UNIVERSITY OF WASHINGTON
DEPARTMENT OF PSYCHOLOGY
BAILEY AND BABETTE GATZERT
INSTITUTE OF CHILD DEVELOPMENT
SEATTLE 5

Nursery School
Child Development Clinic

Research Laboratories

July 7, 1961

Dr. E. J. Engburg
Superintendent
Faribault State School and Hospital
Faribault, Minnesota

Dear Dr. Engburg:

On September 16, I will assume duties as Assistant Professor of Educational Psychology at the University of Minnesota. One of my major responsibilities will be to develop a research program in the area of training and education of the mentally retarded.

The purpose of this letter is to express our desire to conduct research projects at Faribault and to request basic space for these activities. We are aware of pervading space shortages in all institutions for the retarded, but since our program promises to be a long term operation we would like to investigate the possibility of establishing relatively permanent research laboratory facilities. Ideally, we would like to be assigned an approximately classroom-sized room in which we would be permitted to construct partitions and install experimental apparatus. Since most of the research will consist of laboratory experiments, and residents will be requested individually for short periods of time (from 20 to 60 minutes) at irregular intervals (ranging from once a week to once a day), a central location within the institution would be best suited. If possible, a small office-waiting room close to the laboratory would be very desirable. I am enclosing a reprint of our article describing my present laboratory at Rainier School to give you an idea of the kind of facility we envision.

Although the program primarily will involve graduate students in Educational Psychology and Special Education who will be conducting thesis research for advanced degrees, faculty members in Child Development, Psychology and Special Education also have expressed interest in participating. Since all personnel would be University faculty and students, we would not be requesting any time from your institutional staff.

Initial funds for equipment and apparatus are being supplied by the University. We shortly will be applying for a research grant to provide future financial support. This application will ask for a three year grant period.

We hope that you will give us an informal reaction to these plans. Professor Maynard Reynolds and I would like to visit with you sometime toward the end of September for a discussion of formal arrangements. At that time we can also spell out in detail the kinds and purposes of research to be done, and the relationship our program might have with educational objectives at Faribault.

Looking forward to hearing from you soon.

Sincerely,

Robert Orlando, Ph.D.
Research Assistant Professor

RO:je
Enclosure

cc: Dr. Maynard Reynolds
Department of Education
14 Pattee Hall
University of Minnesota
Minneapolis 14, Minnesota

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A LABORATORY FOR THE EXPERIMENTAL ANALYSIS OF DEVELOPMENTALLY RETARDED CHILDREN[1,2]

ROBERT ORLANDO, SIDNEY W. BIJOU,
RUSSELL M. TYLER, AND DAVID A. MARSHALL

University of Washington

Laboratory methods for the study of learning, conditioning, perception, and motivation in children have recently been adapted from techniques developed for infra-human Ss by Skinner and by Harlow. Appropriately modified, the free-operant situation and the Wisconsin General Test Apparatus have been put to use in the study of human behavior (e.g., Bijou, 1957; Lindsley, 1956; Zeaman, House, & Orlando, 1958). Little experimental rigor and control has been lost in the process of adjusting the techniques for human Ss. It has now become possible to study human behavior without sacrificing the precision and objectivity which characterizes most animal research.

The purpose of this paper is to describe a laboratory which incorporates these methods for research with developmentally retarded children[3] and some of the modifications that have been made in tailoring them for this group. The plan of the presentation is to discuss in turn the physical layout, features of each experimental situation, and control and recording operations. In addition, some of the special considerations of laboratory research in an institutional setting are presented, primarily with respect to operational routines and unique characteristics of the *Ss.*

LABORATORY LAYOUT

The laboratory is located on the ground floor of the centrally located hospital building. It consists of a classroom-sized space, subdivided into an office, a small shop, a waiting room, an observation-control room, and three experimental units. Fig. 1 is a schematic floorplan showing the spatial arrangement and relative size of the rooms. Noteworthy features of each unit, identified by small letters, are listed in the legend.

EXPERIMENTAL UNITS

Modified Wisconsin General Test Apparatus (WGTA)

The WGTA consists of a vertical screen which separates *S* and *E* who sit at tables facing the screen on opposite sides. The opaque 6 ft. high and 4 ft. wide screen is equipped with two small one-way windows which permit *E* to observe *S. A* sliding tray, approximately 18 in. wide and 12 in. deep, is

The laboratory is located at the Rainier State School for the Retarded, Buckley, Washington. Superintendent is Dr. Wesley D. White.

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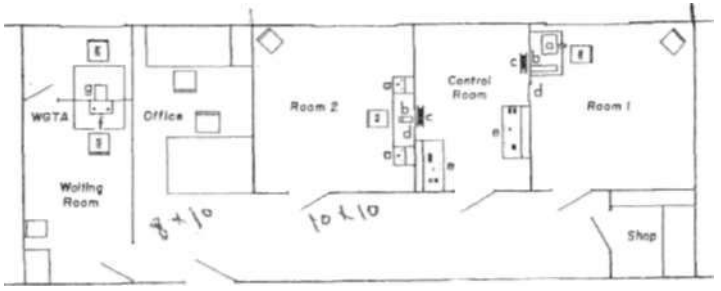
"Developmentally retarded" is used here in place of "mentally retarded" following the practice of Cameron & Magaret (1951).

mounted on the tables with drawer slides in such a way that *E* may push it out to *S*. When withdrawn, the surface of the tray is not visible to *S*.

Two recessed wells, 2 in. in diameter, are spaced 12 in. apart in the tray. These cups are covered by stimulus objects or patterns mounted on 4-in. square slabs. Ss task is ordinarily to select one of the two stimuli on each trial. If correct, the choice is rewarded with a piece of candy in the cup beneath. After a choice is made, *E* withdraws the tray, substitutes or rearranges the stimuli, "baits" the correct choice with candy, and re-presents the tray to *S*.



LABORATORY LAYOUT

FIG. 1. Schematic floorplan of the laboratory, showing arrangement and relative size of the rooms. Response boxes are labeled "a"; reinforcer delivery chutes, "b"; dispensers, "c"; one-way windows, "d"; control panels, "e"; WGTA sliding tray, "f; and Hunter Card Master, "g".

Fig. 2A shows S's side of the apparatus. The tray is in the presented position, showing one of the stimulus objects displaced (the candy in the well reveals that the choice was correct). An aperture between the one-way windows (not shown) can be used to present stimulus materials by means of a Hunter Card Master which is mounted on E's side of the screen. Reinforcements can be delivered automatically to the receptacle on the right side of *S's* table, providing for situations in which reinforcement independent of the sliding tray is required.

Stimulus objects include a wide variety of two- and three-dimensional items which vary in size, color, shape, and texture. Words, pictures, and other meaningful materials are easily presented with the Card Master, and verbal as well as manual responses are often required.

The Free Operant (Single Response Situation)

The single response unit is a relatively soundproofed, 9-ft. by 11 -ft. room furnished with a small table and two chairs. A small one-way window alongside the table and an intercom slave unit high on the wall permit full visual and

"Model 340, Hunter Manufacturing Co., Inc., Iowa City, Iowa.

auditory observation from the control room. Illumination is provided by a 300-w frosted bulb in the center of the ceiling and sunlight from an airshaft-facing window.

A sturdy wooden box, 12 by 12 by 16 in., is fixed to the top of the table and a dispenser chute, extending from the wall, leads to a receptacle next to the box. The response lever, which is made from the metal handle grip for the squeezer of an O'Cedar sponge mop, protrudes 3 in. from the front face of the box, and moves about 4 in. vertically when a 150-gm. force is applied. Usually, a full downward and upward excursion is required, but it is possible to allow a shorter stroke for special purposes.

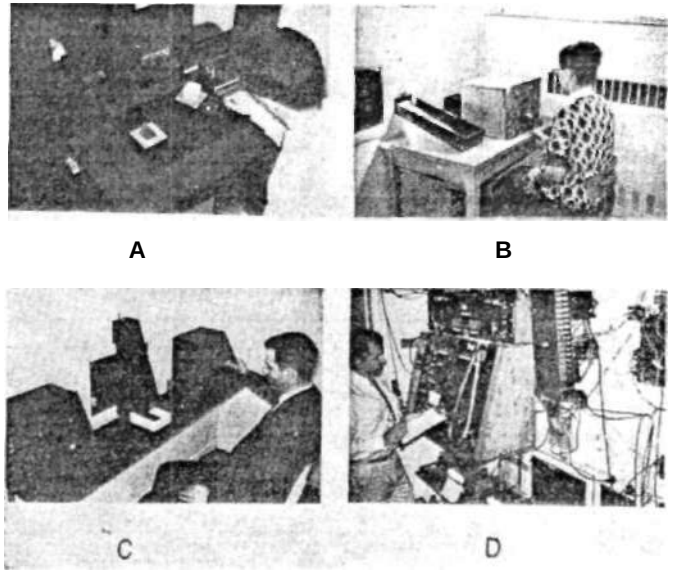


FIG. 2. Photographs of experimental units and a control panel. A is *S's* side of the WGTA; B is the single response free operant; C is the two response free operant; and D is the control panel for the two response free operant.

On either side and above the lever on the face of the box are 1-in. jewel lights, one blue and the other red. These lights are mounted in an interchangeable panel, so that different numbers, colors, or arrangements of lights can be employed. Inside the box are a variety of noise-producers, including a buzzer and a loud "clacker," which can be used as auditory stimuli. A small white jewel light in the wall directly over the reinforcement chute functions as a "bridge" by being illuminated for 3 sec. with each dispenser operation.

Fig. 2B shows the equipment in the single response room. In the photograph can be seen the response box, the stimulus lights, the reinforcement chute, and the one-way window. *S* is sitting in the child-size chair, but an adult-size one is also in the room.

The Free Operant (Multiple Response Situation)

The multiple response operant situation is identical to that for the single response situation with the exception of response devices and stimulus lights. At the present time, two small wooden boxes, approximately 12 in. square, with sloping front faces are mounted on a horizontal 5-ft. shelf fixed to the wall. Each box is equipped with a Lindsley-type manipulandum. These levers, which are spaced about 4 ft. apart to discourage "double pulling," are operated by pulling the knob out about 1 in. with about 150-gm. force. When released, the lever returns to its original position.

Each box is also supplied with two jewel lights (a red and a blue), one on either side and just above the lever. A reinforcement dispenser chute is centered on the shelf between the two boxes, just in front of the one-way window. In addition to the buzzer used in the single lever unit, a chime mechanism which includes single note, double note, and repeating chimes is mounted on the wall for auditory stimulus events.

Fig. 2C shows the multiple response situation. In the photograph can be seen the response boxes, stimulus lights, the reinforcement chute, and the one-way window. *S* is operating the right lever and *is* looking at the reinforcement delivery tray.

CONTROL AND RECORDING

The control room is equipped with manual and automatic devices for programming stimulus events and reinforcement schedules in the two free operant situations. The equipment is similar to apparatus developed for use with infra-human 5s (Ferster & Skinner, 1957) and consists primarily of tape-programmers, timers, relay circuits, and Universal Feeders. Flexibility is provided by manual control switches and the use of snap-lead circuits, unit-components types of apparatus.

Impulse counters and cumulative recorders are used to collect permanent records for later analysis. The counter readings and recorder graphs, along with identification of *S,* date, experiment name, session number, schedule of reinforcement, and other relevant information, are placed on pages of loose-leaf binders.

In addition to the one-way windows, pilot lights in the control room allow monitoring of stimulus and response events occurring in the experimental rooms. This feedback system insures against undetected apparatus failure (e.g., burned-out light bulbs) and also makes convenient the precise control of manually operated experimental contingencies.

Fig. 2D shows the control panel for the two-response situation. In the photograph can be seen the continuous-belt Universal Feeder which dispenses reinforcements *via* a chute through the wall, one of the tape programmers used to schedule stimulus events and reinforcements, the monitoring light panel, control switches, and the counters and cumulative recorders. A similar panel on the opposite side of the control room independently programs and records events in the single lever situation.

OPERATIONAL ROUTINES

Subject Selection and Procured

A file containing an index card for each resident of the institution is maintained in the laboratory. These cards include salient information for each *S* and are used to select *Ss,* make certain that experimental histories are known, and for analysis of subject-variables. Of the more than 1800 residents, over half meet initial criteria for study in the laboratory (e.g., ambulatory, appropriate age range, non-blind, etc). This available population includes a wide range of behavioral and physical attributes, but at the same time is large enough to provide relatively homogeneous samples when needed for specific purposes. For example, stratified samples of *Ss* can readily be obtained for the evaluation of such factors as IQ, CA, length of institutionalization, and diagnostic category.

Procural is accomplished primarily by telephone. For initial sessions, *S* is guided to the laboratory by £ or by a resident-apprentice. Usually, *Ss* who return for subsequent sessions, often on a daily or weekly basis, are able to proceed by themselves to and from the laboratory on request.

Session Control

A rigid routine is maintained for control of *Ss* entering and leaving the laboratory. Arriving *Ss* always go directly to the waiting room (even if *E* is ready to start the session) and return to the waiting room after rhe session is completed. This procedure tends to prevent enthusiastic *Ss* from bursting into a room still in use or leaving the laboratory without *E's* knowledge. Also, conditions for giving instructions and exchanging tokens (if used) are somewhat standardized, and *Ss* have an opportunity to consume candy saved from the session, minimizing the chances for disturbances in the classroom or dormitory.

Since the doors of the experimental units are not locked, Ss may occasionally "pop out" (to show *E* the reinforcers, indicate a desire to leave the room, etc.). This behavior is discouraged by terminating the session after three such pops. Most *Ss* quickly learn rhat frequent excursions from the experimental room result in withdrawal of the opportunity to earn reinforcers. Destructive tendencies are similarly discouraged by terminating sessions if a repetition occurs after one instruction to desist.

Reinforcers

Customarily, all *Ss* are begun on small pieces of readily consumed candy as reinforcers, including M & M's, Hersheyettes, mint coin-wafers, candy corn,

etc. For most experiments, *Ss* who refuse candy are discarded. In other cases, especially with older and more capable 5s, those that refuse candy or indicate that they don't particularly care for it are introduced to the "token" procedure on the second session. Shown a selection of reinforcers (candy, pennies, gum-machine trinkets, cigarettes) and a handful of tokens (small wooden cylinders cut from a dowel), *E* explains that the tokens earned during the session may later be exchanged for whichever reinforcement *S* prefers. After a practice exchange in which a single token is traded for a reinforcer, *S* is introduced into the experimental room with the instruction to earn as many tokens as he can and that he will later be able to trade them for whatever he likes.

The token procedure insures that *S* is operating for the most effective available reinforcer at any one time (which may change from day to day) and permits manipulation of "motivational" factors by adjusting the exchange rate. For example, satiation effects can often be attenuated by the simple procedure of requiring more tokens per reinforcement. In addition, intra-session variability resulting from manipulation of cumulated reinforcers tends to be reduced.

A different kind of reinforcer *is* provided by a Busch Cinesalesman self-contained sound movie projector which plays a continuous loop of film (about 20 min. worth). This machine can be quickly installed in either free operant situation and can be used with or without the dispenser chute. Cartoons are presented or withdrawn for 5- to 15-sec. durations contingent on lever responses, and are programmed in the same way as other reinforcement events. This device allows use of non-tangible reinforcement and can be used to study such factors as "punishment" (in the sense. of positive-reinforcement withdrawal).

Instructions

Under the assumption that instructions may function as drive operations and/or discriminative stimuli, a minimum are given. For initial sessions, *E* enters the waiting room and says, "Now it is your turn to get some of these (showing a handful of reinforcers). Come with me." Ushering *S* into the experimental room, he says, "Sit in this chair." (Indicating the chair in front of the response panel.) Instructions from this point depend on *S's* behavior. (a) If *S* presses the lever on his own, he is reinforced for the fifth response. *E* says, "I'll be back when it is time to go," and leaves the room. (b) If *S* waits for instructions, *E* says, "Now watch me; I'll show you how we get candy here. *(E* presses the lever 5 times at a rate of approximately 2/sec. and the fifth response is reinforced.) See, here is some candy. It is yours. Take it. Now you do it. You get candy." (c) If *S* proceeds to press the lever, his fifth response is reinforced and *E* leaves the room as in the previous case saying, "I'll be back when it is time to go." (d) If *S* does not press 5 times, *E* demonstrates again, followed by the same instructions beginning with, "Now you do it." (e) If *S* still does not respond on his own, *E* takes S's hand and works the lever with him, followed by the usual instruction. Very few *Ss* fail to emit the required 5 independent responses before step (e) is reached.

Subsequent sessions are preceded by the instruction, "It's your turn again. I'll be back when it is time to go," and all sessions are terminated with "That's all for today. Go and sit in the waiting room." Questions and comments by *S* are treated with non-directive repetition of instructions content.

SUMMARY

A laboratory for the experimental analysis of developmentally retarded children has been described. The experimental situations are modifications of free-operant and Wisconsin General Test Apparatus methods originally developed for infra-human *Ss.* In addition to the physical layout and features of the laboratory, operational routines, special considerations in laboratory research in an institutional setting, and unique characteristics of the retarded population are discussed to illustrate the laboratory approach for research with developmentally retarded children.

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Accepted August 6, 1960.

July 21,1961

Dr. Robert Orlando
Department of Psychology
University of Washington
Seattle 5, Washington

Dear Dr. Orlando:

Dr. Engberg and I have discussed your request for research facilities at this institution and are most interested in complying with it. Between now and the time of your first visit we will explore the possibilities of providing certain areas with others on the staff here and with persone1l in the State Department of Public Welfare. We should certainly have a definative answer when you arrive in September.

We look forward to your working in Minnesota and hope we can establish mutually beneficial relations.

Sincerely Yours
Arnold A. Madow
Cheif Psychologist

AAM:rm
Dr. E. J. Engberg
Dr. Howard Davis
Mr. Meynard Reynolds