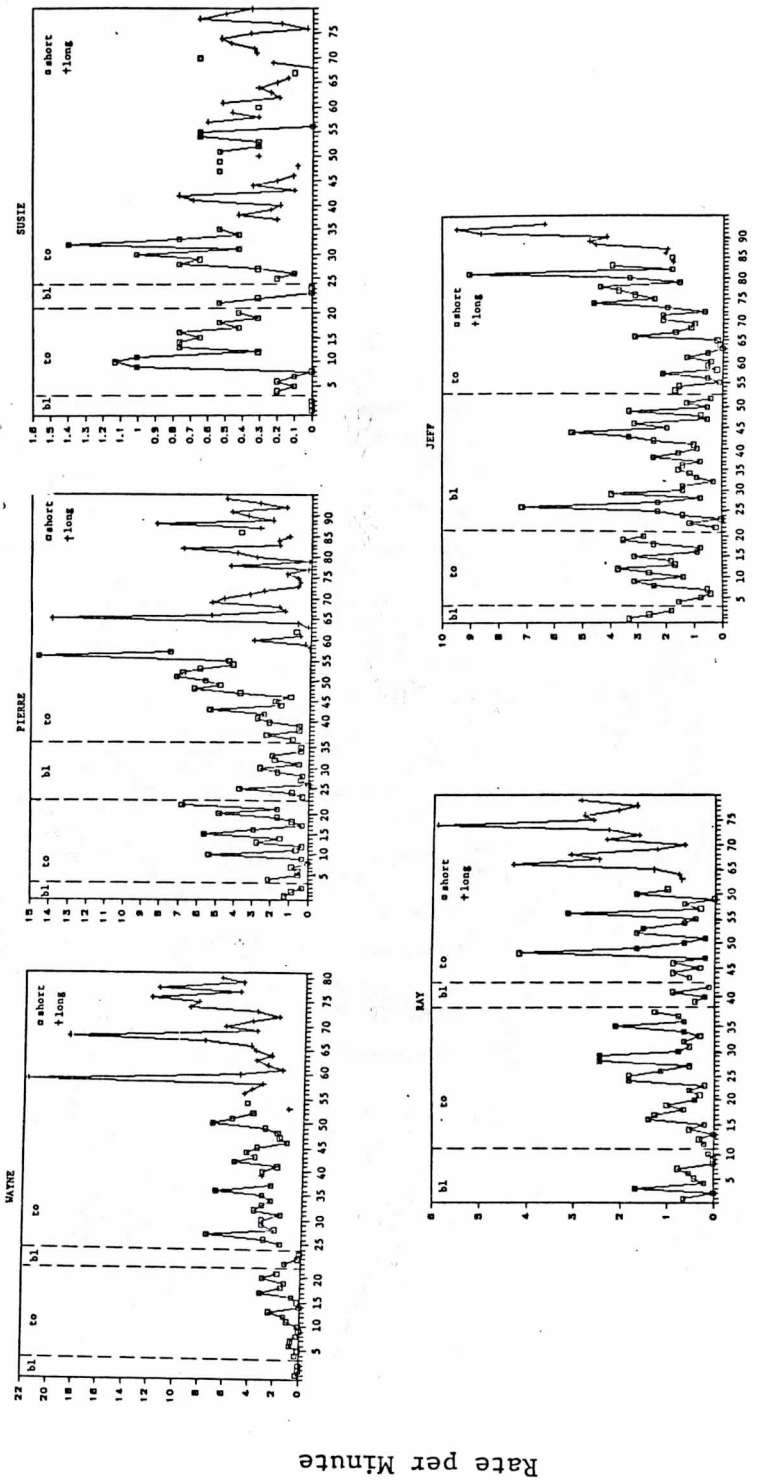

Figure 4. Rate per minute across conditions including long sessions.

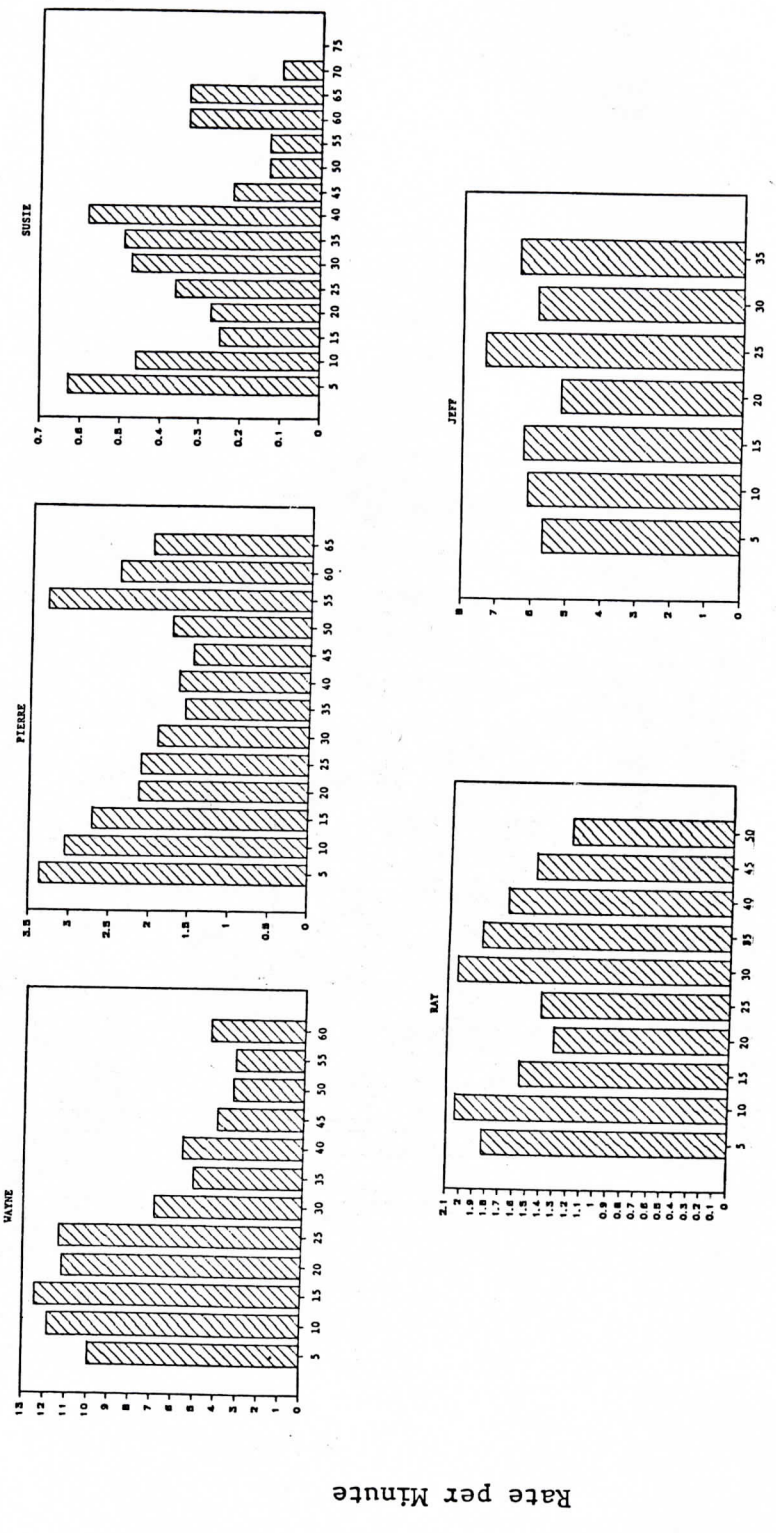

Figure 5. Rate per minute during five-minute blocks of time throughout long sessions.

Chapter V

DISCUSSION

The purpose of this study was to evaluate play of multiply handicapped individuals under the following research questions:

1. Can multiply handicapped individuals acquire the skills necessary to activate switches that produce activation of leisure materials?

2. How long will engagement with leisure materials maintain during extended time periods?

Six of the ten participants showed acquisition of the skill by responding at higher rates when the leisure materials were operating. Four of the participants did not show this skill acquisition. After acquiring the skill, five of the participants had access to leisure material for long periods of time. All five responded at rates higher than baseline rates. Three participants responded at rates higher than the toy operative conditions.

It is important to note the differences in scales for each participant. Susie's y-axis scale is from 0 to 1.6 responses per minute, while Wayne's extends from 0 to 22 responses per minute. This study concentrated on the effect of the leisure material for the individual. Future research

may determine there is an optimal level of responding for each individual.

Four of the ten participants did not learn to activate the switch. There are many possible explanations regarding why participants failed to respond. The leisure materials may not have been reinforcing to these individuals. This study used only battery-operated toys, a VCR, and a tape player. A wider range of materials should be available for research in adapting switches. The "age-appropriateness" (Wehman & Schleien, 1980) of the materials should also be examined. More "adult" toys should be adapted, such as remote controlled cars, televisions, and computer games.

Another possible explaination of why these participants did not acquire the skill involves the way the materials were presented. Other than three initial physical prompts to activate the switch, no prompts or social reinforcements were given. Some multiply handicapped individuals need the intensive training involving much repetition and social praise.

Ricky, Chris and Frances showed a higher rate of responding during the first toy operative phase, but responding completely dropped during the second toy operative phase. Rice (1966) called this phenomenon "spontaneous extinction," in which responding occurs within a training or conditioning paradigm, then declines over a period of a few sessions. Satiation of the leisure material

does not seem to be the explanation, since materials were not presented systematically. Manipulations of scheduling had no effect in Rice's case. Spontaneous recovery was not observed.

One consequence found in conducting long sessions was the increase and decrease in responding across time. Only Jeff responded at a somewhat stable rate over half an hour. The other participants, while generally showing a decline in responding throughout the session,increased and decreased responding for short periods during the session. This change of responding could be the result of fatigue. After 10 or 15 minutes into the sessions, the participant may have grown tired. After a short rest, the participant again responded at higher rates. If the leisure materials can be made accessable throughout the day, the individuals might use the material at their own discretion. In this way it is truly "leisure activity" and not "programming."

Each participant had a great deal of day-to-day variance in responding. Such variance is not unusual for multiply handicapped individuals. Landsman-Dwyer and Sackett (1978) reported variable responding over more than a year of intensive observations in a controlled setting. Rice (1966, 1967, 1968) observed similar fluctuations in a series of studies with multiply handicapped patients. A possible explanation could be the idiosyncrasy of reinforcement. Rice (1967) reported on one subject who

liked M & M's with peanuts, but not plain M & M's . The leisure materials in this study were not presented in a systematic order, and no data were systematically collected on leisure material preferences. In applied settings, a wide variety of leisure materials should be available, and data collected systematically to determine several highly reinforcing items for each individual.

Although this study focused on leisure materials, the use of adaptive switches may provide alternatives to traditional service delivery models. Switches provide a chance to integrate service disciplines. Physical therapists and occupational therapists can focus on the purposeful movement necessary to activate the switch. Educators and psychologists have an opportunity to guide cognitive skills and teach independent behavior.

Multiply handicapped individuals have relatively little control over their daily living environments. By having access to adaptive switches, individuals may have the opportunity to manipulate their environment. Switches may provide more opportunity for choice making and, therefore, more independence. Many aspects of living environments can easily be adapted to accommodate switches. Leisure materials, such as radios, provide the individual a chance to choose, even if the choice is as simple as listening to the radio or not. Also, a variety of switches might be made available concurrently for the individual to have access to

a variety of activities. Such autonomy may enhance social relationships for the individual (Wehman and Schliein, 1981) and improve their quality of life.

Future research must address the ability to make adaptive switches a part of an individual's daily routine. The efficacy of intensively training switch use needs to be thoroughly investigated, as will as exploration of what leisure materials will be reinforcing.

Conclusion

This study focused on the use of adaptive switches to provide leisure activity to multiply handicapped individuals. The results show that six of ten participants learned to activate a switch to gain access to leisure material. Five of these six participants continued to respond during longer sessions. These results suggest that adaptive switches are a feasible alternative to provide multiply handicapped individuals access to leisure materials. Switches may also provide the opportunity to achieve in other areas of life.

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VITA

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