DOCUMENT RESUME

ED 030 934 CG 004 176

By-Carlson, William A.; And Others

A Laboratory Approach to the Cognitive Control of Anxiety.

American Personnel and Guidance Association, Washington, D.C.

Pub Date 31 Mar 69

Note-20p.; Paper was presented at the American Personnel and Guidance Association Convention, Las Vegas, Nevada, March 31, 1969.

EDRS Price MF-$0.25 HC-$1.10

Descriptors-*Anxiety, Behavior, Behavioral Science Research, *Cognitive Development, *Cognitive Processes, *Conditioned Response, Electrical Stimuli, Measurement Techniques, *Verbal Operant Conditioning

This research focuses on the effect of verbal behavior on the conditioning and extinction of an autonomic response, namely, the galvanic skin response (GSR). The major assumption is that the experimentor's verbal behavior produces verbal behavior internal to the subject, and this, in turn has a modifying effect on the conditioning phenomena. The subjects, method, and procedure are discussed, including the use of electric shock, complete with directions given to the subjects. Scoring and results are given, followed by a discussion which notes a significant relationship between the experimentor's instructions and the subject's GSR. Results indicate that cognition can and does control physiological arousal or emotions, and that instructions given by the experimentor can produce some degree of emotion control. References and pictures are found at the end of this study. (SJ)

ED030934

# A Laboratory Approach to the Cognitive Control of Anxiety*

William A. Carlson    Robert M. W. Travers
Edward A. Schwab, Jr.
Western Michigan University

In the first century A. D. Epictetus (translated 1899) stated that "men are disturbed not by things but by the views that they take of them." This view has reappeared in modern times in the works of Albert Ellis (1962) who takes the position that people and things are not in themselves disturbing, but it is in telling ourselves that the world is upsetting that we become upset. A mechanism that may account for this phenomenon is found in the writings of such experimental psychologists as Neisser (1966), Lazarus and McCleary (1951) and Eriksen (1956, 1958, 1960, and 1962) all of whom conclude that responses of human subjects are never directly activated by stimuli, but always involve some kind of cognitive processing. A similar idea was proposed over half a century earlier by Pavlov (translated 1962) in his suggestion that man, in contrast with lower animals, possesses two systems of reality rather than one. A second system of signaling, that of speech, being a signal of the more primitive signals.

Experimental psychologists have also pointed out that classical conditioning experiments with humans are typically found to involve mediating processes which may have drastic effects on their outcomes. In addition, verbal behavior may produce behavioral phenomena similar

*Presented at the American Personnel and Guidance Association meeting in Las Vegas, Nevada, on March 31, 1969.

004176

to those found in classical conditioning. In this connection Grings (1965) in reviewing current research related to verbal perceptual factors and conditioning of autonomic responses concluded that "...behavior change similar to that which occurs through classical conditioning occurs through processes of verbalization and verbal instruction and that equally evident changes result from alterations in the S's perception of the total experimental environment..." Grings and Lockhart (1963) found that instant extinction of classically conditioned response could be produced by telling the Ss that they were no longer going to receive an electric shock.

The research described here is part of a program designed to explore the effect of verbal behavior on classical conditioning phenomena. Since this research finds its roots in the ideas of Albert Ellis, it is focussed on the effect of verbal behavior on the conditioning and extinction of an autonomic response, namely, the galvanic skin response (GSR). In this initial study, data were collected on the effect of E's instructions on classically conditioned GSR. The assumption is that E's verbal behavior produces verbal behavior internal to S, and this, in turn, has a modifying effect on the conditioning phenomena. Ultimately, better methods of controlling the subject's internal verbal behavior will be sought.

## Method

### Subjects

Subjects were adults (N=32), mainly students in an educational research course, who received credit towards their grade by presenting themselves in the laboratory. Participation was purely voluntary and they were not penalized by loss of the credit if they declined, as one did when he found out that the research involved electric shock. In addition to the students, four faculty members and two secretaries acted as *Ss*.

*Equipment*

The equipment and recording devices were located in one room and the *S* was isolated in a small adjoining room as shown in Figure 1. The GSR was recorded on a Grass Model 79 3-channel polygraph with low level DC preamplifier and Driver amplifier. The third channel was equipped with a constant time marker as well as a stimulus marker. A Heath Signal Generator was used to produce a 600 CPS tone. Three Hunter timers were used to control the duration of the tone and the interval between tones. A microphone audioamplifier and head phones were used for communication with the *S*, who was separated from the *E* and equipment, and was constantly monitored visually through a one-way chrome plate glass window. A scientific Prototype shielded shock source produced a 0.01 second 37 volt shock.

..........................

Insert Figure 1 about here

..........................

The duration of the tone was 0.5 second with the interval between the tone and the shock 0.5 seconds. This follows a recommendation by Kimble (1961), following a summary of previous studies involving different inter-stimulus intervals. The *E* chose a constant 37 volt shock, rather than a shock level set for each *S*, in order to make for greater reproducability of the conditions of the experiment. A search of the literature had not revealed any data pertaining to the question of whether optimum conditioning is produced at a particular subjectively judged level of unpleasantness and thus the 37 volt standard was chosen. Ss reported that the shock ranged from mild to quite disagreeable. The stimulus shielded room occupied by S was maintained at a constant temperature varying between 70 and 75 degrees Fahrenheit and a relatively stable relative humidity level which never exceeded 40 per cent. Data were collected over approximately a seven week period during the summer and on particularly hot and humid days the temperature was allowed to rise to 75 degrees Fahrenheit to reduce the shock of coming into contact with dryer colder air. The original aim was to provide uniform physical conditions but this goal had to be partly mitigated in order to provide subjectively perceived uniform comfort.

## Procedure

The S entered the room and was seated at a desk where he was administered a short semantic differential designed to measure his attitude towards electric shock. Standard directions as recommended by Osgood (1957) were used. However, supplementary help was usually found necessary. If it were ascertained by questioning that the S did have any physical limitations such as heart trouble, high blood pressure or pregnancy then he was dropped from the experiment.

Zinc GSR electrodes, separated from the skin by means of a corn plaster and contact paste, following the recommendations of Lykken (1959), were attached to the first and fourth fingers of the S's left hand. Grass EEG gold plated electrodes were attached using Grass EEG electrode paste and an Ace bandage to the S's left forearm near the elbow and were placed two inches apart. S was then taken into the stimulus shielded room, invited to recline in a chaise lounge chair and the electrodes were connected to the appropriate terminals.

Before the earphones were placed on S's head, he was told that he would receive all instructions through them and that he was to sit back and relax. After E left the room the instructions were given immediately through the microphone that S was to sit back and relax for about fifteen minutes in order to become used to the new surroundings. The directions also indicated that a tone would be sounded at various times during that period but that S should relax and pay no attention to the tone. Earlier trial runs had demonstrated a marked drop in the resistance across the electrodes which stabilized after about fifteen minutes.

At the end of the adaptation period E announced that the experiment would now begin and that it would involve electric shock. One of two sets of directions was then read as follows:

Direction A: "This experiment involves a few mild electric shocks. All you have to do is sit back and relax. Close your eyes and rest but do not go to sleep. Try not to think of anything in particular. Sort of let your mind go blank."

Direction A': "This experiment involves a few mild electric shocks. Attend carefully to what is happening in the experimental situation and try to anticipate when you will receive a shock and when you will not. Try not to let your mind wander. Think about what is happening in the experiment. Try to guess when you will or will not be shocked."

The difference in the two sets of directions were designed to produce differences in the response of the Ss to the cues in the experimental situation. The assignment of the Ss to the two treatments followed the order of A, A', A', A, in an attempt to randomize any other uncontrolled variables.

The acquisition series was immediately started with shock being paired with a tone on trials 1, 3, 8, and 10. Trials occurred approximately 30 seconds apart except when the S's GSR occasionally took longer to return to a stable base line. After acquisition S was exposed to one of the two following sets of procedures I or II as indicated in Table 1.

The two procedures provide a means of assessing the effect of giving instructions either that there would be no shock administered on subsequent trials, or that the chances of receiving a shock were 1 in 1,000, or 1 in 5. The two procedures, I and II, represent a partially counterbalanced design.

Originally, the design used only the Procedure I set of instructions with the intent of comparing the mean GSR response taken from all trials involving 1 in 5 instruction with the mean GSR response to the 1 in 1,000 direction which was placed in the middle of the series. However, after a few Ss had been run, it appeared that the responses in the final 10 trials may have been greatly influenced by the fact that the earlier series with the same directions had involved no shock. For this reason the experiment was converted into a partially counterbalanced design by the introduction of the treatment represented by the Procedure II set of directions.

........................

Insert Table 1 about here

........................

Scoring

GSR responses to each sound of the tone were scored by measuring the difference in the heighth of the polygraph record from the beginning of the response to the apex of the response. Typical latencies for genuine GSRs fall between 1.5 to 2.0 sec. after the presentation of the stimulus. Therefore, if a GSR started before 1.5 sec. after the stimulus, the scoring point was taken precisely at the 1.5 point and went to the apex of the response. The electrical bridge to which the S is connected in the polygraph is calibrated so that a change of one millivolt is equal to a change in resistance in the S of 1,000 ohms. The conversion of millivolts to ohms is optional and for convenience the scoring was done in millivolts.

A number of Ss were not included in the final data. Four Ss could not feel the shock and, hence, could not become conditioned to the tone. Nine Ss felt the shock but showed no conditioning. Three of the latter stated that they did not realize that the tone was a signal for the shock; that is, they made no cognitive connection between the tone and the forthcoming electric shock.

Three additional Ss were discarded since the experimenter had made some gross error in connecting the equipment or administering the task. One S had received 100 times the duration of shock intended but showed no conditioning because first, she did not associate the tone as a signal for shock and second the remaining much weaker shocks appeared to her to be almost infinitesimally mild. One S was discarded when she came from the experimental room dripping wet with perspiration and another S was discarded at the end of the run due to having produced such a huge number of GSRs that the record was completely unscorable.

## Results

Of prime interest is the extent to which the instructions of no shock, 1 in 5 chance of shock, and 1 in 1,000 chance of shock influenced the magnitude of the GSR. Since the data involved two probability sequences for shock (1 in 5, 1 in 1,000, 1 in 5, and 1 in 1,000, 1 in 5, 1 in 1,000) the effect of the instructions on GSR was determined separately for each series. The changes associated with the different instructions for these two groups are shown in Figures 2 and 3.

................................

Insert Figures 2 and 3 about here

................................

The changes are entirely as expected. The last two trials of the acquisition series shows a substantial GSR. There is then a sharp drop in GSR associated with the instruction of no shock followed by an appropriate increase associated with the instruction of 1 in 5 or 1 in 1,000 chance of receiving shock. It is noted that the response to the instructions that the chance of shock was 1 in 1,000 are larger than the response to the instruction of "no shock" within each of the two groups of data and still larger when the Ss were told there was a 1 in 5 chance of being shocked after each tone.

There is, however, no clear and consistent difference in the effect of the two sets of directions pertaining to whether the Ss should or should not attend to the experiment in general. That is, there is no systematic difference between the A and A' instructions. In the case of the one group there appears to be a difference, but this does not appear in the other group. The group receiving the directions in the order of 1 in 1,000, 1 in 5, and 1 in 1,000 generally showed a greater responsiveness in terms of general overall level of GSR and the reason for this remains quite obscure. It could be that the group showing the larger responsiveness was studied at a time when the outside temperature was warmer and the humidity significantly higher than the other group. It is recalled that the change in the experimental design was made after some Ss had been run and resulted in a tendency for the more responsive group being tested a little later in the summer and, hence, possibly under conditions where they came into the experimental room from a very hot and humid outside climate.

Although the graphs are quite convincing evidence that the classically conditioned GSR can be highly controlled by the experimenter's statements there is still the possibility that the mean GSRs following each set of directions could be perhaps simply the result of chance. The data was subjected to an analysis of variance in order to test for significance of the variations accompanying each sequence of directions. The analysis of variance based on the data summarized in Figure 2 is shown in Table 2. It is quite clear from this analysis that the conditions did have a significant effect on the magnitude of the GSR ($F = 10$ $p<.001$). In addition, the application of the Newman-Keuls individual degrees of freedom test showed that the 1 in 5 condition was significantly different at the 5 per cent level from both the no shock and the 1 in 1,000 condition.

................................

Insert Tables 2 and 3 about here

................................

Table 3 provides a similar analysis for the data on which Figure 3 is based. Once again the difference between conditions are significant ($F = 11.21$ $p<.001$). A Newman-Keuls test also showed significant differences between 1 in 1,000, no shock and 1 in 5 conditions at the 5 per cent level of significance.

The difference between the 1 in 5 and 1 in 1,000 condition can also be tested by comparing the data in Figure 2 with the data in Figure 3. These two sequences provide data performances under the following sequences of conditions:

| | | | |
|---|---|---|---|
| Figure 2 | 1:5 | 1:1,000 | 1:5 |
| Figure 3 | 1:1,000 | 1:5 | 1:1,000 |

Thus the data can be divided into three blocks, each one of which can form the basis of a separate analysis. However, the comparisons cannot be made on a straight forward basis since the data shown in Figure 3 reflects the performance of Ss with much greater GSR than the Ss whose performances are shown in Figure 2. In order to make the comparisons now under consideration, the data had to be corrected for differences in general level of GSR. This is done by the use of analysis of covariance technic in which the control variable, GSR, is corrected for magnitude of response on the last two trials of the acquisition series. An analysis of covariance testing the difference between the mean level of response under the two conditions (1 in 5, and 1 in 1,000) for each of the three blocks is shown in Table 4. The level of significance of the first of these is unimpressive, but the second and third comparisons provide substantial levels of confidence. ($F = 3.08$ $p<.10$, $F = 7.80$ $p<.01$, $F = 10.5$ $p<.01$)

........................

Insert Table 4 about here

........................

The Osgood symantic differential showed a significant increase in the Ss' positive attitude toward the concept of "electric shock" from before to after their experiencing electric shock ($T = 4.8$ $p<.001$). However, the correlation between the scores on this instrument and the mean amplitude of response on the last two trials in the acquisition series were small and insignificant being $r = 0.12$ with the before measure and $r = -.02$ with the after measure.

## Discussion

The major finding in this study clearly suggests a significant relationship between E instructions and the S's GSR. The greater the stated probability of receiving a shock, the greater the GSR. It is noted, however, that a less specific, more generalized, instruction urging the Ss to attend or not to attend to the experimental conditions apparently had little if any effect on the S's GSR or arousal. It may be that an instruction is more effective when it is made specific to the task, such as "now the probability is 1 in 5 that you will receive an electric shock."

If one is willing to consider that the E's instructions are processed by the S's cognitive system, then it would appear that, at least under some conditions, the S's cognitions or belief systems have a substantial effect on his physiological arousal level, if the GSR can be taken as a measure of physiological arousal. If this physiological arousal is at least an indication of the S's emotional state, then it would appear one might infer that the findings of this research suggest that cognitions can control emotions.

It also appears that S's attitude towards the concept "electric shock" demonstrated a significant shift in the positive direction, that is, viewing electric shock in more positive and less noxious terms by the end of the experiment. At first this might appear surprising and possibly contradictory that the S would have a more favorable attitude towards the concept of electric shock immediately after receiving five electric shocks. It is noted, however, that an informal questioning of the Ss at the very end of the experiments found that the shock was in most cases not nearly as strong as Ss had originally anticipated.

If one assumes that the instructions given by E influence S's beliefs and attitudes, then it appears that S's anticipation or attitude or beliefs do have a direct relationship to his physiological arousal or emotional state. It also appears that his attitudes or beliefs may well change as a result of not only what other people may tell him but also as a result of other experiences such as not receiving nearly as strong a shock as he originally anticipated.

It is also noted that four Ss who failed to condition clearly indicated that they never considered the tone to be a signal for a forthcoming shock.

It appears that both the formal findings, as well as the informal information obtained from the Ss, supports the notion that cognition or thinking can and does control physiological arousal or emotions or feelings, and that instructions given by E can produce some degree of emotional control.

An implication of this laboratory finding for counseling and psychotherapy is that the client's cognitions or beliefs can and do control his emotions or his feelings. This tends to give support to the theoretical work of Albert Ellis (1962) who takes the position that people and things are not in themselves disturbing, but it is the view which one takes of them that is.

References

Ellis, A. Reason and Emotion in Psychotherapy. New York: Lyle Stuart, 1962.

Epictetus. The Works of Epictetus. Translated by Thomas W. Higginson. Boston: Little, Brown, 1899.

Eriksen, C. W. Subception: Fact or Artifact. Psychological Review, 1956, 63, 74-80.

Eriksen, C. W. Unconscious Processes. In M. R. Jones (Ed.), Nebraska Symposium on Motivation: 1958. Lincoln, Nebraska: University of Nebraska Press, 1958.

Eriksen, C. W. Discrimination and Learning Without Awareness: A Methodological Survey and Evaluation. Psychological Review, 1960, 67, 279-300.

Eriksen, C. W. (Ed.) Behavior and Awareness. Durham, North Carolina: Duke University Press, 1962.

Grings, W. W. Verbal-Perceptual Factors in the Conditioning of Autonomic Responses, Chapter 4, Prokasy, W. F. Classical Conditioning: A Symposium. New York: Appleton-Century-Crofts, 1965.

Kimble, G. A. Hilgard and Marquis' Conditioning and Learning. New York: Appleton-Century-Crofts, 1961.

Lazarus, R. S., & McCleary, R. A. Autonomic Discrimination Without Awareness: A Study of Subception. Psychological Review, 1951, 58, 113-122.

Lykken, D. T. Properties of Electrodes Used in Electrodermol Measurement. Journal of Comparative and Physiological Psychology, 1959, 52, 629-634.

Neisser, U. Cognitive Psychology. New York: Appleton-Century-Crofts, 1966.

Osgood, C. E., Suci, G. J., & Tannenbaum, P. H. The Measurement of Meaning. Urbana: University of Illinois Press, 1957.

Pavlov, I. P. Essays in Psychology and Psychiatry. New York: The Citadel Press, 1962.

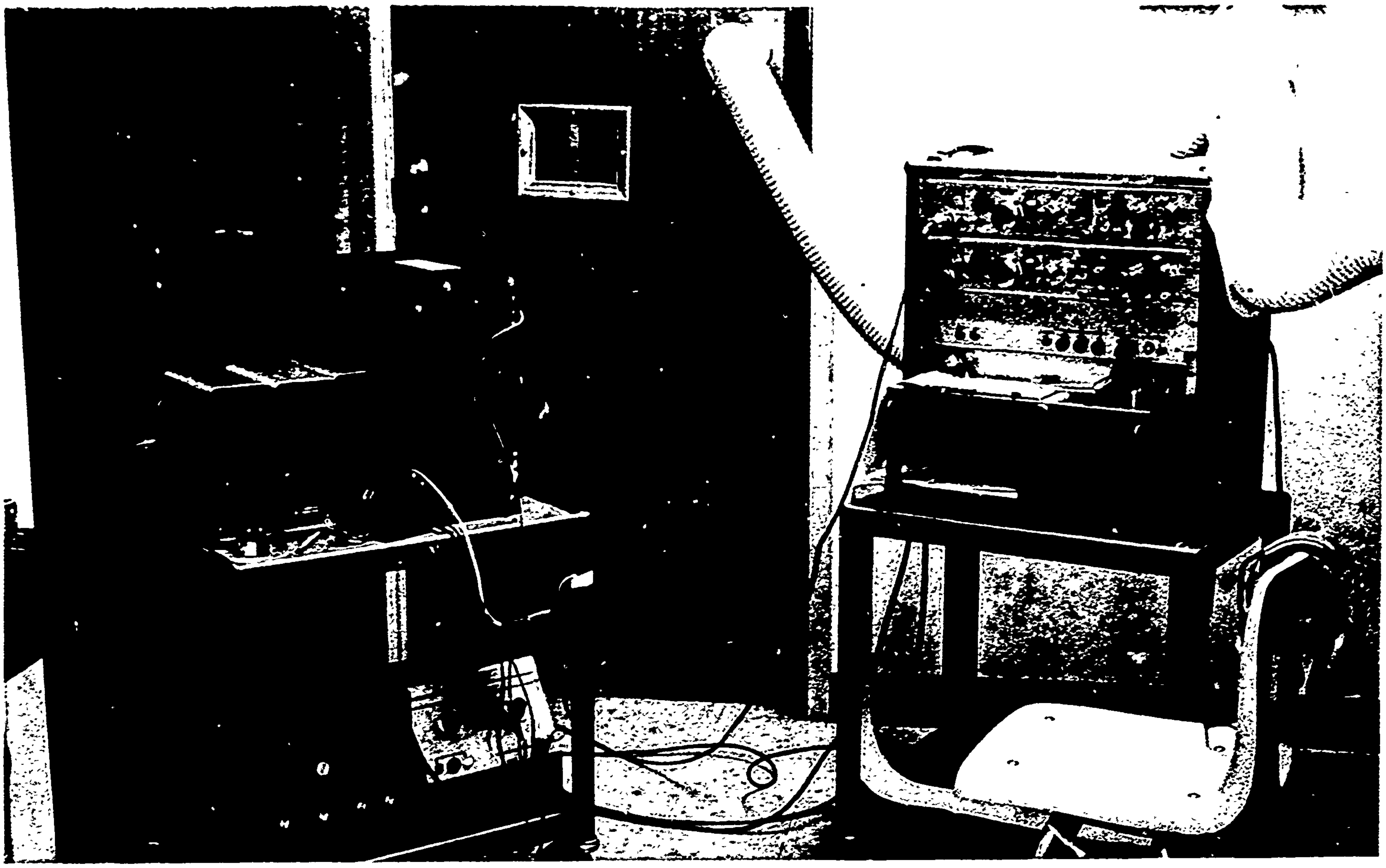

Figure 1

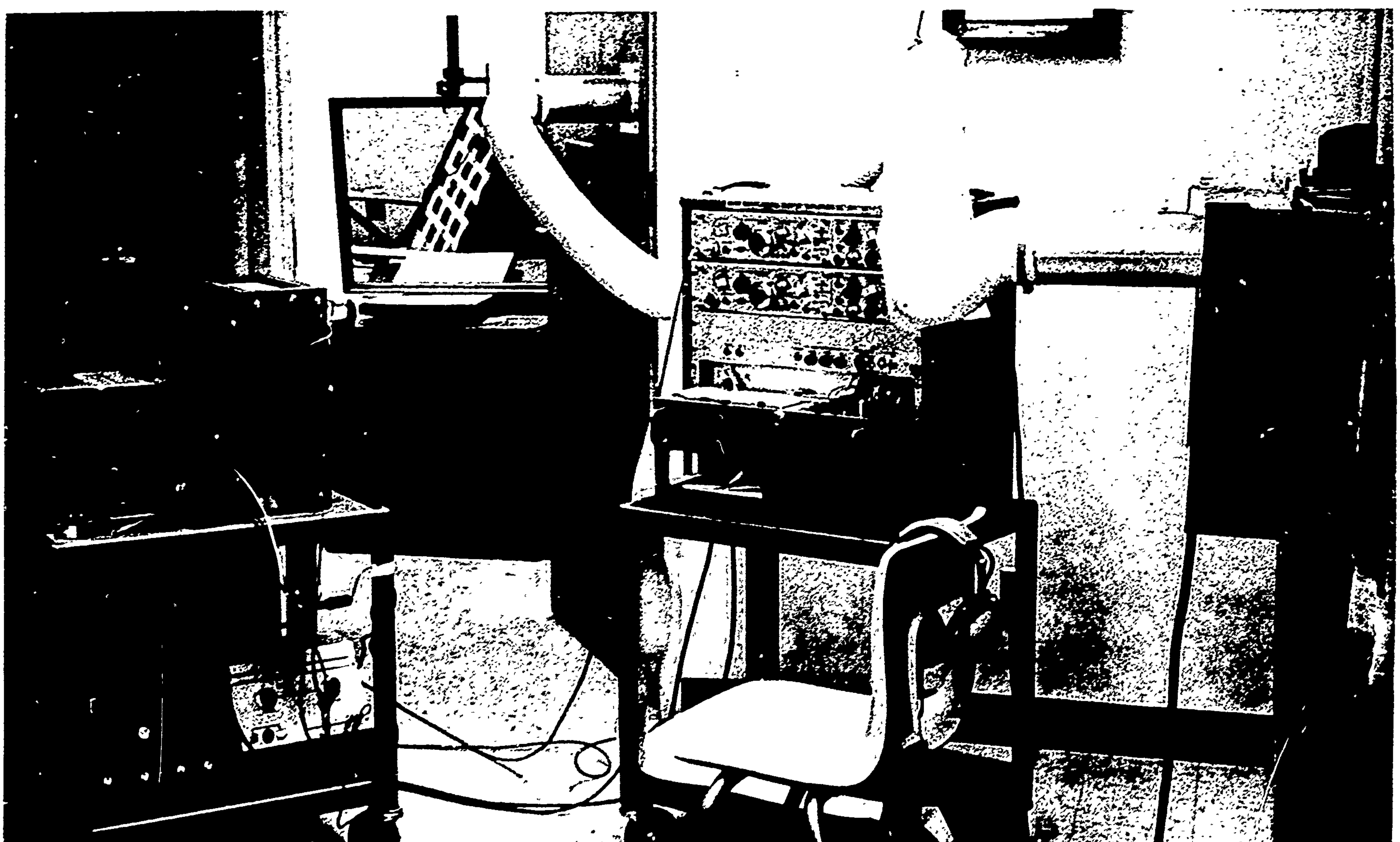

Table 1

Assignment of Trials and Form of Directions

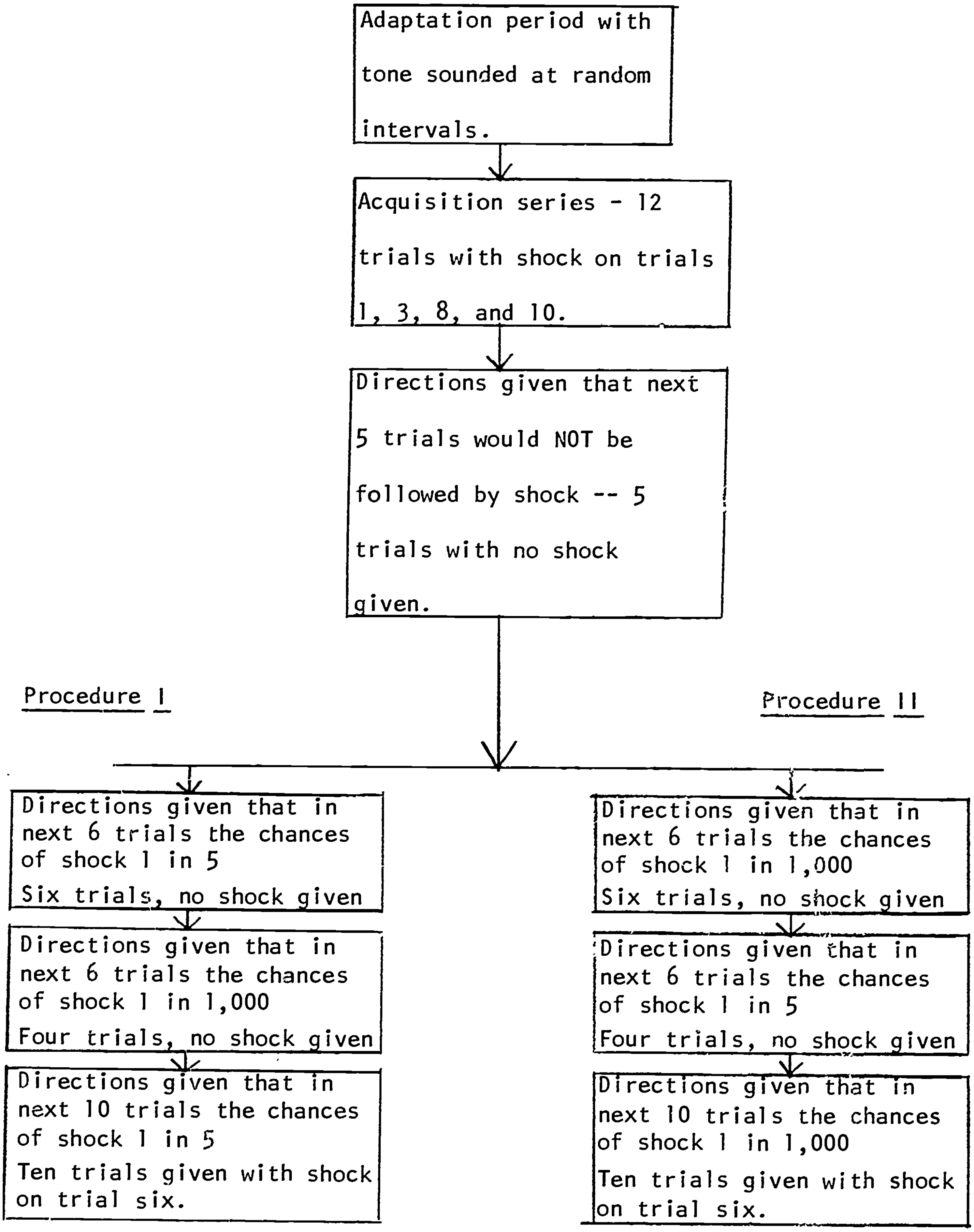

Figure 2

GSR Response Magnitudes, Treatments A and A', Procedure I

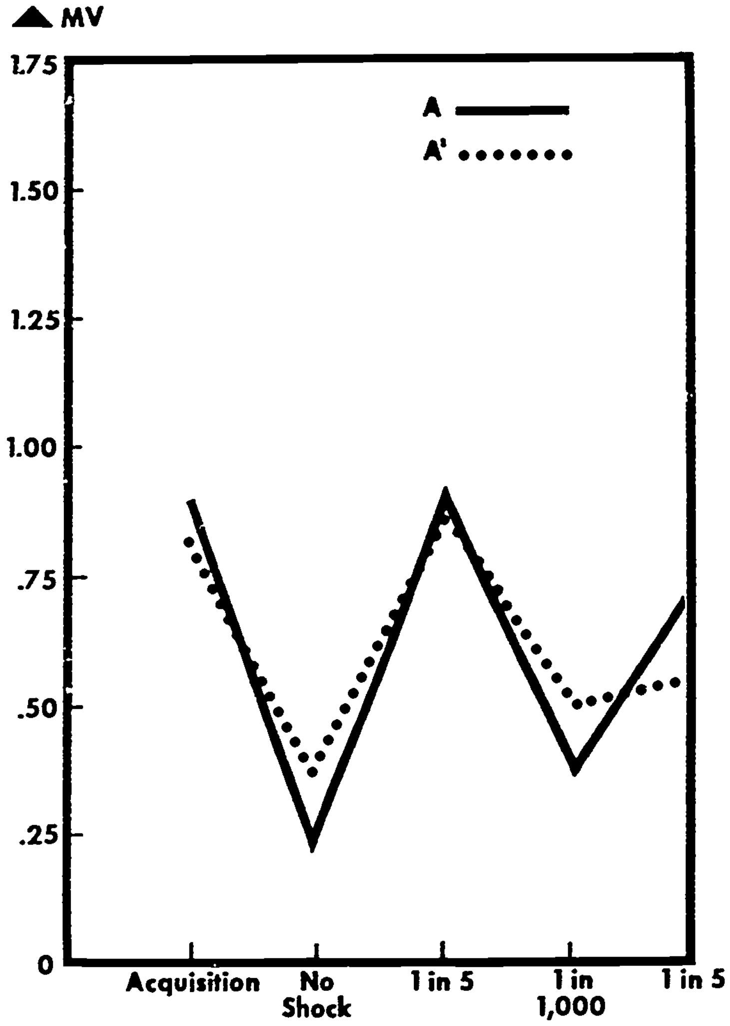


Figure 3

GSR Response Magnitudes, Treatments A and A', Procedure II

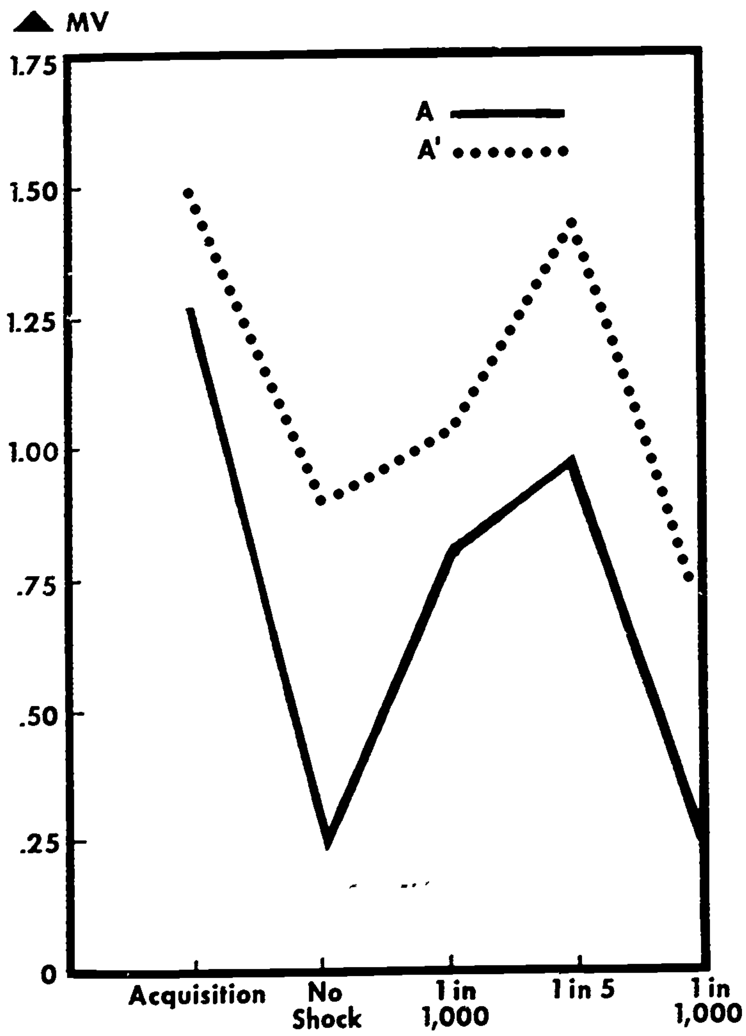

Table 2

Analysis of Variance for Data from Ss Exposed to Conditions - Acquisition, No Shock, 1:5, 1:1,000, 1:5

| Source of Variation | df | MS | F | p |
|---|---|---|---|---|
| Between Ss | 15 | | | |
| AA' | 1 | 0.01 | 0.01 | |
| Ss within groups | 14 | 0.73 | | |
| Within Ss | 64 | | | |
| Between conditions within Ss (B) | 4 | 1.10 | 10.00 | <.001 |
| AB | 4 | 0.06 | 0.55 | |
| B x Ss within groups | 56 | 0.11 | | |

In this analysis the AA' conditions are those involving directions to attend to or not to attend to what was happening. The B condition refers to the 5 conditions of acquisition (last two trials only), no shock, 1 in 5 chance of shock, 1 in 1,000 chance of shock, and 1 in 5 chance of shock. In the case of B, the data are the means of the responses in the case of each variable.

Table 3

Analysis of Variance for Data from Ss Exposed to Conditions -

Acquisition, No Shock, 1:1,000, 1:5, 1:1,000

| Source of Variation | df | MS | F | p |
|---|---|---|---|---|
| Between Ss | 15 | | | |
| AA' | 1 | 3.08 | 1.09 | |
| Ss within groups | 14 | 2.83 | | |
| Within Ss | 64 | | | |
| Between conditions within Ss (B) | 4 | 2.69 | 11.21 | <.001 |
| AB | 4 | 0.08 | 0.33 | |
| B x Ss within groups | 56 | 0.24 | | |

In this analysis the AA' conditions are those involving directions to attend to or not to attend to what was happening. The B condition refers to the 5 conditions of acquisition (last two trials only), no shock, 1 in 5 chance of shock, 1 in 1,000 chance of shock, and 1 in 5 chance of shock. In the case of B, the data are the means of the responses in the case of each variable.

Table 4

Analyses of Covariance for Determining the Significance of the Difference in GSR in the Counterbalanced Design Produced by Experimenter Instructions of Shock Expectancy of 1:5 and 1:1,000. Comparison Made Across Three Corresponding Blocks of Trials Following Trials with No-shock Directions

Block 1

| Source | SS | df | MS | F | p |
|---|---|---|---|---|---|
| Total | 8.26 | 30 | | | |
| Error | 7.46 | 29 | 0.26 | | |
| Treatments | 0.80 | 1 | 0.80 | 3.08 | <.10 |

Block 2

| Source | SS | df | MS | F | p |
|---|---|---|---|---|---|
| Total | 7.38 | 30 | | | |
| Error | 5.82 | 29 | 0.20 | | |
| Treatments | 1.56 | 1 | 1.56 | 7.80 | <.01 |

Block 3

| Source | SS | df | MS | F | p |
|---|---|---|---|---|---|
| Total | 8.03 | 30 | | | |
| Error | 5.92 | 29 | 0.20 | | |
| Treatments | 2.11 | 1 | 2.11 | 10.55 | <.01 |