BIOFEEDBACK IN PERSPECTIVE FIFTEEN YEARS OF DEVELOPMENT

BIOFEEDBACK SOCIETY OF AMERICA FIFTEENTH ANNUAL MEETING March 23-28, 1984 Albuquerque, New Mexico

BIOFEEDBACK IN PERSPECTIVE
FIFTEEN YEARS OF DEVELOPMENT

PROCEEDINGS

Biofeedback Society of America 4301 Owens Street Wheat Ridge, CO 80033 (303) 422-8436 Copyright 1984 by the
BIOFEEDBACK SOCIETY OF AMERICA
Printed in the United States of America

Published by the
BIOFEEDBACK SOCIETY OF AMERICA
Wheat Ridge, CO 80033

Copies may be ordered from:

Biofeedback Society of America 4301 Owens Street Wheat Ridge, CO 80033

Members of the Society: \$14.00 (includes \$1.00 postage/handling) Others: \$18.00 (includes \$1.00 postage/handling)

Foreign air mail at cost

TABLE OF CONTENTS

Oral and Poster	Pres	senta	atio	ons			۰				٠	•	٠	7	
Keyword Index .	٠,							• 0						21!	5
Author Index						_								21	7

THE EFFICACY OF A SELF-CONTROL TREATMENT

PACKAGE FOR FOUR INDIVIDUALS SUFFERING

WITH IRRITABLE BOWEL SYNDROME

Debra F. Neff, Edward B. Blanchard and Frank Andrasik

Center for Stress and Anxiety Disorders

Department of Psychology and bedrogs diod 84 dest

SUNY-Albany

Introduction. The psychological treatment of functional gastrointestinal disorders, more specifically irritable bowel syndrome (IBS) is a relatively neglected area. Traditional medical treatment of diet or drug therapy has provided minimal relief (Dressman, Powell & Sessions, 1977) for irritable bowel syndrome sufferers. Recently, behavioral strategies have been reported (Giles, 1978; Milby, Welte, Dolce, Slaughter, Trippletti, Gurwitch & Beidliman, 1982) with promising results. IBS is typically defined as a disturbed state of intestinal mobility for which no anatomical cause can be found (Drossman et al., 1977): The application of behavioral self-control techniques, including relaxation and biofeedback training, may potentially provide relief for these individuals. The present investigation examined the effectiveness of such a treatment for four individuals suffering with irritable bowel syndrome.

Subjects. The participants in this study were four individuals (2 male, 2 female) who were referred by their physician for psychological treatment of their IBS. All participants described at least an 8 year history of IBS, with the frequency of distressing symptoms ranging from several times a week to daily.

Procedures. Treatment consisted of a combination of educational information, progressive relaxation training, thermal biofeedback and training in effective cognitive coping strategies. Twelve treatment sessions were distributed over 8 weeks. Five of these sessions were devoted primarily to relaxation training, and another five to thermal biofeedback training. Incorporated in these sessions was training in the use of cognitive coping skills in dealing more effectively with stress, which is hypothesized to contribute to, or result from their gastrointestinal symptoms. The first session consisted of both an introduction to the treatment schedule and to the provision of education information regarding normal gastrointestinal functions. The last session dealt primarily with the application of the newly learned skills to future functioning.

Throughout baseline, treatment and for four weeks following treatment, all subjects were asked to keep daily records of their principal gastro-intestinal symptoms. These symptoms were rated on a 5 point scale, where 0 indicates the symptom was not a problem and 4 indicates it was debili-

tating. All patients were also instructed to practice the relaxation exercise at least once per day.

Results. The treatment results are presented in Figure 1. As measured by both daily monitoring of gastrointestinal symptoms and self-report, treatment was successful for reducing distress for subject #2 and subject #4. At the end of treatment, both could be defined as falling within normal range of gastrointestinal functioning. Subject #1 and subject #3 both reported experiencing moderate relief from their distress, but their diaries did not reflect this.

The two subjects who did not change significantly both reported a regular pattern of gastrointestinal distress. They experienced daily distress possibly suggesting a more severe problem. The two successes initially described an irregular pattern and experienced significant distress on the average of several times a week, therefore one distinquishing factor seems to be intensity of problem experienced.

Discussion. This treatment appears to be a potentially useful strategy for individuals suffering with irritable bowel syndrome. The participants in this study all had a relatively severe and distressing gastrointestinal problem as well as a long history of suffering. This treatment can be used either in addition to, or as an alternative to current medical treatment.

References a least the test of the grant the

- Drossman, D.A., Powell, D.W., and Sessions, J.T. The irritable bowel syndrome, Gastroenterology, 1977, 73, 811-822.
- Giles, S. Separate and combined effects of biofeedback training and brief individual psychotherapy in the treatment of gastrointestinal disorders. Paper presented at the meeting of the Biofeedback Society of America, Louisville, March 1981.
- Milby, J.B., Welte, P.O., Dolce, J.J., Slaughter, Trippletti, V., Gurwitch, R. and Beidleman, W.B. Behavioral intervention for irritable bowel syndrome: A pilot study. Paper presented at the meeting of the Society of Behavioral Medicine, Chicago, March, 1982.

Communications should be addressed to:

Dr. Edward B. Blanchard, Center for Stress and Anxiety Disorders Draper 107 135 Western Avenue Albany, NY 12203

Treatment Results

Figure 1.

A PRELIMINARY EXAMINATION OF THERMAL BIOFEEDBACK PROCESS DATA FROM ESSENTIAL HYPERTENSION PATIENTS

Maryrose Acerra, Frank Andrasik, Edward B. Blanchard
State University of New York at Albany

and

Guy C. McCoy, M.D.

Albany Medical College

Problem: A diagnosis of "essential" hypertension is given in approximately 80% of hypertensive cases (Agras & Jacob, 1978) and is defined as arterial blood pressure greater than 140/90 with no obvious organic cause (Guyton, 1971). The technique of thermal biofeedback combined with the use of autogenic phrases in order to decrease blood pressure has recently been explored. For example, Green et al. (1979) presented several case studies which indicated decreased blood pressure levels as well as decreased amounts of required hypertensive medication after extensive training with this technique.

The present study examined several within-session temperature parameters which may influence or predict clinical outcome. These parameters include (1) the high st temperature reached throughout feedback sessions (to examine the association of a criterion temperature level with outcome as has been suggested by recent research on vascular headache (Blanchard et al., 1983)) (2) Temperature means of the 4 phases of each treatment session, (3) temperature change from beginning baseline to the end of each treatment session.

Subjects: Participants were twenty subjects, 12 males and 8 females, diagnosed as having essential hypertension involved in the SUNY Albany-Albany Medical Center research/treatment program. Subjects ranged in age from 29 to 65 years. Subjects included both patients taking a diuretic and a sympathetic inhibiting drug at the time of treatment (n=12) and patients who were withdrawn from the sympathetic inhibiting drug before treatment, remaining on only a diuretic (n=8). (Analysis showed no effect of drug condition on weekly averages of home pressure changes from pre- to post-treatment).

Procedure: During each of 16 thermal biofeedback sessions, subjects were seated in a reclining chair with a thermister taped onto the dorsal aspect of their left index fingertip in order to monitor finger temperature. Printed temperature readings were recorded on a once per 10 second basis. After a five minute adaptation period, subjects were instructed to sit quietly for five minutes (baseline), to warm their hands without the use of feedback for five minutes (self-control 1), to warm their hands with the

use of visual and/or auditory feedback for 20 minutes (feedback), and to continue to warm their hands without feedback for five minutes (self-control 2). Room temperature for each session, as well as subjects' pulse and blood pressure readings before and after each session were recorded.

Results: Pearson Point Biserial Correlations performed on the measures revealed that the mean temperature achieved during the self-control 2 phase (MSC2) of the later sessions of biofeedback training were associated positively tively with outcome (defined as a success or failure judgement made by the M.D. at the time of data analysis); that is, achieving a higher temperature during his phase was associated with improved control of blood pressure (see Table 1). Based on the apparent importance of this phase of each session and of later sessions in the entire training process, temperature differences from baseline to self-control 2 (BL-SC2) were examined. Temperature differences from the first 4 sessions of treatment to the last 4 sessions of treatment were correlated with average systolic and diastolic BP pre-to-post-session differences for the last 4 sessions of treatment. This analysis revealed nonsignificant results, as did correlations between the above BP parameters and 2 other measures, namely outcome, and the highest temperature reached throughout feedback.

Groups were formed based upon the highest temperature achieved throughout feedback ($\$97^\circ$, $<97^\circ$) and analysis of weekly home BP data (BP taken daily, a.m. and p.m., standing and recumbent) was performed. Repeated measures ANOVA revealed that those patients who were able to raise their hand temperature to at least 97° during BF showed decreases in diastolic BP from one week pre-treatment to the last week of treatment (p=.001) (see Table 2).

<u>Discussion</u>: These exploratory analysis lend some support to the notion that what someone "does" during BF sessions relates to clinical outcome. The strongest associations were evidenced at the end phase of individual sessions, as well as at the end of the course of treatment, supporting a skill-learning explanation of thermal biofeedback. The home BP data supports the idea of a relationship between reaching a criterion and clinical outcome.

References

- Agras, S. & Jacob, R. Hypertension. In O. Pomerleau and J. Brady (Eds.),

 <u>Behavioral medicine: Theory and practice</u>. Baltimore: Williams &
 Wilkins, 1978.
- Blanchard, E.B. et al. Four process studies in the behavioral treatment of chronic headache. Behavior Research and Therapy, 1983.
- Green, E., Green, A., & Norris, P. Preliminary report on a new non-drug method for control of hypertension. Primary Cardiology, 1979.
- Guyton, A.C. Textbook of Medical Physiology. Philadelphia: Saunders, 1971.

Poor temperature for each of Table 1 and blood of

Pearson r values for the mean temperature of the self-control 2 phase with outcome

Session	<u>n</u> 50:	wa <u>r</u> an y	Pb)	SGE) of the Jacer's Loaly with quicome
9	20	.3556	.062	D. at the time of
10	20	.4150	.072	day assig and such
12	20	.4389	.026	Tobacca Task I
13	20	.5256	.009	morassa reisl i bi
15	20	.3818	.048	The state of the s

Table 2

Mean Values of Home BPs (diastolic) mm Hg

tallett on a some le	$< 97^{\circ} F (n=9)$	$ > 97^{\circ} F $ (n=11)					
S v and the first state	RECUMBENT						
1 WK, PRE-TX	77.3	79.9					
LAST WK. OF TX	77.2	78.5					
the late of the control of the contr	STANDING						
1 WK. PRE-TX	80.0	90.6					
LAST WK. OF TX	80.6	87.5					

Communications should be addressed to:

Center for Stress and Anxiety Disorders
Draper 107
135 Western Avenue
Albany, NY 12203

List equipment of the stress of the stre

CARDIODYNAMIC PREDICTORS OF CORONARY PRONE BEHAVIOR PATTERNS
ACROSS PSYCHOPHYSIOLOGICAL STRESSORS

Glenn L. Albright, Bruce L. Wilson, and Solomon S. Steiner City College of the City University of New York

The role of stress as a risk factor in coronary artery disease has gained significant acceptance as the result of development and implementation of assessment procedures that objectively measure type "A" or "coronary prone" behavior. These procedures, which include the Jenkins Activity Survey (Jenkins et al., 1979) and structured interview (Rosenman 1978), have been shown to reliably depict characteristically overt behaviors such as striving for achievement, aggressiveness, impatience, etc., that contribute to the atherosclerotic process. In this study, we have demonstrated that there exist cardiodynamic patterns of psychophysiological arousal that significantly correlate with the degree of hard driving and competitive behavior as measured by the factor "H" scale of the Jenkins Activity Survey (J.A.S.).

Twenty full time police officers from the Stamford, Connecticut police force volunteered to participate in a biofeedback intervention program designed to assess the effects of EMG biofeedback-aided relaxation on blood pressure. Each officer completed a J.A.S. in addition to undergoing a psychophysiological stress evaluation which employed both a physical (cold pressor) and psychological(quiz) stressor. The J.A.S. questionnaire was scored for percent of type "A" behavior, and factors "S", "J" and "H". These factors, respectively, represent speed and impatience, job involvement, and hard driving/competitive behavior. Measurements taken during the psychophysiological stress evaluation included systolic and diastolic blood pressure, peripheral skin temperature, frontal EMG, and cardiac impedance variables (stroke volume, heart rate

and Heather index of myocardial contractility).

The six condition assessment consisted of an initial baseline period, followed by a self-control period where subjects were simply asked to relax to the best of their ability. The psychological stressor was subsequently introduced, and involved either a serial seven task or a taped oral quiz. Following the period of recovery from the psychological stressor, each subject underwent a cold pressor test in which they immersed the preferred hand into a bucket of ice water for a one minute period. The evaluation was terminated with a final recovery period in which the subjects were instructed to remain quiet.

Our results clearly demonstrate that the percent changes in specific cardiodynamic variables during the psychological stress test(quiz) predicted the amount of hard driving and competitive behavior as measured by factor "H" of the J.A.S.. The five variables that contributed to this interaction in order of their predictive value were systolic blood pressure, peripheral skin temperature, Heather index, heart rate and stroke volume. These variables accounted for 53 percent of the variance(p<.04). Conversely, the relationship between these variables and factor "H" during the cold pressor test accounted for only 8 percent of the variance at a level of probability of .93.

It can be concluded from these results that a psychological stressor can produce cardiodynamic changes that are predictive of personality characteristics associated with stress that leads to coronary artery disease. These responses, which were demonstrably specific to psychological, as opposed to physical stress, have potential in increasing the power of prediction of stress as a risk factor as well as lending insight into the mechanisms of action by which stress produces cardiovascular damage. In addition, the measurement of specific cardiodynamic changes during a standardized stressor offers us an opportunity to assess the effectiveness of intervention strategies that attempt to modify behaviors that place certain individuals at risk for cardiovascular disease.

Address correspondences to:

Glenn L. Albright
Graduate Program, Department of Psychology
The City College of New York
138th Street and Convent Avenue
New York, New York 10031

given as to now peripheral book temperature reflects carabvascular functioning as an indicator of relaxation/suress. A galvanic skin-response instrument was used in demonstration, and on explanation was given as to now it can be us d as an indicator of stress which can precipitate gastro-intexinal disorders. An electromy organal instrument was used in demonstration, and an explanation was prinvided as to how muscular pain can be alleviated through this type of monitoring. Each of these temporatrations were cognitively amented and not intended as part of treatment.

Base line data werf then tales out (1) perceived state of relaxation. (2) linger, temperature, (3) pulse rate, (4) reading comprehension, (5) forward and reverse digit recall, and (6) divergent light unit and semantic unit production.

All date were recorded by participants on a packer during the prefest and periodically during treatment. Number one above was a self-report estimate on a scale or one to ten ('most tense you've ever been to most relaxed you've ever been!). Number two was taken by each participant from a thermometer attached to their linger, Number three was a count of wrist pulse rate taken by participants as timed by the presenter, Mumber four was scored from responses to extractions

STRESS REDUCTION AND COGNITIVE OUTCOMES*

Bruce L. Arneklev Tacoma Public Schools

<u>Problem.</u> A great deal is written about the cost of debilitating stress and associated physical disorders. Stress management programs are often implemented to reduce absenteeism, pain, and medical cost. However, less documentation is available related to the impact of relaxation training as a facilitator of productivity. In academic settings productivity is usually quantified in terms of cognitive outcomes. This paper outlines a mini-program to document the impact of relaxation exercises on mental functioning.

In 1978 the National Society for the Study of Education (NSSE) published a four hundred page yearbook entitled Education and the Brain. The Scientific American for September 1979 issued a classic volume on "The Brain" and its functioning. One could hope that the renewed interest in science would include an enlargement of brain research and how the brain functions during learning.

Galyean (1981) has done one of the most intriguing jobs of reviewing some of the literature in regard to the brain and its training through educational processes. Her work complements a more technical and stress related presentation by Everly and Rosenfield (1981). Each of these documents identify some of the treatment methods that have demonstrated utility in reducing stress and hold potential for improving neural functioning. Much more exploration is needed.

Subjects and Method. Twenty-four teachers who enrolled for a staff development program on "Learning to relax and its relation to other learning" served as subjects. The three-hour session began with an hour lecture and demonstrations of biofeedback techniques. Fahrenheit thermometers were given to each participant for measurement of finger temperature. An explanation was given as to how peripheral body temperature reflects cardiovascular functioning as an indicator of relaxation/stress. A galvanic skin-response instrument was used in demonstration, and an explanation was given as to how it can be used as an indicator of stress which can precipitate gastro-intestinal disorders. An electromyograph instrument was used in demonstration, and an explanation was provided as to how muscular pain can be alleviated through this type of monitoring. Each of these demonstrations were cognitively oriented and not intended as part of treatment.

Base line data were then taken on: (1) perceived state of relaxation, (2) finger temperature, (3) pulse rate, (4) reading comprehension, (5) forward and reverse digit recall, and (6) divergent figural unit and semantic unit production.

All data were recorded by participants on a packet during the pretest and periodically during treatment. Number one above was a self-report estimate on a scale of one to ten ("most tense you've ever been to most relaxed you've ever been"). Number two was taken by each participant from a thermometer attached to their finger. Number three was a count of wrist pulse rate taken by participants as timed by the presenter. Number four was scored from responses to extractions

from CTBS level four reading comprehension tests in a counterbalanced design where half the group took one passage and the other took the other. The two groups took the alternate passage as the post-test. Number five was scored on the basis of stimuli extracted from the WISC digit span subtest. Number six was scored on the basis of responses to extractions from the Structure of Intellect (SOI) test.

Following pretesting a break was taken, and then treatment began. Some instruction was given on the nature of breathing and its importance to stress reduction. Participants then positioned themselves on their backs on the floor and practiced proper breathing techniques using some visualization of what was happening in their bodies as a result of healthful breathing (Jencks 1979, Rama, Swami, and Ballentine 1979). After discussing selected individual reactions to focusing on breathing, interim data was collected on all physiological variables discussed above.

Instruction was then given on muscular relaxation with emphasis on the quieting response (Stroebel 1982). A final integrated visualization exercise was then lead by the instructor taking participants on an extended tour of their bodies and its sensations. Post-testing on all variables was then administered.

Results. Questionnaire, physiological, and psychometric data can be summarized as follows:

- A. Self-reported estimates of relaxation on a scale of 0-10 (most tense you've ever been to most relaxed you've ever been), increased pre to post for every participant. This change would have occurred by chance less than once in a thousand.
- B. Average finger temperatures pre to post increased 2.4 degrees Fahrenheit, but was not statistically significant largely due to irregular nature of measurements.
- C. Average heart rate as measured by pulse decreased 5.7 beats per minute between pre and post. A t of 2.07 was required to be significant at the .05 level; therefore, the t value attained (2.02) was not statistically significant at that level.
- D. Reading Comprehension increased slightly but not significantly. A ceiling on the test may have interfered with measuring some gains.
 - E. Complete accuracy in recording in sequence orally given digits improved from 58% to 67%; however, this change was not statistically significant. Complete accuracy in recording in reverse order of what was presented orally, improved from 27% to 54%, and this change would have occurred by chance less than five times out of one hundred.
 - F. Divergent figural unit (DFU) production in response to a "Structure of Intellect" square pattern decreased a non-significant amount. Divergent semantic unit production in stories written about DFU outcomes increased a non-significant amount. Some large changes were attained, but again lack of consistency precluded the attainment of statistical significance.

Discussion. This was only a miniature study of many facits. One of its weaker points was in ignoring the literature on optimal levels of arousal. To presume that "less" arousal is a panacea for improving learning is probably inappropriate. Yet, any substitute teacher recognizes a major problem in slowing down students. Whether that is a function of too much T.V. or whatever, we know what type of control most people need for optimal functioning. We (should) know that visualization helps the body to slow down, and the body "knows" when it feels best.

There is always suspicion of the unknown. Participants and parents (if students are involved) must be apprised of the implications when using novel instrumentation or practices. On the one hand, poetry and many types of literture have been lauded for centuries because of the imagery which they induce. On the other hand, there is a great deal of association that can work for or against acceptance of some types of relaxation training (prayer is a type of meditation/visualization). "Openness" is at the foundation of any relaxation and optimal learning environment. Being "up tight" is a literal discription of dis-ease.

We know that drug industries (over the counter, prescription, and illegal) are all multi-billion dollar efforts. The market place is contributing to a lot of unnecessary cost and side effects that would not be necessary if people were trained to self-regulate. Could not our educational system promote some of these requisite skills, and enable people to reap benefits through enhanced physical and mental productivity?

seu-reportes esumares or relavation on a scale of 0-10 (most tense you've ever be æsnereless beto been), increased pre to post

Everly, George S. and Rosenfield, Robert. The Nature and Treatment of the Stress Response, Plenum Press, New York, 1981

Galyean, Beverly-Colleene. The Brain, Intelligence and Education: Implications for Gifted Programs, 767 Gladys Avenue, Long Beach, CA 90804

Hubel, David H. The Brain, Scientific American, September 1979

Jencks, Beata Your Body Biofeedback At Its Best, Nelson Hall, Chicago, 1977

Peper, Eric. Mind/Body Integration, Plenum Press, New York, 1979

Rama, Swami; Ballentine, Rudolph and Hymes, Alan. Science of Breath, Himilayan International Institute, Honesdale, Pennsylvania, 1979

Stroebel, Charles F. QR: The Quieting Reflex, New York, G.P. Putnams, 1982

Wittrock, M.C. Education and the Cognitive Processes of the Brain, Education and the Brain, NSSE 77th Yearbook Part II, Univ. of Chicago Press, Chicago, 1978

Communications should be addressed to: (1) thru language integrated .

Bruce L. Arneklev salists of noticepory the California mass and Evaluation allowers transferage nor beauty and Tacoma Public Schools lead vonet lead to long alays and P.O. Box 1357
Tacoma, WA 98401

THE EFFECTS OF DIAPHRAGMATIC AND THORACIC BREATHING ON PERIPHERAL TEMPERATURE

Martha Bacon Southern Illinois University Roger Poppen Southern Illinois University

PROBLEM

Somatic meneuvers, in the form of changes in skeletal-muscular or respiratory activity, are commonly regarded as confounding variables in research on learning visceral control. Efforts have been made to prevent or control such maneuvers rather than train or investigate them (Keefe, 1975; Lynch, Schuri & D'Anna, 1976; Taub & Emurian, 1976). Consequently, little is known about the effects of somatic maneuvers per se. In their review, King and Montgomery (1980) noted that significant temperature changes were produced during biofeedback when somatic activity was permitted but were less likely when such strategies were prohibited.

Scattered evidence suggests that practitioners of Eastern meditative techniques, which rely heavily on breathing maneuvers, are able to exhibit dramatic temperature control. The exact nature of breathing maneuvers characteristic of Zen, Yoga, and other techniques is difficult to determine from the literature. Many of the descriptions are couched in mystical terms and elchorate metaphors. Examination of several sources and discussion with trained persons, revealed the following respiratory characteristics to be generally true of Eastern meditative techniques. The breathing is diaphragmatic, nasal, slow, regular, and the focus of attention. One or more of these breathing activities have also been described as characteristic of various relaxation procedures (Bernstein & Borkovec, 1973; Jacobson, 1934; Schilling & Poppen, 1983).

The purpose of the present study was to determine if engaging in the above respiratory maneuvers, in the absence of temperature feedback, would be effective in controlling peripheral (digital) temperature.

METHOD

Subjects. Three female volunteers were screened to exclude chronic smokers, current practice in breathing techniques, and finger temperatures over 32.2°C (90°F) during any of three pre-baseline measures. Subject 1 was a 24-year-old single black graduate student, Subject 2 was a 32-year-old single white graduate student and Subject 3 was a 24-year-old white, married college graduate and store employee.

Setting. The experimental chamber was a sound-attenuated, temperature-controlled room containing one straight back cushioned chair with arm rests. The ambiant temperature was maintained at 22.2°C \pm .25° (72°F \pm .50). An intercom was used for communication. The experiment took place in the summer months, characterized by warm to hot outdoor temperatures.

Apparatus. A Narco Bio-Systems, Inc. Physiograph Four-B recorded amplitude of diaphragmatic breathing measured by a bellows pneumograph, and rate of breathing through the mouth on a moving paper chart. An Autogenic Systems, Inc. 100b monitored the subject's peripheral temperature and temperature of the experimental chamber.