

ENVIRONMENTAL EXPLORATION IN FOUR PROFOUNDLY  
RETARDED, MULTIPLY HANDICAPPED INSTITUTIONALIZED  
PERSONS: A COMPARISON BETWEEN TWO ENVIRONMENTAL DESIGNS

A Thesis

by

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ENVIRONMENTAL EXPLORATION IN FOUR PROFOUNDLY  
RETARDED, MULTIPLY HANDICAPPED INSTITUTIONALIZED  
PERSONS: A COMPARISON BETWEEN TWO ENVIRONMENTAL DESIGNS (APRIL 1982)

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The use of leisure time in a productive manner is an important aspect of habilitation for profoundly retarded, multiply handicapped persons. However, this population is characterized by low rates of environmental interaction and a limited capacity to participate in productive leisure activity. Furthermore, these persons are usually confined to an institutional group-care setting in which few entertaining materials or activities are available. The institutional environment also tends to foster dependence by these clients rather than foster independent environmental interactions. Using an ABAB design, four subjects were exposed to two experimental conditions. The A condition consisted of providing the subjects with constant toy availability. The B condition provided each subject with constant toy availability and exposure to a toy matrix. The mobile matrix was an environmental design which provided auditory and visual feedback whenever the subjects manipulated the presented objects. Results indicated that under both phases of the toy matrix condition when compared with the toy availability phases overall subject environmental

responses increased in the areas of subject eye contact with objects and peers, object manipulation and peer contact. The toy matrix condition data also indicated a reduction of subject mouthing behavior and a slight increase in subject smiling and vocalizing. Object contact by subjects showed a slight increase under the toy availability condition.



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## Chapter 1

### Introduction

Independent, productive use of leisure time has been cited as an important aspect of habilitation for the profoundly retarded, multiply handicapped person (Jarman and Reid, 1977; Wehman, 1978; Reid, Willis, Jarman and Brown, 1978). As with normal infants and toddlers, leisure time for the severely handicapped should allow for opportunities to practice and generalize newly acquired skills, and set the occasion for socialization with peers. The ability to use this time productively will foster the development of these skills, and in some cases, may even prevent the development of undesirable behaviors (e.g. self injury, self stimulation).

This is especially true of the institutional, group care setting, which is generally characterized by an over-abundance of leisure time and insufficient staff to provide meaningful activities in which clients can participate (e.g. Katz and Yekutieli, 1974; Luckey and Shapiro, (1974). Hart and Risley (1976) described the institutional setting as one which deters, rather than facilitates, independent exploration and activity engagement for the sake of client safety and staff efficiency. Kenowitz, Sweibel and Edgar (1978) also note that the majority of profoundly retarded persons receiving educational services are located in large residential facilities.

This problem is accentuated by the fact that the profoundly



retarded, multiply handicapped person is characterized by low rates of environmental interaction and a reduced capacity to participate in meaningful leisure activities. A normative study of 100 nonambulatory profoundly retarded, multiply handicapped persons in two North Carolina State Mental Retardation facilities concluded these individuals are observed actively and independently using materials less than 10% of the available times (Lattimore, Jones and Favell; note 1). In contrast, developmentally normal children actively engage in play materials approximately 85% of the time they are available (Lattimore et al., note 1).

Staff interactions with profoundly retarded, multiply handicapped institutionalized persons, when they do occur, typically fosters dependence rather than independence (Hart and Risley, 1976). Lattimore et al., (note 1) found that institutional direct care staff spend only half of their working time contacting clients and over 70 percent of these interactions take the form of staff doing some activity for the client, rather than facilitating independent client behavior. Adequate materials (toys, food during meals, audio-visual equipment and staff) were available only 51% of the time to clients (Lattimore et al., note 1).

While part of the problem appears to be an issue of improved management (e.g. modifying staff attitudes and work behavior, providing adequate amounts of play materials and activities), another major shortcoming is lack of research investigating leisure activities among the retarded (Reid, Willis, Jarman and Brown, 1978; Wehman, 1978), and particularly among the multiply handicapped retarded (Brown, 1975; Wehman, 1978).

### Purpose Of The Study

The purpose of this study was to determine and compare the rate and type of environmental interactions by four profoundly retarded, multiply handicapped institutionalized persons, when they were provided with two environmental designs. A ward mobile was devised to provide for toy play in a ward of eight clients diagnosed as profoundly retarded and multiply handicapped at a regional center for the mentally retarded in 1978. This mobile matrix provided constant toy availability and variable feedback to the clients in the ward. Although the mobile matrix was not developed as a study and subsequent baseline or treatment data was not taken, the clients seemed to engage the objects presented most of the time they were observed. Observations were made by a variety of staff members. Client visual attending to objects presented, mobile matrix materials, ward staff and peers also seemed to increase during the two month period the matrix was available to them. A comparison between constant toy availability and the mobile matrix could help to determine any change in client environmental exploratory behavior. If the mobile matrix did increase environmental interactions by the subjects, an inexpensive environmental design could be used to facilitate such interactions by clients. The matrix could also be utilized as a training tool to facilitate, maintain or generalize skills with the severely handicapped. Also of interest would be the actual increase or decrease of subject behavior under both conditions. Behavior change noted in this experiment could also be used as dependent variables for further research in this area.



### Research Questions

The research questions asked in this experiment were:

1. What is the rate and type of exploratory behaviors exhibited by four profoundly retarded multiply handicapped, institutionalized persons when they are provided with constant toy availability?
2. What is the rate and type of exploratory behaviors exhibited by four profoundly retarded multiply handicapped, institutionalized persons when they are provided with constant toy availability and variable feedback for object manipulation via a mobile matrix?
3. What is the change in the rate and occurrence of exploratory behaviors when constant toy availability and constant toy availability with exposure to a mobile matrix are compared?

### Summary

The need for purposeful leisure time activities for the profoundly retarded, multiply handicapped institutionalized person is well documented in the literature. The need to research and develop environmental designs to facilitate externalization of institutional clients has also been cited in literature as a need. Past experience with a mobile matrix seemed to increase exploratory behavior with eight profoundly retarded, multiply handicapped persons. The purpose of this experiment was to determine if constant toy availability or constant toy availability with exposure to a mobile matrix had an effect on exploratory behaviors with four profoundly retarded, multiply handicapped institutionalized persons. This experiment also compared the two conditions and determined what exploratory behaviors showed change and what was the rate of such change.

## Chapter 2

### Review of Relevant Research

The paucity of information and lack of research investigating leisure activities among the retarded continues to be a problem (Reid et al., 1978). Brown (1975) and Wehman (1978) indicated this is particularly true for the multiply handicapped population. Research done with infants indicates that toy availability, presentation of an object and actual toy selection can increase infant exploratory behaviors. Research with the profoundly retarded also indicates that toy availability and presentation can increase exploratory behavior. Toy density also has increased exploratory behavior with the profoundly retarded.

#### Toy Availability and Presentation

Toy availability with 23 ten week old infants was shown to increase the babies' toy play with the crib mobile 31% of the infants waking time. Twardosz, Cataldo and Risley (1974) reported in their study that toy availability could provide a portion of stimulation for this population without affecting their sleep behavior. McClannahan and Risley (1974) did a study with eight severely disabled geriatric patients and showed that object availability (e.g. beads on a string, xylophone, shape box) increased mouth contact 2%, simple grasping 20% and active manipulation of objects 18% of the time in their subjects. Favell and Cannon (1976) likewise showed an increase of

toy engagement of 55% with severely handicapped institutionalized persons when toys were made available to them. Wehman (1978) also noted an increase in toy engagement among ambulatory severely retarded residents in an institution occurred when toys were presented in close proximity (instead of across the room) to subjects. Jones (1975) evaluated the effect of toy presentation and engagement with two profoundly retarded nonambulatory multiply handicapped institutionalized persons. When toys were presented on the client's tabletop for subject one, the toy was immediately knocked off as a result of trying to engage the object. However, a 34% average engagement was noted when the toy was suspended to a mobile attached to the back of the client's chair. For subject two, engagement increased from an average of 33% (without mobile) to 91% engagement when the toys were attached to the overhanging holder. Jones (1975) studied the effects of toy density on toy engagement with four profoundly retarded, nonambulatory, institutionalized persons with a mean age of 14 years and a mean mental age of 5.4 months. Toy density was defined as increasing the number of toys within a constant area. Data was taken for six, thirty minute sessions with each subject. Results indicated that when one toy was presented, the subjects averaged 33% toy engagement. Toy engagement increased to a 44% average when two toys were made available and further increased to a 59% average when three toys were presented to the subjects. Toys were mounted on a plexiglass mobile to insure constant availability.

#### Novelty And Environmental Engagement

Novelty has been used to increase exploratory play with infants



and preschool children. Judith Rubinstein (1974) studied the responsiveness of six month old infants to novel and familiar stimuli to determine the effects on their visual and manipulative behavior. Forty-four six month old infants, half boys and half girls, participated in this experiment. Both the duration of visual fixation and duration of manipulation reveal differential responding to novel compared with familiar stimuli. The infants looked at and manipulated objects that were novel longer than familiar objects. Schaffer (1974) disputes Rubinstein's claim that both visual and manipulative behaviors were increased by the novel stimuli presentation. By citing other experiments (Schaffer 1975, Schaffer and Parry 1972, Parry 1973) he concludes that only the visual fixation is increased at the six month level by novel stimuli presentation and the manipulative system response to novel objects increases significantly only at the eight month age level. However, both agree that the choice of novel stimuli can induce greater visual attending by six month old infants with objects.

Linford and Linford (1977) found that when the same novel versus familiar toy selection was given to 96 first graders, the subjects preferred novel toys to play with immediately but familiar toys to keep permanently. The effect of toy novelty and the social interaction on the exploratory behavior of preschool children also demonstrated that novel toys could increase time spent with a peer in examination and interaction with the novel objects. Thirty-six children, ages 35 to 62 months, were tested by Rabinowitz, Moely and Finkel (1975). Their exploration of a large colorful novel toy and familiar objects was investigated. Children who played in the presence of the

same sex peer spent more time with the novel toys and found more information about the novel toys by finding hidden activator feedback devices.

McCall (1974) identified several stimuli characteristics found to influence the exploratory activity of nine, twelve and fifteen month old infants when selecting play materials. Configural complexity or objects which had various contours and edges, sound potential or objects which make noise or sound when acted upon and objects which were malleable or with the quality of "plasticity" influenced duration of play and decreased responses in latencies with all three groups. Research with two year olds and novelty as a stimulus which will increase toy play indicates that novelty is a stimulus characteristic heavily influenced by the child's previous history (Nunnally and Lemond, 1973; Bijou, 1975).

#### Summary

Research indicates that toy availability, toy presentation and toy density can affect environmental engagement by the profoundly retarded person. These variables become important when working with the profoundly retarded, nonambulatory population since their ability to actively seek out environmental objects is limited by their physical involvement. The role of novel stimuli in increasing exploratory behavior in infants seems to suggest that this variable can be useful in eliciting environmental responses, decreasing latency and increasing social play.

## Chapter 3

### Method

The need to research and develop environmental designs to facilitate purposeful leisure activities for the severely handicapped has been documented in the literature (Reid, et al., 1978; Brown, 1975; Wehman, 1978). The purpose of this experiment was to determine if constant toy availability or constant toy availability with exposure to a mobile matrix had an effect on exploratory behaviors with four profoundly retarded, multiply handicapped institutionalized persons. This experiment also compared the two conditions and determined which exploratory behaviors showed change and what was the rate of such change.

#### Subjects

Four subjects were chosen at random by a school principal out of a possible 30 subjects. The subject pool was determined by five special education teachers who were asked to submit a list of six students who fell within the following subject parameters:

1. Nonambulatory
2. Use of at least one arm so that range of motion allows for movement two feet in any direction
3. Adequate visual acuity to see presented objects and three peers located around a five foot radius from the subject's head.

4. A recent diagnosis (within the last year) of profound mental retardation and multiply handicapping condition.

The school principal and teachers were not aware of the purpose of the study. Subject descriptions are shown on Table 1. Subject test scores were obtained from the Uzgis-Hunt Ordinal Scales of Psychological Development (Uzgis and Hunt, 1975), The Vineland Social Maturity Scales (Doll, 1947) and The Bayley Scales of Infant Development (Bayley, 1969).



Table 1  
Subjects

<u>Age</u>	<u>Sex</u>	<u>Length of Institutionalization</u>	<u>Primary/Secondary Diagnosis</u>	<u>Test Scores and Assessment Tools</u>
16 yrs.	Female	1 yr. 9 mo.	Profound mental retardation, microcephaly, seizure disorder, scoliosis, crying behavior.	Bayley - 5-7 mo. Vineland - 9.5 mo. Uzgiris-Hunt - 4-8 mo. mean
34 yrs.	Male	17 yrs.	Profound mental retardation, spastic quadriplegia, thoracolumbar scoliosis, mixed type seizure disorder	Vineland - 6-7 mo. Uzgiris-Hunt - 4-8 mo. mean
14 yrs.	Female	11 yrs.	Downs Syndrome, profound mental retardation, mild hearing loss, seizure disorder, cataracts, pseudopapilledema	Vineland - 13 mos. Uzgiris-Hunt - 12 mo. mean
19 yrs.	Male	12 yrs	Profound mental and motor retardation, spastic quadriplegia	Vineland - 16 mo. Bayley - 7 mo.

### Setting

This research was conducted in the A Unit on the campus of Western Carolina Center. All subjects were seated in a 25 foot by 20 foot classroom in their wheelchairs, including their wheelchair tabletops. The subjects were positioned in the center of the room so that they were facing toward the center of the room and formed a square with one peer directly across from each subject and two peers on either side. Each subject's tabletop made contact with the tabletops of the two peers on either side. An audible timer was used to indicate the time intervals used for data collection. The timer was placed on the floor at the center of the room so that the data collector and reliability observer could hear the audible tone simultaneously. The author served as data collector and a master's level special education teacher and educational program unit supervisor served as reliability observers.

### Materials and Equipment

Four constant toys were used throughout the two treatment procedures. A soft squeeze toy, a flower rattle, an hour glass filled with beads and a jingle bell wrist bracelet were presented to the subjects. Elastic one-half inch in width was used to suspend the presented objects. The mobile consisted of an elastic matrix, made by tying one-half inch elastic together to form a rectangular shape eight foot by ten foot, one inch from the top of an eight foot ceiling. Half-inch elastic was then used to connect the sides of the rectangle so that every two feet there was a piece of elastic intersecting the inside of the rectangular matrix. The one-half inch elastic was then used to suspend objects in varying

lengths from the matrix. The objects were attached to the matrix top and suspended on  $\frac{1}{2}$  inch elastic at random, up to 12 inches in length from the top of the matrix. Objects suspended from the matrix included: small balloons filled with uncooked rice; colored ribbons (pink, blue, green, yellow); red, yellow, green and blue cellophane paper; silver, pink and blue metallic paper cut into different geometric shapes; pictures from a Newsweek magazine; Christmas tree ball ornaments; small bird toys; garland (silver, gold and blue); boats made out of construction paper of various colors; and 10 Chinese windchimes evenly dispensed within the mobile matrix. The objects were attached from the top of the matrix so that there was an object hanging every 18 inches within the matrix. Objects suspended from the matrix to each subject were attached to  $\frac{1}{2}$  inch elastic so that any movement 3 inches by the subject resulted in the entire matrix moving at least 2 inches up and down. An audible timer, a Casio pocket watch electronic calculator PW-80, was used to indicate the time intervals for data collection.

#### Procedures

A 5 inch long soft animal squeeze toy, a 7 inch long flower rattle, a 9 inch hour glass toy filled with blue and white beads and a 6 inch jingle bell wrist bracelet were provided to the subjects in both experimental conditions. Objects presented remained stationary while subjects were rotated in a clockwise movement for each data collection session. The objects were presented so that one object was present directly at midline and within 1 foot of each subject's head, within each subject's range of motion and 6 inches above each subject's

tabletop. Subjects were positioned according to the specifications noted in the setting portion of the paper. Data were taken using a 10 second observation interval and a 10 second recording interval (Favell, 1977). Data collection began within 1 minute of presentation of the objects to all subjects. Data collection began with an initial subject and then was taken on each subject in a clockwise sequence. The timer used to indicate the time intervals was a Casio pocket watch electronic calculator PW-80. Ten, ten second observation intervals were made per subject per session and five sessions per treatment phase occurred. The occurrence of the following environmental interaction variables was checked by the observers as they occurred within the 10 second subject observation interval. Environmental interaction was defined according to the variables listed in Table 2.



Table 2  
Complete List of Environmental Interaction Variables

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-List Variables-	
1. Subject Smiling -	a facial expression showing pleasure, amusement, affection, amazement or friendliness, characterized by an upward curving of the corners of the mouth.
2. Subject Vocalizations -	any sound emitted through subject's mouth
3. Subject - Object Eye Contact -	eye contact and fixation on presented objects (subjects and peers) for at least 2 consecutive seconds.
4. Subject - Peer Eye Contact -	eye contact and fixation on a peer for at least 2 consecutive seconds.
5. Object Contact -	hand to object contact.
6. Mouthing -	contact with object presented or body part to the subject's mouth.
7. Object Manipulation -	movement of hand or fingers by the subject with presented object.
8. Peer Contact -	hand or arm contact by subject with peer, toy presented to peer or peer's tabletop.

### Research Design

Each subject participated in the experimental sessions in an ABAB design, where A referred to constant toy availability and B referred to constant toy availability and exposure to a toy matrix. The ABAB design demonstrates experimental control through the introduction and removal of specific treatment variables (Gelfand and Hartman, 1976). Criteria for changing conditions was based on the comparison of the observed behavior in each treatment phase of the experimental design.

For the A phase of the experiment, subject-object eye contact with any of the four objects presented to group was considered subject-object eye contact. For the B phase, the entire mobile matrix including objects presented on top of the matrix as well as the specific objects presented to the subjects was considered to be the object presented in subject-object eye contact.

All experimental sessions were held between 8:30 a.m. and 4:30 p.m. One session occurred per day and the total sessions for all treatments were evenly divided between morning and afternoon times. Once the objects were presented the data collector and reliability recorder did not intervene in any way with the subject interaction.

### Reliability

Reliability of the recordings for each behavior was assessed according to the following procedure. Two observers independently recorded the occurrence of the dependent variables for the following phases with the corresponding results. An educational unit supervisor and special education teacher were directed on how to take the data and operational definitions of the dependent variables. Neither was told

of the experimental objectives. Reliability was taken 50% of the time during the initial treatment and reversal phases of each experimental condition. The method of assessing the inter-observer agreement was that of percent agreement (Kelly, 1977; Yelton, Wildman, and Erickson, 1977). Percent agreement was calculated using the following formula:

$$\frac{\text{\# of Agreements}}{\text{\# of Agreements} + \text{\# of Disagreements}} \times 100 = \text{Percent Agreement}$$

Average reliability for all phases of the experimental conditions was 94%. All percent agreements calculated for the occurrence and nonoccurrence of the dependent variables ranged from 91% to 97% for all reliability sessions. An agreement for occurrences was defined as both observers recording an occurrence or a nonoccurrence of a behavior in a given time sample interval. Disagreements were defined as the number of behaviors within a given time sample interval not agreed upon by both observers.



## Chapter 4

### Results

This experiment asked three questions. First, what is the rate and type of environmental interaction when objects were made constantly available to the subjects. Second, what is the rate and type of environmental interaction when objects were made constantly available to the subjects and a mobile matrix was also provided. Third, which variables indicated an increase when both conditions were compared.

The data indicated that the B treatment or mobile matrix was superior in increasing all target behaviors except mouthing and eye contact when compared to the A treatment or constant toy availability.

Results shown in Figure 1A indicate that each subject demonstrated a higher rate of object manipulation under the initial B condition (mobile matrix) when compared to the initial A condition (toy availability). During the reversal to the A condition, object manipulation declined for each subject and again increased during the return to the B condition.

Figure 1B indicates that each subject demonstrated a higher rate of eye contact with objects and peers during the initial B condition when compared to the initial A condition. During the reversal to the A condition, eye contact with objects and peers declined for each subject and then increased during the return to the B condition.

Figure 1C indicates a decrease in mouthing behavior by three of

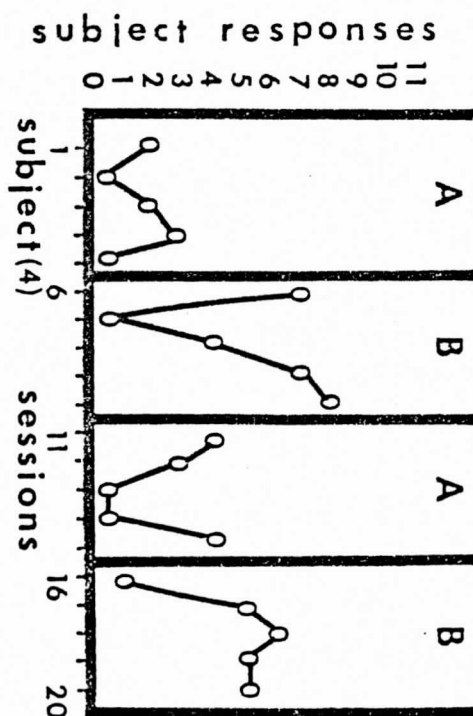
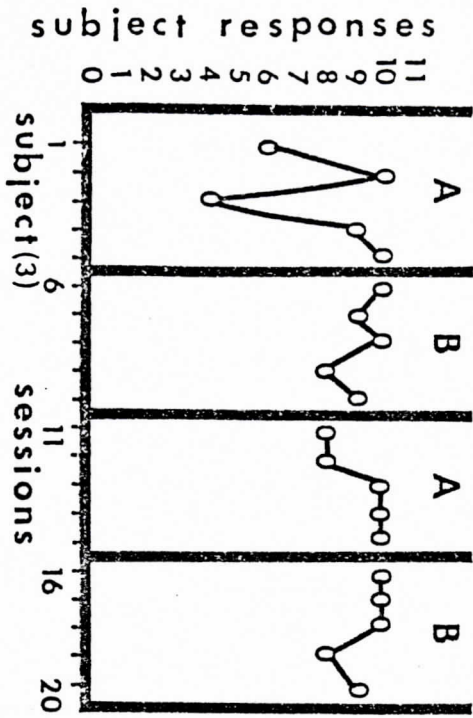
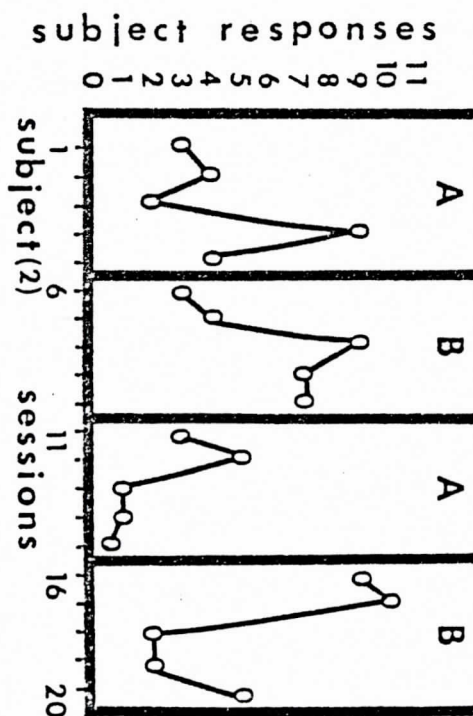
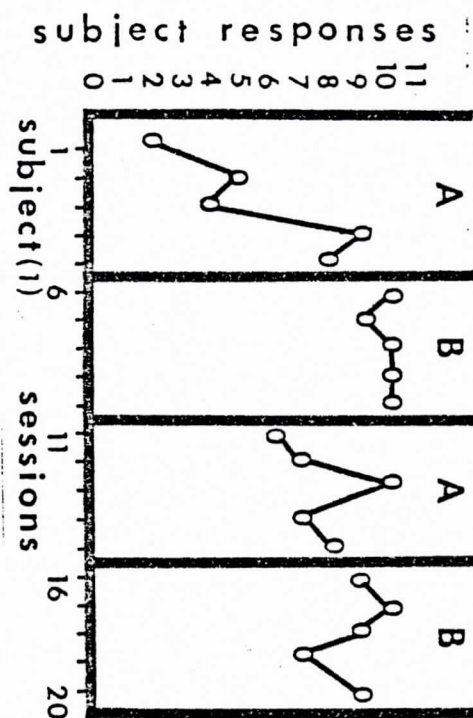
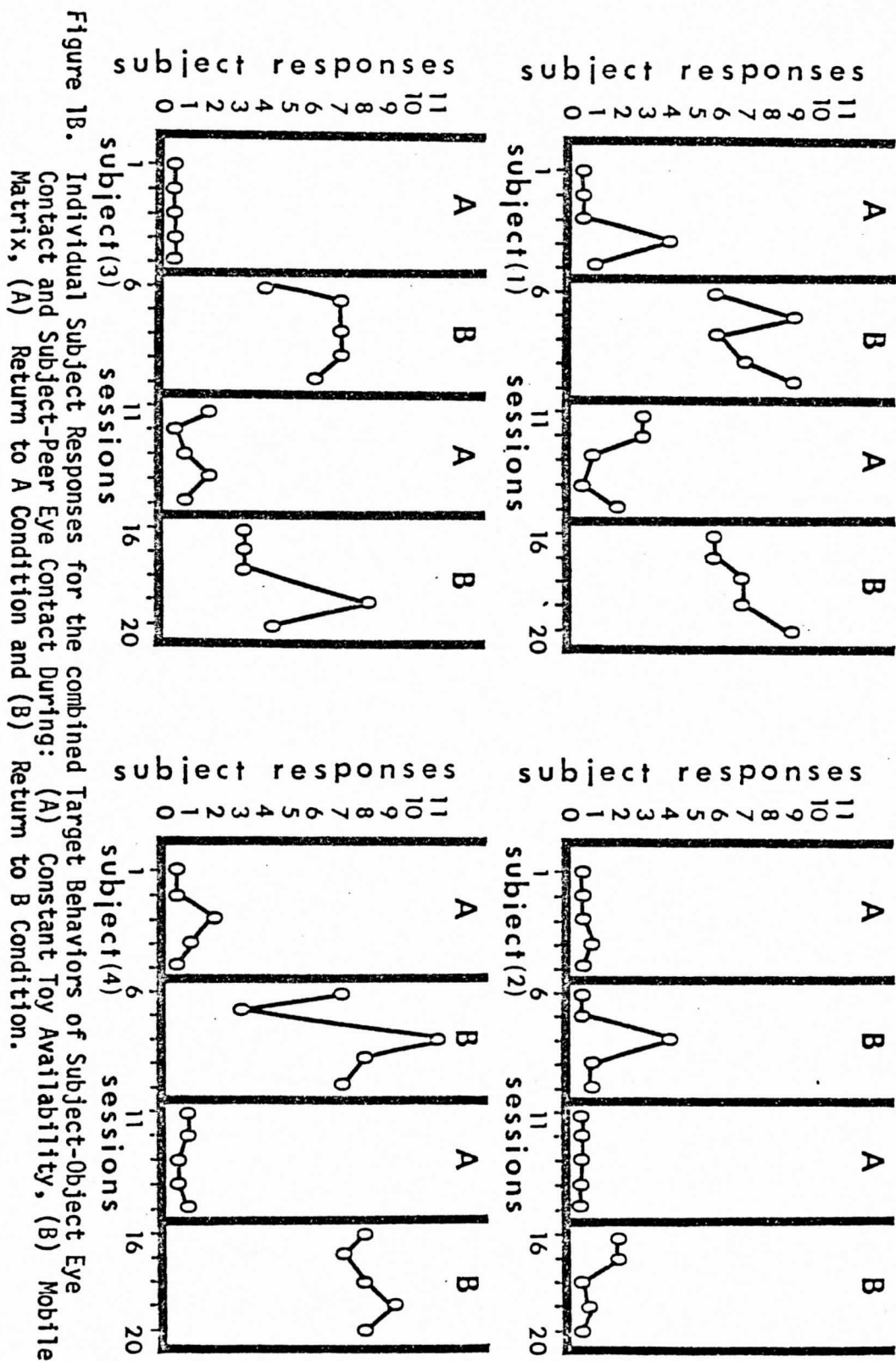


Figure 1A. Individual Subject Responses for the Target Behavior of Object Manipulation During:  
 (A) Constant Toy Availability, (B) Mobile Matrix, (A) Return to A Condition and  
 (B) Return to B Condition.



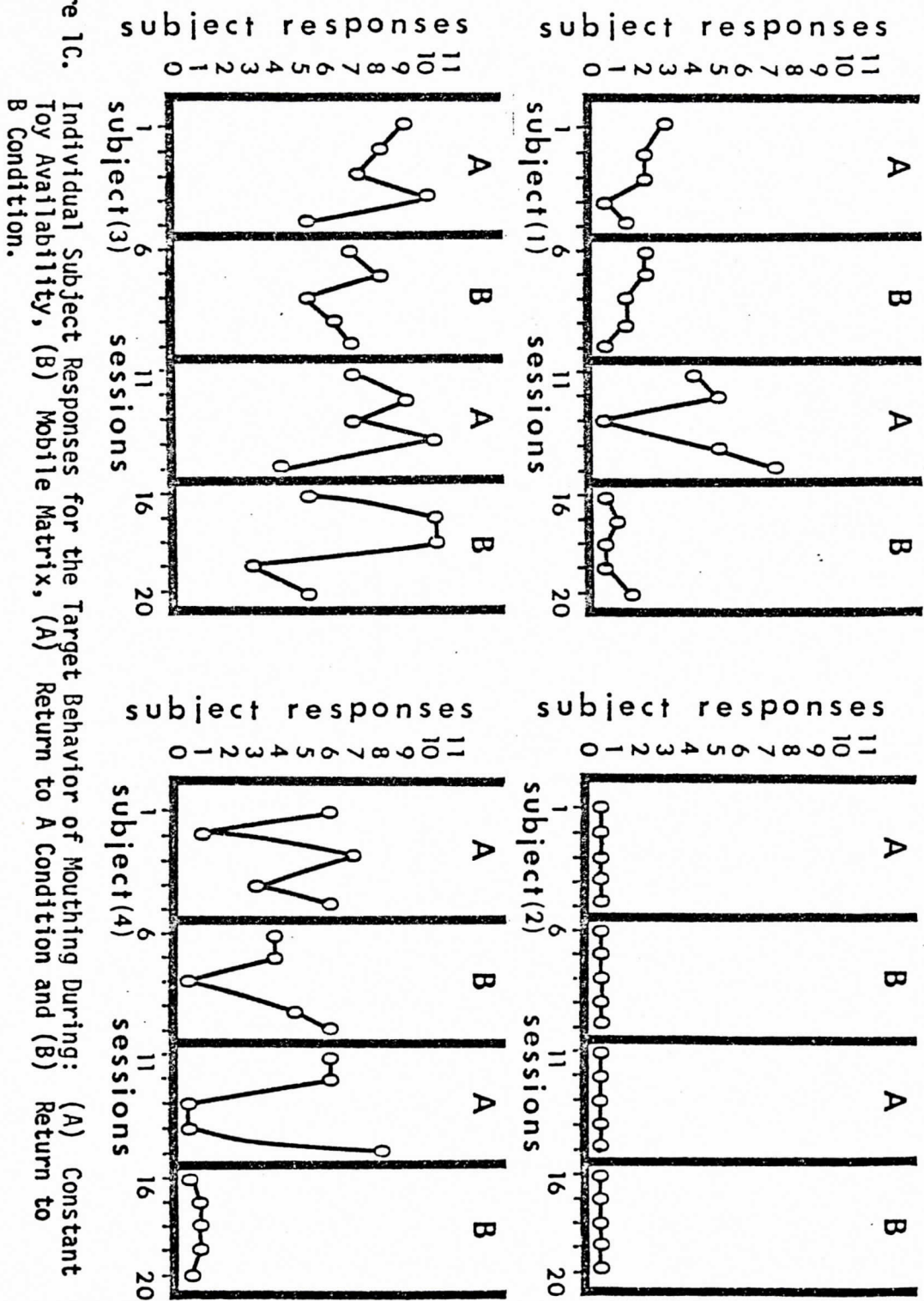


Figure 1C. Individual Subject Responses for the Target Behavior of Mouthing During: (A) Constant Toy Availability, (B) Mobile Matrix, (A) Return to A Condition and (B) Return to B Condition.



the four subjects under the initial B condition when compared to the initial A condition. One subject did not demonstrate mouthing behavior in either condition. The reversal to the A condition indicated a higher rate of mouthing for the three subjects. When returned to the second B condition, a decline in mouthing occurred for the subjects.

A comparison of the A and B treatments indicated that there were slight differences in subject responses for the remaining environmental variables, which were not represented graphically in a figure. Each subject showed a slight increase in peer contact under both B conditions when compared to the A conditions. Three of the four subjects demonstrated a slight increase in smiling and vocalizing under the B conditions when compared to the A conditions and object contact showed a slight increase under the A condition when compared to the B condition of this study. It should be noted that object contact was not subsumed into object manipulation during the data sessions. This was done to differentiate between active toy play and in many cases passive interaction other than subject-object contact.

Object manipulation, subject-object eye contact, subject-peer eye contact and mouthing were the variables which demonstrated the greatest change between treatments.

### Summary

The data indicated that the B condition or mobile matrix was superior in increasing all target behaviors except mouthing and eye contact when compared to the A condition or constant toy availability. Mouthing showed a decline in both B conditions and object contact showed a slight increase in the first A condition. The variables

which showed the greatest change were object manipulation, subject-eye contact with objects and peers and mouthing. Experimental control was demonstrated through the ABAB design for all subjects with the object manipulation and eye contact with objects and peers variables. Experimental control was also demonstrated with three of the four subjects who exhibited mouthing behavior. There was an increase in peer contact under the B treatment when compared to the A treatment. Smiling and vocalizing also showed a slight increase under the B condition and object contact showed a slight increase under the A condition when compared to the B condition of this study.

## Chapter 5

### Discussion

This experiment determined the type and rate of environmental interaction by four profoundly retarded, multiply handicapped, institutionalized persons, when they were provided with constant toy availability and constant toy availability with a mobile matrix. Data collected using an ABAB design was also used to compare the two experimental conditions and to determine which environmental variables exhibited by the subjects might be considered for further research in this area.

Results indicated that overall subject exploratory behaviors, with the exception of mouthing and object contact, were higher under the mobile matrix condition when compared to constant toy availability. Object manipulation, subject-object eye contact, subject-peer eye contact and mouthing were determined to be subject exploratory behaviors that were most prevalent and more sensitive to change between the two experimental treatments. The mobile matrix proved to be superior in increasing each subject's object manipulation and eye contact skills while also decreasing mouthing behavior.

#### Subject Exploratory Responses When Exposed To Constant Toy Availability

Data indicated that object manipulation, mouthing and subject vocalizations were the most prevalent behaviors under the A experimental condition. An average of both treatment phases indicated that object manipulation for all subjects occurred 50% of the time.



Mouthing occurred 37% of the time and vocalizations occurred 25% of the time. Smiling, subject-object eye contact, subject-peer eye contact, object contact and peer contact occurred less than 1% of the time under the A conditions of this study.

#### Subject Exploratory Responses When Exposed To Constant Toy Availability And A Mobile Matrix

Data showed that under this experimental condition, object manipulation, vocalizing, subject-object eye contact, subject-peer eye contact and mouthing were the most prevalent subject exploratory behaviors. Object manipulation for all subjects occurred 72% of the time. Vocalizing occurred 34%, while mouthing was evident 24% of the time. Subject-object eye contact occurred 30% and subject-peer eye contact occurred 22% of the data sessions. Smiling and peer contact were evident 1% of the time and object contact took place less than 1% of the time in this experimental phase.

#### A Comparison Of Subject Responses With The Two Experimental Phases

A comparison of single subject responses in both treatment conditions indicates the mobile matrix produced increased response rates for each subject in object manipulation, eye contact with objects, eye contact with peers and peer contact, when compared to toy availability. Three of the four subjects showed a slight increase in smiling and vocalizations during the mobile matrix condition. Each subject showed a decrease in mouthing behavior during the mobile matrix condition and a slight increase in object contact was demonstrated by two of the four subjects during the toy availability treatment.

The most obvious increase in each subject's responses for both

experimental conditions was in the areas of eye contact with objects and eye contact with peers. Experimental control was demonstrated for each subject in the area of subject-object eye contact using an ABAB design. As a group, subject-object eye contact increased from 1% during the constant toy availability condition to 30% under the mobile matrix condition. Since the mobile matrix was considered to be the presented object, the opportunity to observe a variable not available during toy availability could have resulted in such an increase. Visual and auditory stimulation provided by the mobile matrix could also have contributed to the increase in subject eye contact. Visual attending is a behavior considered to be prerequisite to other higher level skills. Visual attending to environmental stimuli can also be thought of as a preferred behavior especially within an institutional setting. The data results imply that the mobile matrix provides an inexpensive and more effective alternative than constant toy availability in eliciting eye contact with presented objects and can be a useful environmental design for promoting eye contact behavior.

Subject-peer eye contact also increased under the mobile matrix condition. Experimental control for each subject was demonstrated through the ABAB design. In condition A subject-peer eye contact occurred less than 1% of the time. In the B phase it occurred 22% of the time. Since no other object or change in the definition of subject-peer eye contact occurred in either condition this data demonstrates the mobile matrix itself could be useful in promoting subject social behavior through increased subject-peer eye contact. Literature

indicates that toy novelty can be used to facilitate social behaviors with first graders (Linford and Linford, 1977). The mobile matrix itself, as well as the variable auditory and visual feedback it provided, could have increased subject-peer eye contact.

Object manipulation by all subjects showed an increase during the mobile matrix condition when compared to toy availability. Experimental control was also demonstrated for all subjects using an ABAB design. Under the A condition (toy availability), total subject responses occurred 50% of the time. This data agrees with Favell and Cannon (1976) results which indicated a 55% object engagement with severely handicapped institutionalized persons when toys were made available to them. Subject object manipulation behavior increased to 72% during the B condition (mobile matrix), demonstrating the mobile matrix superiority in increasing the rate of object manipulation responses when compared to toy availability. Other research demonstrated that increasing the number of toys provided within a given area can increase toy manipulation (Jones, 1975). The maximum engagement by the four profoundly retarded, institutionalized subjects in the Jones study was 59% and that occurred with three objects presented. The mobile matrix treatment made one toy available to each subject and demonstrated higher rates of engagement by the subjects. The mobile matrix data suggests that the type of feedback provided may be more effective in eliciting toy engagement than increasing the number of objects presented.

Mouthing by the subjects was reduced from 37% of the time in the A condition to 22% of the time in the B condition. Experimental



control was demonstrated for the three subjects who exhibited mouthing behavior through the ABAB design. The reduction in subject mouthing behavior in conjunction with the overall increase in externalized subject responses implies that the mobile matrix may be useful in facilitating the externalization of subject behaviors. Internalized behavior is a condition found in many profoundly retarded, multiply handicapped institutionalized persons and the mobile matrix may prove useful in reducing its occurrence while providing an alternative appropriate behavior.

Vocalizing, peer contact and smiling did not show any great change between both treatment conditions. The institutional environment could possibly be responsible for the low rates of the above variables.

#### Further Research

The mobile matrix proved to be more effective in increasing positive environmental exploratory behaviors while decreasing mouthing behavior for all subjects than did constant toy availability. A comparison of total subject responses in both treatment conditions indicated the mobile matrix produced a total of 380 more total responses in the subjects than did toy availability. There were a total of 847 total responses during the mobile matrix conditions and a total of 567 total responses under the constant toy availability conditions.

Further research is warranted to determine which variables in the mobile matrix design produced changes in subject exploratory behavior. Also, a longer time study could also be used to determine what effect habituation to the mobile matrix might have on subject



exploratory behavior and what variation to the matrix might maintain or increase environmental exploratory play durability.

The need to develop environmental designs and leisure activities for the severely handicapped is well documented (Wehman, 1978). At the Western Carolina Center nonambulatory unit where I am a special education teacher, most toys are made available by a mobile attached from the back of the clients' wheelchair. This experiment demonstrated that constant toy availability may not be the most effective way to elicit environmental responses with the profoundly retarded, multiply handicapped person. It should also be noted the mobile attachments for the back of the wheelchairs are frequently misplaced and pose a management problem, leaving residents many times without objects available to them. This is especially a concern with nonambulatory persons. Wehman (1978) has demonstrated that toy proximity can increase subject play behaviors. Further research can be done to compare the semipermanent mobile matrix structure to other forms of object availability.

The profoundly retarded, multiply handicapped institutionalized person rarely has purposeful social interaction with peers. The mobile matrix increased subject-peer eye contact and subject-peer contact. The placement of the presented objects suspended from the mobile matrix need further study. Since the subjects did increase eye contact with each other as well as actual contact with peers and their objects, the placement of presented objects between subjects instead of in front of each individual subject might facilitate more subject social behaviors. Further research needs to be done to

determine various object designs and placements within the mobile matrix and their effect on the types and frequency of subject social behaviors. Contingencies placed on the occurrence of subject social play prior to mobile activation could also be researched.

The mobile matrix also reduced mouthing behavior for all subjects who exhibited it when compared to toy availability. Internalized behavior is a condition found in many profoundly retarded, multiply handicapped institutionalized persons. Although other internalized self stimulatory and inner directed behaviors were not taken in this data, results of the mouthing decrease in conjunction with the overall increase in externalized subject responses gives impetus to further research in the use of the mobile matrix in facilitating externalization of other inner directed behaviors. The use of the mobile matrix in decreasing negative subject behaviors could also be researched as well as the most effective behavior change procedures to use in conjunction with the mobile matrix design.

The mobile matrix could also be used as a teaching tool with the profoundly retarded multiply handicapped person. The high rates of object engagement indicate the mobile matrix had a reinforcing consequence to the subjects. In addition to reaching a variety of curricular behaviors from bilateral teaching to different types of object schemas to various communicative behaviors, the mobile might also be useful in helping to maintain and generalize subject skills. The use of the mobile matrix as a leisure activity design within the institutional setting should also be explored.

### Summary

The need to further research and develop environmental designs for leisure activities with profoundly retarded, multiply handicapped institutionalized persons continues to exist. The comparison of constant toy availability and constant toy availability with a mobile matrix was made using an ABAB experimental design.

Results indicated that the mobile matrix was more effective in increasing overall subject exploratory behaviors while decreasing subject mouthing behavior when compared to constant toy availability.

Further research is warranted to determine which variables in the mobile matrix treatment produced subject behavior change. The use of the mobile matrix to develop and increase various positive subject behaviors and decrease internalized and negative subject behaviors also needs to be explored. Mobile modifications and durability in developing, maintaining and increasing subject responses should also be checked. The mobile's potential use as a leisure activity design is also evident. A total cost of twenty-five dollars in the mobile matrix construction presents an inexpensive and effective means of providing an environmental design to facilitate exploratory behavior with profoundly retarded, multiply handicapped institutionalized persons.

Reference Note

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## VITA

Kurt John Murgo was born in New York City on October 16, 1950. He graduated from Freeport High School, located in Freeport, New York, in June 1968. The following September he enrolled in Fredonia State College located in New York, and received a B. S. degree in Secondary Education in 1973. The next year he worked as a substitute teacher throughout Nassau County, located on Long Island, New York. In 1974, Mr. Murgo began employment at the Suffolk Child Development Center in Bayshore, New York. For two years he worked as a team teacher with 12 adolescents diagnosed as emotionally disturbed and autistic.

In September, 1976, he moved to Morganton, North Carolina and accepted employment with Western Carolina Center, directing a functional lifestyles workshop with 15 severely handicapped students. In 1978, he received certification in Special Education from Appalachian State University. Mr. Murgo began working towards a Master's of Arts degree in Special Education in January, 1980. In May, 1982, he earned his Masters of Art degree with concentrated study in the area of severe and profound mental retardation.

Mr. Murgo continues to be employed at Western Carolina Center and now works as an Educational Specialist with severely and profoundly handicapped individuals.