Experimental Desensitization to Anger-Producing Stimuli *

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ABSTRACT

The experiment is a cross-validational study of desensitization of anger responses by using thematically heterogenous anger stimuli which are unidimensionalized through a single type of measure, namely, skin conductance response (SCR) and by (2) utilizing cognitive relaxation training rather than motor relaxation procedures, that is to say, EEG-alpha relaxation instead of EMG relaxation procedures. Furthermore, relaxation levels were controlled through EEG-alpha monitoring during the visualization phase of desensitization, something which had not been provided for in previous studies of this phenomenon. Findings show significant positive desensitization effects on anger responses for the experimental group compared to those of placebo and non-treated controls.

Systematic desensitization has been widely used for eliminating or reducing anxiety as well as specific fears or phobias. Several methods have been employed to reduce anxiety by some variation of the counterconditioning procedure, but the most frequently employed technique has been that which was developed by Joseph Wolpe (1958), which uses relaxation as the counter-conditioning response to the anxiety-producing stimulus. The basic idea is that by pairing a high-arousal stimulus to relaxation, which is a low-arousal physiological response, the high-arousal stimulus loses or reduces its power to produce fear or anxiety. The research work that has been devoted to this phenomenon has been quite massive since Wolpe brought out his monograph on psychotherapy by reciprocal inhibition. This has been appropriately reviewed by Paul and Lang (Franks, 1969), while enthusiasm for this clinical method continues unabated to the present time.[1]

The central idea in systematic desensitization, however, has been carried over from the reduction of fear/phobia responses to that of anger along analogous principles. Since anger is ten-

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1 See, for example the *Psychological Abstracts* of the APA through the 70's for long entries under systematic desensitization.

sion bound, and since it involves activation of the autonomic system, as in anxiety/fear states, then some similar mechanism to that of fear desensitization has been assumed to be involved in the desensitization of anger, i.e., in pairing of an anger-producing stimulus situation with the relaxation response.

The earliest report of a successful utilization of the relaxation response in the reduction of anger in a non-experimental situation seems to have been that of Herrell (1971) who used it in a desensitization procedure to eliminate exaggerated anger in a patient to whom the stimulus to anger and violence was that of being ordered by a person in authority.

There followed a number of studies on the desensitization of the anger response, the most noteworthy of which has been by Rimm and his associates (1971), in which they demonstrated experimentally that a desensitization anger group showed significant reduction in GSR responses and subjective anger scores over those of a placebo group and non-treated controls. Rimm used 20-minute deep muscle relaxation as the counterconditioning response for desensitizing anger felt in vehicle driving situations. In this experiment, however, there was no measure for depth of relaxation during the counterconditioning sessions for desensitization. The experimenters merely *presumed* there was deep muscle relaxation as a result of the 20-minute relaxation training procedure.

In a separate study by O'Donnell and Worell (1973) of desensitization of anger generated by black racial stimuli in white males, a distinction is made between motor relaxation and cognitive relaxation: motor relaxation being that obtained by the Jacobson progressive relaxation method, where the subject is trained to discriminate the feeling of tension and release from tension, in successive muscle groups; and cognitive relaxation being that obtained by merely thinking of relaxation without going through the tension and release procedure. This experiment reports a significant improvement of a desensitization group using Jacobson's method over that using cognitive relaxation and that of a non-treated control. They however make the very important point that the depth of relaxation, irrespective of the form of relaxation procedure, just before the presentation of the aversive-high-arousal imagery material, may be the critical factor in achieving desensitization effects.

The Rimm and O'Donnell studies are take off points for our experiment.

THE PROBLEM

While previous studies seem to have demonstrated the effectiveness of a desensitization procedure in the reduction of an anger response to an aversive stimulus presentation, a number of questions arise:

(1) If the high arousal state of the organism is the invariant target factor in the desensitization of the individual, a desensitization procedure should be valid irrespective of the topography, situation, or source of the anger response that is to be desensitized. The Rimm experiment made the anger response uniform with respect to a well-defined situation, i.e. anger in driving situations. The O'Donnell study utilized black racial reactions of whites as the stimulus for anger arousal, also a narrowly-defined stimulus for anger arousal. Since the GSR is a good measure of arousal whatever may be the source of arousal, it would be useful to experiment with anger arousal in terms of GSR solely as the unidimensional dependent variable irrespective of source and content of anger, in order to see whether Rimm's and O'Donnell's findings could be *cross validated* across any anger situation other than the driving and black racial stimuli situations with which they experimented.

(2) The important point was made by O'Donnell that relaxation level at the moment of presentation of the aversive imagery material is crucial to an understanding of the nature of desensitization, which requires relaxation as a method for counterconditioning. No study in the literature so far reviewed by the author, has undertaken to obtain independent data on relaxation level during training. And since the O'Donnell study raised this question with respect to the negative results he obtained in desensitization by cognitive relaxation, it would be important to experimentally control the relaxation level for a cognitive relaxation experimental group.

(3) Cognitive relaxation as defined by the O'Donnell study involves listening to relaxation instructions which did not involve actual practice for learning the motor skill of relaxation. There are, however, a number of cognitive methods available for producing relaxation, any one of them may be some version or combination of suggestion methods, a meditational/paying-attention-to-various-part-of-the-body procedure and imagining those parts as relaxing, etc. If any of these methods should be used for experimental purposes, it would still be necessary to monitor the relaxation state of the subject by electrophysiological methods. Almost all of the reported experiments on desensitization of anger responses have used relaxation by direct muscle motor relaxation training, not by cognitive methods. It would be of

some theoretical interest to depart somewhat from the usual procedure of desensitization by relaxation through direct muscle relaxation. Instead one could utilize a cognitive relaxation method, say a combination of suggestion and meditational techniques, provided one monitored the relaxation state of the subject. An alternative method to that of the EMG, for monitoring directly this relaxation state would be EEG-alpha (8-13 Hz), which would describe more appropriately the state of repose or tranquillity of the subject rather than muscle relaxation. Although laboratory experience has taught us that EEG-alpha is generally correlated with low EMG potential readings, this is not by any means always the case. The literature reports of cases where low EMG readings are accompanied by predominantly EEG-beta activity, which means that even if the muscles are deeply relaxed, there is some degree of autonomic arousal present which EMG readings are not able to detect.

So that if one could proceed in terms of producing relaxation by another method than skeletal muscle training (motor relaxation training in the words of O'Donnell), provided the relaxation level was monitored also by another method, such as by EEG-alpha readings, one would be in a position to validate previous findings by a different relaxation method and, therefore, prove the generality of the desensitization effects thus obtained. One also could therefore determine whether the O'Donnell negative finding for cognitive relaxation was in fact due to the cognitive relaxation procedures that he used.

METHOD

Subjects. -- The 30 Ss for the experiment (10 males, 20 females) were students who participated as part of their course requirements in introductory psychology and were recruited on the basis that they had problems related to anger. All subjects were told of possible benefits from participation: that it might help them with respect to their anger problem besides enabling them to fulfill their course requirement for experience in a research setting.

Ss underwent a *fear-anger discrimination test:* they were asked to write down four experiences in which they were very angry and four in which they were extremely afraid. They were then asked to compare the four pairs of fear and anger experiences by indicating whether they could distinguish between their emotional feelings, a pair of anger-fear items at a time. All subjects who could not distinguish between the subjective feelings represented by a pair of anger-fear items were informed that they did not qualify for the study.

Those who passed the fear-anger discrimination test received a form containing three items designed to find out the intensity of his anger, the nature of his anger and the extent to which it bothered him. If the subject got angry to a greater degree than the average person, from his point of view, and was bothered by his anger, he was selected for the experiment.

Apparatus & Instruments. — An Autogen 70A Biofeedback Encephalograph gave data not to the S but to the experimenter who could then monitor brain activity, specifically, the relaxation state (EEG-alpha), of the S. The instrument was adjusted for feedback whenever the S emitted brain waves within alpha range.

The ASI standard electrode assembly was used for monitoring EEG activity, with two active electrodes set above the left ear Coordinate T3 of the Electrode Placement Coordinates as set forth by the International Federation of Societies for Electroencephalography and Clinical Neurophysiology and the proximal left side of the occipital region (Coordinate 01). The ground electrode was set over the S's right forehead.

A digital summator, Autogen S100 Digital Integrator and Waveform Analyzer, gave information at 10-second intervals on the percent time the S was in EEG-alpha.

On the other hand, an Autogen 3000 Feedback Dermograph was used to give data on skin conductance responses (SCR). This apparatus was set at delta-CL so that both slow shifts and momentary rapid shifts in skin conductance responses of the S could be monitored. The sensitivity of the dermograph was set at scale factor X1. Any skin conductance deflection from given base levels, defined as zero in a -10-0-10 meter scale, could be read directly at any given time, specifically, immediately after S was presented a critical anger arousal stimulus.

The E normally used a standard set of electrodes, which consisted of three finger electrodes: one ground electrode which was attached to the forefinger and two active electrodes which were attached to the third and fourth fingers. All electrodes were attached to the S's dominant hand.

The E used the silver/silver chloride recessed electrode assembly in cases where the standard set of electrodes malfunctioned. This set consisted of two active electrodes which were attached to the palmar surface of the S's dominant hand with the ground electrode attached to the dorsal surface of the same hand.

An Autogen S100 Digital Integrator and Waveform Analyzer unit was used in conjunction with the feedback dermograph. It was used to provide the E with a means of monitoring the S's progress in terms of his absolute skin conductance level. This was

provided for by setting the instrument to compute S's average skin-conductance level over intervals of 15 seconds with 0.1 -second rest periods in between.

The 15.1 sec. recording periods were later utilized by the E as a cue for when a stimulus was to be given.

All sessions were conducted in an airconditioned room at constant temperature and humidity.

Identification of subject anger responses/situations. — Those who qualified were given fifteen 5 x 8 cards in which they were instructed to describe situations that made them angry but all situations of which related on one particular theme. For example, if riding in a bus were distressful and made them angry in specific situations therein, then each of the 15 cards was to describe a different situation related to the theme of riding on a bus. They were at first requested to describe a situation that made them angry. These were the limits of the subject's anger. They were then asked to continue describing in the cards situations the instigation values to anger of which lay in the middle and between the three limiting points, until they had 15 different situations. The different descriptions were then transferred to the 15 index cards.

Each of the descriptions were written in the first person in sentences of not more than 20 words. They did these at home and the cards were collected the following day from them. The cards were then checked and screened; if the descriptions were too long or were lacking in specificity or involved several themes they were rechecked or corrected accordingly during the hierarchy construction sessions which followed.

There was a wide variety of anger themes/situations produced by the Ss: sibling problems, anger over imposition of authority, over non-fulfillment of obligations, anger over lack of resources caused by unconcerned or neglectful significant others, and a wide variety of other family and social situations that lead to intense anger arousal. All of these were the bases for hierarchy construction preparatory to desensitization proper.

HIERARCHY CONSTRUCTION

The hierarchy construction and pre-test were incorporated into a single session, which started with the construction of the hierarchy of anger-provoking situations. Each S was instructed to rank the content of the 15 cards from the least anger-provoking to the most anger-provoking situation. He was then to choose seven of the cards based upon the following criteria: that the seven situations

to be chosen were recent and recurring, so they could easily be remembered and felt by the S; that the seven cards would have situations unique to each other to prevent the repetition of similar scenes; and that the interval of anger between cards be kept constant.

Then the S was again asked to rank the seven chosen situations in the cards from the least to the most anger-provoking. These situations were presented by the E to the S in one of two predetermined but random orders. The S was asked to rate the anger value of each of the situations according to a 5-point anger scale. The rating procedure was utilized to check the ranking of anger-provoking situations by the S. If a discrepancy was noted between rating a situation received with respect to its rank, the card was re-ranked or re-rated until the ratings of the situations correlated with their ranking order.

For a Test Aversive Stimulus (TAS), the Ss were instructed to choose a situation whose anger value was halfway between that of the least and the most of the eight remaining cards.

The Ss were instructed to fill out two additional cards. One contained a description of a situation which was neutral in emotional value of the Ss. Neutral was defined for the S to be any situation which does not elicit any emotional response whatsoever. Examples of neutral scenes were then cited. One example is one where the S saw himself brushing his teeth or washing his hair.

The other card contained a description of a pleasant scene. Pleasant was defined for the S to be any situation which made him feel relaxed physically and mentally, leaving him feeling free and comfortable. Examples were given to the S. One example was a scene where the S saw himself lying down on a meadow watching the clouds float lazily overhead. Both situations were to be described in the first person point of view in not more than 20 words. Ss were later asked to describe 2 to 3 neutral scenes after the E noted that Ss tested during preliminary pilot sessions tended to tire and become restless from the use of a single neutral situation.

PRETEST

General Procedure. — After the electrodes were attached and the connections checked for artifacts the S was asked to sit up straight with their eyes open for two minutes. This was followed by a 2-minute period when the S was asked to be as comfortable as they could. This was followed by 2-minute period where the TAS was presented. The whole procedure was repeated with the Ss' eyes

closed. This procedure was undertaken to determine the baselines of the Ss across normal and relaxed conditions, and to give the E an idea of the S's latency and duration of anger responses. Also it was used to determine in which conditions, eyes open or close, the Ss could best relive or reexperience the anger situation.

The neutral stimulus was then presented to the S. The S was asked to rate the clarity of the scene on a 7-point clarity scale and its anger value on the 7-point subjective anger scale.

The S was told to keep his mind blark until his skin conductance returned to its previous baseline or had stabilized.

Upon reaching the baseline level, the E presented the first of 7 anger stimuli. The stimuli, which had been ranked from the least to the most anger-provoking in value, were presented in one of two predetermined but random orders. After a peak in the S's skin conductance deflection was observed, he was asked to rate the anger value of the just-presented anger scene according to the 7-point subjective anger scale. He was then presented with a neutral stimulus until his skin conductance level reached the baseline level. Then the next stimulus was presented. The procedure was repeated for the remaining 6 stimuli.

Following the presentation of the last anger scene, the S was asked to visualize himself in a neutral scene until he reached and maintained his baseline levels for 2 minutes. The S was then informed that the session was over. The electrodes were removed, the areas of attachment on the skin cleaned. He was then dismissed after being told that he would be contacted for the next session.

Procedure, details. — Practice sessions were conducted by the E in order to familiarize himself with the pre-test procedure and to test and modify if necessary, the procedures used in measuring the anger skin conductance deflections of the Ss.

The E patterned the pre-test procedure on that used by Rimm et.al. (1971) to measure the S's skin conductance response (SCR) deflections in response to anger stimuli. This procedure incorporated the presentation of anger and neutral scenes in an alternate order. The presentation period of the anger stimulus was initially kept constant at 10 seconds during which the S's SCR deflection was taken. The S was then to give his rating of the anger value of the presented anger situation within two seconds after the end of the anger stimulus presentations. This was followed by the presentation of the neutral situation for a period of 30 seconds before presenting the next anger stimulus. All anger stimuli were presented by the E's reading the description

of the anger scenes in the cards of the S. These random orders used for the presentation were different from those used in the hierarchy construction.

The initial practice sessions conducted in the above manner, however, revealed defects with regards to the applicability of Rimm's procedure to this study. It was noted that the latency and duration of the S's anger response as indicated by his skin conductance deflections often exceeded the 10-second presentation period. The duration and latency of the S's response varied. Thus, readings taken after the end of the 10-second presentation period represented a baseline reading in cases of a long latency or only the initial deflection of a response whose peak occurred after the 10-second presentation period. It was also noted that the rating of the aversive or anger situation was enough to cause a deflection in the skin conductance level of the S. When operating on a fixed-time schedule, the E could not be sure if the observed peak deflection was due to a continuation of the S's anger responses or due to the act of subjective rating itself. These deficiencies necessitated the modification of the procedure.

The skin conductance deflection for a particular stimulus was derived from the observed maximum deflection of the needle from the zero mark of the 10-0-10 meter scale. The baseline was set before the presentation of each anger scene by depressing the auto button. The E presented the anger stimulus at the start of a 15-second recording interval and simply waited for the maximum deflection on the meter scale. The S was asked to rate the subjective anger value of the anger situation only after a decline in the SCR level was observed from the maximum level for two consecutive recording periods.

The initial period outlined by Rimm, et. al. called for the presentation of the neutral stimulus after the rating of the anger value of an anger situation. Any deflection due to the neutral scene was then to be subtracted from the deflection value of the anger stimulus.

The E utilized the neutral stimulus for another purpose. The neutral stimuli were administered, in order to allow the elevated skin conductance level to settle following the stimulus presentation and rating of the anger stimuli. It was further noted that the rating of the same neutral scene over the different stimuli tended to tire the S, which resulted in an increase in the basal skin conductance level (SCL) that was compounded by a sharp deflection due to the act itself of rating the neutral stimulus.

The E modified the procedure so that the Ss would rate the neutral scene once, before the presentation of the first anger situation. The anger deflection value for a particular stimulus was taken to be the simple difference between the baseline skin con-

ductance level during the presentation of the stimulus and the maximum deflection level.

There was no time limit set for the lowering of the skin conductance level to the baseline. The E waited until the observed level had stabilized or had reached the level before the preceding anger scene was presented.

The E resorted to the use of a standard set of neutral stimuli to prevent the S from getting fidgety over having to use the same neutral scene over and over again.

Design and conditions. — Subjects were formed into three random groups: Desensitization Group, Placebo Goup, and Non-Treated Control Group. There were 10 Ss per group.

The Desensitization Group was given relaxation training and regular desentization sessions which utilized their relaxation skill.

The Placebo Group was given the opportunity to talk about the situations described in the anger cards they submitted. Every Placebo subject had a corresponding yoke in the Desensitization Group with respect to time spent in the desensitization session, in order to equalize between groups for time spent in exposure to the experimental situation.

The Non-Treated Group was merely given a Pre- and Post-Test, which were also given the other two groups.

Desensitization. — The Ss were briefed on what was to be done during the desensitization session: that the session would consist of two stages, an initial relaxation phase followed by a desensitization phase. The principle and the purpose of the desensitization procedure were explained to the Ss before they were brought to the rear end of the room where the electrodes from the biofeedback instruments were attached.

The first 20 minutes were spent relaxing the S as deeply as possible using a cognitive method. The S's relaxation progress was monitored through the biofeedback instruments. It should be noted here that the feedback was available only to the E and not to the Ss. A S was considered to be relaxed if he satisfied concurrently the criteria that his absolute skin conductance level be lower than 100 micromhos and that he maintain his percent time in the alpha frequency at 80-100%.

The present stimulus was then introduced after the S reached the relaxation criteria stated above. If no upward deflection in the S's conductance level was observed, or if a continued decrease in his skin conductance level was noted, the S was then presented with the first of the 7 anger stimuli. The anger stimuli were pre-

sented in an increasing order of anger-provoking values. The anger stimulus was presented during a 15-second interval and was maintained for another 30 seconds. The S was then instructed to forget the anger scene and to shift to a pleasant scène. These instructions were complemented by further suggestions for relaxing even more deeply. The S was then presented with the same anger stimulus for 15 seconds, one minute after the presentation of the pleasant stimulus.

In cases where the S signified the presence of anger or where an upward deflection in the S's skin conductance level was observed, the S was immediately instructed to forget the anger scene and to shift to a pleasant scene. This was always accompanied by instructions to deepen the S's level of relaxation. The S was kept relaxed at the former or lower level of relaxation for 2 minutes before the next stimulus presentation. This procedure was repeated until no indications of anger nor skin conductance deflections was elicited by the anger stimulus. The anger stimulus was then presented with a pleasant stimulus before moving on to the next item in the hierarchy.

After the presentation of all the anger scenes, the S was asked to visualize the pleasant scene and to remain relaxed for 2 minutes. The S was "awakened" by the E and told that the session was over.

Prior to the treatment of the Desensitization Ss, four practice sessions were conducted. These were conducted to allow the E to familiarize themselves with the procedure and modify any part of the procedure if necessary. The initial presentation period of the anger stimuli was increased to 45 seconds because it took the E the full 15-second period to present the anger scene. The extra 15 seconds was added in order to visualize the anger scene more clearly and deeply while retaining his relaxed state. The subsequent presentation periods of an anger situation were kept down to 30 seconds since the S was already cued to the particular stimulus.

The other modification in the desensitization procedure involved the use of a standard set of pleasant stimuli to prevent the Ss from getting impatient over the repeated presentation of the same pleasant scene.

Placebo. — The placebo procedure involved the yoking of the Ss of the desensitization group with those of the placebo group such that placebo sessions depended upon the length of time it took to desensitize the yoked partner in the desensitization group. All placebo sessions were thus conducted after the conclusion of the desensitization sessions of the yoked Ss. The length

of time required for desensitization was noted and marked down as the alloted time for the yoked placebo S.

The placebo session centered on a discussion of the anger situations written down by the S on the 3 x 5 index cards. The Ss were told that a thorough discussion of the anger situations could be of help to the E and the Ss themselves in trying to understand as well as control their anger problem. The Ss were asked to recall each of the anger incident as vividly as possible. The Ss were often urged to seek out for themselves the solutions to the problems which bothered them. The E throughout the session offered the minimum of advice and instead directed the discussion towards the S's being able to formulate his own solutions.

The procedure was repeated across as many scenes as possible within the alloted time. The Ss were then dismissed after being informed that they would be notified for their next session.

Non-treated Controls. — The Ss in this group received only the pre- and post-tests.

POST-TEST

The post-test procedures were identical to those of the pre-test. The E did not take down the deflection for the TAS since the S's magnitude and duration of the anger response was known from the pre-test results. All the anger stimuli were presented in a predetermined but random order.

The Ss in both placebo and non-treated control groups were given relaxation training at the end of the post-test following the presentation of the last of the anger stimuli.

RESULTS

Pre-test (baseline) data. — Skin conductance level (SCL)* measures in micromhos for the three groups in the pre-tests (Table 1) do not show any significant differences as groups (Duncan's Range Test: $P < .05$, 26 df $Rp = 156.2$). There is a trend towards higher levels of basal physiological arousal for the desensitization group, which means that this experimental group had to be desensitized against greater odds than either of the placebo or non-treated control groups.

Table 1. Pre-Test: Skin Conductance Levels (SCL)[a]

DESENSITIZATION (D)	PLACEBO (P)	NON-TREATED (NT)
739.9	126.3	
198.6	206.4	116.3
132.6	88.3	318.4
313.3	197.6	432.6
356.9	337.3	446.7
200.0	89.6	109.3
150.7	101.0	133.9
522.1	106.7	63.1
146.6	134.1	69.4
343.5	203.7	144.4
3154.1	1591.3	1834.1
315.4	159.1	203.7

— baseline of group D significantly different from baseline group P at $p < 0.05$, 26 df, $Rp = 156.2$, using the Duncan's Range Test

--- no significant difference between baseline values of groups D and NT, and of groups P and NT at $p < 0.05$, 26 df, $Rp = 145.9$ [a] The figures represent the absolute level of the Ss skin conductance across the seven anger stimuli. The baseline is the S's absolute skin conductance level at the moment immediately prior to the introduction of the anger stimuli.

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* SCL, sometimes known as "basal skin conductance", is considered to be a measure of generalized activation of the physiological system under observation and the absolute value of which one may use as the base along which momentary skin conductance deflections (due to arousal stimuli) may be measured.

Table 2 shows averaged measures of skin conductance response (SCR) to anger cards for three groups in the experiment, and there are also no significant differences between the three groups (Duncan's Range Test: P 0.01, 27 df, Rp = 25.6).

Table 2. Pre-Test Skin Conductance Deflections Values (in micromhos)

Subject No.	DESENSITIZATION (D)	PLACEBO (P)	NON-TREATED (NT)
1	105.7	76.4	120.7
2	66.0	68.0	112.0
3	58.7	22.4	89.1
4	54.7	54.9	78.9
5	54.6	54.3	46.3
6	44.7	54.1	44.8
7	39.7	89.1	30.9
8	37.4	36.0	37.7
9	15.4	7.7	27.7
10	68.0	32.1	71.1
ΣX	544.9	495.1	659.3
$\bar{X}$	54.5	49.5	65.9

Least significant difference Rp = 25.6 (by Duncan's Range Test $\alpha < 0.01$, df = 27); the difference between extreme mean values (49.5 and 65.9) must at least be 25.6. The groups belong to the same population.

As for the Subjective Anger Rating to the imagined anger situations (Table 3), there are no significant differences between the three groups (Kruskall-Wallis one way analysis of variance, 2 df, H = 0.99)

Table 3. **Pre-Test Subjective Anger Scale (SAS) Values***

Subject No.	DESENSITIZATION (D)	PLACEBO (P)	NON-TREATMENT (NT)
1	5.7	4.1	3.4
2	4.0	4.4	4.3
3	5.3	5.3	4.4
4	3.7	4.9	3.9
5	4.7	4.7	4.0
6	3.8	4.7	6.0
7	3.3	4.6	3.0
8	5.1	3.6	4.4
9	4.1	4.1	3.7
10	4.6	3.9	5.3

EX	44.4	44.4	42.4
X	4.4	4.4	4.2
ER	148.5	139.5	177.0

H ⩽ 0.99 df = 2, no significant difference between SAS values observed using KRUSKALL-WALLIS one-way analysis of variance

* Mean value of SAS judgement of each subject for 7 cards.

One must note that the anger situations utilized in this experiment were thematically heterogenous across individuals within a group and therefore also across groups.

Table 4. Post-Test Skin Conductance Level (SCL) Values[a] (in micromhos)

	DESENSITIZATION (D)	PLACEBO (P)	NON-TREATMENT (NT)
	210.5	164.0	
	81.8	114.1	81.3
	179.8	73.7	118.7
	86.8	103.1	273.6
	122.2	90.6	157.8
	178.8	86.0	85.6
	68.7	166.4	171.6
	114.1	64.1	65.6
	78.0	83.1	110.4
	69.3	121.3	68.9
EX	1190.3	1066.6	1133.4
$\bar{X}$	119.0	106.6	113.3

— Differences between groups were not significant using Duncan's Multiple Range Test at $p < 0.05$, 26 df, $Rp = 58.3$.

[a]The figures represent the absolute level of the Ss skin conductance level across the seven anger-stimuli. The baseline is the S's absolute skin conductance level immediately prior to introduction of the anger stimulus.

Post-test (after treatment data). — Basal skin conductance levels (SCL) were not significantly different across desensitization, placebo and non-treated control groups, which means that general arousal levels in the post-test situation were relatively at equal levels for all groups. (Table 4)

But SCL levels for the desensitization group had gone down so dramatically that the reduction constituted a significant difference with respect to pre-test values. (Table 5) This means that

Table 5. Skin Conductance Level (SCL) Reduction (Pre-Test Less Post-Test)

GROUP	DIFFERENCE (in micromhos)	t
DESENSITIZATION	196.4	3.1*
PLACEBO	52.5	1.6
NON-TREATED	93.9	1.8

— The figures represent the average reduction in skin conductance levels per group. The reduction values was obtained by subtracting the post-test values from the pre-test values.

* Significant at $p < 0.01$, 18 df, using t-test

this group learned to relax very well or that their physiological arousal level had been considerably reduced through EEG-alpha training.

Table 6 shows differences between post-test and pre-test measures of skin conductance response (SCR) to anger stimuli among the groups. The difference between the desensitization and placebo groups is significant at the 5 percent level by Duncan's Range test, but not between the desensitization and the non-treated control groups. By correcting for the possible loss of interest in the experiment by one S in the non-treated group, a recomputation (Table 7) shows a significant difference at the 1 percent level.

Table 6. Differences in Skin Conductance Deflections (SCD)[a] Skin Conductance Deflection Reduction[b] (in micromhos)

DESENSITIZATION (D)	PLACEBO (P)	NON-TREATED CONTROL (NT)
103.1	12.1	114.4[c]
77.3	-18.0	8.6
53.7	3.3	8.7
58.8	39.3	38.0
58.3	32.0	-17.1
17.0	15.6	-11.7
34.3	19.0	29.4

	DESENSITIZATION (D)	PLACEBO (P)	NON-TREATED CONTROL (NT)
	25.6	39.3	34.0
	12.9	14.8	11.7
	63.5	21.4	57.6
EX	504.4	178.9	274.6
$\bar{X}$	50.4	17.9	27.5

Difference between groups D and P significant at $p < 0.05$, 27 df, $Rp = 26.8$ using Duncan's Range Test.
Difference between groups D and NT not significant at $p < 0.05$, 27 df, $Rp = 28.1$ using Duncan's Range Test.

a The figures represent the average deflection for each S across the 7 anger stimuli

b Difference equal to SCD pretest less SCD posttest

c Possible deviance. S informed E that he was no longer bothered by anger problem at time of posttest and did not want to participate in the experiment.

Table 7. Difference in Skin Conductance Deflection (SCD)[a] SCD Reduction (in micromhos)

	DESENSITIZATION (D)	PLACEBO (P)	NON-TREATED (NT)
	103.1	12.1	
	77.3	-18.0	8.6
	53.7	3.3	8.7
	58.8	39.3	38.0
	58.3	32.0	-17.1
	17.0	15.6	-11.7
	34.3	19.0	29.4
	25.6	39.3	34.0
	12.9	14.8	11.7
	63.5	21.4	57.6
EX	504.4	178.9	160.1
$\bar{X}$	50.4	17.9	17.8

a The figures represent the average deflection for each S across the seven anger stimuli.

- Difference between group D and groups P and NT significant at $p < 0.01$, 28 df by Duncan's Range Test
- Difference between groups P and NT not significant

Tables 8-A and 8-B show the same significant effects of desensitization procedures on anger responses by analysis of variance and by the Schefe Test for difference between groups.

Table 8-A. Analysis of Variance
Skin Conductance Deflection Reduction

SOURCE OF VARIATION	df	Ss	Ms	F
Between groups	2	7087.1	3543.5	6.3*
Within groups	26	14566.2	560.2	

* Significant at p <0.01

Table 8-B. Schefe Test for Difference Between Groups
Skin Conductance Deflection Reduction

GROUP COMPARISON	F
Desensitization vs. Placebo	9.4*
Desensitation vs. Non-treated	9.0*
Placebo vs. Non-treated	.0001[a]

* Significant at p <0.05

[a] Not Significant

Table 9 shows some confirmatory evidence of how better the desensitization group did over the placebo and non-treated control group controls. The differences are significant by the Mann-Whitney U Test. The placebo did better than the non-treated controls, and this difference is also significant at the .05 level.

Table 9. Subjective Anger Scale Rating Differences
(Pre-Test Less Post-Test)

DESENSITATION (D)	PLACEBO (P)	NON-TREATED (NT)
4.7	1.7	
0.1	0.4	0.4
3.7	2.0	0.4
1.7	0.3	0.3
1.8	0.3	0.4
1.7	0.6	1.0
1.4	1.4	0.4
1.6	2.0	0.1
2.4	2.4	0.7

	DESENSITIZATION (D)	PLACEBO (P)	NON-TREATED CONTROL (NT)
	2.6	2.2	1.1
EX	21.5	13.3	2.8
$\bar{X}$	2.2	1.3	0.3

Each figure represents the average reduction in the subjective anger scale ratings over the seven anger stimuli.

*GROUP COMPARISON**	*U*
D vs P	24.5[a]
D vs NT	7.0[b]
P vs MT	17.0[c]

*Using Mann-Whitney Test for difference between groups

a. Significant at $p < 0.05$
b. Significant at $p < 0.001$
c. Significant at $p < 0.001$

Discussion

This experiment was intended to find out whether the generality of the Rimm, et al proof of positive desensitization effects for anger responses could be extended by an experimental design that allowed for multi-thematic anger stimuli across individuals, provided the response measure, in this case, skin conductance response, was unequivocally unidimensional. This experimental design has confirmed identical positive desensitization effects on anger responses of a wide variety in non-clinical subjects.

There was the need also to give greater precision to relaxation levels utilized for desensitization, since O'Donnell and Worell posited that depth of relaxation might well be a critical factor in the effectiveness of desensitization procedures. By imposing criterion levels of repose, 80-100 percent time under EEG-alpha during relaxation training before the desensitization procedures that followed for the experimental group, it was possible to control for this particular factor that should leave no doubt as to its presence and therefore its effects. Also, the use of EEG-alpha instead of the EMG as the monitor for depth and stability of S relaxation state is a procedure that deserves attention, because the relaxation training method here utilized was mainly a cognitive relaxation method rather than the usual tension-and-release-of-tension method of Jacobson which usually requires the EMG for monitoring. The results of the experiments show that, under appropriate controls with respect to depth of relaxation, the negative findings of O'Donnell and Worell on the role of cognitive relaxation in the desensitization of anger need not be negative; the results here show positive effects. Future experiments in this area of work should, in fact, wherever possible, provide for quantification of relaxation levels utilized for desensitization by electrophysiological methods in order to obviate a major source

of unknown variation affecting the phenomenon being studied.

We come now to the original notion that brought about this experiment, which in part also explains the approach which placed some confidence in electing for a design that allowed for a heterogenous set of anger stimuli situations for one of the variables in the study. Long before the author came into contact with the Herell and Rimm studies, he thought that perhaps any tension/anxiety bound response such as anger, fear, hate, greed, responses, could be desensitized through the now well-known procedures rediscovered for us by Wolpe. The author had already started to work on an experiment on the desensitization of aggression responses when he came upon the Herell and, later, the Rimm studies quite by accident. He came to the conclusion that their methods could be modified to achieve greater generality and precision in the results. We had just done that. But the greater promise of the method, it seems, lies in its application to other tension/anxiety-related behaviors such as hate and greed, besides fear and violence-related responses. The concept of desensitization has lain far too long in the narrow confines of work on fear or phobic responses. It deserves exploration and extension into the classical human situations that have been associated with high physiological arousal.

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EXPERIMENTAL DESENSITIZATION TO ANGER PRODUCING STIMULI

F. G. David, Ph.D.
Discussant

Maybe I will not have anything for discussion if only I can submit myself to desensitization to Dr. Lagmay and help demonstrate beyond doubt that his techniques succeed, but that is rather a too homely way of discussing with a colleague.

Permit me first to thank you for giving me this opportunity. To make one individual listen to you is a privilege enough and to make many listen to you, especially scientists, respectable as they are, is indeed a manifold privilege. Also, I like to thank Dr. Lagmay for inviting me to be one of his discussants. I like to believe that when he comes to like you, he will go out of his way to speak better for you than for himself. Maybe it is not too much of me to think that he likes me, which makes me relax.

Perhaps, there is really nothing much to discuss in the way of contention, debate or argument. So I'll discuss in the mild sense of discussion, just to talk and possibly to come out with some frame of thinking concerning setsof opinions about desensitization.

One way or the other, it is the case in the breakthroughs in the many sciences that many of the breakthroughs concern commonly known phenomena. Everyone knows one way or the other that at some point of his maturity he discovers that it is wise to be relaxed or to institute some self-control. But it takes science to demonstrate that there is something behind the wisdom. And in the behavioral sciences one can point to the investigations and discoveries, as those of that elevate to the level of verification what has been known as common knowledge throughout the millenia. This is not to dismiss the importance of a contribution to the literature of science. Like desensitization and progressive relaxation by Jacobson, but to put the matter in proper perspective. I have only very few points to raise in a manner of discussion or discoursive consideration. Mostly they have to do with the data. I presume that in the use of Duncan Multiple Range Test, which is an aposteriori test, that a suitable overall F-ratio has first demonstrated a significant main effect. So in resorting to aposteriori test, one may go into finer analysis, by comparison of all salient groups as dictated by the design. It is not, however, apparent or understood whether an overall F-ratio has been first performed, and therefore I would make some reservations about the findings based on Duncan Multiple Range Test. In this light, also given the fact that there are only three groups, I suppose

a simpler test like Tuckey's honestly significance difference test or least significance difference test would be perhaps better than the Duncan's, which works better with a bigger number of comparison groups.

Now concerning the more significant finding, the Table 5 comparing the pretreatment and treatment conditions, using I suppose a T-test of related samples, the performance of the desensitization treatment group might have been erroneously shown to be significant. This is a minor observation. Maybe the number of freedom is not eighteen, but only nine. But be that as it may, significant as it is, one may raise the question, is it possible that the difference may be an articraft of the high base line. That is mainly the finding on which this study stands on four feet or solidly. I would like to cast some questions concerning it.

Then another point to raise, that is unique in this study, concerns level of relaxation. I wonder why the design did not go on to a parametric manipulation of level of relaxation, differentiated in terms of length in percent of the amount of alpha observed. And perhaps with that one can even, if lucky, come up with some trend analysis or an analysis of a possible function relating relaxation with a decrease in responding to fear, anger or highly emotive stimuli.

On the whole, by the way, I like to believe that the design as it is perhaps can be submitted to an analysis of variance, something like split-plot factorial. You have three groups subjected to the pre-test, to the treatment and to the post-test, the subject in each group being repeatedly observed.

Now, lastly, given the facts as they are, believing in my colleague and Academician, one more question arises. What is behind the facts, what mechanism underlies them? Is it learning? Is it some associative process or is it simply sensory adaptation? If it is learning, then it should be relatively permanent, it should not be unstably bound to the transient situation of the test. And if it is sensory adaptation, then I suppose simple exposure to stimuli repeatedly will do the same trick. I am not making any conclusion, but I'm only guessing what is behind the facts. If it is sensory adaptation, is it through inhibition of the arousal system at the brain core, let's say of the reticular formation? A kind of inhibition known in the medical sciences or in neurophysiology as central inhibition known in the medical sciences or in neurophysiology as central inhibition. The literature is replete with indicative investigations, like the studies of Hernandez Peop, Galambus, and many others. If it were so, then one could perhaps vali-

date the findings with the psychopharmacological findings in the literature, demonstrating effects of tranquilizers or sedatives at the region. If that turned out to be the case, that could lead to generalize the findings, and increase consensus or agreement among scientists in the area. Knowledge is a consensus. Is it not?

EXPERIMENTAL DESENSITIZATION TO ANGER-PRODUCING STIMULI

EDWIN T. DECENTECEO, Ph.D.
Discussant

I would like to thank the Academy for inviting me, and Dr. Lagmay for suggesting my name as one of the discussants.

I think the effort of Dr. Lagmay to use desensitization and applying it to anger is noteworthy. There are over a hundred well controlled studies that demonstrate the effectiveness of desensitization when it comes to fear. As a matter of fact the question now is really why is it effective. Perhaps, by attacking a different problem in this case, anger and comparing the work on fear and on anger, one might be able to arrive at some suitable explanation for the effectiveness of the procedure. As things stand, there are at least five explanations for why it works and not one shown to be better than the others.

I think also his attempts to monitor the level of relaxation continuously is an important contribution. It has always been difficult technically to do continuous monitoring of relaxation level while doing a systematic desensitization procedure. Although, to be fair to those who have been working in the area of fear, they have used test situations which involve actual exposure to fear situations. When you are involved in an actual situation and you attempt to make physiological recordings at the same time, you come up with very noisy recordings.

In fairness to O'Donnel and Herell, perhaps a measure of intensity of anger should be taken. It is possible that in a study on anger using racial stimuli in a southern university in the United States, you might be utilizing high levels or moderately high levels of anger. And maybe that is why O'Donnel and Herell were not so successful. Of course it can not be determined now. But it would be important to determine how effective what level of relaxation is with what level of anger. The systematic desensitization literature on anxiety shows that cognitive methods, relaxation, and cognitive desensitization are less effective when you are at high levels of fear. They are more effective at low to moderate levels. Level of anger would also be very important in the clinical application of the procedure. I think what Dr. Lagmay has done is demonstrate that physiological reduction does occur. More work can be done to tease out the clinical implications as well as technical problems that come with applying something like this into real life. Levels of anger would be an important factor here because one might say that college students who are

volunteering for an experiment may not experience as much anger as someone else in a real life situation, say a harried secretary or someone in a field who has to answer to his boss. Those levels of anger might be higher.

One other comment I can make about the study is that I would have wanted to see other measures of reduction of anger not just on the physiological side. Particularly when you are inducing low to moderate levels of arousal, you may not have very good correlations between physiological responses and behavioral responses. We can not be sure that since there was a diminishing of the physiological response that there would be a consequent or correlated diminishing of the behavioral response. (Also, if one uses behavioral measures, one would be closer to real life situations.) But again, the technology of developing a behavioral test can be a difficult one, aside from raising ethical questions about inducing anger in experimental subjects.

It is known in the fear literature that real life situations will always lag behind treatment. That is, you can be on step 9 in treatment, but your performance will be only up to step 4 in real life. It remains to be seen whether the same thing will hold for anger. But just in case, one could begin to work on behavioral methods for reducing anger, that is, *in vivo* methods such as the barb technique where people take turns shooting verbal barbs at someone while he tries to control his anger. There is also literature on stress inoculation which covers a whole range of a stress stimuli which can be delivered in real life situations.