An Evaluation of a Portable Automated Desensitization Device Using a Standardized Hierarchy

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AN EVALUATION OF A PORTABLE
AUTOMATED DESENSITIZATION DEVICE
USING A STANDARDIZED HIERARCHY

by

Robert John Eizenga

A Thesis
Submitted to the
Faculty of The Graduate College
in partial fulfillment
of the
Degree of Master of Arts

Western Michigan University
Kalamazoo, Michigan
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Robert John Eizenga
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INTRODUCTION

Systematic desensitization (SD) has been one of the most widely researched therapies for the reduction of neurotic phobias and has been proven effective both clinically (Lazarus, 1963; Wolpe 1958) and experimentally (Paul, 1969).

A thorough account of the procedure and its rationale is given by Wolpe and Lazarus (Wolpe, 1958; Wolpe & Lazarus, 1966). Briefly described, the procedure involves training in muscle relaxation and construction of graded hierarchical scenes topically related to the specific phobia. These scenes are then visualized in ascending order from least to most aversive while in a relaxed state. Subsequent scenes are visualized only after the preceding scene can be visualized clearly in the absence of detectable tension. Should tension occur during the visualization of a scene, the visualization is repeated until the tension experienced recedes to an undetectable level. Thus the treatment proceeds step by step until the most aversive item (most feared situation) can be visualized while completely relaxed.

Theoretically the process is "reciprocal inhibition," in which a response incompatible with anxiety (e.g., relaxation) is made to inhibit the anxiety response (phobic object) by initially pairing the relaxation with a stimulus that evokes the anxiety weakly, and subsequently proceeding through each step of a graded hierarchical order of anxiety-evoking stimuli.
Recent experiments on SD have been concerned with the crucial ingredients of its process, as well as its general outcome. The resulting need for sophisticated laboratory control of the various parameters of desensitization has led to the development of automated devices to administer the SD treatment and its experimental analogues.

To date, research in automated desensitization has proceeded along three different dimensions. In a series of studies conducted by Lang and his associates (Melamed & Lang, 1967; Lang, 1968, 1969b; Lang, Melamed, & Hart, 1970) an expensive, elaborate, programmable apparatus was constructed which followed Wolpe's (1958) treatment procedural descriptions exactly, tailoring the treatment to the subject's individually constructed hierarchy. The primary purpose of this device was, of course, the achievement of precise experimental control of the differentially defined parameters of SD, particularly those dealing with the role of the therapist.

Another dimension of automated desensitization, arising out of the clinical setting, uses devices which are much simpler and more economical, as well as portable. Like the laboratory device, these devices follow closely the individually tailored hierarchy construction and treatment administration procedures suggested by Wolpe and Lazarus (Wolpe, 1958; Wolpe & Lazarus, 1966). However, the purpose of these devices is different from the laboratory device in that they have been conceived as adjuvant therapists, which can be used by clients in lieu of or along with scheduled therapy sessions at the convenience of the client and even in his own home. To date,
Unfortunately, the study of such devices has been limited to the case study method, and no controlled comparative studies have appeared in the literature.

Still another dimension in the study of automated desensitization centers around the use of standardized portions of the treatment procedure, particularly items of the anxiety hierarchy. Such studies are the result of empirical findings from a variety of sources indicating that individually tailored hierarchies are neither necessary nor superior (statistically, at least) to standardized or group-constructed hierarchies for the success of the SD treatment. The purpose of these standardized hierarchies is again experimental control, although the practical implications have been recognized by some researchers, e.g., Nawas, Fishman, and Pucel (1970).

The purpose of the present study was to combine the features offered by a portable automated device and the standardized hierarchy, since the clinically oriented device has never been tested under experimental conditions, nor have standardized hierarchies been employed in the clinic using a portable device such as those described in clinical case studies. Such a combination, if proven successful, could increase greatly the value of both the portable device and the standardized hierarchy, since the necessity of laborious hierarchy construction each time the device was used would be eliminated, and the standardized hierarchy with accompanying research results could assume a more clinically relevant and practical role. In fact, a device combining the two features of
portable economy and standardization, if proven successful, could be prescribed by the clinician in much the same manner as the present use of therapeutic drugs by the psychiatrist.

Therefore a device fitting these qualifications was constructed and compared with both live desensitization and a placebo. The null hypothesis for this study was that there would be no differences among the three treatments. Specifically, it was predicted that live SD would prove superior to both automated and placebo treatments.
REVIEW OF THE LITERATURE

Several reviews covering the available research literature on SD have been published. Paul (1969) has reviewed both clinical case studies and controlled experiments totaling 75 investigations with respect to the outcome of SD, concluding that "(t)he findings were overwhelmingly positive (p. 159)."

Within the same book edited by Cyril M. Franks, Lang (1969a) again reviewed laboratory studies, concentrating on the "mechanics" or parameters of desensitization and the general evaluation of fear. Covering over 70 studies relevant to the issues raised, Lang generally concluded that the results of SD treatment are consistently positive despite the fact that none of the explanatory theories is sufficient to account for them.

Among the overall conclusions reached by these reviewers, several are worth mentioning in connection with the present research. First of all, the positive results of SD have been obtained despite wide variation in procedural details with respect to therapist training and experience, construction and gradation of hierarchies, use of hypnosis and relaxation, and mode of presentation of hierarchies. Of particular interest is Lang's (1969a) conclusion that "desensitization may be successfully applied ... even by an anonymous machine (p. 189)." Finally, both reviewers agreed that the measures used in the assessment of both process and outcome are themselves in need of clarification. Some research along this line

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has since been done, and will be discussed later in this paper.

A more recent review attempting to clarify apparent discrepancies amongst the various outcome measures has been published by Mathews (1971). Limiting his coverage to those studies utilizing psychophysiological measurement, he has nevertheless covered a number of investigations which were not available at the time for Paul and Lang. While reiterating the overall effectiveness of SD, he has further postulated that apparent discrepancies in outcome of some of the individual dependent variables used throughout the literature are caused by temporal displacements in improvement, particularly physiological measures versus self-rating and behavioral measures. Apparently, physiological measures are somewhat slower in responding to treatment than self-rating and behavioral measures. Therefore the length of the treatment procedure often affects the outcome of physiological measures.

In another recent review, Wilkins (1971) focused attention upon the social and cognitive treatment factors as well as the theoretical foundations of SD. Although the coverage of studies appears somewhat selective, the conclusions reached are nonetheless important. Again reiterating the documented overall effectiveness of SD, Wilkins suggested that while instructed visualization of fear-provoking scenes remains necessary for the success of SD, these need not be graded into a hierarchy, nor administered concomitant to a state of relaxation. He further concluded that (1) expectancy of therapeutic gain, (2) information feedback of success, (3) training in the control of attention, and (4) vicarious learning of behavioral
contingencies (via modeling), as well as certain social variables in the patient-therapist relationship are responsible for the effectiveness of the procedure, rather than Wolpe's theoretical model of reciprocal inhibition via mutual antagonism between muscle relaxation and anxiety.

Still another interpretation is offered by Goldfried (1971) who views the SD process as the positive acquisition of a mediational skill with which anxiety can then be dealt, rather than one of passive inhibition which eliminates specific fears. Thus, the theoretical status of SD remains very much in doubt and the conclusion reached by Paul (1969) is still relevant:

While research now needs to focus specifically on questions of "how" desensitization works (e.g., Lang, Chapter 4) there are specific technique variations which pose empirical questions of effectiveness (p. 154).

The present research is directed toward the latter comment regarding technique variations, and the recent relevant literature is herewith discussed. The specific technique variation involved is the use of a mechanized procedure for administering treatment as opposed to therapist administration. Since each mechanized procedure used constitutes one value of the independent variable, the apparatus will be described in detail.

The construction of a mechanized procedure for administering SD was begun by Melamed and Lang, who built an elaborate apparatus with two tape recorders and electronic switching circuits which they christened the "device for automated desensitization (DAD)."

An elaborate description of the computer device is given by
Lang (1969b). Briefly, the device contains two tape transports, each with audio output through headphones worn by the subject. One transport is programmed with relaxation instructions, and the other with instructions to visualize the constructed scenes, described in graded hierarchical order. Two buttons located on the arms of the relaxation chair allow $S$ to interact with the apparatus, initiating or continuing the visualization of scenes by pressing the right arm button when he feels relaxed, or stopping the visualization of scenes and initiating the relaxation instructions by pressing the left arm button when he becomes tense. Thus $S$ proceeds through the hierarchy at his own pace depending upon how often he signals anxiety by pressing the left switch. Programmable logic circuits and tape search mechanism allow for re-presentation of either the same or earlier scenes in $S$'s hierarchy depending upon how many times the left switch is pressed per scene. In addition, the device continuously monitors several physiological measures selected by the experimenter.

Preliminary results from use of the device were reported in a paper (Melamed & Lang, 1967), in which they found the device about as effective as the live therapist for SD of snake phobia, measuring pre- to posttreatment change scores on a behavioral avoidance test (Lang & Lazovik, 1963) and a self-rating measure (Walk, 1956). Several pilot clinical case studies of the device followed with similar results (Lang, 1968), and finally the completed experimental investigation (Lang, et al., 1970).

The purpose of the study by Lang, et al. (1970) was to assess
the effectiveness of the device for automated desensitization (DAD) as opposed to a live therapist (LIVE), and as opposed to no treatment (NT) for the reduction of snake phobia. After initial screening, 29 female Ss were selected and randomly assigned to one of the three groups. Treatment length was 4 relaxation training sessions and 11 SD sessions.

In order to assess results, the Behavioral Avoidance Test (BAT), modeled after previous studies by the same author (Lang & Lazovik, 1963), was used, along with a 10-point self-rating Fear Thermometer (FT), a Fear Questionnaire (SNAQ), an experimenter (E) rating of fear, and a Fear Survey Schedule (FSS) from which individual snake item and total scores were obtained. In addition, measures for heart rate, skin resistance, and respiration rate were monitored at certain points within treatment. Post-minus pretest change scores were obtained on all measures except the avoidance test (BAT) for which percentage of change was calculated according to a previously described procedure (Lang & Lazovik, 1963). Variance analysis of change scores were significant for all measures except E rating of fear and total FSS score. Both DAD and LIVE groups showed significantly more positive change than control, with no significant differences between each other except on FSS snake item, for which DAD was significantly superior. Thus, the overall result showed DAD to be an effective therapist, replicating previous experimental (Melamed & Lang, 1967) and clinical (Lang, 1968) results. If anything, DAD was shown to be slightly superior to LIVE.

Clinical use of a portable automated device was first reported
by Migler and Wolpe (1967) in a case study. Using a specially modified Wollensak T-1600 tape recorder, they successfully desensitized a single patient for fear of public speaking. The criterion of success was the patient's report that after seven desensitization sessions, he was able to attend a previously avoided staff meeting and deliver a speech disagreeing with previous speakers. An 8-month follow-up report by the patient yielding similar results was included.

The apparatus used by Migler and Wolpe (1967) was a single tape recorder equipped with pause switch and two metal sensing guides. When prepared for desensitization, the recorder played relaxation instructions followed by instructions to visualize hierarchy scenes, described in the usual graded order. If $S$ experienced anxiety during visualization of these scenes, he pressed a button which automatically rewound the tape until it reached a designated point where one of the sensing guides automatically switched the tape from rewind back to play. The designated point to which the tape rewound would then contain instructions to stop visualizing the scene and relax, followed by instructions to visualize the same scene on the hierarchy depending upon where $S$ had experienced the anxiety in the course of the tape session. $S$ could also press the pause microswitch to stop the tape whenever he needed more time to relax or obtain a clear image of a scene. Thus, as in the laboratory device, $S$ proceeded through the tape at his own pace, depending upon how many times he rewound the tape to repeat a scene.

A supplementary note by Migler (1968) described an even simpler and less expensive portable device, for which changes in the inter-
nal wiring were unnecessary. The device consists of any tape recorder which satisfies the following specifications; (1) a minimum playing time of 40 minutes, (2) control of playback, rewind, and stop with little physical exertion, preferably in a single switch, and (3) sound playback during rewinding to detect the beginning of each section. Of these three the last is most important since it provides the tape search mechanism. Instead of using a tape search mechanism, the therapist merely records some innocuous low pitched sound between sections of scenes.

In use, the $S$ proceeds through relaxation instructions and visualization of scenes by section. If during a visualization of a scene he experiences anxiety, he switches to rewind. All of the recorded sounds are heard at high pitch in reverse, thus garbled beyond recognition until the beginning of the section, at which point $S$ hears the innocuous low pitched tone made by the recorder as a short but clear continuous "beep." This sound is the signal for $S$ to stop rewinding and return to play, thus repeating the same or earlier scenes.

Note that this device differs, procedurally, from the single modified tape recorder (or a live therapist) in that $S$ must take positive action (turning the switch) to reinstate the visualization of scenes. The same is true of Lang's laboratory device, although it can be programmed either way, i.e., it may also automatically reinstate the visualization of scenes.

Still another device was described and tested by Kahn and Baker (1968). The device is a do-it-yourself kit consisting of a
12-inch long playing record and a manual of instruction, which
S can read and follow at home. The instruction manual describes
the technique and explains how to build a hierarchy, which S then
constructs himself. The record contains relaxation instructions on
one side (20 min.) and instructed visualization of scenes on the
other. However the instructions for visualizing scenes are gen-
eralized ("the first item on your hierarchy . . . the second item
. . . .", etc.) so that each S can use his own hierarchy.

To test the device, 13 subjects were recruited and randomly
assigned to a "conventional desensitization" (LAB) versus "do-it-
yourself" (HOME) group, with 7 and 6 Ss respectively. Ss were
treated for a variety of phobias described as "sub-clinical," i.e.,
"severe enough to cause discomfort but not so severe as to have
cau sed them to seek clinical assistance (p. 198)." The study was
limited to 6 weeks, with the HOME group averaging 13 desensitization
sessions and the LAB group 12 sessions. The HOME group was kept in
telephone contact for weekly progress reports.

Results were assessed by telephone interviews with both groups
of subjects 3 months after completion of the study. The therapist
conducting the interview rated Ss "cured," "much improved," "no
change," or "worse." Results indicated that either treatment was
successful, with the HOME group slightly but not significantly
better. Of course, the small sample size and lack of a control
group permitted no meaningful statistical analysis of the results.
In addition, the authors duly noted the limitation of having no ob-
jective dependent measure, plus a slight truncation of procedure by
assisting the HOME group with hierarchy construction. Noteworthy
also is the fact that the do-it-yourself kit was designed for "an
intelligent and motivated patient (p. 198)."

Still another automated device, equally inexpensive and por-
table, was described by Wark in a technical report (Wark, 1971). He
suggested the use of two portable cassette tape recorders, each hav-
ing a jack for a remote control switch. The remote control switch
constructed by Wark contains two spring-loaded normally-open
switches which are connected to each recorder. Relaxation instruc-
tions are then programmed on one recorder while the other contains
the constructed hierarchy. $S$ may then depress one switch for
visualizing scenes of the hierarchy and the other to obtain relaxa-
tion instructions. The properties of the remote control unit for
this device are such that merely releasing the switch shuts off the
recorder controlled by it. Thus $S$ must hold the appropriate switch
depressed throughout the session. Suggestions were given for both
the type and length of relaxation instructions and the sound stimuli
to be recorded to mark segments of the hierarchy.

Wark pointed out an advantage of his device, in that it allows
for variation of relaxation instructions, should $S$ experience anx-
xiety during a scene visualization. However, it also suffers from the
disadvantage in that, as constructed, the device does not repeat the
anxiety-provoking or earlier scene once it has been played. No
results were reported from the use of this device.

Another dimension in automated desensitization is provided by
research on standardized hierarchies, the advantages of which are
discussed in the introduction of this paper. Use of a standardized hierarchy was first experimentally tested by Emery and Krumboltz (1967), although technically one might consider its origins in the study of group desensitization (Lazarus, 1961; Paul & Shannon, 1966). The point of departure is that Emery and Krumboltz used a hierarchy tailored by a group other than the experimental group to which it was applied.

The Ss were 56 college freshmen, stratified by sex, and randomly assigned to either (1) desensitization using a standardized hierarchy, (2) desensitization using an individualized hierarchy, or (3) no treatment control. All subjects were "test anxious" as measured by selection criteria. Experimental Ss were given 8 weeks of twice-weekly desensitization sessions. Dependent variables included examination grades adjusted for previous grades, posttest anxiety scale scores adjusted for pretest scores, and a 7-point self-rating scale. Analysis of covariance results indicated that both experimental procedures were equally efficacious on all dependent variables. While experimental groups rated themselves significantly less anxious about examinations than the control group, covariance analysis of final examination grades did not reach generally accepted significance levels.

With respect to generalization of the results, this study suffers from the following methodological limitation. The individualized hierarchies were not truly individual, since these Ss obtained their hierarchies by ranking the 16 items from the standardized hierarchy, and adding their own items if they wished.
Thus when the construction procedure was completed, there was a 60 percent overlap between standardized and individualized hierarchies (McGlynn, 1971).

A similar methodological limitation was present in a study by Donner and Guerney (1971), the purpose of which was to combine into a single procedure the group desensitization of Lazarus (1961) and the use of a standardized hierarchy similar to that of Emery and Krumboltz (1967). Test anxiety was the fear chosen for desensitization, with Grade Point Average (GPA), Affect Adjective Check List (AACL), Taylor Manifest Anxiety Scale (TMAS), and Test Anxiety Questionnaire (TAQ) as the dependent variables.

Ss were 42 female college students, assigned to either wait list control, group desensitization with therapist absent, or group desensitization with therapist present. Results indicated that treatment groups showed greater reduction in anxiety than wait list controls, with therapist-present group performing slightly better than therapist-absent group. A 5-month follow-up study by Donner (1970) showed that improvement for both experimental groups was not only maintained, but increased, with no differences between therapist-present versus -absent groups.

Continuing in the same vein, Nawas et al. (1970) developed a standardized scheduled desensitization program, again applicable to both group and individual treatment, for desensitization of snake phobia. Based upon the steps of the Behavioral Avoidance Test used by Lang and Lazovik (1963), the hierarchy consisted of 20 items, standardized over 280 Ss for number and length of presentations as
well as content. The final treatment package consisted of five 50-minute sessions of SD for snake fear, following one relaxation training session.

Ss were 40 females who were assigned to either (1) systematic desensitization (SD), (2) standardized systematic desensitization (SSD), (3) pseudo desensitization (PD), or (4) no treatment control (NT) groups. One dependent variable, the Behavioral Avoidance Test (BAT) was used to assess results. It should be noted that no signaling of anxiety was permitted for the SSD group, thus permitting the entire treatment to be recorded and administered on an unmodified single tape recorder.

Analysis of variance results, using pre- to posttreatment change scores, showed highly significant ($p$ less than .005) improvement for the two treatment groups over against the control groups. No difference between the two treatment groups or the two control groups was obtained, although comparison of treatment means indicated slight superiority for SSD over therapist desensitization (SD).

The purpose of a study by Nawas (1971) was to assess the results of a revised version (SSDFD) of the standardized scheduled desensitization (SSD) program. Results indicated that the newer program (SSDFD) was superior, though not to a statistically significant degree ($p$ less than .07). Qualitatively, according to the author, the newer program appears to be more generally applicable and immune to motivational influences.

In an attempt to overcome the previously mentioned limitations of the Emery and Krumboltz (1967) study, McGlynn (1971) compared
individual versus standardized hierarchies for which only the final item was common across treatment groups. Ss were 21 female college students assigned to either individual hierarchy (IH), standardized hierarchy (SH), or no treatment (NT) groups. The standardized hierarchy used was similar to that used by Nawas, et al. (1970). The IH and SH groups were given a maximum of eight desensitization sessions for snake phobia, with the Behavioral Avoidance Test (BAT) serving as dependent variable.

Results on pre- to posttest BAT change scores indicated significant (p less than .005) improvement for both treatment groups, and no significant differences between them, although the SH group showed slight superiority.

A number of other studies utilizing standardized hierarchies have appeared in the literature (Aponte & Aponte, 1971; Krapfl & Nawas, 1970; Linder & McGlynn, 1971; Lomont & Brock, 1971a, 1971b; Miller & Nawas, 1970; Oliveau, Agras, Leitenberg, Moore, & Wright, 1969; O'Neill & Howell, 1969; Taylor, 1971; Woody & Schauble, 1969). These will not be reviewed in detail in this paper, however, since their primary independent variables of interest are not the standardized hierarchies per se. Suffice it to say that they provide ample supportive evidence of the results reviewed here.
METHOD

The discerning reader will note from the foregoing review the wide variety of procedures used, not only with respect to the independent variable procedures, but the dependent measures as well. The fact that these variations do not alter the overall outcome picture, while perhaps simplifying the clinician's task, has been a source of heuristic challenge to the researcher. These variations pose problems of "external validity" (Campbell & Stanley, 1963), and as such, reinforce the need for further research of many of the parameters of SD, including those dealt with by this study. Nonetheless, these variations were not haphazardly employed. Therefore a thorough explanation of the procedures used in this study is necessitated.

With respect to the independent variable parameters, Paul (1969) has reviewed some of the variations throughout the literature and has delineated four "procedural packages." Of the four listed, this study most closely fits that used by Lang and his associates (Lang & Lazovik, 1963; Lang, Lazovik, & Reynolds, 1965; Lang, et al., 1970) with respect to the parameters listed, i.e., length and type of relaxation training, and desensitization proper. With respect to hierarchy construction, this study used the "SSDFD" standardized hierarchy (Nawas, 1971), commensurate with the goals of the study. In addition to these considerations, there are several other topics worthy of consideration which were not covered by

The first topic for consideration is the selection of the specific phobia for treatment. Most studies have used either snake fear or test-taking anxiety. Either one is apparently practical in terms of subject availability. Snake phobia holds certain theoretical advantages (Lang & Lazovik, 1963) while test-taking anxiety might intuitively be considered of more eminent concern. Since previous research on automated treatment has used snake phobia, and since a standardized hierarchy was readily available, small animal phobia (fear of either snakes or rats) was chosen for this study.

A variable related to the specific phobia is the degree of importance which it holds for the subject. Ideally, experimental Ss should manifest equal motivation (although extremely difficult to assess) to the clinic patient who has sought relief from his phobia. Empirically, however, this is seldom the case. Instead, most experimental studies have used Ss whose fears motivationally fall into the category defined as "sub-clinical" mentioned above (Kahn & Baker, 1968). The advantages of using such a population are thoroughly discussed by Lang, Lazovik, & Reynolds (1965, p. 396), and for the compelling reasons given, the present study also used Ss whose phobias were sub-clinical.

Included in the population with sub-clinical phobias are many college students. Thus many of the studies reviewed, notably excepting clinical case studies, have used students, mostly females, who were not being treated for any other emotional disturbances. This study used Ss who were referred to a psychiatric outpatient
clinic specifically for animal fear treatment. None were concurrently being treated for other emotional disturbances, although two had previously been clinic patients.

To insure homogeneity of Ss, and that each was sufficiently phobic for treatment, all previous studies have used selection assessment criteria. These criteria, however, vary considerably. Some have used Behavioral Avoidance Test (BAT) scores, while others have used self-rating measures, or grade point averages. At least one reason for this variation of selection criteria is the variation of fears treated, discussed above.

When dealing with animal phobia, the behavioral test (BAT score) seems most appropriate where the research emphasis is upon theoretical issues regarding behavior change, while self-rating measures are apropos for studies emphasizing clinical relevance. The choice is perhaps arbitrary, but seems warranted to this author for two reasons. First, clinic patients who are self-referred have ipso facto rated themselves in a way which would qualify them for treatment by a self-rating criterion. Furthermore, the discomfort implicitly present for those who endorsed an extremely fearful self-rating would intuitively suggest homogeneity with respect to motivational factors.

Both of these reasons are conjectural, and therefore perhaps the best approach is to compromise with dual criteria. Such was the procedure in the present study, which used self-rating scores of ten ("complete panic") on a 10-point rating scale, along with an absolute behavioral criterion of not being able to pick up the animal.
Response Measures

Previous studies have used a variety of dependent measures to assess results. Of the pool of measures used in previous studies, eight were selected for this study. These dependent variables were:

1. Behavioral Avoidance Test (BAT)
2. Fear Thermometer (FT)
3. Fear Inventory Individual (FII)
4. Fear Inventory Total (FIT)
5. MMPI Psychasthenia Scale (Pt)
6. Taylor Manifest Anxiety Scale (TMA)
7. Welsh A Factor Scale (A)
8. Welsh Anxiety Index (AI)

The Behavioral Avoidance Test (Lang & Lazovik, 1963; Nawas, 1971) consists of a direct confrontation of S with the phobic object, in this case either a laboratory white rat or a 26-inch nonpoisonous hog-nosed snake. The animal was housed in a glass cage at the end of an experimental chamber 20 feet long by 6 feet wide. Ss were asked to approach as closely as they dared, following step by step instructions given by E as he observed from the rear of the chamber. A score was obtained by measure of the approach distance along 21 discreet steps listed in Appendix A. These steps (with the exception of 0, 1, and 2) also provided the items of the standardized hierarchy.

The Fear Thermometer (Walk, 1956) is a 10-point self-rating scale, upon which fear was rated in "degrees" at the point at which the BAT test terminated.

The Fear Inventory (Wolpe & Lazarus, 1966) is a list of 78 potentially phobic objects upon which S rated fear on a scale from 1 ("not at all") to 5 ("very much"). The individual score (FII) was
the rating checked for the snake (or rat) item, and the total score (FIT) was the sum of all rated items.

The remaining measures (Pt, A, TMA, & AI) are scale scores, reported as standard T scores extracted from the Minnesota Multiphasic Personality Inventory (MMPI, Hathaway & McKinley, 1943) purporting to measure "overt anxiety" (Dahlstrom & Welsh, 1960). All are single scales except the anxiety index (AI), which is a composite of four MMPI scales, i.e., Depression (D), Hysteria (Hy), Hypochondriasis (Hs) and Psychasthenia (Pt). These scales are weighted according to the following formula: \[ 1.33(D) + (Pt) - 0.66(Hs) - 0.66(Hy) = AI. \] Each S was administered the full MMPI as part of the assessment battery.

**Subject Selection**

With the foregoing considerations in mind, Ss were recruited by referral from laboratory assistants at Western Michigan University, and therapists from the St. Joseph Lodge, a psychiatric day care center in Kalamazoo. Those who were referred then filled out the questionnaire shown in Appendix B.

On the basis of these questionnaires, 42 prospective Ss were screened and invited for an initial interview with E. These prospective Ss were given a taped explanation of the treatment procedure (Lazarus, 1970). However this explanation included only a description of the procedure for and benefits to be gained from relaxation training. In addition, the study was described as an "animal fear workshop" which had previously been proven successful.
The first half of the pretest battery was then administered, including the FSS, BAT and FT, in that order. The BAT scores were immediately evaluated as the behavioral criterion and those who failed, according to the criteria discussed above, were dismissed for "insufficient fear," while those who remained were invited to participate in the "animal fear workshop."

Of the 42 people interviewed, 27 either refused treatment or failed the selection criteria, or both. Included in the 27 were those who thought they might not benefit from treatment. Thus all 15 Ss who were retained for the study were thoroughly convinced that they were receiving a viable treatment. The remaining 15 Ss were then scheduled for 3 weekly 50-minute sessions, followed by 10 twice-weekly sessions of 30 minutes duration. To insure continued motivation of Ss, a $5.00 deposit was collected from each S, and refunded contingent only upon completion of the required sessions. All Ss completed the treatment.

Although none of the 15 Ss received other forms of treatment during the study, two, who were referred by the day care center, were taking prescribed sedative and anti-depressant medication. They were both previous psychiatric patients, and had obtained their prescriptions during previous hospitalization. This prescribed medication, however, was judged to be of neutral effect since (1) the type and dosage of medication remained constant throughout the treatment, and (2) the prescriptions had been in effect for more than two months prior to the study.

Therefore they were retained in the study since they also
fit the initial selection criteria, including the sub-clinical nature of their phobias, and because felt that the results for these Ss might prove to be of great heuristic value, given that most psychotherapy is given in conjunction with medication.

The 15 Ss used in the study ranged in age from 18 to 39 with a mean age of 23. All but two were females, and four were black students. Eight were treated for snake phobia while seven were rat-phobic.

Procedure

On the basis of the pretest BAT scores, Ss were rank-ordered and divided into five blocks of three Ss each, in preparation for analysis by randomized block analysis of variance (Edwards, 1972). The Ss within each block were then randomly assigned to either live therapist desensitization (L), automated desensitization (A), or placebo treatment control (C) groups. The seven other pretreatment measures did not correlate sufficiently with BAT scores to permit the blocking to apply to them. However, no significant differences between groups were obtained for any of the pretreatment measures.

The device for automated desensitization used in this study was a Dokorder transistor tape recorder, model PT-36BX, which fit the specifications of the general device described by Migler (1969). The recorder was attached to the arm of a high-backed, reclining lounge chair, such that S's right hand rested upon the single switch which operated the stop, rewind, and play functions. During relaxation training, all Ss received standard instructions for operating
the device, including signaling of anxiety.

All Ss were treated separately by the same E, according to the following schedule:

Session 1 (50 min.): Subject selection interview and first part of pretest battery
Session 2 (100 min.): Second part of pretest battery (MMPI) and relaxation training
Sessions 3-4 (50 min.): Relaxation training
Sessions 5-12 (30 min.): Desensitization or placebo treatment
Session 13 (30 min.): First part of posttest battery
Session 14 (50 min.): Second part of posttest battery

All relaxation training (sessions 2-4) was conducted with the device for automated desensitization. Procedure for the three groups differed only for sessions 5-12, and in the following way.

The control group (C) Ss were told that the next eight sessions would be designed to enhance the benefits of relaxation by having them visualize relaxing scenes, while attempting to relax as fully as possible. They were then given taped sessions instructing them to visualize neutral scenes, using the automated device. The neutral scenes consisted of five visualizations of natural landscapes, graded into hierarchical order by intensity of detail. These five scenes corresponded to the five sessions into which the standardized treatment program was divided. One scene was presented per session, but divided into as many descriptive presentations as its desensitization treatment counterpart.

The automated desensitization (A) Ss were told that the next eight sessions would be designed to apply the relaxation they had learned to their specific fear. They were then given the SSDFD standardized hierarchy of scenes, divided into five sessions. The
only modification of the program necessary for its adaptation to
the automated device was that the word "animal" was substituted for
"snake," and an innocuous, low pitched, diminishing tone was re-
corded between selected intervals of scene presentations. Prior to
each tone S was instructed to become progressively more relaxed as
the tone diminished. This tone, when heard during rewinding as a
five second "buzz," became the signal for S to stop rewinding the
tape following an anxiety signal. Thus, whenever anxiety was
experienced during the visualization of a scene, S "signaled" by
rewinding the tape until the "buzz." Then, proceeding on play, S
heard the relaxing tone followed by re-presentation of the same or
earlier scene in the hierarchy.

The live desensitization (L) group was similarly given the
SSDFD program except that E conducted the sessions, reading the
program from the manuscript. Since no tape recorder was used, no
tone was heard, and Ss signaled anxiety by raising one forefinger.
RESULTS

All Ss in the C group completed their "hierarchies" prior to posttesting, without signaling anxiety. Although 8 of the 10 treatment Ss similarly completed their hierarchies, all signaled anxiety at least once. The two Ss who failed to complete the hierarchy also obtained the lowest pre- and posttest BAT scores for each treatment group.

Means and standard deviations of pre- and posttest scores for all groups on all measures are given in Table 1. Since fear responses vary considerably across Ss, and since the treatment effects were likely to be relatively slight, a randomized block analysis of variance was chosen to analyze the data for the main independent variable (Edwards, 1972). The resulting $F$ of 3.76 (df=2/8) yielded a $p$ value of less than .077.

For the remainder of the dependent variables, separate analyses of covariance of the raw pre- and posttest scores were used in preference to the usual pre- to posttest change score assessment (Campbell & Stanley, 1963). Since it was noted that the pretreatment blocking was rather crude, i.e., there were larger score differences within than between blocks, an analysis of covariance was undertaken for the BAT as well. The results for all eight measures are shown in Table 2.

Of the eight measures, only two, BAT and FT, yielded significant main effects ($p$ less than .05), while FII, FIT, Pt, A, and TMA
<table>
<thead>
<tr>
<th></th>
<th>C</th>
<th>L</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAT</td>
<td>Pre</td>
<td>Post</td>
<td>Pre</td>
</tr>
<tr>
<td>Mean</td>
<td>9.000</td>
<td>9.800</td>
<td>8.000</td>
</tr>
<tr>
<td>SD</td>
<td>4.528</td>
<td>7.294</td>
<td>6.671</td>
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<tr>
<td>FT</td>
<td>Mean</td>
<td>8.800</td>
<td>7.500</td>
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<tr>
<td>SD</td>
<td>1.396</td>
<td>2.092</td>
<td>0.837</td>
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<tr>
<td>FIT</td>
<td>Mean</td>
<td>4.200</td>
<td>3.800</td>
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<tr>
<td>SD</td>
<td>0.837</td>
<td>0.837</td>
<td>1.789</td>
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<tr>
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<td>156.600</td>
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<tr>
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<td>24.464</td>
<td>19.773</td>
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<tr>
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<td>Mean</td>
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<tr>
<td>SD</td>
<td>13.820</td>
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<td>Mean</td>
<td>60.750</td>
<td>55.800</td>
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<td>TMA</td>
<td>Mean</td>
<td>24.000</td>
<td>18.600</td>
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<tr>
<td>AI</td>
<td>Mean</td>
<td>75.553</td>
<td>71.682</td>
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<tr>
<td>SD</td>
<td>26.640</td>
<td>25.206</td>
<td>27.014</td>
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TABLE 2

Analysis of Covariance Summary Table

<table>
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<tr>
<th>Measure</th>
<th>F Ratio (df=2/11)</th>
<th>p less than:</th>
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<tbody>
<tr>
<td>BAT</td>
<td>5.25</td>
<td>.025</td>
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<tr>
<td>FT</td>
<td>4.08</td>
<td>.046</td>
</tr>
<tr>
<td>FII</td>
<td>1.09</td>
<td>.371</td>
</tr>
<tr>
<td>FIT</td>
<td>1.92</td>
<td>.192</td>
</tr>
<tr>
<td>Pt</td>
<td>0.33</td>
<td>.730</td>
</tr>
<tr>
<td>A</td>
<td>1.00</td>
<td>.403</td>
</tr>
<tr>
<td>TMA</td>
<td>0.53</td>
<td>.608</td>
</tr>
<tr>
<td>AI</td>
<td>3.80</td>
<td>.059</td>
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</tbody>
</table>

_t Values for Posttest Comparison of Adjusted Treatment Means

<table>
<thead>
<tr>
<th>BAT</th>
<th>FT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Live</td>
</tr>
<tr>
<td>Live</td>
<td>2.15*</td>
</tr>
<tr>
<td>Auto</td>
<td>2.55**</td>
</tr>
<tr>
<td>L+A</td>
<td>2.58**</td>
</tr>
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</table>

* p greater than .40
* p less than .10
** p less than .05

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conversely remained markedly unchanged from pre- to posttest. Consequently, \( t \) test comparisons of the adjusted treatment means (Edwards, 1972) were used to ascertain the source of the variations for the BAT and FT. The results are shown in Table 2.

Close inspection of Table 1 shows that change on the means of all measures for all groups from pre- to posttest was in the direction of improvement with the exception of AI for the automated group, which actually showed a slight increase. Furthermore, the analysis of covariance for this measure also showed a borderline \( p \) value (less than .06), which appears to reflect a sharp mean drop for the L group from pre- to posttest. Consequently, a \( t \) test comparing the combined C + A versus L adjusted treatment means was undertaken, with a resulting \( p \) value of approximately .10.

However, no other measure suggested a possible difference between the two treatment groups, and the \( t \) test comparisons for the BAT and FT measures conversely show a remarkable degree of similarity between the two treatment means (\( p \) greater than .40).
DISCUSSION

The BAT was selected as the measure of primary importance for several reasons. Not only is it a highly objective instrument for the assessment of specific fear, but one of the most reliable as well (Borkovec & Craighead, 1971). In addition, its behavioral qualities give it maximal content validity, while its widespread use adds "external validity" (Campbell & Stanley, 1963).

The analysis of covariance for the FT as well as the BAT demonstrates a significant improvement for both treatment groups versus the control group, with virtually no difference between treatments suggested by the t test comparisons. Although the level of significance reached was not as high as previous studies using the same program (Nawas, et al., 1970; Nawas, 1971), several factors account for the difference. Among these factors are small sample size and differences in statistical procedures used in this study. Furthermore, the control group for this study showed some degree of improvement, whereas previous studies using control groups with "no treatment" have not reported such improvement.

The improvement in the control group may be attributable to "expectancy of therapeutic gain" (Marcia, Rubin, & Efran, 1969; Wilkins, 1971) since this factor was highly, albeit positively controlled. At no point in the study did control Ss suspect that they were receiving a nonviable treatment. For the same reason, however, the comparatively significant improvement in the treatment
groups may not be attributed to this factor. A similar conclusion was reached by Lick and Bootzin (1970), using other parameters of the same treatment.

Despite the significant effects for the BAT and FT, other measures, notably excepting AI, remained remarkably stable across all groups. One possible explanation for this outcome is suggested by a recent factor analytic study of nine commonly-used fear assessment measures, among which were the BAT, FT, TMA, A, and equivalent versions of FII and FIT (Schroeder & Craine, 1971). The two factor solution which was interpreted as "trait anxiety" (A, TMA) and "state anxiety" (BAT, FT) suggests that the treatment procedure used in this study was effective only for the specific animal fear (state anxiety) and not for free-floating, generalized (trait) anxiety. This limited effectiveness may, in turn, be due to (1) the brevity of the treatment (Mathews, 1971) or (2) the fact that the phobias were sub-clinical, i.e., not constituting a central life problem (Paul, 1969). However, these hypotheses remain quite tentative, subject to further investigation.

The nearly significant result of the AI measure was the only outcome suggestive of a major difference among treatments. Although this difference did not reach generally accepted significance levels, it has implications of great clinical importance which preclude premature closure. The difference suggested by this outcome was that the group which received therapist contact throughout the treatment (L), as opposed to C and A groups, both of which received mechanized treatment, showed greater improvement with
respect to generalized discomfort or free-floating anxiety.

While this question remains open, there were several factors in the study which negated the significance of the outcome, foremost of which is the fact that it did not reach the customary (.05) alpha criterion. Furthermore, the three other highly correlated measures of the same factor (Dalstrom & Welsh, 1960), i.e., A, TMA, and Pt, did not even suggest such a treatment difference. Nonetheless, because of the crudeness of the fear and anxiety measures previously noted by Lang (1969a), the question is left to the scrutiny of further research.

Meanwhile, however, the device for automated desensitization can be used with some degree of confidence, subject to the clinician's inevitable scrutiny regarding its appropriateness to the patient, and the limitations of its effectiveness, which (along with those of SD generally) remain to be tested.
REFERENCES


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Lomont, J. F., & Brock, L. Stimulus hierarchy generalization in systematic desensitization. Behavior Research and Therapy, 1971, 9, 197-208. (b)


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APPENDIX A

Score Categories for Behavioral Avoidance Test

0 - Refusing to enter experimental chamber
1 - Standing more than 15 feet from cage looking at animal
2 - Standing 10-14 feet from cage looking at animal
3 - Standing 5-9 feet from cage looking at animal
4 - Standing 3-4 feet from cage looking at animal
5 - Standing 1-2 feet from cage looking at animal
6 - Standing next to cage looking at animal through screen
7 - Place palm against glass nearest animal
8 - Opening cage and looking at animal
9 - Holding 12-inch ruler, putting it part way in without touching animal
10 - Holding 12-inch ruler, putting it in and touching animal once (0-5 sec.)
11 - Putting gloved hand part way in cage without touching animal
12 - Placing gloved hand into cage and touching animal once
13 - Putting bare hand part way into cage without touching animal
14 - Putting bare hand into cage and touching animal once
15 - Reaching into the animal cage and petting animal with bare hand
16 - Reaching into the animal cage and picking up any part of the animal 1-2 inches (0-2 sec.)
17 - Reaching into the animal cage and picking up animal, holding it outside cage for 5 sec.
18 - Reaching into the animal cage and picking up animal, holding it outside cage for 15 sec.
19 - Reaching into the animal cage and picking up animal, holding it outside cage next to chest for 15 sec.
20 - Reaching into the animal cage and picking up animal, petting it, and allowing it to crawl on arm
APPENDIX B

Subject Selection Questionaire

1. NAME_________________________ Phone Number_________________________

2. How would you rate your fear of the following animals on a scale from one (1) = no fear at all, to ten (10) = complete panic. Put a circle around the appropriate number for each animal.

   1 2 3 4 5 6 7 8 9 10 Worms
   1 2 3 4 5 6 7 8 9 10 Bats
   1 2 3 4 5 6 7 8 9 10 Flying Insects
   1 2 3 4 5 6 7 8 9 10 Cats
   1 2 3 4 5 6 7 8 9 10 Birds
   1 2 3 4 5 6 7 8 9 10 Crawling Insects
   1 2 3 4 5 6 7 8 9 10 Rats
   1 2 3 4 5 6 7 8 9 10 Dogs
   1 2 3 4 5 6 7 8 9 10 Mice
   1 2 3 4 5 6 7 8 9 10 Snakes
   1 2 3 4 5 6 7 8 9 10 Any other animal Specify__________

3. Would you be interested in a workshop (7-9 weeks in length) to overcome your fear of any of these animals? Yes____ No____

4. Could you participate in the workshop for 50-minute sessions, twice-weekly? Yes____ No____
   Give days and times available: Day_________Time_________
   "_________"_________

5. Would you be willing to submit to testing (to be kept confidential) to assess progress in the workshop? Yes____ No____

6. Would you be willing to make a deposit of $5.00, which upon completion of the workshop with no absences, would be refunded to you? Yes____ No____