Some Variables in Conditioned Suppression with Humans

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SOME VARIABLES IN
CONDITIONED SUPPRESSION
WITH HUMANS

by

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INTRODUCTION

One basic tenet in the experimental analysis of behavior is the insistence upon dealing with behavior, regardless of complexity, as objectively observable and measurable events (Skinner, 1953). An area which has been extremely deficient in this type of analysis is the area of emotional processes. Both clinical and experimental investigations typically have stressed the "phenomenological" or "feeling" characteristics of emotion, an approach which has led to many "highly speculative theories" (Brady, 1962). If an investigation of this problem is to be conducted within the framework of an experimental analysis of behavior, adherence to dealing with observable and measurable data must be followed.

Brady and Hunt (1955) point out that one of the possible effects of "emotional disturbance" can be the disruption or interference of an organism's on-going behavior. While acknowledging the fact that such disturbances in behavior can be the result of other variables, they propose that "...with the proper experimental controls, it is possible to produce such emotional disruption dependably and to isolate important variables of which it is a function."

One method of objectively demonstrating the disruptive effects of "emotion" on an organism's behavior is the procedure, first developed by Estes and Skinner (1941), which is referred to as conditioned suppression or conditioned emotional response (CER). In this procedure, some stable performance (e.g., lever pressing)
is maintained by the presentation of food or water at previously
designated intervals. A stimulus (CS), which is neutral in regards
to its disruptive effect on the performance, is then presented
independently of the on-going behavior and is terminated by a brief
unavoidable shock. After a number of such stimulus (CS) - shock
pairings, the phenomenon of conditioned suppression becomes apparent
in the attenuation of the response rate during the presentation of
the stimulus (CS).

Although there is a lack of a definitive causal explanation
for conditioned suppression, most observers report certain behavior­
al and physiological changes during suppression which are commonly
assumed to be indicative of emotion. These include overt behavioral
changes such as increases in urination, defecation, crouching,
freezing and other signs of agitation (Brady & Conrad, 1960; Brady
& Hunt, 1955). The physiological correlates of increased heart
rate, (Stebbins & Smith, 1962), blood flow (De Toledo & Black, 1966)
and pituitary-adrenocortical activity (Mason, Brady & Sidman, 1957)
reported during suppression also are characteristics of emotional
stress. Similar correlations between ACTH secretion and stress,
not unlike anxiety, have been found in human subjects (Thorn, Jenkins
& Laidlow, 1957), giving further substantiation to the emotional
quality of the behavior during suppression.

The results of research on conditioned suppression with a
variety of organisms demonstrate the generality of the phenomenon.
Conditioned suppression has been obtained with rats (Estes & Skinner,
1941), pigeons (Lyon, 1964), monkeys, cats (Brady & Conrad, 1960),
fish (Geller, 1963), dogs (Lindsley & Jetter, 1953) and guinea pigs
(Valenstein, 1959). The experimental evidence for the existence of
this phenomenon in humans, however, is not as obvious. The study
by Watson and Raynor (1920), in which a small child was conditioned
to "fear" a white rat by pairing the animal's presence with a loud
noise, was an early attempt at demonstrating conditioned suppression
in humans. While some of the behaviors exhibited by the child
(e.g., withdrawal) are similar to those observed in animals in
conditioned suppression procedures, this study does not fall within
the strict definition of the phenomenon since the noise was not
presented independently of the child's behavior. More recently,
Kanfer (1958a; 1958b) attempted to demonstrate conditioned suppres­
sion in humans using a verbal baseline. The results of these ex­
periments indicated an increased verbal rate during the CS rather
than a decrease or suppression of the rate. The lack of evidence
of suppression in these studies may be due to the fact that there
were no external contingencies applied to maintain a specific
pattern of verbal behavior. Mulder, Lyon and Pott (1967) applied
the Estes and Skinner conditioned suppression procedure to human
subjects and obtained tentative evidence of suppression in three
subjects. However, the limited number of subjects used in this
study make any definitive conclusions unwarranted.

A review of the literature in infra-human research reveals
three variables which have been shown to have an important function
in establishing conditioned suppression. These variables are the intensity of the shock, the duration of the CS and the type of reinforcement schedule used to maintain the animals' performance.

The effect of shock intensity on the acquisition of conditioned suppression has been investigated by Brady and Susla (1955) and Singh (1959) using a limited range of intensities. The results of these studies indicated a greater degree of suppression at relatively higher shock intensities. Aunua and Kamin (1961), in a more extensive parametric study of intensity, supported earlier findings by demonstrating increases in the amount of suppression during the CS as the shock intensities were increased.

The importance of the temporal relationship between the CS and shock was demonstrated in a study by Stein, Sidman and Brady (1958). They presented each subject a variety of CS durations with the data indicating that the shorter durations, relative to the amount of time in which the CS was not on, produced the greatest degree of suppression. Kamin (1965) varied both the duration of the CS itself and the length of time between the onset of the CS and the shock. He reported that the actual duration of the CS was not as crucial to the degree of suppression as was the time interval between the beginning of the CS and the shock, regardless of how long the CS was on during that interval. He found that the shorter the interval between CS onset and shock, the greater the degree of suppression.
The third important variable is the reinforcement schedule or the particular sequence in which the appetitive stimulus was presented to maintain the animal's performance. The amount of suppression displayed by the organism was found to be directly affected by different schedules of reinforcement (Brady, 1955; Carlton & Didamo, 1960; Lyon, 1963; Lyon, 1964; Stein, Sidman & Brady, 1958). Lyon (1964) suggested that with procedures in which the reinforcement was presented on a fixed schedule, the amount of suppression should be determined by the temporal proximity of the CS to the presentation of a reinforcement. A further study (Lyon & Felton, 1966) indicated that suppression is greatest if the CS is presented soon after reinforcement, whereas, presenting the CS just prior to reinforcement resulted in the organism responding up to the time of reinforcement and then suppressing.

The present study applies the Estes and Skinner procedure to human subjects in an attempt to replicate the conditioned suppression phenomenon found in infra-human research and to study some of the important variables in the establishment of this phenomenon. The effects of different CS durations, varied CS-shock pairings, different shock intensities and the topography of the shock are examined. The variable of reinforcement schedule is examined by using a fixed ratio schedule in which a specified number of responses are required to obtain reinforcement. This particular schedule was chosen both to establish a stable performance rate and to determine if the animal data obtained by Lyon and Felton (1966) could be replicated.
in human subjects.
METHOD AND RESULTS

Subjects

The subjects were 5 female and 13 male undergraduates from Western Michigan University and 4 female employees of the Kalamazoo State Hospital, Kalamazoo, Michigan. All subjects were paid volunteers. Male subjects are hereafter referred to as SM and females as SF.

Apparatus

The experiment was conducted in a darkened 10 x 15 foot laboratory which contained laboratory equipment, a chair, and a console mounted on a 3 x 5 foot table. Figure 1 shows a subject seated in front of the console. An 18 inch bar mounted on the right side of the console served as the response lever. A correct response went through an excursion of 20 inches to activate a microswitch at the bottom of the excursion. Three 6 watt white lights, located in the center of the console, served as the house lights for general illumination. Reinforcement was indicated by a 1 second illumination of a 6 watt red light under a counter which recorded the cumulative number of reinforcements. A 25 watt red light on top of the console served as the conditioned stimulus (CS). The shock was delivered through two silver electrodes, mounted 1\(\frac{1}{2}\) inches apart, on an electrode band from a Keller polygraph. The shock was

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Figure 1. Subject seated at human response console used in study of conditioned suppression in humans.
adjusted by a Variac transformer and programmed by a .5 sec. fixed
pulse former. A dummy cuff made of a 3 x 5 inch cloth pad, two \( \frac{1}{2} \) inch
metal screws and two 8 inch long strips of rubber hosing, was attached
to the left side of the console and served as a means of keeping
the left arm stationary in those subjects who had the electrode band
placed on their right arm.

The procedure was programmed automatically by electro-mechanical
circuitry and the data were recorded from electrical impulse counters,
a running time meter and a Gerbrands cumulative recorder. The paper
was driven through the cumulative recorder at a constant speed of 60
cm. per hour. Each lever pulling response produced a 2 mm. vertical
movement of the recorder pen.

General Procedure

Since there has been only one previous attempt at applying the
conditioned suppression procedure to human subjects (Mulder, Lyon &
Pott, 1967), the complete experimental design was not specifically
determined prior to the initial conditioning sessions. The variety
of procedures used for different subjects was dictated by the ex-
perimental data. Table 1 summarizes the procedure for each subject.

The subjects were seated in front of the console (Figure 1)
with the electrodes placed on the inside forearm of either their left
or right arm. Electrode jelly was used on the contacts to reduce any
changes in resistance due to perspiration. Each subject was given
the following instructions:
Table 1. Summary of experimental procedure for each subject. Male subjects are referred to as SM and females as SF.
Table 1

Summary of Procedures for each Subject

<table>
<thead>
<tr>
<th>Subject</th>
<th>Fixed Ratio</th>
<th>Shock Intensity (Volts)</th>
<th>CS-shock Pairing</th>
<th>CS Duration (Sec.)</th>
<th>Shock Topography</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF-1</td>
<td>200</td>
<td>60-75</td>
<td>Variable</td>
<td>30</td>
<td>Left Arm</td>
<td>Completed</td>
</tr>
<tr>
<td>SM-2</td>
<td>200</td>
<td>45-75</td>
<td>Variable</td>
<td>30</td>
<td>Left Arm</td>
<td>Completed</td>
</tr>
<tr>
<td>SM-3</td>
<td>300</td>
<td>55-85</td>
<td>Variable</td>
<td>30</td>
<td>Left Arm</td>
<td>Completed</td>
</tr>
<tr>
<td>SF-4</td>
<td>300</td>
<td>30-60</td>
<td>Variable</td>
<td>30</td>
<td>Left Arm</td>
<td>Completed</td>
</tr>
<tr>
<td>SM-5</td>
<td>500</td>
<td>40-55</td>
<td>Variable</td>
<td>30</td>
<td>Left Arm</td>
<td>Terminated</td>
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<tr>
<td>SM-6</td>
<td>300</td>
<td>40-50</td>
<td>Variable</td>
<td>30</td>
<td>Left Arm</td>
<td>Terminated</td>
</tr>
<tr>
<td>SM-7</td>
<td>300</td>
<td>40-50</td>
<td>Variable</td>
<td>30</td>
<td>Left Arm</td>
<td>Terminated</td>
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<tr>
<td>SM-8</td>
<td>300</td>
<td>40-45</td>
<td>Variable</td>
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<td>Completed</td>
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<tr>
<td>SF-9</td>
<td>300</td>
<td>40-45</td>
<td>Variable</td>
<td>30</td>
<td>Left Arm</td>
<td>Completed</td>
</tr>
</tbody>
</table>
Table 1 (continued)

Summary of Procedure for each Subject

<table>
<thead>
<tr>
<th>Subject</th>
<th>Fixed Ratio</th>
<th>Shock Intensity (Volts)</th>
<th>CS-shock Pairing</th>
<th>CS Duration (Sec.)</th>
<th>Shock Topography</th>
<th>Session</th>
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</thead>
<tbody>
<tr>
<td>SM-10</td>
<td>200</td>
<td>40</td>
<td>Continuous</td>
<td>15</td>
<td>Left Arm</td>
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<tr>
<td>SF-11</td>
<td>200</td>
<td>40</td>
<td>Continuous</td>
<td>15</td>
<td>Left Arm</td>
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<td>SM-12</td>
<td>200</td>
<td>40</td>
<td>Continuous</td>
<td>15</td>
<td>Left Arm</td>
<td>Completed</td>
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<tr>
<td>SM-13</td>
<td>200</td>
<td>40</td>
<td>Continuous</td>
<td>15</td>
<td>Left Arm</td>
<td>Completed</td>
</tr>
<tr>
<td>SM-14</td>
<td>200</td>
<td>40</td>
<td>Continuous</td>
<td>15</td>
<td>Left Arm</td>
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<tr>
<td>SF-15</td>
<td>200</td>
<td>30</td>
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<td>15</td>
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<tr>
<td>SM-16</td>
<td>150</td>
<td>35</td>
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<td>Varied</td>
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<tr>
<td>SM-17</td>
<td>150</td>
<td>40</td>
<td>Continuous</td>
<td>Varied</td>
<td>Left Arm</td>
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<tr>
<td>SM-18</td>
<td>150</td>
<td>35</td>
<td>Continuous</td>
<td>Varied</td>
<td>Left Arm</td>
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</tbody>
</table>

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Table 1 (continued)

Summary of Procedure for each Subject

<table>
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<tr>
<th>Subject</th>
<th>Fixed Ratio</th>
<th>Shock Intensity (Volts)</th>
<th>CS-shock Pairing</th>
<th>CS Duration (Sec.)</th>
<th>Shock Topography</th>
<th>Session</th>
</tr>
</thead>
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<tr>
<td>SF-19</td>
<td>150</td>
<td>35</td>
<td>Continuous</td>
<td>Varied</td>
<td>Right Arm</td>
<td>Completed</td>
</tr>
<tr>
<td>SM-20</td>
<td>150</td>
<td>40</td>
<td>Continuous</td>
<td>Varied</td>
<td>Right Arm</td>
<td>Completed</td>
</tr>
<tr>
<td>SF-21</td>
<td>150</td>
<td>35</td>
<td>Continuous</td>
<td>Varied</td>
<td>Right Arm</td>
<td>Completed</td>
</tr>
<tr>
<td>SF-22</td>
<td>150</td>
<td>30</td>
<td>Continuous</td>
<td>Varied</td>
<td>Right Arm</td>
<td>Completed</td>
</tr>
</tbody>
</table>
"You are to pull this lever with your right hand. How much money you make will depend on the rate at which you pull the lever — the more you pull it, the more money you will make. Each time you have earned 50¢, this small red light here in front of you will go on briefly, while these three white lights, which will be on during the experiment, will go off. The counter here in front of you will count the total number of times you have earned 50¢. You can determine the amount of money you have made by multiplying the number on the counter by 50¢. You must complete the entire session in order to be paid. If you do not complete the session, any money you have previously made will be forfeited. From time to time, you will receive a shock on your (left, right) arm. Do not remove the arm band. If you do, you will not be paid. Be sure to pull the lever all the way to the top and down as far as it will go, because failure to do this means you will be responding for nothing. Remember, the counter in front of you shows you how much money you have made. Any questions?"

Each subject was given a pre-experimental exposure to different shock intensities in an attempt to establish an appropriate shock level. This procedure started at a relatively low voltage and increased 5 volts with each shock presentation until a maximum intensity for each subject was reached. The maximum intensity was established at that point at which the subject refused to continue the experiment if the shock would be increased.

After a shock level was obtained, each subject was allowed to complete one or two ratio runs with no CS or shock presentation, depending on how quickly a stable rate of lever pulling was established. A ratio run is defined as the number of responses required to attain reinforcement. Following the establishment of a stable response rate, the CS was presented in a ratio run without shock to assure that it alone had no disruptive effects on the lever.
pulling performance. The conditioning procedure of pairing the CS with shock by presenting the shock at the termination of the CS was introduced at this point. One CS was presented in each ratio run for the remainder of the experimental session.

Lever pulling was maintained by four different fixed ratio (FR) schedules of reinforcement: FR-500; FR-300; FR-200; FR-150 (See Table 1). The size of the ratios was decreased because some subjects became tired and terminated the session with the larger ratios.

The position of the CS in every ratio run was varied for each subject. The range of variation of CS presentations ran from 10 responses following reinforcement to 10 responses preceding reinforcement. This variation of CS position was used in order to determine if the degree of suppression was affected by different CS positions as suggested by Lyon and Felton (1966).

The length of the experimental sessions ran from 14 to 80 minutes depending on the rate at which the subject pulled the lever, with each session terminating after 20 reinforcements. Each subject who completed the session received ten dollars.

Experimental Procedure

Experiment #1 - shock intensity

Procedure

Subjects SF-1 through SF-4 in this experiment, received shocks
programmed through a 14K ohm resistor which stabilized the shock intensity for changes in skin resistance. Due to both the subjects' verbal reports that the shock was mild and was felt only on the surface of the skin and a separate test of extreme voltage with this resistor (up to 110 volts), it was felt that the shock was not aversive enough for proper implementation of the procedure. The resistor was removed for the remainder of the study.

The shock intensity for all subjects (SF-1 through SF-9) in this experiment was increased during the experimental session when no suppression was indicated (See Table 1). The CS was paired with shock in a varied sequence with each subject receiving at least eight CS presentations terminated by shock. The CS duration was 30 seconds for all subjects in this design.

Results

The rate of lever pulling may be derived by measuring the slope of the cumulative record. A horizontal line would indicate a zero response rate and a perfect vertical line would indicate an extremely high response rate. Each CS-shock presentation is indicated by a downward deflection of the pen for the duration of the CS. The degree of suppression may be determined by inspection of the slope during these deflections. A horizontal line indicates complete suppression and a continuation of the slope is indicative of no suppression. Reinforcements are indicated by a downward pip of the pen.
A typical cumulative record for the subjects receiving shock programmed through the 14K ohm resistor is presented in Figure 2 for SF-4. Inspection of the slope during the CS reveals no obvious disruption or suppression of the lever pulling behavior. The results of the other three subjects using the resistor also show no suppression. SF-9 (Figure 3) began demonstrating suppression during the fifth CS and continued to suppress during the next two CS presentations. At point (A) the subject began to respond with a very short excursion and the response rate increased as is evidenced by the change in slope. The suppression which had occurred prior to the increase in rate, dropped out and the CS no longer had any noticeable disruptive effect on the response rate. At point (B) the subject was instructed to pull the lever through the entire 20 inch excursion and the rate slowed down. Subsequent to this decrease in rate, suppression was re-established during the tenth CS and continued for the last two CS presentations. This was the only subject to demonstrate any significant degree of suppression in this experiment.

Experiment #2 - CS duration and CS-shock pairings

Procedure

One subject, SF-9, stated that the reason for suppression during the CS was the fact that apparently this cessation of lever pulling intermittently prevented the onset of shock. Thus it
appeared as though the variable CS-shock pairing was creating a situation in which suppression of lever pulling was superstitiously reinforced by the intermittent absence of the shock following the CS. This experiment eliminated the possibility of superstitious reinforcement by terminating every CS with shock. The CS duration in this experiment was decreased to 15 seconds following the suggestion by Stein, Sidman and Brady (1958) and Kamin (1965) that shorter CS durations produce greater degrees of suppression.

The shock intensity was held constant in each subject regardless of the evidence of suppression, due to the high percentage of subjects who quit the session when shock intensity was increased (See Table 1).

Results

Although there was some variability in the response rate during the CS presentations, none of the subjects in this experiment (SM-10 through SF-15) demonstrated any significant degree of suppression.

Experiment #3 - random CS duration

Procedure

When suppression was not demonstrated by those subjects with whom the CS duration was held constant at either 30 or 15 seconds (See Table 1), a varied CS duration was introduced on the basis that this design would give the subjects fewer cues as to when the shock
was to be delivered, thus maximizing the disruptive effects of conditioned suppression. The CS duration was varied in a range from 5 to 30 seconds by a repeated 30, 15, 5, 25, 10, 20 second sequence.

Results

None of the three subjects (SM-16 through SM-18) used in this experiment showed any significant degree of suppression during the CS.

Experiment #4 - the topography of shock delivery

Procedure

Several of the subjects in the previous experiments, while not demonstrating suppression, exhibited some bizarre motor behaviors during the CS. Many of these behaviors involved movement of the subject's left arm, on which the electrodes were attached. On the basis of these reports, the electrodes were placed on the subject's right arm during this experiment while continuing to require the subject to respond with this arm. This was done to determine if the bizarre motor behaviors would also affect the right arm and subsequently suppress lever pulling. A dummy cuff was attached to the subject's left arm to prevent any lever pulling responses with the left arm.
Results

Of the four subjects in this design (SF-19 through SF-22), SF-19 was the only subject who showed any significant degree of suppression. Figure 4 presents the cumulative record for this subject. The initial CS presentation, which was not followed by shock, resulted in a partial suppression of the rate. Three additional presentations of the CS without shock were given in the beginning of the session until suppression during the CS alone was no longer evident. Complete or partial suppression was recorded during every CS for the remainder of the session.

General Results

Sixteen of the twenty-two subjects used in this study completed the entire session (See Table 1). Two of these subjects, SF-9 and SF-19, demonstrated significant degrees of suppression during the CS. Five of the six subjects who did not complete the session, received a minimum of four CS-shock pairings. The remaining subject terminated the session during the pre-experimental exposure to shock.

The position of the CS in the ratio run had no apparent effect on the degree of suppression. The records of SF-9 (Figure 3) and SF-19 (Figure 4) indicate that suppression occurred in a variety of CS positions in a ratio run. Neither subject demonstrated the phenomenon found in the Lyon and Felton study (1966) of continuing...
to respond until reinforcement and then suppressing when the CS
came near the end of the ratio run. The eleventh CS presentation
for SF-9 (Figure 2) was presented just prior to reinforcement,
with reinforcement coming approximately at the same time as CS
termination. The horizontal line during the CS gives no indication
that the subject continued to respond until reinforcement and then
suppressed.
Figure 2. Cumulative record for SF-4. Each of the CS - shock presentations is indicated by a downward deflection of the pen for the duration of the CS. Onset and termination of the CS are indicated by the arrows. Reinforcements are indicated by a downward pip of the pen.
Figure 3. Cumulative record for SF - 9. Each of the CS - shock presentations is indicated by a downward deflection of the pen for the duration of the CS. Onset and termination of the CS are indicated by the arrows. Reinforcements are indicated by a downward pip of the pen.
Figure 4. Cumulative record for SF - 19. Each of the CS - shock presentations is indicated by a downward deflection of the pen for the duration of the CS. Onset and termination of the CS are indicated by the arrows. Reinforcements are indicated by a downward pip of the pen.
DISCUSSION

The results of the present study indicate a degree of difficulty in establishing conditioned suppression in humans, using a technique which has been successful in showing this phenomenon in animals. Manipulation of variables found to be important in animal research had little effect on human subjects. The response characteristics of suppression shown by Lyon and Felton (1966) in pigeons and replicated in part by Mulder, Lyon and Pott (1967) with humans, were not evident in the present study. The position of the CS in the ratio run had no apparent effect on the degree of suppression.

Many of the variables studied in animal research are important in establishing the degree of suppression, rather than determining the initial occurrence of the phenomenon. If a procedure for establishing consistant suppression in humans can be developed, those variables determining specific characteristics of degree in animals may be shown to have a similar important function in research with humans.

The tentative results of this study are further weakened by the fact that the suppression demonstrated by SF-9 (Figure 3) may have been superstitiously reinforced by the intermittent absence of shock following the suppression. This differs from the interpretation that suppression during the CS is a result of various conditioned emotional behaviors disrupting the organism's response rate in a manner determined by past environmental factors. The
employment of a continuous CS-shock pairing with SF-19 (See Table 1) eliminated the possibility that the absence of shock maintained suppression, thus giving more credibility to these data as evidence of conditioned suppression.

Although the quantitative evidence for conditioned suppression found in this study is meager, there were a number of qualitative indications that the subjects were experiencing some disruptive form of "anxiety". SM-5, for example, terminated the session because "My head started pounding, waiting for the shock to come and I got too nervous to continue." Other subjects reported exhibiting such non-adaptive responses such as standing, biting lips or tie and raising arms during the CS.

If the above mentioned behaviors can be construed as indicators of emotion, a possible explanation for the absence of lever pulling suppression in these subjects may be found in the complexity of the response. This relatively simple motor task may not be complex enough to be affected by the disruptive factors of conditioned suppression. Conditioned suppression in humans may be a function of the type of response being measured, with more complex responses which require prolonged and careful attention by the subject, being more susceptible to the disruptive effects of suppression.

Another problem in interpreting the results of this study deals with the aversive quality of the shock. A minimal shock intensity is necessary to establish suppression and as the intensity increases, the degree of suppression becomes greater (Annau & Kamin,
1961). The variability among human subjects of the reaction to electric shock is well documented (Laneer, 1943; Clark & Bindra, 1944). The present study used a pre-experimental exposure to shock, relying on the subject's verbal report to determine an aversive level. Goldiamond (1962) pointed out the problem involved in establishing thresholds by verbal report, stressing the importance of motivational variables which are not under the experimenter's control. The present study attempted to increase shock intensity (See Table 1) and found that subjects terminated the session. This termination can be viewed as suppression in a more generalized form than cessation of lever pulling. If the subject could be kept in the experimental session at a shock level which would make him want to leave the session, perhaps the suppression of lever pulling could be demonstrated. Increasing the value of the reinforcement at this point may be a useful device in discouraging termination of the session.

A third problem in establishing conditioned suppression in humans involves the factor of the individual histories of the subjects. Animal studies report that the suppression of appetitively maintained behavior is dependent upon the behavioral history of the organism. Herrnstein and Sidman (1958), for example, found that monkeys which had been trained to press a lever to avoid shock, showed an increase rather than a decrease in response rate during the CS when exposed to an Estes-Skinner conditioned suppression procedure. Waller and Waller (1963) showed that dogs exhibited
little or no suppression when working for food reinforcement, after being trained to avoid shock by emitting a designated response. An unknown factor in research on suppression in humans, is the previous conditioning history of the subjects in "anxiety" producing situations. Perhaps some human subjects have had a history which was incompatible with the cessation of a simple motor task in stressful situations. This factor could explain the variability of suppression shown by the subjects in the Mulder, Lyon and Pott study (1967) as well as the present study.

The CS duration was varied in the present study in an attempt to reduce the number of cues available to the subjects as to when the shock was to be presented (See Table 1). SF-19 (Figure 4) demonstrated suppression under this procedure. However, the shock was always presented at the end of the varied CS durations, thus providing the subject with a physical cue which accompanies the onset of the shock. A procedure described by Kamin (1961) eliminates this physical cue by presenting the CS for a short duration and then varying the interval between CS offset and the onset of shock. This procedure would maximize the uncertainty of shock presentation creating a situation which should lend itself to the disruptive effects of conditioned suppression.
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