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ABSTRACT

Research evaluated captioned educational films for the deaf for possible use in classes with normal hearing slow learners. Specifically, the project sought to determine the effects of captioning on attention, vocabulary level and reading ability, using conjugate reinforcement as an evaluation procedure. The results indicated that, under certain conditions, students emitted a greater effort (responses) to see a captioned as opposed to a non-captioned filmstrip presentation. However, the differences between reading levels and between the educable mentally handicapped students and the control groups of normal students were not significant. Additional research should be undertaken to control the periods of time for which captioned versus non-captioned slides are presented and to determine the effect of audio stimuli. (Author/PB)

SPECIAL REPORT #742
Walter H. Winchell
March 1974

THE APPLICATION OF CONJUGATE REINFORCEMENT TECHNIQUES TO EVALUATE STUDENT PREFERENCE FOR ALTERNATE MEDIA

Walter H. Winchell

ABSTRACT

An attempt was made to explore the use of captioned media for the deaf with normal hearing, slow learners. Specifically, the researcher sought to determine the effects of captioning on attention, vocabulary level, and reading, using conjugate reinforcement as an evaluation procedure. The subjects were elementary level educable mentally retarded (EMR) and normal children. The results indicated that, under certain conditions, students will emit a greater effort (responses) to see a captioned vs. non-captioned filmstrip presentation. However, differences in reading level and differences between EMR and normal populations were not significant. The researcher suggests areas for further investigation.

SPECIAL REPORT No. 742
COMPUTER-BASED PROJECT for the EVALUATION of MEDIA for the HANDICAPPED

Title: THE APPLICATION OF CONJUGATE REINFORCEMENT TECHNIQUES TO EVALUATE STUDENT PREFERENCE FOR ALTERNATE MEDIA

BY: Walter H. Winchell

BACKGROUND

The Computer Based Project for the Evaluation of Media for the Handicapped, based on contract #OEC-9-423617-4357 (616) between the Syracuse (N.Y.) City School District and the Media Services and Captioned Films Branch, Bureau of Education for the Handicapped (United States Office of Education) for the five year period July 1, 1969 through June 30, 1974. The major goal is to improve the instruction of handicapped children through the development and use of an evaluation system to measure the instructional effectiveness of films and other materials with educable mentally handicapped (EMH) children, in-service training and media support for special teachers, and studies related to the evaluation process and the populations used.

The Project has concentrated on the 600 films and 200 filmstrips from the Media Services and Captioned Films (BEH - USOE) depository; however, specific packages from Project LIFE, various elementary math curricula, and selected programs from Children's TV Workshop have also been evaluated. The evaluation model used requires that: 1) objectives of materials be specified and written; 2) instruments be constructed to test and measure effectiveness; and, 3) children be the major sources of evaluation information. A number of instruments and methodologies are employed in the gathering of cognitive and affective data from 900 EMH children and 80 special teachers to make the effectiveness decisions. Over half of the EMH population can neither read or write; therefore, a unique Student Response System (SRS) is employed, consisting of a twenty station G.E.-1000 SRS which can be operated in a group or individual recording mode and is connected to a remote computer system. The computer capabilities consist of remote telephone connections to the Rome (N.Y.) Air Development Command, the Honeywell time-shared network, and the Schenectady (N.Y.) G E Research and Development Center; and batch mode capabilities of the Syracuse City Schools, Syracuse University, and various commercial sources.

In-service and media support activities provide on-the-job training for teachers, teacher aides, equipment, and materials to the special teachers in the city schools. The research activities have centered around investigations and special problems related to the development of the evaluation model. The four major areas considered are: 1) testing effects, 2) captioning effects, 3) special student characteristics; and, 4) evaluation procedures validation.

Documentation of the major activities appear in the five annual reports and the 600 evaluations prepared on materials used. Staff members were encouraged to prepare special reports and the attached paper is one of these. The opinions expressed in this publication do not necessarily reflect the position or policy of the Computer Based Project, the United States Office of Education, or the Syracuse City School District, and no official endorsement by any of the agencies should be inferred.

Research Report 742
Walter H. Winchell
March 1974

THE APPLICATION OF CONJUGATE REINFORCEMENT TECHNIQUES TO EVALUATE STUDENT PREFERENCE FOR ALTERNATE MEDIA*

Introduction

Considerable effort has been expended during the past quarter century in the area of assessment of instructional materials and media and their consequent impact upon the learner. Numerous approaches have been employed and some validated in an attempt to generate meaningful summative findings (Lumsdaine, 1963). The literature, however, appears to be somewhat deficient in certain areas, among which are those problems associated with special students and their experiences with instructional media.

Perhaps even more significant is the fact that few studies report the use of children as direct input to the evaluation process. Somehow they seem to have been neglected as an integral component of the "system." However, the present efforts of the Children's Television Workshop (CTW), producers of the programs *"Sesame Street"* and the *"Electric Company,"* as well as the Computer Based Project (CBP) for the Evaluation of Media for the Handicapped are, at least, two notable exceptions.

The Children's Television Workshop actively engages both formative and summative research activities through the participation and subsequent observation of children in their evaluation process; these efforts have been documented by Palmer (1973), Land (1972), and Lesser (1973).

*Presented in Summary form at Association for Educational Communications and Technology Conference, Atlantic City, New Jersey, March, 1974.

A portion of the Computer Based Project's charge is the evaluation of various instructional media, especially the library of captioned educational films for the deaf for classroom application with students possessing other handicaps. The mentally handicapped and emotionally disturbed children constitute the major portion of the field sample used by CBP in the evaluation of instructional media. Another portion of the evaluation effort is concerned with the effectiveness of captioned films upon student learning and attitude.

The evaluation system or model in use at CBP has been described in detail by Bond (1972) and consists of a series of procedures for systematically selecting media, specifying objectives and conducting field tests under controlled classroom conditions, collecting attending behavior profile data, pre/post test criterion measures as well as student and teacher interview data and the like. To date some 400 individual films and filmstrips have undergone such evaluation (Computer Based Project, 1973).

In as much as the captioned materials were originally developed for use by the deaf and hard of hearing student populations, little concern was initially given to their effectiveness when used in the context of normal hearing, slow learners. The present study is one attempt to answer a part of that concern and more specifically to determine what the effects of captioning are upon attention, vocabulary level, and reading ability. The specific questions to be answered are: (1) Does the student attend longer to a slide which has been captioned (with either one, two, or three lines of captioning) than to one which does not

contain a caption? (2) Are indicators of reading level dependent upon a student's performance with regard to reading and responding to the captioned materials? (3) Does the EMR (Educably Mentally Retarded) student respond in a significantly different manner to a student in a "normal" classroom situation?

Two types of instrumentation were used in this study, one for determining the subject's reading level and the other for evaluating his responses to the captioned and uncaptioned materials. A sight-vocabulary word list comprised of representative words selected from the filmstrip and weighted by reading level difficulty was employed to assess a differential level of reading between caption formats. In order to assess the subject's response to the various stimuli, a technique referred to as conjugate reinforcement was employed (Lindsley, 1962; Grass and Wallace, 1969).

Conjugate Reinforcement

In applying conjugate reinforcement as an evaluation procedure, the presentation time of the stimulus (in this instance pictures and an accompanying audio track) is varied in accordance with the subject's response rate. In effect, the subject is required to respond at a predetermined threshold rate in order to maintain the stimulus; failing to do so, the intensity is reduced to a level that is barely perceptible to him, hence, the presence of the stimulus itself serves as the reinforcer.

Conjugate reinforcement has as its early roots the work of B. F. Skinner (1953) in operant conditioning Skinner observed that any emitted response which leads to reinforcement has a higher probability of

reoccurrence associated with it than does a non-reinforced response. Skinner later implied that in an instructional setting operant conditioning might be used as a tool to enhance student learning (1963). In an earlier study, Lewis (1972) cites that the conjugate reinforcement procedure is of value in the measurement of attention since it provides evidence of a functional relationship between a stimulus and an associated response. The present study will assume this to be true and attempts to determine whether or not significant differences do indeed exist in a subject's attending behavior to pictures which have been captioned in the manner specified. Nomeland (1973) essentially used much the same procedure in a study wih deaf students, but did not investigate the effects of reading level.

Lewis (1973) has described in detail the procedures and equipment available at the Computer Based Project for this task. In an earlier study, he found that all subjects did attend to captions as presented, but found their response rates varied markedly throughout the presentation sequence. All of the students had been drawn from lower primary grades and none were selected from special classes.

Method

The subjects were drawn from five classes at Prescott School Syracuse, New York. Three of those classes were special classrooms in the intermediate and primary levels and two were second and third grade students. All students were administered a pre-test of eight selected words from the filmstrip, *'The Brave Little Tailor'* (Walt Disney Productions, 1968) randomly arranged in each of the seven levels of a basic functional wordlist (Tudyman and Groelle, 1963).

During the initial training session, each subject spent three to five minutes in a training session to familiarize himself with the chamber (see figure 3) and the response system (Lewis, 1972). The title slide of the presentation was used for the training session. After each subject showed he understood the operation of the system and felt comfortable about the environment, he was administered the slide-tape presentation. A closed-circuit television camera was used to observe the subject's behavior while in the research chamber.

The filmstrip had been re-photographed onto color slide material such that the captions were randomly distributed throughout in terms of their length and presence. In other words, some frames contained no caption, whereas others contained one, two, or three lines of captions. This procedure was initially proposed by Nomeland (1973) in an effort to control for possible variability in the presentation of captions with a second system, as had been done earlier by Lewis (1973). The slides were projected using a modified Kodak carousel type projector and a coxco cassette recorder was used to supply control signal information as well as a pre-recorded audio narrative of the script to the subject's chamber. In an earlier pilot study, it was found that the addition of this second stimulus did not materially affect a subject's response, but rather gave him confidence in the presentation experience.

A visual conjugate reinforcer (VCR) was housed in the experimental portion of the chamber. This device was earlier described by Lewis (1973). The VCR was programmed such that each press of the micro-switch by the subject produced a visual stimulus for one-quarter second.

A pressing rate in excess of 4 per second would be sufficient to maintain the stimulus at a constant level. The incremental slide changes and cumulative responses of the subject's button pressing activity were recorded on a Harvard-type cumulative recorder. Figures one and two show typical records for subjects responding at both a high and low response rate.

Procedure

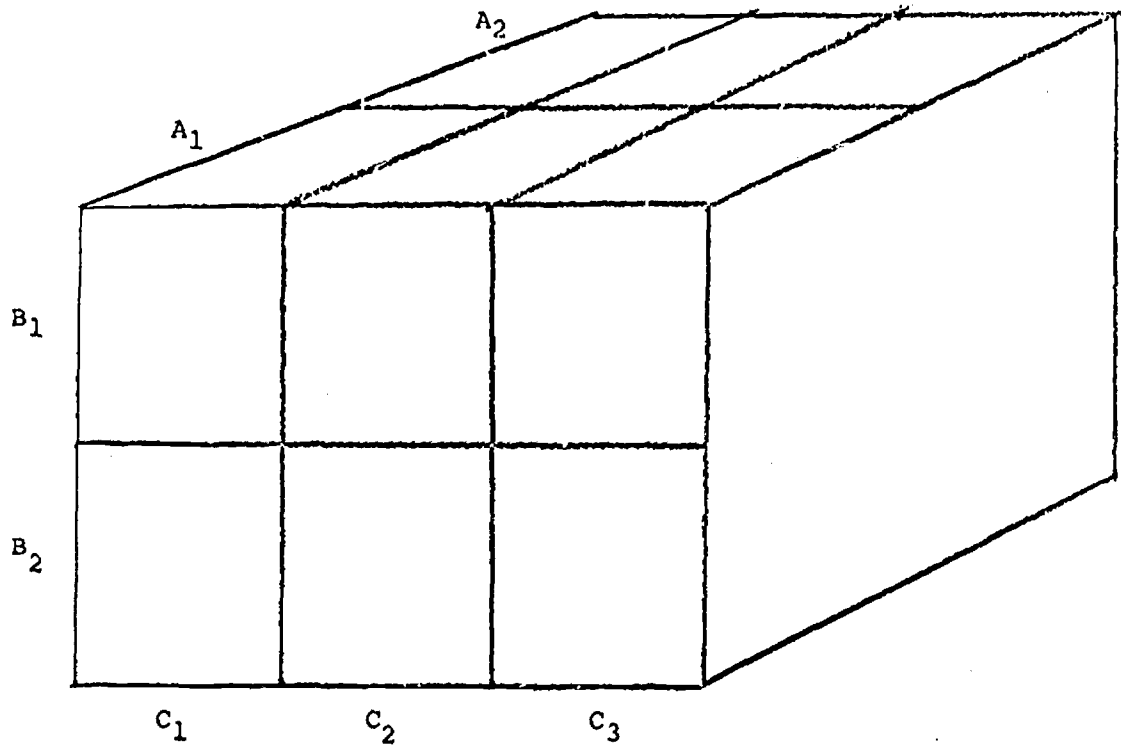
Each slide was projected for a period of time ranging from 7-12 seconds, depending upon the length of the caption. Each new slide was projected for a fraction of a second and then withdrawn to cue the subjects to its presence. Thus, in order to view the stimulus, the S was required to emit a continuous series of button presses, at a minimum rate of four per second (or the projected image would decrease to a threshold level).

The S_S were brought into the chamber and introduced to the screen and the switch. The experimenter explained how the system operated using the title slide as a training stimulus. The subject was instructed "If you wish to continue seeing the picture you must press the button, let go, and then press it again and again" (then demonstrate).

After the subject had sufficiently demonstrated that he could perform the task, he was instructed that each new picture would come on for a "second" and then go away and if he wished to see it he would have to press the button as before. The subjects were rewarded with candy after completion of the treatment.

Following each treatment, the subject was then administered a vocabulary level test constructed of repreentative words from the script of the film-strip and arranged in order of increasing increments of reading level difficulty.

DESIGN



A Lindqust Type III a, b, c, treatment intereaction design was employed (1953) in which:

A = Captions vs. non-captions

B = Normal vs. EMR

C = Reading level

Data Analysis

The data taken from the individual cumulative records was analyzed using a simple computer program with a variable template to format the absence or presence of one, two, or three lines of captioning. For this study, caption length was disregarded and a summation of all three contingencies was used for the data analysis. Thus, for each subject, two cumulative response rates were computed that reflected the absence of captions as well as the accumulated responses to the captioned slides.

The reading tests were scored by assigning a level to each student based upon his ability to read aloud each individual word. This data was used to categorize each subject into level c_1 c_2 or c_3. Level C_1 reflects a reading difficulty level extending from pre-primer to first grade, C_2 from second grade through third and C_3 intermediate level words (Tudyman & Groelle, 1963).

Using a Lindqust III design, an analysis of variance was performed to investigate differences between captioned and non-captioned formats, normal and EMR students responses, and reading level. Table I shows the results of the ANOVA.

Analysis of Variance Summary Table

SOURCE	df	SS	MS	F
BETWEEN S_s	27	1532313		
B	1	93980	93981	1.88
C	1	180840	180840	3.63
BC	3	161895	53965	1.08
ERROR b	22	1095598	49800	
WITHIN S_s	28	4286755		
A	1	3555216	3555216	134.92**
AB	1	79453	79453	3.02
AC	2	29474	14737	0.56
ABC	2	42887	21444	0.81
ERROR w	22	579725	26351	
TOTAL	55			

TABLE I

S	FORMAT	READING DIFFICULTY LEVEL		
		C_1	C_2	C_3
"EMR'S"	A_1 UNCAPTIONED	253	240	89
B_1	A_2 CAPTIONED	757	813	301
"NORMAL"	A_1 UNCAPTIONED	251	213	222
B_2	A_2 CAPTIONED	301	764	806

TABLE II: MEAN RESPONSES OF ALL SUBJECTS

Results

A total of 28 subjects were evaluated. Sixteen from the special classrooms and 12 from the normal classes. Each subject responded to the prescribed treatment and was administered a vocabulary level test. Table II shows the mean responses of all subjects to their respective treatments, at each reading level.

The ANOVA table (table one) indicates that a significant difference was obtained for the captioned vs. the non-captioned format. Differences in reading level were not significant at the .05 level; however, at .10 they could be considered to be significant. The difference between the responses of the two student populations were not found to be significant.

Conclusion

Although significance was obtained with respect to the subjects' response to the captioned vs. non-captioned format, it is not certain whether or not the subjects actually read the captions. The reading level test results are inconclusive to prove or disprove this point.

The fact that the slides containing a greater amount of captioning (two or three lines) were presented for a larger period of time gave the captioned format a decided advantage with respect to response accumulation. In future studies this variable must be more carefully controlled. A reading and criterion test in concert with one another may significantly aid in determining what the student has learned from the treatment.

Another area that should be further investigated is the addition of the audio stimulus; perhaps this might be used as a secondary reinforcement.

In summary, the results of this rather simple study indicates that under certain conditions students will emit a greater effort (responses)

to see a captioned vs. non-captioned filmstrip presentation. It is, however, inconclusive at this juncture as to what the student has learned from such an experience.

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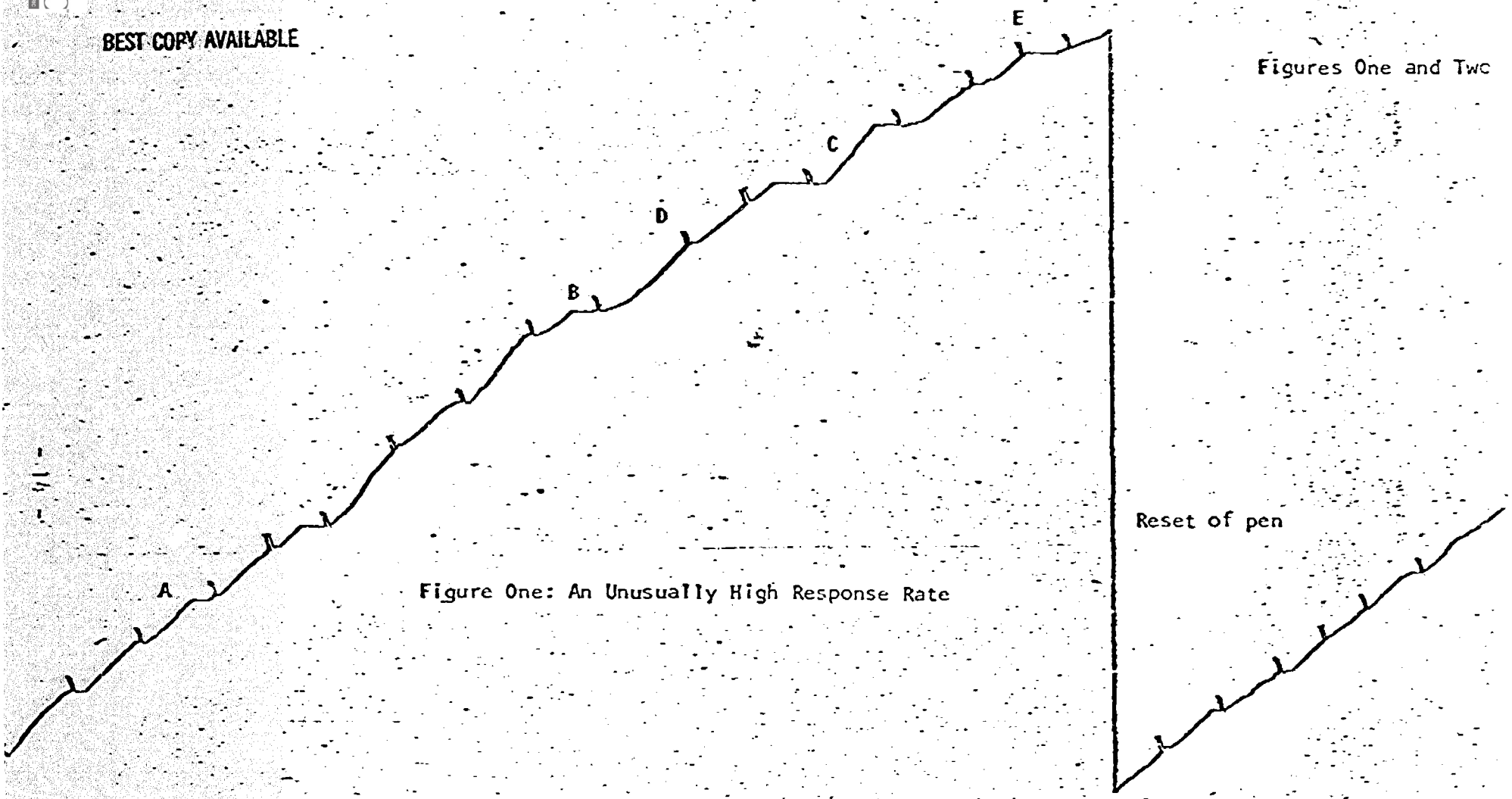
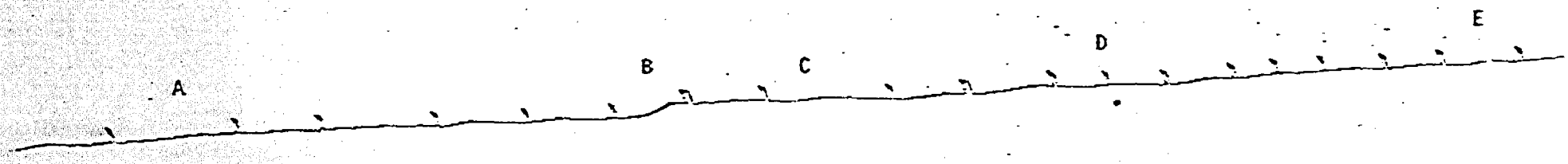


Figure One: An Unusually High Response Rate

Figure Two: A Very low rate of response



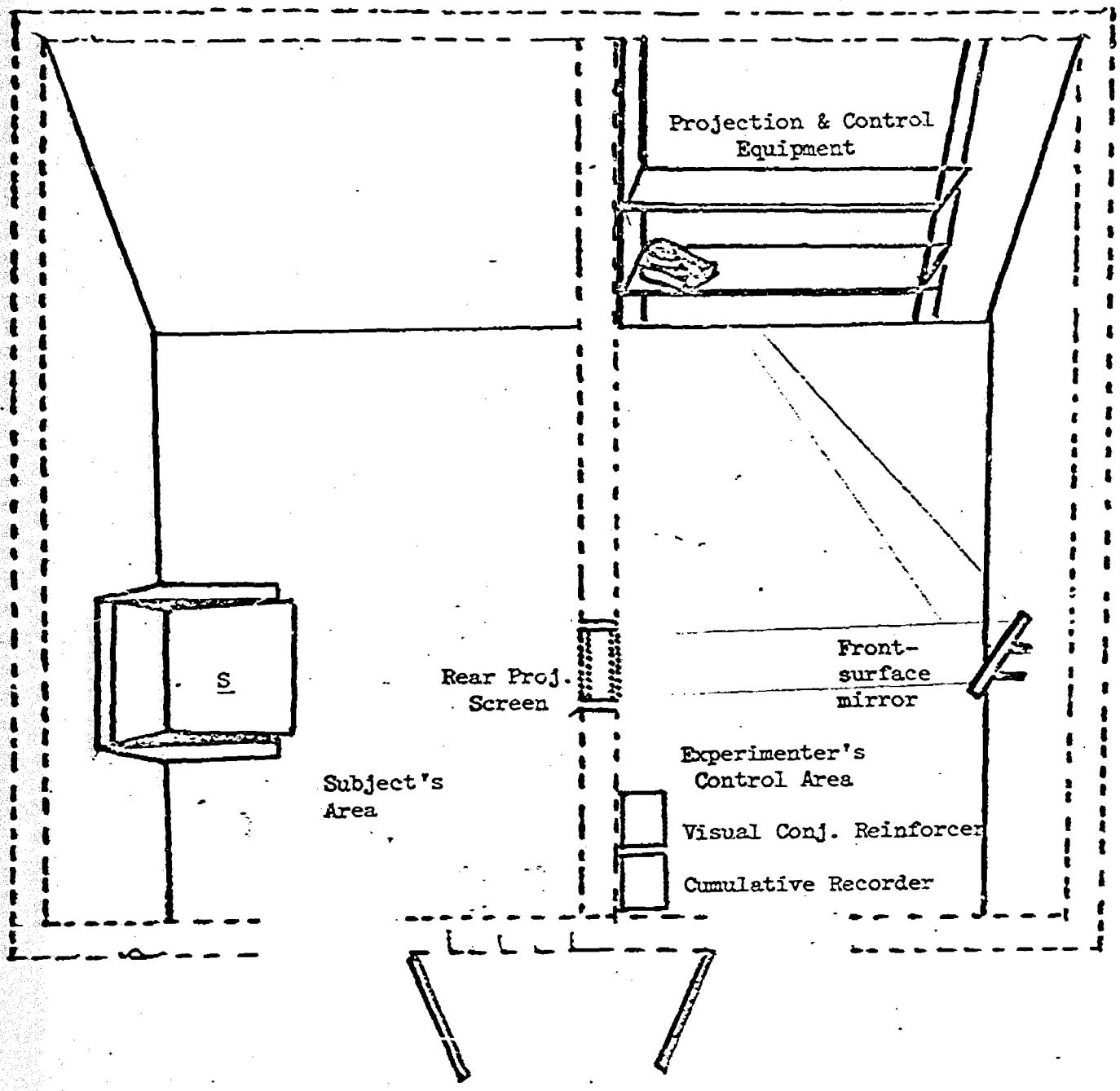


Figure Three:

Pictorial View of the Conjugate Reinforcement Research Chamber

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