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The effect of anxiety on the stimulus generalization gradient in operant verbal conditioning.

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THE EFFECT OF ANXIETY ON THE STIMULUS GENERALIZATION GRADIENT IN OPERANT VERBAL CONDITIONING

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The Effect of Anxiety on Stimulus Generalization in Operant Verbal Conditioning

It has been suggested (Krasner, 1958, 1965; Williams, 1964; Williams and Blanton, 1968) that operant verbal conditioning resembles psychotherapy in that both can be seen as belonging in a broad class of behavior influencing techniques. Krasner (1965) says that if changes in verbal behavior can be shown to have consequences for changes in other kinds of behavior, then systematic modification of verbalization itself can be called treatment. Given this point of view, the empirical question to be answered then is, "Does reinforcement of a particular response class through verbal conditioning procedures lead to changes, not only in verbal behaviors, but in other overt behaviors as well, in a variety of situations?" In other words, if this position is valid, it should be experimentally demonstrable that operant verbal conditioning, aside from simply modifying verbal behavior, can result in substantial modification of other behaviors in a variety of situations, not just in the original conditioning situation.

In contemporary learning theories, when an organism has been operantly conditioned to respond in the presence of a particular stimulus, the organism will emit the response in the presence of similar stimuli, even though these other stimuli have not been used in training. The more similar the new stimuli are to the stimuli present during conditioning, the greater the response strength will be; the less similar, the smaller the response strength will be. The result is a

gradient of response strength, that is, the stimulus generalization gradient (SGG). An operant response therefore is not related simply to a precise discriminated set of stimuli, but to a class of stimuli, and the strength of the response emitted by the organism will depend on how similar the new set of stimuli are to the original stimuli. Because environmental situations rarely, if ever, recur in nature, this phenomenon, stimulus generalization (SG), is important to the adaptive economy of the organism. That is, in order for a response to be emitted, the precise stimulus situation which originally set the occasion for the operant behavior need not be present. The operant behavior will be emitted if any of the general class of stimuli to which it became related are present. There are data to support such a phenomenon in operant conditioning (Guttman & Kalish, 1956; Honig, Boneau, Burstein, & Pennypacker, 1963). Similarly, although a response has been reinforced, it may not be repeated in exactly the same way. When responses are repeated, they are likely to vary over a range of more or less similar acts. The strength of the various responses, the response generalization (RG), depends on how similar each response is to the originally conditioned response. The result is a gradient of response strength, the response generalization gradient (RGG).

In traditional verbal psychotherapy several processes can be hypothesized as occurring simultaneously. One such process, as mentioned above, might be operant verbal conditioning. In such a process, the therapist may be conceptualized as being a reinforcing agent who shapes certain desired behaviors in his client. Usually, reinforcement

is made contingent upon certain desired verbal behaviors and, in general, the reinforcement is some form of approval from the therapist. The conceptual framework for explaining how nonverbal behaviors can be changed as a result of verbal behavior change involves the mechanism of RG. When a verbal response is strengthened by reinforcement, a whole class of behavioral responses are strengthened, the amount of strengthening depending on how similar the other responses are to the original. For example, if a therapist reinforces his client for the verbal expression of anger toward his dominating wife, several other behavioral responses should also theoretically be strengthened. Such responses might include thinking angry thoughts about his wife, talking angrily in a face to face confrontation with her, and hopefully, behaving more aggressively toward her in general. The amount of strengthening in the other responses depends again on how similar they are long certain continua (e.g., physical, conceptual, etc.) to the originally reinforced response according to the principle of RG. Similarly, the conceptual framework for explaining how verbal behavior change in a therapist's office results in verbal behavior change outside of that office involves the mechanism of SG. The strength of the verbal response emitted outside of the therapist's office depends on how similar the new set of stimuli are to the original stimuli, again, along certain continua. Thus, one possible process occurring in psychotherapy, that is, verbal conditioning, depends upon SG and RG as explanatory concepts.

Several studies have unsuccessfully attempted to demonstrate that verbal conditioning can result in changes in nonverbal behavior in

stimulus situations other than the conditioning situation. Wimsate and Vestre (1963) verbally conditioned patients to give more extroverted or introverted responses on MMPI items. They found no generalization to a self report inventory or to ward behavior as rated by attendants. Neuringer, Meyer, and Nordmark (1966) matched experimental and control Ss on the Aesthetic Scale in the Study of Values. The Ss were reinforced for talking about aesthetics. Only those Ss who conditioned in the experimental group were included in the generalization study. The Study of Values and the Vocational Preference Survey were the instruments used to test for generalization, of which the authors found no evidence.

Rogers (1960), using a variety of personality tests, did not find any evidence of generalization when he conditioned positive and negative self reference statements. Lanyon (1967) interviewed college females concerning their childhood experiences; he then gave them social approval either following content responses (plural words), affect responses (emotional words), or at a constant interval. A second experimenter in another room then administered a 100 item sentence completion task which was designed to evoke similar responses. For content responses, contingent approval increased production during the interview but not on the transfer task. For affect responses, contingent approval had no significant effect, although mere participation in the interview increased production on the sentence completion tasks. Thus Lanyon's study also failed to support the utility of the verbal conditioning technique for producing cross modality behavior change.

Sacks (1962) also failed to find a transfer or generalization effect after verbal conditioning. He first gave his Ss an inkblot test. He then reinforced them for picking sentences concerned with human movement. On readministration of the inkblot test he found no increase in human movement responses.

In contrast, however, several studies have demonstrated the efficacy of operant verbal conditioning for changing nonverbal behaviors in new situations. Lovaas (1961) conducted an experiment where he reinforced children for emitting aggressive verbal responses. He found that this conditioning generalized to a situation where the children could press a bar to view aggressive doll play. That is, children who had been reinforced for verbalizing aggression pressed the bar more often to see dolls fighting.

In another study, Lovaas (1964) showed that with children, when positive reinforcement is associated with the verbal response denoting a food, then the consumption of that food increases. There was generalization, then, from verbal behavior to other, non-verbal behaviors in a situation different from the original conditioning situation.

Vogel (1964) reinforced Ss for over- or underestimating the size of circles. He found that this behavior generalized when he had Ss draw the circles rather than verbally estimate their sizes.

Thavel and Oakes (1967) obtained generalization of the use of hostile or neutral verbs. The generalization task was telling stories to TAT cards. Coons and McEachern (1967) conditioned Ss low on self esteem to give more accepting answers on items of a questionnaire. A post conditioning questionnaire with different items showed that conditioning was

successful. The results also generalized to a measure of acceptance of others.

Harmatz (1967), arguing against frequency manipulations of verbal output, employed a procedure in which he shaped the level of endorsement of Ss to positive and negative self references. He found generalization to several post-conditioning measures, but noted that the conditioning procedure employed would only be applicable in a laboratory situation.

Lapuc and Harmatz, in press, attempted to make the conditioning situation as similar as possible to a psychotherapeutic situation. Psychiatric Ss were given social reinforcement following positive self-reference during eight 30-minute weekly therapy type sessions. A yoked-control group received exactly the same reinforcement delivered noncontingently. The results demonstrated conditioning and generalization to some personality measures. Behavioral ratings and a number of personality measures showed no generalization effects, however. This last finding is similar to that of Brodsky's (1967) demonstrating generalization from the behavioral level to verbal behavior, but not from the verbal level to non-verbal behavior.

In the experimental literature then, there appear to be conflicting results concerning whether operant verbal conditioning can change non-verbal behavior in stimulus situations other than the original. However, these various studies have attempted only to demonstrate whether the phenomena of SG and RG are present in operant verbal conditioning; they have not attempted to investigate or systematically control stimulus and/or response factors which might influence generalization. The present study concerns itself with systematically manipulating the

physical stimulus properties of the generalization tasks in an attempt to produce a stimulus generalization gradient. None of the above investigators report considering if the stimulus characteristics of the generalization tasks were in fact part of the stimulus class which became related to the operant and set the occasion for its occurrence in the conditioning procedure. If they were not part of such a class, then generalization would not be expected. However, those investigators who demonstrated generalization did use generalization tasks with such characteristics, even though they may not have intentionally designed them that way.

Further, none of the above studies attempted to systematically manipulate any of the variables which have been shown to have some influence on both the amount of conditioning achieved and on the amount of SG responsivity. Anxiety is one such variable.

Taffel (1955), using the Taylor Manifest Anxiety Scale (MAS), divided subjects into 3 groups-- high, medium and low anxious. He found that the high anxious group was superior in the amount of operant verbal conditioning obtained. This finding is in agreement with much research literature which indicates that on simple tasks, anxiety generally facilitates performance (e.g., Spence and Taylor, 1951; Taylor, 1951).

In contrast, Moore and Heap (1968), found that only subjects with low anxiety demonstrated the conditioning effect in a replication of Taffel's procedure. Similarly Buss and Gerjuoy (1958) found that high anxious subjects showed less conditioning in an operant verbal conditioning procedure than either the medium or low anxious subjects, again using the MAS as the instrument measuring anxiety.

Dollard and Miller (1950) hypothesize that an anxiety response has drive properties and contributes to the total drive state of an organism. They further hypothesize that generalization varies directly with drive and, hence, with anxiety. Mednick and Freedman (1960) in their review of the literature find much evidence supporting this hypothesis (e.g., Jenkins, Pascal & Walker, 1958; Murray & Miller, 1952; Brown, 1948). Rosenbaum (1953) used 3 degrees of noxious stimulation (strong shock, weak shock, and buzzer) to produce varying levels of drive state with human subjects in a classical conditioning procedure where the noxious stimulus was paired with visual figures. While the weak shock and buzzer conditions did not produce differing results, the strong shock resulted in considerably elevated SGGs.

Mednick (1957) compared the SGGs of experimentally naive and experimentally sophisticated Ss finding that the naive Ss demonstrated greater SG responsiveness than the sophisticated Ss. He assumed naive Ss to be more anxious than sophisticated Ss. This effect was also marked in Ss who scored high on the MAS.

A study by Buss (1955), using psychiatric patients, found no difference in SG as a function of MAS scores. Fager and Knopf (1958) also found no relation between MAS scores and SG with psychiatric patients.

A problem in interpreting these conflicting results arises in that the various experiments involve different training procedures (respondent vs. operant conditioning) and different subject populations (college students vs. psychiatric patients). However, if the Ss anxiety level is elevated, it may be possible to raise the SGG and the Ss generalization responsivity. This, in effect, would include more stimuli in the original

stimulus class which are capable of setting the occasion for the reinforced operant response. An increase in the S's anxiety level might also be seen as an experimental analogue of the typical state of a client in therapy.

Finally, Greenspoon (1955) reported that learning could occur in an operant verbal conditioning procedure without the S being aware of the reinforcement contingencies. Studies which followed Greenspoon's were reviewed by Krasner (1958). He reports that only about 5% of Ss in all of the 31 studies reviewed were said to be aware. However, since that time, several experimenters (e.g., Dulaney, 1961; Farber, 1963) have questioned the possibility of learning without awareness in an operant verbal conditioning paradigm.

In summary, as an analogy to traditional verbal psychotherapy, the present study is designed first, to investigate whether operantly conditional verbal behavior learned in one situation will generalize to physically similar situations; and secondly, this study is designed to assess the effect of anxiety on conditioning, extinction, and generalization of operantly conditioned verbal behavior. The present study, then, is designed to investigate three major hypotheses. These are:

1. In operant verbal conditioning, as in other operant learning situations, a response previously reinforced in the presence of stimulus set O, should also be emitted in the presence of test stimuli similar to O. The SGG can be said to occur if the strength of these generalized responses varies as an orderly function of the physical difference between the test stimuli and Stimulus set O.

2. Experimentally induced anxiety should facilitate conditioning and also elevate the SGG.
3. Awareness of the reinforcement contingencies is not necessary for operant verbal conditioning to occur.

METHOD

Subjects: 74 undergraduate females were drawn from the subject pool at the University of Massachusetts to participate in this experiment. Apparatus: 2 experimental rooms were used. One was equipped with nonoperating electronic equipment placed behind the subject. The other room had three desks and chairs placed against the walls. Materials for the experimental task, derived from Taffel (1955) included 80 3" x 5" white unlined index cards. A different past tense verb was typed in the center of each card. Below each verb there were 6 personal pronouns (I, We, She, He, You, They). The pronouns were arranged in a random order for each card. There were 4 kinds of stimuli for the generalization tasks. 80 more 3" x 5" unlined cards similar to the conditioning cards were used (Stimulus Set S_1). A second group of 80 3" x 5" lined cards were arranged in the same way as the original 80, using a different type style (Stimulus Set S_3). The fourth set of stimulus materials were 80 past tense verbs with the 6 pronouns below, typed and numbered sequentially on 4 $8\frac{1}{2}$" x 11" white paper (Stimulus Set S_4) Procedure: Of the 74 Ss who appeared at the experimental room, 2 refused to participate, 2 were excluded for not following instructions, 2 were excluded for being judged aware of the reinforcement contingency, and the other 4 appeared to negatively condition.

The remaining 64 Ss were divided into 2 groups of 32 Ss each. The first group, the low anxiety group (group LA) were given the following instructions:

I am Mr. Ford from the Department of Psychology. I have asked you to serve as a subject in an experiment concerned with the effects of mild vibration. This vibration will be so mild that you will be unable to feel it. However, because of our lack of knowledge in this area, it is very important to study this kind of vibration especially as it influences behavior. The task you will be doing is concerned with investigating how people make up sentences. Here is a sample of what you will be doing. (E gave S a sample card with the stimulus word and the six pronouns.) Your job will be to construct a sentence using one of the six pronouns in combination with the single past tense verb, for example, He kicked the ball. It doesn't matter how long the sentence is, but try to say the first that comes to mind. You may know that experiments are often run by psychologists which use vibration to punish wrong answers. That is definitely not the case here since there are no right or wrong answers in the exercise that you will be doing, and also because any vibration that is given is given by this machine (E pointed to an electronic apparatus sitting on the table directly in front of the S) which works in a random fashion. Therefore, there is nothing you can do in the experiment to change whether or not it is given. Your job is to concentrate on constructing the sentences. Again, you could possibly receive very mild vibrations during the course of the experiment, but I guarantee you will not feel it or notice it. (AT NO TIME WAS ANY VIBRATION ACTUALLY ADMINISTERED.)

The S then had 2 finger clamp electrodes attached to the thumb and index fingers of the non-dominant hand. E then turned on a light in the machine facing the S, and also moved some dials and switches. E then gave the S the following rating scale to determine his level of anxiety (after Schachter, 1959):

How do you feel about participating in this experiment?

I feel extremely uneasy	Very uneasy	Quite uneasy	A little uneasy	Relatively calm	Completely calm
6	5	4	3	2	1

Each S was then presented with the original 80 cards one at a time. The first 20 cards were used as an operant block to determine the operant rate of usage of I and WE by each S. Each time S used I and WE in trials 21 - 80 she was reinforced with an " mm-Hmm" after she completed the sentence. In conditioning, the number of I's and WE's emitted per block of twenty trials was the dependent variable. After the conditioning trials there was a 2 minute pause. During this pause the S filled out her experimental credit card.

Trials 81 - 160 were extinction trials. The number of times the conditioned pronouns were emitted per block of 20 trials without reinforcement was the dependent variable.

Eight Ss went through extinction using the first SG task, i.e., stimulus set S_1. A second group of 8 Ss went through extinction using the second SG task, i.e., stimulus set S_2. A third group of 8 Ss moved to the other experimental room during the 2 minute pause and there they received the third SG task, i.e., stimulus set S_3. A fourth group of 8 Ss also moved to the other experimental room during the 2 minute pause

and there they received the fourth SG task, i.e., stimulus set S_4. In all SG situations the S was instructed to give her pronoun choice verbally. E sat in the same position during conditioning and extinction only for stimulus set S_1 in order to make it as physically similar to the original conditioning situation as possible.

The second group of 32 Ss, the high anxiety group (Group HA), was given the following instructions:

I am Mr. Ford from the Department of Psychology.

I have asked you to serve as a subject in an experiment concerned with the effects of electrical stimulation. This stimulation will be such that it might be rather uncomfortable. However, because of our lack of knowledge in this area, it is very important to study this kind of shock especially as it influences the physiological functioning of your body as measured by this machine (E pointed to the electronic equipment) along with associated equipment in the other room, which is all attached to your chair. The task you will be doing is concerned with investigating how people make up sentences. Here is a sample of what you will be doing (E gave S a sample card with the stimulus word and the six pronouns). Your job will be to construct a sentence using one of the six pronouns in combination with the single past tense verb, for example, He kicked the ball. It doesn't matter how long the sentence is, but try to say the first that comes to mind. You probably know that experiments are often run by psychologists which use electrical stimulation to punish wrong answers. That is definitely not the case here since there are no right or wrong answers in the exercise

you will be doing, and also because any shock that is given is given by this machine (E again pointed to the machine sitting on the table directly in front of the S) which works in a random fashion. Therefore there is nothing you can do in the experiment to change whether or not it is given. Your job is to concentrate on constructing the sentences. Again, you could possibly receive electrical stimulation during the experiment. It may be uncomfortable but it is perfectly safe. (AT NO TIME WAS SHOCK ACTUALLY ADMINISTERED.)

Each Ss then had the 2 finger clamp electrodes attached to the thumb and index finger of the non dominant hand. The Ss also received the anxiety rating scale. The 32 Ss were divided into 4 groups of 8 Ss each. Each subject then went through the identical conditioning and extinction procedures as comparable LA subjects, using the 4 different stimulus sets in extinction.

After extinction, all subjects were asked the following questions for assessing awareness (after Taffel, 1955):

1. Did you usually give the first sentence that entered your mind?
2. How did you go about deciding which of the words on the bottom to use?
3. Which do you think you used the most times?
4. Why?

An S was considered aware if she could state that either I or WE or I and WE was followed by the experimenter's "mm-Hmm." Only those subjects judged unaware by E were included in the subsequent data analysis.

RESULTS

In order to assess the effectiveness of the low anxiety vs. the high anxiety instructions, a t test was performed on the anxiety ratings of the 2 groups of subjects. A t value of -5.7758 was obtained, which is significant beyond the .001 level on 62 df.

Table 2 contains the mean frequency of occurrence of the pronouns I and WE for each block of 20 trials in conditioning. The conditioning data are graphically presented in Figure 1. The mean frequency of occurrence of I and WE in trials 1 to 20 (operant level) ranged from 5.75 to 8.25. To determine if there were any significant differences in operant rate due to level of anxiety and/or stimulus set an analysis of variance was performed on the raw data. A summary of the analysis appears in Table 2. There were no significant differences in operant rates due to anxiety level of stimulus set grouping.

An analysis of variance was then performed on the entire set of raw conditioning data. A summary of the analysis appears in Table 3. There was no effect due to anxiety level or stimulus set grouping. However, a highly significant trials effect was obtained ($F=4.33$, 3/168 df, p .005). Thus there was a significant change in rate of emission of I and WE over conditioning trials.

In order to determine if there was any anxiety effect analogous to those found in other studies, the low anxiety-stimulus set data was compared with the high anxiety-stimulus set data, using an analysis of variance. A summary of the analysis of variance appears in Table 4. There was no significant anxiety effect. The raw scores for conditioning were

TABLE 1

Mean Frequency of Occurrence of I and WE
for All Groups for Each Block of 20 Trials in Conditioning

Group	Trials 1-20	21-40	41-60	61-50
A_1 B_1	6.500	7.875	8.875	8.875
A_1 B_2	5.750	6.000	7.750	7.000
A_1 B_3	7.625	7.250	7.750	9.250
A_1 B_4	7.500	8.125	9.375	9.000
A_2 B_1	8.250	9.125	8.625	9.250
A_2 B_2	7.875	6.500	8.500	9.125
A_2 B_3	7.375	7.875	7.250	8.125
A_2 B_4	6.750	6.375	6.125	7.500

A_1= Low Anxiety

A_2= High Anxiety

B_1- B_4= Stimulus Set

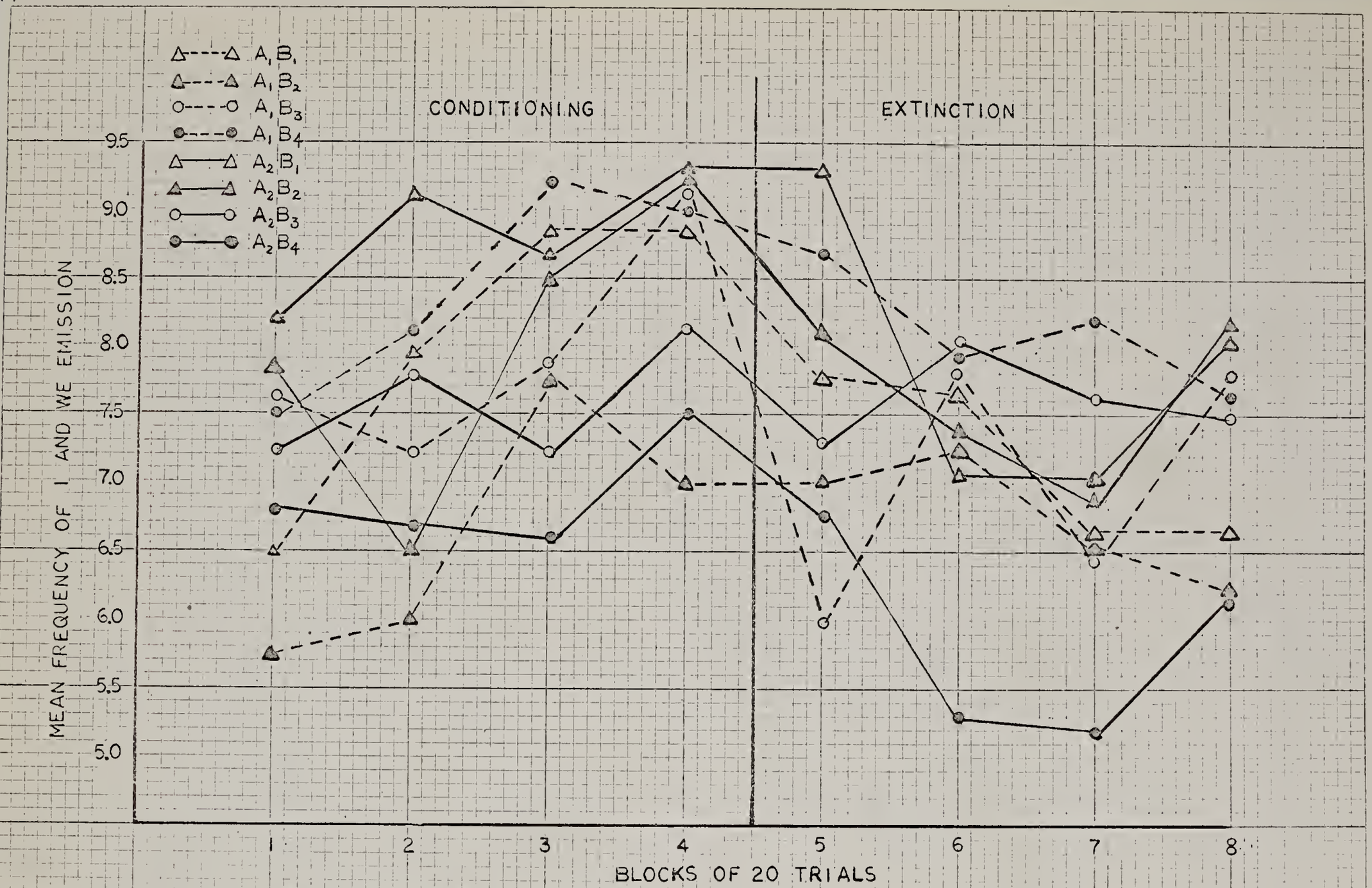

FIG 1-PLOT OF GROUP MEANS PER BLOCK OF 20 TRIALS

TABLE 2

Analysis of Variance for Operant Block

SV	df	SS	MS	F
A	1	8.27	8.27	1.53
B	3	4.42	1.47	> 1
AB	3	24.55	8.18	1.51
S/AB	56	303.18	5.41	

TABLE 3

Analysis of Variance for Raw Conditioning Data

SV	df	SS	MS	F
Between				
A	1	.0039	.0039	0
B	3	42.64	14.20	> 1
AB	3	94.14	31.38	1.41
S/AB	56	1250.16	22.32	
Within				
C	3	69.67	23.22	4.33
CA	3	19.23	6.41	1.19
CB	9	26.94	2.99	> 1
CAB	9	18.94	2.10	> 1
SC/AB	168	901.47	5.37	

$p < .005$

TABLE 4

Analysis of Variance for Low Anxiety-Stimulus Set 1 Data and High Anxiety-Stimulus Set 1 Data

SV	df	SS	MS	F
A	1	0.04	0.04	> 1
C	2	50.33	25.17	> 1
S/A	6	200.25	33.38	
AC	2	4.33	2.17	> 1
SC/A	12	30.00	2.50	

then converted by two different methods in order to remove any effect due to differences in operant levels between groups. The first method was to divide the mean operant rate at each anxiety-stimulus set level into each Ss mean score (per block of 20 conditioning trials) within each anxiety-stimulus set level. Table 5 contains the mean percentage scores for each block of 20 trials in conditioning. An analysis of variance was carried out on the percentage scores. A summary of the analysis of variance appears in Table 6. Again only a significant trials effect was obtained ($F=5.025$, 3/168 df, p .005).

The second method used to remove any effect due to differences in operant levels between groups was to subtract the mean operant rate at each anxiety-stimulus set level from each Ss mean score (per block of 20 conditioning trials), within each anxiety-stimulus set level. Table 7 contains the mean difference scores for each block of 20 trials in conditioning. An analysis of variance was carried out on the difference scores. A trend analysis was also performed on the difference score data for the trials variable. A significant linear trend at the .01 level ($F=11.91$, 3/168 df, p .01) was found using the Scheffé multiple comparison method with a criterion F of 11.32. A summary of the analysis of variance appears in Table 8. Again, only a significant trials effect was obtained ($F=4.04$, 3/168 df, p .01), indicating a change in rate of emission of I and WE over conditioning trials.

Turning to the extinction data, Table 9 contains the mean frequency of occurrence of the pronouns I and WE for each block of 20 trials. The extinction data are also graphically presented in Figure 1. An analysis of variance was performed on the extinction data to determine if there

TABLE 5

Mean Conditioning Percentage Scores for Each Block of 20 Trials for All Groups Rounded to 3 Decimal Places

Group	Trials 1-20	21-40	41-60	61-50
A_1 B_1	1.000	1.251	1.365	1.365
A_1 B_2	1.000	1.043	1.130	1.413
A_1 B_3	1.000	0.951	1.034	1.230
A_1 B_4	1.000	1.088	1.250	1.200
A_2 B_1	1.000	1.106	1.045	1.125
A_2 B_2	1.000	0.825	1.079	1.175
A_2 B_3	1.000	1.068	0.983	1.102
A_2 B_4	1.000	0.944	0.907	1.074

A_1= Low Anxiety

A_2= High Anxiety

B_1- B_4= Stimulus Set

TABLE 6

Analysis of Variance for Conditioning Percentage Scores

SV	df	SS	MS	F
Between				
A	1	0.87	0.87	2.17
B	3	0.46	0.15	> 1
AB	3	0.23	0.08	> 1
S/AB	56	22.41	0.40	
Within				
C	3	1.66	0.55	5.03*
AC	3	0.39	0.13	1.17
BC	9	0.57	0.06	> 1
ABC	9	0.38	0.04	> 1
SC/AB	168	18.5086	0.11	

* $p < .005$

TABLE 7

Mean Conditioning Difference Scores for Each Block of 20 Trials for All Groups Rounded to 3 Decimal Places

Group	Trials 1-20	21-40	41-60	61-50
A_1 B_1	0.000	1.500	2.375	2.375
A_1 B_2	0.000	0.250	2.000	2.375
A_1 B_3	0.000	-0.375	0.125	0.375
A_1 B_4	0.000	0.625	1.875	1.500
A_2 B_1	0.000	0.875	0.375	1.000
A_2 B_2	0.000	-0.531	0.625	1.250
A_2 B_3	0.000	0.500	0.719	0.750
A_2 B_4	0.000	-0.375	-0.625	0.750

A_1= Low Anxiety

A_2= High Anxiety

B_1- B_2= Stimulus Set

TABLE 8

Analysis of Variance for Conditioning Difference Scores

SV	df	SS	MS	F
Between				
A	1	24.22	24.22	1.17
B	3	22.39	7.46	>1
AB	3	23.76	7.92	>1
S/AB	56	1161.63	20.74	
Within				
C	3	65.42	21.84	4.04 *
LIN(C)	1	64.24	64.24	11.91
QUAD(C)	1	.01	.01	
CUB(C)	1	1.11	1.11	
AC	3	14.30	4.77	>1
ABC	9	14.25	1.58	>1
SC/AB	168	906.22	5.39	

*$p < .01$

TABLE 9

Mean Frequency of Occurrence of I and WE or All Groups for Each Block of 20 Trials in Extinction

Group	Trials 1-20	21-40	41-60	61-80
A_1 B_1	7.750	7.625	6.625	6.625
A_1 B_2	7.750	7.250	6.625	6.250
A_1 B_3	6.125	7.625	6.500	7.625
A_1 B_4	8.625	7.750	8.375	7.875
A_2 B_1	9.250	7.375	7.250	8.000
A_2 B_2	8.000	7.125	6.875	8.250
A_2 B_3	7.250	8.125	7.625	7.000
A_2 B_4	6.875	5.375	5.250	6.375

A_1= Low Anxiety

A_2= High Anxiety

B_1-B_4= Stimulus Set

was an extinction effect and to determine if there was any effect on extinction due to the anxiety level in conditioning or to the stimulus set used in the extinction trials. A summary of the analysis of variance appears in Table 10. No significant effects were found.

In the event that some effects were being obscured because each anxiety-stimulus set group reached a different rate of I and WE emission in the final block of 20 trials in conditioning, the raw scores were converted. That is, in order to assess any decrements in performance between groups due to SG, each group ideally should have reached the same level of conditioning. Since this was not the case, the means of each subject in extinction were statistically adjusted for final conditioning level. This was done in two ways. The first method involved dividing the mean of the final 20 conditioning trials for each anxiety-stimulus set group into each subject's mean score (per block of 20 extinction trials) within each anxiety-stimulus set level. Table 11 contains the mean percentage scores for each block of 20 trials in extinction. An analysis of variance was carried out on the percentage scores. The analysis is summarized in Table 12. No significant effects were found.

The second method used to convert the extinction data was to subtract the mean of the final 20 conditioning trials for each anxiety-stimulus set group from each Ss mean score (per block of 20 extinction trials) within each anxiety-stimulus set level. Table 13 contains the mean difference scores for each block of 20 trials in extinction. An analysis of variance was performed on the difference scores. The analysis is summarized in Table 14. An effect at the .08 level was found

TABLE 10

Analysis of Variance for Raw Extinction Data

SV	df	SS	MS	F
Between				
A	1	0.25	0.25	>1
B	3	8.28	2.76	>1
AB	3	97.03	82.34	1.96
S/AB	56	922.1	16.47	
Within				
C	3	21.72	7.07	1.70
AC	3	8.91	2.97	>1
BC	9	35.00	3.89	>1
ABC	9	24.31	2.70	>1
SC/AB	168	698.56	4.16	

TABLE 11

Mean Extinction Percentage Scores for Each Block of 20 Trials for All Groups Rounded to 3 Decimal Places

Group	Trials 1-20	21-40	41-60	60-80
A_1 B_1	0.875	0.859	0.746	0.746
A_1 B_2	0.954	0.892	0.815	0.769
A_1 B_3	0.662	0.824	0.828	0.824
A_1 B_4	0.458	0.875	0.931	0.875
A_2 B_1	1.000	0.784	0.770	0.865
A_2 B_2	0.863	0.755	0.712	0.877
A_2 B_3	0.842	1.000	0.938	0.862
A_2 B_4	0.417	0.717	0.700	0.850

A_1= Low Anxiety

A_2= High Anxiety

B_1- B_4= Stimulus Set

TABLE 12

Analysis of Variance for Extinction Percentage Scores

SV	df	SS	MS	F
Between				
A	1	0.0011	0.0011	> 1
B	3	0.03	0.011	> 1
AB	3	0.600	0.20	> 1
S/AB	56	11.97	0.21	
Within				
C	3	0.24	0.08	1.38
AC	3	0.18	0.06	1.06
BC	9	0.56	0.06	1.08
ABC	9	0.27	0.03	> 1
SC/AB	168	9.70	0.06	

TABLE 13

Mean Extinction Difference Scores for Each Block of 20 Trials for All Groups Rounded to 3 Decimal Places

Group	Trials 1-20	21-40	41-60	61-80
A_1 B_1	-1.125	-1.250	-2.250	-2.250
A_1 B_2	-0.375	-0.875	-1.500	-1.875
A_1 B_3	-1.969	-1.625	-2.750	-1.625
A_1 B_4	-0.575	-1.250	-0.500	-1.000
A_2 B_1	0.000	-1.875	-2.000	-1.250
A_2 B_2	-1.125	-2.000	-2.250	-1.125
A_2 B_3	-0.875	-0.000	-0.500	-1.000
A_2 B_4	-0.625	-2.125	-2.250	-1.125

A_1 = Low Anxiety

A_2 = High Anxiety

B_1 - B_4 = Stimulus Set

TABLE 14

Analysis of Variance for Extinction Difference Scores

SV	df	SS	MS	F
Between				
A	1	1.52	1.52	>1
B	B	4.10	1.37	>1
AB	3	45.34	15.11	>1
S/AB	56	917.58	16.39	
Within				
C	3	29.18	4.73	2.42 *
AC	3	6.02	2.01	>1
BC	9	20.78	2.31	>1
ABC	9	22.58	2.57	>1
SC/AB	169	675.35	4.02	

* $p < .08$

for trials (F=2.41, 3/168 df). Thus there was a significant change, at least at the .08 level, in the rate of emission of I and WE over extinction trials.

In the event that the extinction effect was possibly overshadowing a weak SG effect, only the first block of 20 trials were analyzed. Using raw scores, difference scores, and percentage scores, three analyses of variance were performed. These analyses are summarized in Table 15. Again there was no significant effect due to stimulus situation.

In summarizing the results, there was a highly significant linear conditioning effect. Unexpectedly, no significant effect could be attributed to anxiety level during conditioning. No effect was found due to stimulus situation as expected since this variable was not introduced until extinction. No interaction effects of any of these variables were found. For the extinction data, no significant effects were found in either the raw data or the difference data. However, in the percentage data, a significant extinction effect was found at the .08 level. No effects were found due to anxiety or stimulus situation. No interactions of any of these variables were found to be significant. Thus, a stimulus generalization gradient of zero slope was found, bothfor high and low anxiety subjects.

TABLE 15

3 Analyses of Variance for First Block of 20 Trials in Extinction Using Raw, Difference, and Percentage Scores

Raw Scores:

SV	df	SS	MS	F
A	1	1.27	1.27	>1
B	3	27.17	9.06	1.47
AB	3	25.30	8.43	1.37

Difference Scores:

SV	df	SS	MS	F
A	1	1.49	1.50	>1
B	3	8.57	2.86	>1
AB	3	10.86	3.62	>1
S/AB	56	307.18	5.49	

O/O Scores:

SV	df	SS	MS	F
A	1	0.05	0.05	>1
B	3	0.28	0.09	1.14
AB	3	0.27	0.09	1.09
S/AB	56	4.57	0.08	

DISCUSSION

The present study was unable to generate a SGG in which response strength (number of I and WE emissions during extinction) varied as an orderly function of the physical differences between the test stimuli and the original stimuli. These results suggest a gradient of zero slope. Similar zero slope SGGs have been demonstrated by Littman (1943) and by Burstein, et. al. (1967). However, any attempts at equating the present findings with those of Littman and Burstein, et. al. would be rather difficult because of differences in procedures (operant vs. respondent conditioning) and because of differences in dependent variables (verbalization vs. GSR).

There are several possible explanations for the failure to establish a decremental gradient of generalization in the present study. The first explanation might be that SG does not in fact exist at all. This is a particularly difficult position to defend in light of the extensive research literature which tends to support the validity of the SG phenomenon (see review by Mednick and Freedman, 1960). The second explanation would be that the test stimuli were not physically dissimilar enough for any response decrement to appear. This lack of enough dissimilarity might be a function of two factors. The first factor is that the Ss may have been responding in a cognitive internally constructed environment rather than to the objective one constructed for them by E. Thus if the physically different stimuli were conceptually the same for the S, i.e., if the different stimuli were perceived as similar in that they all belong to a psychology experiment in which the S was participating, it becomes

obvious that what is defined as an important difference by the E is not, in fact, a difference for the S. However, Burstein, et. al. (1967) eliminated this subjective factor and still found no decremental SGG as a function of the characteristics of the stimuli as perceived by the S. A second factor, assuming no cognitive interferences on the part of the S would be that, in fact, the test stimuli were not physically different enough to cause a decrement in response strength. That is, the test stimuli were not sufficiently dissimilar to trigger the mechanism underlying SG, whatever that mechanism might be. The present experiment, however, presents no data for discriminating the merits of either of these explanations.

A third explanation for the failure to establish a decremental gradient of SG in the present study would be that the Ss received too many reinforcements during training. Several experiments in the literature (Spiker, 1956; Margolius, 1955; Hovland, 1937) indicate that the amount of generalization responsivity increased with increasing numbers of reinforced training trials. In the present study, a large number of reinforced training trials. In the present study, a large number of reinforced trials (overall average number of reinforcements/ S=23. 94) may have obscured any decrement due to the difference between stimulus 0 and the test stimuli.

Finally, the large number of F values smaller than one obtained in the several analyses of variance indicates the possibility that some variable which was not controlled for by subject randomization in the present experiment was inflating the error term. For example, the present study attempted to manipulate through instructions the situational

anxiety level of the Ss. However, if the Ss state anxiety level is the variable which has the most influence on conditioning, the SS_{error} would be inflated rather than the $SS_{anxiety}$. Similarly, if the measure of awareness used in the present study was inadequate, awareness could not properly be controlled for. Depending on the importance of awareness for the present experimental manipulations, the SS_{error} would again be inflated. Thus, it is important to keep in mind that some variable which is uncontrolled for by subject randomization may be inflating the error term, especially of the between subjects variables.

Returning to the verbal conditioning-as-psychotherapy analogue, the SG results of the present study suggest that the process by which a newly learned verbal response will generalize is a function of many factors rather than simply a function of physical stimulus similarity. However, the present results might also suggest that an operantly conditioned verbal response might be more resistant to a generalization decrement due to physical stimulus change than experimental evidence from infra-human subjects suggests (e.g., Guttman & Kalish, 1956).

The absence of the expected effect due to the experimental induction of anxiety, both on conditioning and SG, appears to be at odds with earlier studies (Taffel, 1955; Buss & Gerjuoy, 1958). These studies, however, are somewhat different from the present one in that the earlier investigators used MAS scores to divide their Ss into low and high anxious groupings. Because the MAS was not administered in this study, the present anxiety ratings could not be correlated with MAS scores, enabling a comparison of earlier studies with the present one. Further, it is difficult to interpret MAS scores and thus to interpret experimental results

obtained using the MAS. Ss with different scores on the MAS probably differ in other ways too, and it is these differences which complicate the interpretation of the results. For example, the MAS correlates with certain other factors such as general neuroticism (Franks, 1956), introversion (Eysenck, 1955) and emotional responsivity (Spence, 1958). Runquist and Ross (1959) obtained a significant correlation between physiological measures of emotionality (heart rate and GSR changes) and MAS scores. In an eyelid conditioning experiment they found that subjects who were highly responsive in physiological terms and who had a high MAS score showed superior conditioning. Williams (1964) found that a wide variety of personality factors affect conditioning differentially. In view of this finding and the findings which correlate other factors with MAS scores, it becomes difficult to assess whether or not it was truly the Ss anxiety level affecting the performance in earlier studies. However, remembering the earlier discussion of uncontrolled variables influencing and inflating the SS_{error}, MAS scores may be a better indicator of conditionability than a measure of the level of experimentally induced anxiety. It seems, then, that the results of the present experiment with regard to anxiety level are very difficult to compare with the results of earlier studies using the MAS.

Another hypothesis concerning the lack of an anxiety effect may be a function of the Taffel procedure itself. Assuming that an S attempts to provide E with a variety in pronoun usage, exceeding a certain level of repeated pronoun emission may not be possible because the S might feel herself becoming excessively repetitious. Assuming this to be true, high anxious Ss might suppress conditioned pronoun emission to a level which

is similar to that of the emission rate of the low anxious group whose rate of response had not yet seemed repetitious, even in the final conditioning trials.

Since all of the Ss were judged unaware of the reinforcement contingency, there seems to be little doubt that operant verbal conditioning can occur without the S being aware of the reinforcement contingencies. This, of course, assumes that the awareness questions used were valid and it assumes the validity of the notion that to be aware is highly correlated with the ability to verbalize what one is supposed to be aware of.

The implications of the present study for the operant verbal conditioning-as-psychotherapy analogue are somewhat tentative and inconclusive. While unable to demonstrate a decremental gradient of SG, the present study did generate a SGG of zero slope. If the experimental procedure is valid, we are left with the conclusion that an operantly conditioned verbal response is more resistant to SG decrement than it might have been thought in view of the results with infra-human Ss. Therefore, we would expect what a client "learns to say" in therapy should generalize to situations physically dissimilar from the learning situation, i.e., the therapist's office. Of course in actual life situations SGGs from other learning situations will also be influencing the client's behavior, thus complicating the ability to predict precisely what his response will be in the new situation from just the SGG developed in the operant verbal conditioning procedure. Even from an "in situ" operant verbal conditioning procedure such as therapy, several SGGs are built up from the many different kinds of responses which may be reinforced,

e.g., content responses, emotional responses, etc. In contrast, the present experimental procedure was a very distilled reflection of this using only a small subset of responses which could be reinforced in psychotherapy, i.e. pronoun usage.

In terms of the anxiety variable, in spite of the methodological problems mentioned previously, the present results indicate that experimentally induced anxiety with human Ss has a somewhat different effect on conditioning and SG than would be expected in view of previous work using the MAS. Again, with the above-mentioned methodological questions in mind, the present study does not support the hypothesis that anxiety can lead to better conditioning and greater SG responsivity. This would mean that high levels of anxiety would not necessarily facilitate psychotherapeutic change through operant verbal conditioning in the client, nor would it cause him to have greater generalization responsivity.

In terms of future research in this are, the phenomenon of a decrement SGG still remains to be demonstrated. Not only should this be demonstrated through manipulation of objective stimulus differences, but also through manipulations which take into account the Ss subjective scaling of physical stimulus differences. SG should also be investigated using a series of situations which vary along a continuum of meaning. For example, increasing the rate of I and WE usage may be acceptable in an experimental laboratory with several other Ss present, but if those Ss were perceived as peers or as authority figures, the increased rate of I and WE usage may be less acceptable because of the societal stigma placed on talking about oneself to others. Further experimentation should

also make use of a dependent measure which is closer to the content of therapy, e.g., self references, emotional words, etc.

Certainly the whole question of anxiety and its effect on conditioning and SG needs to be investigated in greater detail with human Ss. One possible way to do this would be to match Ss on MAS scores, and then manipulate the acute anxiety level with instructions. This would hopefully control some of the other dimensions mentioned earlier which may be clouding the anxiety issue.

Similarly, awareness should be directly manipulated rather than having to measure it with a questionnaire. Possibly this could be accomplished again with instructional differences.

Finally, the whole area of RG remains unexplored and certainly similar scaling, anxiety, and awareness problems would be encountered.

SUMMARY

In traditional verbal psychotherapy several processes can be hypothesized as occurring simultaneously. One such process might be operant verbal conditioning. One goal of verbal psychotherapy is to effect changes in a client's behavior outside of the therapist's office. The conceptual framework for exlaining how verbal behavior change in a therapist's office results in verbal behavior change outside of that office involves the mechanism of stimulus generalization, that is, the principle that a response conditioned in the presence of one stimulus may also be emitted in the presence of similar stimuli, the strength of the emitted response depending on how similar the new stimuli are to the original. This study was designed to investigate whether verbal behavior operantly conditioned in one situation will generalize to situations of varying degrees of dissimilarity. The present study was also designed to investigate the effect of experimentally induced anxiety on conditioning, extinction, and stimulus generalization. Further, this study attempted to elucidate whether conditioning could take place without the subject being aware of the reinforcement contingencies.

The procedure in this study involved having 64 female subjects make up sentences using the Taffel operant verbal conditioning procedure. The usage of the pronouns "I" and "We" were reinforced by the experimenter saying "mm-hmm" after their occurrence. 32 of the subjects received low anxiety producing instructions. The other 32 subjects received

high anxiety producing instructions. Thee two groups rated themselves as significantly different in anxiety level. In both high and low anxiety groups, 4 groups of 8 subjects each went through extinction with 4 different sets of cards, varying in several physical characteristics from the cards used in conditioning. The number of "I" and "WE" pronouns used in extinction was the measure of generalization. An awareness questionnaire was administered following the experimental procedure. None of the subjects was judged to be aware of the reinforcement contingency. Data analysis revealed a significant conditioning effect but failed to show a significant extinction effect. Further, no significant effect was attributable to anxiety level or to the stimulus set used in extinction. In essence, a stimulus generalization gradient of zero slope was found. Several methodological and theoretical issues were discussed in an effort to further understand these findings. The implications of the results of this study for operant verbal conditioning as a process involved in traditional verbal psychotherapy were also discussed.

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