
The Efficacies of Three Relaxation Regimens in the Treatment of PTSD in Vietnam War Veterans



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Ninety male Vietnam veterans with posttraumatic stress disorder (PTSD) were administered relaxation instructions, relaxation instruction with deep breathing exercises, or relaxation instructions with deep breathing training and thermal biofeedback. Improvement appeared on only 4 of the 21 PTSD and physiological dependent variables studied. All 21 Treatment X Time interactions were nonsignificant. This suggests that the treatments were mildly therapeutic, but that the additions of training in deep breathing and thermal biofeedback did not produce improvement beyond that associated with simple instructions to relax in a comfortable chair.
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An important controversy has developed over the comparative efficacies of various relaxation regimens used to treat posttraumatic stress disorder (PTSD) and other anxiety disorders. Most relaxation therapies include both instructions to relax and adjunctive psychological or physiological training. One of the more prominent contemporary adjuncts to relaxation instructions is training in deep breathing (Lavey & Taylor, 1985; Peniston, Marinan, Deming, & Kulkosky, 1993) and biofeedback (Denny, Baugh, Gregory, & Jessop, 1993; Peniston, 1986; Peniston & Kulkosky, 1990, 1991; Peniston, Marinan, Deming, & Kulkosky, 1993; Rice & Blanchard, 1982; Silver, Brooks, & Obenchain, 1995; and Taylor, 1978). A number of studies (e.g., Gould & Clum, 1995; Telch et al., 1993) report finding deep breathing associated with clinical improvements. Similarly, a number of studies describe improvements after biofeedback therapies (e.g., Peniston, 1986; Peniston & Kulkosky, 1990, 1991; Peniston et al., 1993; Rice & Blanchard, 1982).

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On the negative side, however, Holmes (1994, p. 421) reported finding biofeedback no more effective in the reduction of anxiety correlates such as pulse rate and blood pressure than simple resting in a comfortable chair. Moreover, Banner and Meadows (1983) found thermal biofeedback to be no more effective in the treatment of "tension" than a placebo condition. Silver, Brooks, and Obenchain (1995) also reported biofeedback ineffective in the treatment of PTSD. Additionally, many of the positive results listed above described studies in which combinations of treatments were assessed. This makes it difficult to determine which of the treatments was therapeutic. Similarly, workers in our laboratory found α wave biofeedback to be effective in the reduction of anxiety when it was combined with relaxation training, but not when it was administered alone (Passini et al., 1977; Watson & Herder, 1980). These reports raise questions about the efficacies of training in deep breathing and biofeedback for the treatment of PTSD and other anxiety disorders. The purpose of this study was to compare the efficacies of simple relaxation instructions, relaxation instructions with deep breathing training, and relaxation instruction with both deep breathing and thermal biofeedback in the treatment of veterans with posttraumatic stress disorder.

METHOD

Subjects

Ninety male Vietnam war veterans in treatment for PTSD at the St. Cloud (Minnesota) Department of Veterans Affairs Medical Center served as subjects. All met the DSM-III-R criteria for PTSD (American Psychiatric Association, 1987, p. 250–251) as operationalized in the Posttraumatic Stress Disorder Interview (PTSD-I; Watson, Juba, Manifold, Kucala, & Anderson, 1991). Only subjects who participated in at least 9 of the 10 scheduled sessions were included in the analyses. Those who did not complete at least nine sessions were dropped from the study and replaced by other volunteers. According to their reports, none of the subjects had received prior biofeedback treatment.

The three groups did not differ significantly in mean age ($F[2, 87] = .96$; overall mean = 45.6 years) or education ($F[2, 87] = .74$; overall mean = 13.3 years). Seventy-seven of the subjects were Caucasian, nine were Native American, three were African-American, and one was Hispanic. The Relaxation group included four minority group members, the Relaxation/Deep Breathing group contained three, and the Biofeedback/Deep Breathing/Relaxation sample contained six. The proportion of minority group members did not vary significantly across groups ($\chi^2[2] = 1.26$). All subjects were informed of their rights to refuse or discontinue participation in the project without prejudice; each signed a consent to participate in this study.

Procedure

A technician trained by a doctoral psychologist with 7 years experience in biofeedback and relaxation therapies recruited the subjects, administered the treatments, and conducted the assessments. The treatment sessions were conducted in a quiet, dimly lit laboratory. Subjects were seated in a comfortable reclining chair for 10 min before treatment to adapt to room temperature.

The subjects were randomly assigned to one of three regimens—relaxation instructions, relaxation instructions plus training in deep breathing, or relaxation instruction plus deep breathing training and thermal biofeedback—in samples of 30 each. The treatments were administered individually. Each of the 10 sessions lasted 30 min.

The Relaxation Instruction group members were simply seated in a comfortable reclining chair and instructed to relax as much as possible during the sessions. The Relaxation/Deep Breathing sample members were additionally instructed to practice deep breathing during the

treatment sessions. They were also given instructions in deep breathing before each session. This consisted of detailed instruction to gradually fill their lungs completely and then exhale slowly and thoroughly. After repeating this procedure several times, the participant was placed in the reclining chair and instructed to practice relaxing and deep breathing for the following 30 min. Members of the Relaxation/Deep Breathing/Biofeedback group were administered the relaxation and deep breathing instructions and were also told that, while in the reclining chair, they would hear a tone indicating their level of relaxation. They were instructed to increase their finger temperature and lower the tone as much as possible by relaxing during the sessions.

Biofeedback Apparatus

An Autogenic Systems BioLab 11000 computerized physiological monitoring system with a single M20 thermal sensory module attached to the participant's left middle finger was used to measure the finger temperature. The auditory signal was produced by a Yamaha FB-01 sound generator, which changed one tone for every tenth of a degree Fahrenheit. Data from the thermal module were inputted directly into an IBM computer utilizing Autogenic Systems' S118 IBM BioText Software.

Skin temperature and frontalis muscle EMG data were also collected for use as dependent measures of relaxation. The EMG apparatus consisted of the Biolab system with an M30 EMG module. Muscle tension data were not used to provide feedback.

The EMG electrodes were secured to prejelled disposable electrode strips affixed to each subjects' frontalis muscle area. The biofeedback electrodes were attached before the relaxation instructions were read to the participants.

Dependent Variables

The severities of the PTSD symptoms were assessed with the Keane, Cadell, and Taylor (1988) Mississippi Scale for Combat-Related PTSD and the PTSD-I.

The PTSD-I consists of a trauma identification process and 17 7-point self rating Likert scales based on the DSM-III PTSD symptom criteria. It has demonstrated strong test-retest reliability (total score $r = .95$) and concurrent validity (correlations of .79 to .94) with the Mississippi Scale for Combat-related PTSD (Keane, Malloy, & Fairbank's, 1984), the Minnesota Multiphasic Personality Inventory PTSD Scale, and Robins and Helzer's (1985) Diagnostic Interview Schedule PTSD module (Watson, 1990; Watson et al., 1994).

The Mississippi Scale for Combat-Related PTSD consists of 35 self ratings associated with PTSD. It too has also demonstrated good validity (Watson, 1990). The PTSD-I and Mississippi Scale have shown validities superior to those of two other instruments in a comparative validation (Watson et al., 1994).

Statistical Analyses

The data were analyzed primarily with Type 1 mixed analyses of variance (Lindquist, 1953, pp. 267–273). This permitted comparison of the three groups' mean scores over both evaluations combined (group effect), assessment of pretreatment vs. posttreatment change (time effect), and comparisons of the amount of change manifested by the three groups over the treatment period (interaction effect). The PTSD-I and the Mississippi Scale were administered just before the subjects' first treatment and just after his last. Tests of these effects over all PTSD symptoms combined were accomplished by running these analyses on the Mississippi and the PTSD-I total scores. The effects of these treatments on individual PTSD symptoms were evaluated with Type 1 analyses on the individual PTSD-I items. We also compared the finger temperature and

muscle tension mean scores over the first and last sessions to assess changes in physiological arousal levels. Finally, we compared the mean initial and final finger temperature and muscle tension readings of subjects over all ten treatment sessions combined to determine whether the physiological responses changed during the individual treatment sessions.

RESULTS

Within-Session Improvement

As Table 1 indicates, significant Time effects appeared on both EMG and finger temperature, indicating that relaxation occurred during the sessions. However, the interaction effects were negative, suggesting the mean amount of within-session relaxation did not vary substantially across the three treatment regimens (see Table 1).

As Table 2 indicates, only 4 of the 21 Time effects comparing before-treatment or first session to posttreatment/last session scores on the PTSD-I, the Mississippi Scale, or the physiological measures were significant at the .05 level. These changes appeared on the PTSD-I exaggerated startle and intrusive memory items, Mississippi Scale total scores, and finger temperature. All four changes indicated improvement over time.

More important, none of the 21 interaction effects testing for differences in improvement across treatment conditions was significant. This suggests that the effects of the three treatment regimens on the 17 PTSD-I symptom self ratings, Mississippi Scale and PTSD-I total scores, skin temperature, and frontalis muscle tension did not differ substantially from one another. Thus, the additions of deep breathing and thermal biofeedback both failed to improve on the gains associated with instructions to relax and sitting in a comfortable chair. These results are described in Table 2.

DISCUSSION

The data presented here suggest that frontalis muscle tension decreases and finger skin temperature increases during individual treatment sessions in which PTSD patients are instructed to relax and placed in a comfortable chair. However, the additions of training in deep breathing and thermal biofeedback failed to generate additional improvement. Similarly, the subjects improved over the 10 session treatment program on a few of our criteria, but the additions of

Table 1. *Within Session Change*

Dependent Variable	Treatment Condition Means								
	F			Relaxation		Breathing & Relaxation		Biofeedback, Breathing, & Relaxation	
	Group	Time	Interaction	Initial	Final	Initial	Final	Initial	Final
Finger temperature (F degree)	2.06	159.11**	1.70	86.1	89.5	87.8	91.7	86.8	91.7
EMG muscle tension (in V)	.29	5.63**	.32	30.0	29.6	29.9	29.5	29.9	29.0

** $p < .01$.

Table 2. Between Treatment, Time and Interaction *F* Tests with Dependent Variable Means

Dependent Variable	Group	<i>F</i>		Treatment Condition					
				Relaxation		Breathing & Relaxation		Biofeedback, Breathing, & Relaxation	
				Initial	Final	Initial	Final	Initial	Final
PTSD-I									
Total	2.22	1.01	.19	95.4	95.0	98.1	97.8	90.5	89.4
Intrusive memories	.25	15.61**	.21	5.5	5.1	5.6	5.3	5.4	5.0
Nightmares	1.23	.00	.51	5.0	5.0	5.5	5.4	4.8	5.0
Flashbacks	1.14	2.55	1.67	4.8	4.8	5.3	5.3	5.1	4.6
Upset by reminders	.76	.08	.99	5.5	5.8	5.7	5.6	5.3	5.3
Avoidance of thoughts	1.71	.43	.52	5.9	5.8	5.9	6.0	5.4	5.2
Avoidance of activities	1.94	.21	.78	5.8	5.7	5.9	5.8	5.1	5.4
Psychogenic amnesia	1.67	.75	.06	5.0	5.0	4.6	4.8	4.1	4.3
Loss of interests	3.37*	.56	.69	5.8	5.8	6.0	6.0	5.4	5.1
Emotional estrangement	3.20*	.38	.22	6.2	6.3	6.2	6.2	5.6	5.8
Emotional deadening	4.79**	.01	1.09	6.1	6.1	6.2	6.3	5.7	5.5
Foreshortened future	1.12	.26	.02	5.8	5.8	5.8	5.9	5.4	5.4
Sleep difficulties	.35	.47	.97	5.8	5.9	6.1	6.0	5.7	5.8
Irritability	.16	.23	.01	5.4	5.4	5.4	5.4	5.2	5.2
Concentration problems	.23	.92	.65	5.5	5.5	5.7	5.4	5.3	5.3
Hyperalertness	1.67	2.03	1.24	6.1	6.0	6.3	6.4	6.0	5.7
Exaggerated startle	2.19	5.76*	1.26	5.9	5.8	6.4	6.3	6.0	5.7
Hyperresponse	1.37	.30	.37	5.4	5.3	5.6	5.7	5.1	5.2
Mississippi Total	1.37	4.98**	1.48	128.7	124.8	129.3	129.0	122.7	121.2
Physiological									
Finger temperature									
(F degree)	1.77	4.98*	1.48	88.6	89.0	89.9	91.8	89.5	91.3
EMG muscle tension	2.29	1.24	1.51	30.2	29.1	28.7	28.9	28.6	28.5

* $p < .05$. ** $p < .01$.

deep breathing training and thermal biofeedback failed to increase improvement on any of our 21 criteria over the 10 session program.

These findings suggest that relaxation instructions are modestly therapeutic for PTSD patients, but raise doubts about the efficacies of adjunctive deep breathing and/or thermal biofeedback training in the treatment of PTSD.

These reports support Holmes' (1994, pp. 132–133, 421) conclusion that the psychotherapeutic effects of biofeedback treatment may be attributable to quiet sitting, rather than the biofeedback process itself, at least as it pertains to PTSD patients.

Readers should be careful not to overinterpret these findings. We studied the effects of thermal biofeedback in this study. Other types of biofeedback might have yielded different results. Additionally, our subjects were all male Vietnam veterans with PTSD. Replications on other groups might have yielded different findings as well.

Readers should also remember that our relaxation condition consisted of simple instructions to relax in a reclining chair. This treatment should not be confused with more comprehensive, systematic relaxation training programs. Readers should also note that, while the four significant time effects (described in Table 2) suggest that all three conditions were therapeutic, the improvement might have resulted from the passage of time or other therapeutic activities to which the subjects might have been exposed.

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