

AUTONOMIC REACTIVITY AS A FUNCTION OF ANXIETY LEVEL AND MODE OF STIMULUS PRESENTATION¹

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ABSTRACT. Thirty-two snake-phobic female subjects participated in a study to assess the efficacy of using imaginary, as opposed to in-vivo, phobic stimuli in eliciting a conditioned GSR. It was predicted that high-anxious (HA) Ss would be more responsive than low-anxious Ss to the imaginary mode of presentation as used in desensitization. Ss were divided into four groups on the basis of manifest anxiety level (MAS) and order of stimulus presentation. Statistical analyses indicated differential GSR responsivity to the imagination of a phobic stimulus as a function of MAS level.

RESUMEN. 32 mujeres con una fobia de serpientes participaron en un estudio cuyo objetivo era comparar la eficacia de usar estímulos imaginarios, en contraste con estímulos *in vivo*, para suscitar respuestas psicogalvánicas condicionadas. Teóricamente se esperaba que las Ss con alta-ansiedad reaccionarían más que las Ss de baja-ansiedad al modo imaginario de presentación tal como se emplea en la desensibilización progresiva. Se dividieron a las Ss en cuatro grupos con base en su nivel de ansiedad evidenciado por la Escala Taylor de Ansiedad (MAS) así como en el orden de presentación de los estímulos. Los resultados da un análisis factorial de variancia 2×2 evidenciaron que había diferencias en el nivel de reactividad psicogalvánica como función del nivel de ansiedad. Los sujetos de nivel bajo de ansiedad no respondieron tan intensamente al modo imaginario de presentación como lo hicieron los sujetos de nivel alto de ansiedad. El trabajo presenta las implicaciones de este estudio para la desensibilización de fobias.

A patient's progress in desensitization therapy is dependent upon his ability to respond to the imaginary mode of presentation of a phobic stimulus. The basic assumption underlying desensitization is that "the response to the imaginal situation resembles that to the real situation" (Wolpe, 1958, p. 139). Other investigators have also stressed similar views (cf. Lazarus, 1961; Paul, 1966).

Systematic desensitization is a counterconditioning process in which a relaxation response is elicited in order to inhibit a conditioned fear response (Davison, 1968). According to learning principles, for counterconditioning to occur both responses should be elicited in temporal contiguity. That individuals do respond differentially to desensitization has already been established (Clark, 1963; Cooke, 1966). Differential responsiveness of individuals to desensitization may be related to their ability to acquire classically conditioned responses and to generalize from an imaginary to a real sit-

uation. Anxiety, as defined by Taylor's (1953) Manifest Anxiety Scale (MAS), has been demonstrated to correlate highly with conditionability in situations where a single response tendency is elicited (Spence, 1956; Taylor, 1956).

Since desensitization is based on a classical conditioning paradigm (Agras, 1965), it should be expected that subjects who are defined as "high-anxious" (HA) on the basis of MAS scores should be more responsive and capable of greater response generalization with reference to the imagination of a feared stimulus than "low-anxious" (LA) subjects. In the only desensitization study that controlled for level of general anxiety (Cooke, 1966), the above hypothesis was confirmed, i.e., HA subjects were found to be more responsive to imaginal desensitization than LA subjects.

The present study aimed at a comparative assessment of the efficacy of using imaginary as opposed to in-vivo stimuli in eliciting autonomically conditioned responses in subjects differing in general anxiety level as determined by the MAS. To provide for an objective measure of autonomic responsiveness, the galvanic skin response (GSR) was used. That the GSR is reliable when used to differentiate between fearful and non-fearful stimuli was demonstrated by Geer (1966).

It was assumed that the lack of a significant GSR difference between the imaginary versus the in-vivo mode of stimulus presentation would indicate a strong response generalization from the real to the imaginary situation. That greater generalization can be predicted from drive theory using MAS scores was experimentally verified by Mednick (1957).

The main hypothesis tested in the present experiment was that for LA subjects, imaginary scene presentations of a phobic object should be significantly less effective in eliciting autonomic arousal than in-vivo presentations of the same object. For HA subjects either mode of stimulus presentation should be equally effective.

METHOD

Subjects. Thirty-two female subjects were selected from undergraduate psychology courses at The University of Texas at El Paso. On the basis of a subject scoring at approximately the upper one-fifth or lower one-third on the MAS (Taylor, 1953), they were contacted by phone for an appointment. Only those subjects were used who said they were at least "definitely tense" at the sight of a non-poisonous snake and had volunteered for participation in the experiment. Only females were used since Geer (1965) found a higher correlation among females between their subjective reports and behavioral measures of fear.

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Design. Based on the above criteria, 16 HA and 16 LA subjects were selected and divided into four groups of eight each. Subjects were counterbalanced with respect to order of presentation of the phobic stimulus, to allow for possible effects due to this variable. All subjects received both treatment conditions. The experiment was designed as a 2×2 factorial analysis of variance to assess the effects of anxiety level, order of presentation, and their interaction.

Apparatus. The instrument used for measurement of the dependent variable was a Model B polygraph, Model 7603 SA, Lafayette Instrument Co. A Wollensak portable tape recorder Model 3500 was used for all imaginary scene presentations. Noise, illumination, and temperature were held constant during the experiment, which was conducted in an anechoic chamber. In addition, a reclining chair, which gave complete bodily support, was provided for the subject.

Field test. Since self-report instruments and verbal reports of fear in the absence of the feared stimulus are at best a gross estimate of fear (cf. Lanyon & Manosevitz, 1966), a field test where each subject was confronted with the phobic object was required. This confrontation helped to insure that only subjects who were truly snake-phobic were used in the experiment. The first part of the field test consisted of a brief interview to gain some knowledge about the subject's fear of snakes. The subject was then required to enter a large room, and there the experimenter said: "At the end of the room there is a harmless bull snake in a glass cage. The purpose of this session is to find out how afraid you are in the presence of a snake. You will not be forced to do anything which you are afraid to do. You are now to approach the snake as close as you can and open the cage from the top." The glass cage was 16"×14"×14" and covered by wire grating. The bull snake was about 18" in length. In order to provide a more sensitive test and to avoid producing behavior elicited by the subject's observation of modeled approach responses (cf. Bandura, Grusec, & Menlove, 1967), the experimenter stood at all times not closer than one foot from the cage and did not touch it. Subjects qualified if they would not place their hand inside the cage. Those who qualified were given an appointment for the experimental session.

Treatment. Each subject was taken to the anechoic chamber in which the experiment was conducted. In order to alleviate any anxiety surrounding the situation, a brief explanation of the nature of the chamber was given before the subject was taken into the room. Inside the chamber, the subject was seated in a reclining chair. In order to reduce potential sources of subject-experimenter interac-

tions, the experimenter remained out of the subject's view. The GSR electrodes were then attached to the first and third fingers of the subject's hand. After the experimenter checked the positioning of the electrodes, the subject was instructed to refrain from body movements, to relax, and to maintain a natural attitude toward the experimental situation. A five-minute rest period was permitted to allow for stabilization of the base skin resistance level before presentation of the stimuli. During this time the subject's baseline was stabilized at the center of the graph by means of the helipot control. With constant sensitivity, one-inch deflection corresponded to a resistance change of 7000 ohms. This procedure assured that the obtained measurements were independent of the absolute skin resistance values. The range of possible GSR change was therefore equal for all subjects. Uniformity in introducing the subjects to the experimental situation and in presenting instructions was assured by using a tape recording for all scene presentations. Each subject was given three imaginary scene presentations of the phobic object with three neutral scenes between each phobic stimulus presentation. A GSR was defined as a pen deflection occurring within 15 seconds after the onset of the stimulus. In order to avoid any carry-over effects, the subsequent scene was not presented until the subject had returned to baseline. A five-minute rest period was introduced between the imaginary and in-vivo modes of presentation. At the end of the imaginary scene presentations, the experimenter unobtrusively left the room to get the snake. The experimenter held the snake in front of the subject at a distance of three feet and the GSR was measured as previously described. Continuous GSR recordings were taken for all stimuli. In all groups, a subject's GSR to the imaginary mode of presentation was defined as the maximum pen deflection of the responses given to the three stimulus presentations. Thus was provided a more sensitive test of the hypothesis of differential responsiveness for LA subjects. The in-vivo mode of presentation was introduced only once for each subject.

RESULTS

For each subject, two resistance change measurements were derived—one for the imaginal mode of stimulus presentation and the other for the in-vivo presentation. The raw data recorded for each subject were resistance changes in ohms from baseline readings subsequent to stimulus presentation. Of the six different transformations that have been empirically derived for GSR measures (Siddowski, 1966), the logarithm of resistance change was used in the present study. Each transformed score was then multiplied by 100 for ease of computation.

The first step in the analyses was to assess whether there were

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significant differences in reactivity to the imaginary versus the in-vivo modes of stimulus presentation as a function of MAS level and/or order of stimulus presentation. The difference between the resistance change measurement for the in-vivo mode of presentation minus that for the imaginary mode of presentation was determined for each subject. These differences were then subjected to a logarithmic transformation and used as data for a 2x2 factorial analysis of variance with anxiety level and order of stimulus presentation as the main variables.

The effects due to anxiety level were highly significant ($F=8.99$, $df=3/28$, $p<.001$) in the direction of larger differences between in-vivo vs. imaginary modes of presentation for the LA subjects. No statistically significant differences were found for order of stimulus presentation. The interaction between anxiety level and order of stimulus presentation did not reach significance at the .05 level. This lack of significance of the interaction indicates that the difference due to anxiety level is not dependent upon order of stimulus presentation in the present study. The rationale for counterbalancing subjects with respect to order of presentation of stimuli was that order may have had an effect on the responsiveness of subjects to the imaginary scene presentation, especially when the in-vivo presentation was first.

Further statistical analysis involved t tests to compare the mean responsiveness across anxiety levels for a single mode of stimulus presentation.

TABLE 1

Mode	HA	LA	t
Log imaginary	376.9375	233.4375	3.4668*
Log in-vivo	387.9375	388.5000	0.2865

* $p<.01$, two-tailed test

The GSR to the imaginal mode of presentation alone was subjected to a logarithmic transformation for each subject in both anxiety levels. A t test for independent samples confirmed the finding of differential imaginal responsiveness as a function of anxiety level (see Table 1). The GSR for each subject to the in-vivo mode of stimulus presentation was transformed as above. A t test found no significant differences between anxiety levels for in-vivo presentation (see Table 1).

DISCUSSION

The relation of systematic desensitization to a classical conditioning paradigm has been demonstrated elsewhere (cf. Agras, 1965; Davison, 1968) as well as the correlation between MAS scores and

conditionability (Mednick, 1957; Taylor, 1956). The present study demonstrates that the MAS can reliably predict responsiveness to the main component of desensitization: the subject's ability to respond to a verbal description of a phobic stimulus with autonomic arousal comparable to that of the real situation. It was found that there is no statistically significant difference in autonomic arousal between HA and LA subjects when confronted with a phobic object in-vivo. However, when responding to the imagination of the phobic object, considerable difference in autonomic responsiveness was evident ($p < .01$). These findings should not be construed to infer a differential ability to "imagine" as a function of MAS level, but only a difference in autonomic responsiveness to the recorded description of the phobic object in a fear-inducing situation.

The implications for desensitization therapy are obvious. First, utilization of in-vivo stimulus presentation should be effective in eliciting conditioned autonomic responses in both HA and LA subjects. Second, LA subjects should not be as responsive to imaginal desensitization as HA subjects since they do not emit autonomic responses comparable to the real situation. This inference may reflect on Cooke's finding that "under the imaginal treatment, subjects with a high general anxiety level exhibit a greater reduction in fear than subjects with a low general anxiety level" (1966, p. 21).

In light of the present experiment, the differential effects that systematic desensitization has had on fear and avoidance behavior in some subjects (cf. Davison, 1968; Johnson & Sechrest, 1968) may have been due to the susceptibility of a particular subject to the imaginary mode of stimulus presentation. The fact that avoidance behavior was reduced in some subjects while fear was not, may have been due at least in part to the demands of the situation. Avoidance behavior, being operant in nature, could be altered in a given situation while anxiety, as reflected in autonomic activity, is not under the subject's control.

The design and focus of the present investigation provided a study of a subject's individual characteristics as related to differential susceptibility to a particular mode of stimulus presentation and the conclusions should be limited to female subjects. The ability to predict a person's responsivity to a particular treatment should be of considerable value to future research as well as clinical practice. The implications of this study are not limited to desensitization but should also be useful in other forms of therapy which are based on a classical conditioning paradigm and which require that generalization of responses be made from an imaginary to a real situation.

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FOOTNOTE

¹Based on the senior author's M.A. thesis under the direction of the junior author at The University of Texas at El Paso. Acknowledgment is due to Philip Himelstein and Randolph Whitworth for serving on the author's committee. Appreciation is expressed to Schellenger Research Laboratories for the use of their anechoic chamber.