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Effects of EMG Relaxation Training and the Role of Cognitions, During Training, on Self Image: A Pilot Study with Three Direct Replications

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EFFECTS OF EMG RELAXATION TRAINING AND THE ROLE OF COGNITIONS, DURING TRAINING, ON SELF IMAGE: A PILOT STUDY WITH THREE DIRECT REPLICATIONS

by

Kathleen E. Paulsen

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

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Kathleen E. Paulsen
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WESTERN MICHIGAN UNIVERSITY, M.A., 1979
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Introduction

According to William Glasser, one of the basic needs for maintaining mental health is a positive self image (1969). In this study the experimenter assisted Ss through autogenic biofeedback training, to develop relaxation skills, the acquisition of which can lead to enhanced self image (Colvin, 1975). Biofeedback relaxation training was selected, as research has shown that use of biofeedback produces superior results in speed of learning and depth of muscle relaxation when compared to other methods of relaxation training. See Canter, Kondo, and Knott, 1975; Coursey, 1975; Green et al., 1971; Reinking and Kohl, 1975; and Stoyva and Budzinski, 1974.

The effects of biofeedback relaxation training have been shown to influence particularly high degrees of learned self regulation found to generalize to other physiologic systems. See Chavoya, Williams, and Johnson, 1978; Green and Green, 1977; Patel, 1975; and Stoyva and Budzinski, 1974. Changes in the physiologic system appear to effect self image and self talk. Green and Green (1977) report that in patients receiving biofeedback self regulation training, "personality changes accompanied the physiological changes" (p. 71). The Greens explain it thus: "It is as if for each individual there is not only an ideal homeostatic balance in the physiological domain but also an ideal homeostatic balance in the personality domain. Movement toward healthy homeostasis in the one tends to bring it to the other " (p. 71).

Few studies on the effects of biofeedback relaxation training on self image are available to date. Among this research, however, data are beginning to accumulate that suggest:

1. In positively enhancing self image biofeedback training is in some ways superior to autogenic training or relaxation training without feedback. In a study by Colvin (1975) autogenic feedback and autogenic training were both effective in enhancing self
image but autogenic feedback training was more so. As measured by the self acceptance subscale of the Personal Orientation Inventory, the scores obtained by the autogenic feedback group were significantly increased as compared to the autogenic training and control groups. As measured by a tabulation of inner control statements, autogenic feedback training was more effective in enhancing internal locus of control.

2. New cognitions triggered by and coupled with, the developing control over physiological change bring about a change in self image. As Hardt (1978) explains, biofeedback training requires the subject to adopt new cognitions and affects and to sustain these for long periods: "If these patterns are experienced as pleasant, useful, or adaptive by the trainee, they may be adopted by the trainee and may become habitual, thus becoming part of the individual's new self concept" (p. 216). See also Green and Green (1977) and Meichenbaum (1976).

Of the biofeedback studies addressed to the subject of self image, all appear to be group studies. Point two, above, suggests a need for doing a single organism study where more time can be given to attending to and noting for clinical use, client cognitions. Such an experiment can incorporate client cognitions to facilitate training. Learning which thoughts make the body feel good and which thoughts make the body feel bad can bring about a desire to change ones thoughts. Thus maladaptive responses are "deautomatized" (Meichenbaum, 1976) in that they are made conscious and subject to change by deliberate changes in self talk and imaging.

Concern is growing regarding the gap which exists between research and the applicability of results to current clinical practice (Hersen and Barlow, 1976). Traditional group design research often is deficient in information needed by the clinician. Major deficits cited by Hersen and Barlow are (1) lack of description of individual response of subjects, (2) difficulty manipulating design to satisfy idiosyncratic needs of individuals and (3) levelling of data in averaging of results. As Pellatier (1977) points out, whether
an individual enters into training in meditation practice or biofeed-
back, specifically to unstress or for internal exploration of conscious-
ness, "minute but critical adaptations inevitably need to be made to
suit his special needs" (p. 104). The single case study unlike the
group design more easily provides a multiple baseline-multidimensional
approach. In the case study the experimenter can attend to and modify
where necessary, the subject's self talk to facilitate change, which
as Stoyva (1976) claims, is close to what actually happens in clinical
practice. This is not to discount the value of group studies, of course,
which can present more convincing evidence of the generality of a tech-
nique; it is only to point out that the single case study does have a
useful function which according to Hersen and Barlow has been largely
overlooked in recent years.

According to Meichenbaum (1976) biofeedback researchers have not
answered the question: what role do client cognitions play during
the training phase of treatment? In an attempt to begin to answer
that question with the individual, this study engaged in a continu-
ous appraisal of client cognitions, modifying self talk where ap-
propriate and where the S desired change. Meichenbaum (1976) and
Stoyva (1976) point out that modifying cognitions as well as physio-
logy helps the behavior generalize to new situations and to maintain
for longer periods. Attending to and modifying cognitions where the
client desires change can help him take control of his own therapy.
Throughout, emphasis in this study was on client self control.

According to the Greens (1977), "Every change in the physio-
logical state is accompanied by an appropriate change in the mental
emotional state, conscious or unconscious; and conversely, every
change in the mental-emotional state, conscious or unconscious is
accompanied by an appropriate change in the physiological state"
(p. 33-34). This principle coupled with volition allows the nat-
ural process of self regulation to unfold (Greens, 1977). In be-
havioral terms, then, this says that, altering cognitions, genera-
lizes to physiological behavior, which in turn generalizes to cog-
nitions which in turn generalizes to physiological behavior, etc.
In addition, physiological and cognitive components may combine synergistically to create greater effects than either factor alone (Pellatier, 1977). This study describes this process as it investigated:

1. effects of EMG assisted relaxation training on self-image
2. effects of cognitions on EMG relaxation training.

As recommended by Herson and Barlow (1976), a single organism design followed by three direct replications was selected to ascertain some generality of findings across subjects. As recommended by Colvin (1975) and Green et al. (1972), autogenic type phrases and imaging were used to facilitate the feedback training.

**Method**

**Setting and Apparatus**

All sessions took place in a 10' by 16' carpeted room, designed as much as possible to appear homelike in spite of the presence of biofeedback equipment. Ss were seated in one of three cushioned reclining chairs.

EMG analog feedback was conducted with an Autogenic Systems Incorporated electromyogram, model 1500c, which monitors EMG activity in the range of 100 to 200 hertz, provides a root mean square measure of microvolts (μV), and measures the number of digital points per 1/10 of a second over a preselected time span. A threshold selector on this model was used with S4 only, to terminate audio feedback whenever frontalis activity fell below a pre-determined threshold level. This was an effort to reward successive approximations as S4 moved toward deeper relaxation. Ss 1, 2, and 3 learned quickly without use of the threshold device. Input noise range of the Autogen 1500c is .09 μV (typical) to .15 μV (maximum).

A Micronta ohm meter, model number 22-2030A, was used to measure resistance, at electrode placement, which was kept under 5,000 ohms.

On line acquisition of data was provided by an Autogenic Systems Incorporated Digital Integrator, model 5100. This digital integrator provided computation of the time integral i.e. the cumulative average.
amplitude of electromyogram activity over a pre-determined period of
time. Accuracy of this equipment falls within 0.3%. A four digit
light emitting diode (LED) display provided the visual readout of the
EMG activity that was monitored.

Subjects

This investigation included two males and two females ranging
in age from 14 to 63 years.

1. Pilot subject was a 63 year old male who demonstrated a
need, based upon test scores, for improved self image. He was pro-
vided with EMG autogenic feedback relaxation training, for nine ses-
sions. Feedback and recording proceeded off the frontalis muscle area.

2. Three direct replications of the pilot subject study were done
employing two females and one male who demonstrated a need, based upon
test scores, for improved self image. Ss were provided with EMG
autogenic feedback relaxation training for nine to eleven sessions
depending upon S need. Feedback and recording proceeded off the
frontalis muscle area.

3. Criteria for selecting subjects were: (1) expressed desire
for biofeedback relaxation training and (2) demonstrated need to en-
hance self image: Ss who scored one half standard deviation below
the mean or lower on either the Self Regard or Self Acceptance sub-
scles on the Personal Orientation Inventory qualified to continue
as Ss for this study.

Procedure

Orientation Phase

E conducted an informal consent briefing with Ss, and parents
where S was a minor, to inform them of (1) the purpose of the research,
(2) to provide a description of training risks and/or benefits, and (3)
to ascertain, parental consent, where needed, a signed volunteer state-
ment, and a medical history. Samples are included in Appendix A.

Each subject was given one, two hour orientation session to
develop some familiarity with the experimental setting and recording
procedures. During this session a battery of assessment tests was administered. See "Assessment" section for description. Prior to training, two 20 minute baseline sessions were conducted on separate occasions. Baselines for Ss 1 and 2 were divided into two 10 minute periods separated by a 5 minute break. Baselines for Ss 3 and 4 were not separated in this manner but rather ran for 20 minutes without interruption. This change in procedure was made after Ss 1 and 2 expressed the view that such a break was not necessary and interrupted rather than facilitated the attempt to relax. After the second baseline each S was given an additional 10 minutes with both auditory (click) and visual (LED) feedback to begin to acquaint them with the training process.

Experimental phase

Ss were seated in a reclining chair while E affixed each of two electrodes one inch above the middle of each eye brow. The ground electrode was placed one and one half inches above the bridge of the nose. E initiated a 10 minute settling down period. Data accumulated were on EMG activity expressed in integral average microvolts (uV). Readings of microvolt activity during baseline and training periods were taken from a LED display on the data integrator. Training sessions including settling down period, pre-baseline, training segment, post-baseline, therapy and/or subjective reporting totaled between one and on half and two hours.

1. Prior to the first EMG training session, E instructed Ss regarding passive volition and use of deliberately invoked imagery to aid in relaxation. In addition, though the original design did not include this, design was modified to include therapy when necessary before the EMG part of the session. This modification developed as a result of early training experiences with Ss 1 and 2 and is described in the "Results" section.

2. The EMG training session was originally to have been divided into two 10 minute sessions of five 2 minute time samples with a 5 minute break between segments. E discovered with Ss 1 and 2 that
breaking the training session into two segments interrupted relaxation. Both Ss preferred to continue for 20 minutes without break. Use of the 20 uninterrupted minute training session of ten 2 minute time samples, then, was continued for Ss 3 and 4, except where breaks were required to satisfy the needs of S4.

Following the training session, E taped reports of Ss' 1 and 2 subjective experiences. Due to the highly confidential nature of material disclosed by S3 and due to the discomfort expressed by S4, recording was done via hand written notes for these Ss.

3. Approximately half way through the training, i.e. at sessions five or six, E read a process meditation, The Well and the Cathedral (Progoff, 1971), to Ss 1, 2, and 3 in place of the autogenic phrases. This is described in the "Assessment" section and was not used for S4, as, after eleven training sessions, she had not been able to reduce frontalis area tension to the degree that Ss 1, 2, and 3 had achieved after five or six sessions.

4. A five minute within session post baseline followed the EMG training session.

5. After post-baseline, Ss recorded subjective experiences on the report form (see Appendix D). An interview of approximately 25 minutes followed, during which, Ss elaborated on physiological awarenesses and discussed imagery and/or any disturbing experiences that may have occurred, or discussed problems of which they became aware during EMG practice. During this time, E conducted therapy where appropriate to help Ss deal with problems or disturbing experiences and to reflect cognitions Ss had that could be used to facilitate relaxation training. Working with Ss via eclectic methods, (e.g. Karkuff problem solving, or Gestalt techniques, or various behavioral interventions, E assisted Ss in eliminating self talk detrimental to achieving relaxation.

6. Collection of within session pre-baseline data across sessions enabled E to determine whether or not an across-sessions training effect was occurring.
Assessment

Baseline
1. Assessment of self image was measured via the Clinical Analysis Questionnaire, Delhees and Cattell (1971); the Internal Powerful Others and Chance Scales, Levenson (1973); the Personal Orientation Inventory, Shostrum (1974); and the State trait Anxiety Inventory, Spielberger (1970).

2. Assessment of muscle tension level was measured via the EMG.

During training
1. Midway through training, the Internal Powerful Others and Chance Scales was re-administered.

2. Between the one third and two thirds points in training Ss filled out a self report form that allowed him/her to report and discuss subjectively perceived changes, if any, in self image/self control (see Appendix E).

3. Ss filled out a check list type self report form pre and post each EMG session providing subjective evaluation of physical and emotional feelings pre and post EMG work.

4. With Ss 1, 2, and 3 at session five or six, E used the process meditation, The Well and Cathedral, (Progoff, 1971).

5. Material from the end of session interviews, and pre-session therapy described in the "Experimental" section was used to provide anecdotes and examples to illustrate findings.

Post training
1. After the final training session, Ss again filled out the self report described in item 2 above.

2. After the final training session, Ss again were given the same battery of assessment measures as at baseline.

3. Notes were taken on Ss' subjective reporting on total training experience.

4. A 20 minute, no feedback, post-baseline was taken on each S on the EMG.
Follow up

E is in process of arranging follow up on Ss which will include repeat of assessment measures used in post training baseline. Results will not be included in this paper.

Background on assessment measures

The Internal, Powerful Others, and Chance Scales, developed by Hanna Levenson (1973) measure locus of control. Those individuals who believe they control their own lives are internally controlled. Those who believe their lives are controlled by fate, chance, or powerful others are externally controlled. The scale contains 24 items (8 for each variable measured) which the S ranks according to amount of belief/disbelief. The Levenson scale was selected, as unlike the Rotter scale, it measures two variables of external control, the rationale for this being derived from the assumption that a difference exists between those who believe the world is unordered as compared to those who think the world is ordered but controlled by powerful others (Colvin, 1975). Knowledge of which belief the client holds could have therapeutic implications. Split half reliabilities were in the mid .60s for an adult sample and mid .60s and high .70s for the student sample. Test-retest reliability after one week was in the .60s and .70s according to Levenson (Colvin, 1975).

Shostrum's Personal Orientation Inventory was designed to measure values and behaviors important to self actualization. The POI consists of 150 two choice comparative, value and behavior judgments regarding: time competence and inner directedness (the two major scales) and ten subscales i.e. (1) self actualizing values, (2) existentiality (3) feeling reactivity (4) spontenity (5) self regard (6) self acceptance (7) view of humanity (8) synergy (9) acceptance of agression (10) capacity for intimate contact. Theoretically the closer the individual scores to between the standard scores of 50 and 60, the more self actualizing he is. Scoring higher than 60 suggests a false score (Shostrum, 1974). Research has shown the POI to be a valid measure of self actualization at the .01 level of confidence (Shostrum, 1974).
The Clinical Analysis Questionnaire developed by Delhees and Cattell (1971) determines where an individual ranks on a scale between 16 sets of opposing personality characteristics and 12 sets of health to pathology characteristics. That is, the CAQ ranks an individual on a scale from one to ten between opposites such as reserved/warmhearted and low general psychosis/high general psychosis. The CAQ measures the individual's self worth, energy, contentment with life, anxiety, ego strength, manner of relating to others, sense of adventure, self reliance, self control, and tendency toward or away from pathology. Test-retest reliabilities for the personality traits run from .56 (intelligence) to .73 (tension) and on the pathology supplement .71 (guilt/resentment) to .90 (schizophrenia). Construct validity, labelled concept validity (because no single life performance correlates perfectly with these scales) runs from .53 (intelligence) to .70 (sizothymia/affectothymia; threctia/parmia; harria/premsia) in personality traits and from .45 (depression) to .76 (hypochondriasis) on the pathology supplement (Delhees and Cattell, 1971).

The State Trait Anxiety Inventory consists of two self report scales to measure the two distinct anxiety concepts: (1) "A state", level of anxiety for a given point in time; and (2) "A trait," stable level of anxiety proneness. Since high A trait persons are more likely to respond with increased A state intensity in situations involving interpersonal relationships posing a threat to self esteem, this suggests that A trait anxiety was related to self image and was, therefore, a significant variable to measure in this study, and state anxiety was a significant variable to assess in a relaxation training program. The STAI contains 40 statements, 20 for each scale. The A trait scale statements ask Ss to report how they generally feel and A state scale asks Ss to report how they feel at the moment. Test-retest correlations for the A trait scale ranged from .73 to .86. Test-retest correlations from the A state scale ranged from .16 to .54. Correlation of STAI with other anxiety scales run as follows: (1) with IPAT, .75 to .77 on three populations (2) with the Taylor Manifest Anxiety Scale, .73
to .85—same three populations and (3) with Affect Adjective Checklist .41 to .57 on two populations (Spielberger, et al., 1970).

The E designed the Biofeedback Relaxation Training: Self Report Form in order to provide one more means of evaluating progress in process. The items selected resulted from interviewing pre-research practice Ss who were taking biofeedback relaxation training. In addition to providing another means of assessing how Ss subjectively evaluate progress/lack of progress, the form also provided a check to see how Ss' subjective views compared with the more formal testing measures used.

The words and images of The Well and the Cathedral process meditation facilitate the individual's entry into inner space i.e. help the individual focus subjectively in a way that does not normally happen during consciousness. The suggestive language prompts the S to produce his/her own images. The Well and the Cathedral consists of several segments designed to be followed by a pause to allow the S to record subjective experiences between segments. Validity for its use as an assessment measure is based on the limited experience of this experimenter, who discovered that use of this device can prompt Ss to encounter a self image that he/she holds subliminally. This image may be disturbing. Thus it is best to wait until S has some experience with relaxation prior to its use. However, Ss' encounter with such an image can provide another means of assessing self image.

**Definition Of Terms Used In Study**

In this study the terms **self image** and **self concept** are synonymous and refer to the attitudes and mental pictures one has about himself: effects upon locus of control, self actualization, and anxiety, variables related to self image, were measured. **Locus of control** refers to the extent to which people believe they exercise control over their own lives--internally controlled--or the degree to which they believe their destiny is beyond their control--externally controlled (Levenson, 1975). **Self actualization** refers to one's progress or movement toward development and use of his unique capabilities and potentials.
(Pervin, 1975). Autogenic biofeedback training used in this study is defined by Green et al. (1973) as follows: "The self suggestion formula of autogenic training tells the unconscious section of the mind, or brain, the goal toward which the person wishes to move, and the physiological feedback device immediately tells him the extent to which he is succeeding" (p. 154). In autogenic biofeedback training, as with autogenic training, auto suggestion is used to modify subcortical interrelations, thereby enabling natural forces to regain their otherwise restricted capacity for self regulatory normalization. Autogenic training intentionally influences autonomic processes by directing physiological changes via one's focus of attention, that is, by imaging and visualizing the intended change while in a relaxed state i.e. passive volition (Green, 1977). See also Luthe (1969).
RESULTS: INCLUDING IDIOSYNCRATIC RESPONSE AND COGNITIONS AND EFFECTS IN TRAINING

Subject One

S1 was a 63 year old professional man. Pre-training test results showed S1 to be assertive, perfectionistic, somewhat rigid, conservative, practical in his approach to problem solving, having a high regard for his abilities but intolerant of his weaknesses, on the independent side of the norm but enjoying companionship, and having a good capacity for intimacy. His high extroversion score seemed to suggest not only warmth but emotional lability, as was demonstrated later by an erratic within session post-baseline EMG record. He had an external locus of control. According to the Speilberger scale, state anxiety was low (20th percentile), and trait anxiety was a bit above the norm (55th percentile). This latter score correlated with the second order factor anxiety score of 6.0 on his CAQ.

In the initial interview S1 discussed his practice which was evidently diminishing, his incoming bills and lack of money, his concern for having to retire with less money than he had hoped to have, and the waking insomnia which he had been experiencing two weeks prior to his baseline session. We also discovered that his blood pressure, which had been 120/75 six months previously, had risen to 180/90. During the initial baseline EMG session, he averaged 1.69 uV in the first ten minutes and 5.8 uV in the second ten minutes. He had engaged in cognitive obsessing during the high microvolt half of the session. He concluded that he was not accomplishing anything positive with the obsessing. His money problems were the same whether he obsessed or not and he was putting unnecessary strain on his body.

Target behaviors that might influence and be influenced by relaxation training were:

1. cognitive obsessing
2. waking insomnia
3. elevated blood pressure
4. frontal area tension

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The following target behaviors were added later as they became apparent:

5. sleeping during training sessions
6. depression which showed up in training session six.

Outcome Of Training For SI

Highlights from sessions relating to target behaviors

1. Cognitive obsessing: during baseline two, SI averaged 1.58 uV during the first ten minute segment and during the second ten minute segment, he averaged 4.14 uV. He was obsessing over money problems. In training session one, he became aware that when he had certain thoughts, the audio feedback clicked faster: "I realized I'd better cut that out," he said, "'cause that's what makes the motor boat go racing." With the exception of training session three, where he became uncomfortably cold when the furnace stopped working in the building, and training session seven, when he became restless after a dip to .69 uV, his microvolt average moved down steadily, apparently as he gained control over cognitive obsessing. By the last two sessions he appeared to be able to turn off the obsessing at will to get the microvolt level down for training, but E suspects that he was still obsessing between relaxation sessions, as he frequently came into the session in a state of agitation. He came in for post-baseline the day before the rent was due with not enough money to pay it and lowered his frontal readings to an average of .91 uV over 20 minutes from pre-training baseline averages of 3.75 and 2.86 uV, eventhough this situation was intensly stressful for him. However, his time orientation scale on the POI was very low, almost two stens below the norm and over one sten lower than his pre-test score, suggesting that he was so preoccupied with his problems that he was rarely in the here and now except when he was practicing relaxation.

2. Waking insomnia: at the end of training SI claimed he was having less insomnia as he had been awakening at between 3:00 and 5:00 AM almost nightly two weeks prior to baselines and at the end of training was awakening only a couple of nights per week. However,
when E saw Sl in his office one month after training, he reported having had insomnia for the previous three nights and described his economic situation as having continued to worsen.

3. Blood pressure: Sl's pre-training blood pressure (BP) reading was 180/90. He had two chiropractic treatments during training. After the first, his BP was 140/90. After training session four, where his BP pre-session baseline reading was 140/88, he came in for the following session at 136/76. Just prior to his post training baseline session after five more training sessions over 23 days, his BP read 130/72. Thus, it appears that relaxation eased his elevated BP.

4. Reduction of frontal tension: Sl's pre-training baseline averages over twenty minute periods were 3.75 and 2.86 uV. His post-training baseline average was .91 uV over twenty minutes demonstrating a reduction of 2.39 uV from his baseline average. See table one.

5. Sleeping during training sessions: E suspected Sl was sleeping during first training session, but he denied it until training session four. At this point E spoke to Sl about the physiological differences between sleep and the relaxation response. At session five, where he still dropped off, E gave him a copy of the "meditation vs. sleep" material from The Relaxation Response (Benson, 1976). At training session six, E sat Sl up straighter in the chair. He remained awake and had no trouble with sleeping during sessions for the remainder of training.

6. Depression: this showed up in training session six. Sl's business had continued to fall off. He repeatedly had to pay his rent a week or two late and was beginning to have to borrow from his savings. He talked about unhappiness with his marriage, discussed his lack of money, and said he thought of wanting to drive his "car into a semi and end it all." Ironically, this discussion was followed by his most successful EMG training period up to that time. He dipped at one point to .45 uV and averaged 1.18 uV over 20 minutes of training. When he came in for training session seven, he announced that he wanted to set the record straight: "My wife also has good qualities," he said, "She's taking me to dinner tonight." Over all, this session was not as
Table 1

EMG Training Results For S1

<table>
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<tr>
<th>Readings</th>
<th>B1</th>
<th>B2</th>
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good as the previous one regarding reduction of frontal tension.
After a dip to .69, he rose abruptly to 1.78 uV. E sensed that some­thing was threatening Sl at a subliminal level of consciousness and that he was struggling to regain his earlier defences. His average was up from 1.18 for the previous session to 1.73 uV. When E suggested the possibility of his feeling uneasy at .69 uV, Sl laughed loudly, interrupted, and said: "Well I think one reason the reading jumped is because I was sitting in this upright chair to avoid sleep." He changed the subject to describe in detail the pain in his toe. He had demonstrated this technique of shifting to detailed accounts of safe subjects in earlier sessions, also. By the end of his last training session, he appeared subdued, depressed, and expressed feelings of hopelessness regarding his future.

On the "Experience Checklist" he reported being depressed twice before sessions but reported no depression post session on these days. On the subjective report, administered at midpoint and at post-training, Sl claimed to be less depressed and less anxious, and claimed he felt better about himself. However, this may have resulted from temporary feelings of well being induced by the relaxation ses­sion completed just prior to filling out this questionnaire, as his other test scores indicate differently.

Sl took the remaining post-training tests the day before the rent was due, when he did not have enough money to pay it. He reported feeling depressed and agitated and said, "Well, I'm afraid those tests aren't gonna come out too good 'cause I was pretty upset that day." His CAQ indicated an increase in self disgust and suicidal thoughts, increased anxiety, more emotional lability, and increased compulsivity. However, his stern adherance to the law and his self discipline would probably interfere with consciously self destructive acting out.

Remaining test scores not discussed above revealed self regard on the POI remaining in the self actualizing range, but the remainder of his sten scores are below the norm i.e. whereas feeling reactivity, self regard, acceptance of aggression, and capacity for intimacy had
been in the self actualizing range at pre-test, all but self regard had dropped into the non self actualizing range with drops of over two stens in feeling reactivity and agression and drops of one sten in self acceptance and capacity for intimate contact. His CAQ revealed that socially he had become subdued, manipulative, more cautious, and less sensitive to his own needs. The Speilberger scales showed extreme state anxiety in the 99th percentile and an increase in trait anxiety from the 55th to the 82nd percentile. His locus of control had shifted from external to internal but this conflicted with a drop in inner directedness on the POI.

**Summary**

While it seems that one should consider the stress to which S1 was reacting the day he filled out the post training tests, it also appears that while S1 had learned to control muscle tension in the frontal area and to lower his BP, his cognitive tension outside of relaxation practice remained the same. This seems to have been demonstrated by a comparison of results, revealed on self reports administered immediately after training, with results on tests taken several hours after a training session. E also wondered if relaxation training did not strip or threaten to strip the defences with which S1 avoided getting in touch with his depression, which prior to training may have been manifesting itself in waking insomnia.

It seems S1 has learned to help his body respond in a healthier way to stress but he is still growing old with less money than he wants and his expectations are diminishing. He was quite defensive through out training. Anytime E attempted to intervene with any technique other than empathy, he shut her out. Further, any empathic response suggesting that S1 felt fear or felt threatened, brought immediate denial and a quick change of topic. S1's response to The Well and the Cathedral also suggested defensiveness. Initially he saw images prompted by the guided meditation but when the meditation began to provide cues, the aim of which is to trigger images of the self, S1 announced, "I saw absolutely nothing," and had no more images for the rest of the session. See Table 2.
Table 2
Summary Of Results For S1

1. Cognitive obsessing: S1 was able to stop obsessing for ten minutes only, during each of two 20 minute pre-training baselines. He was able to stop it for a minimum of 20 minutes for the last two training sessions and post-training baseline.

2. Waking insomnia: S1 reported awakening between 3:00 and 5:00 A.M. nightly prior to training. At end of training he reported sleep interruptions occurring twice weekly.

3. High blood pressure: Pre-training BP was 180/90. After two chiropractic adjustments and nine EMG relaxation training sessions, his BP read 130/72.

4. Frontal tension: Pre-training baseline averages were 3.75 and 2.56 uV. Post-training baseline was .91 uV.

5. Sleep during training: S1 would not acknowledge that he was sleeping until training session four. He stayed awake for remainder of the sessions.

6. Depression: This became apparent during training session six and remained through the end of training. Although he reported being less depressed immediately after relaxing, scores from CAQ taken the next day after his post-baseline relaxation session showed a 5 sten move toward suicidal disgust and a 1 sten move toward low energy depression.
Subject Two

S2 was a female junior high school student. She had been talking back to her teachers, skipping classes, and receiving "D"s and "E"s whereas a year previously, she had received "B"s and "C"s. She had been suspended for smoking in the rest room at school. She was threatening to run away and thinking about getting pregnant, because as she put it: "I'd be gettin' back at my Mom and Dad." Early interviews with S2 revealed dissatisfaction with her relationship with her father. "I can't talk to my Dad anymore, not since ____ was born. He prefers her to me. He looks at me like he hates me. Well I know he hates me. He treats me like I'm not even his kid."

Her pre-training CAQ scores showed S2 to be experiencing an adolescent adjustment reaction with a tendency toward psychotic behavior. State anxiety was at the 68th percentile; trait anxiety at the 72nd percentile. She felt persecuted, envious, was compulsive and impulsive, depressed and agitated, and desired to retreat from reality. She was undisciplined, headstrong, and was more accepting of herself as imperfect than of herself as a person of worth. She showed low energy as well as agitated depression, felt guilty, resentful, and frustrated. Socially, she was withdrawn and hostile, but aware. Her unusually high inner directedness on the POI may have indicated the headstrong quality showing on the CAQ. Her unusually high score suggests this to be a negative rather than positive characteristic. However, she was sensitive to her needs and feelings and showed a great capacity for intimacy. Locus of control was external. Frontalis tension averages over two baselines were 2.89 and 2.63 uV.

In the initial interview S2 reported that she did not like herself "much." She said she liked to be active and got tired of sitting in school. She described an incident that had occurred that day in a class, where she said the teacher had called her "stupid," and she had called him an "old fart" and had been sent to the office for talking back. Throughout training she continued to describe similar incidents.
S2 has burn scars resulting from a childhood accident. She seemed self conscious about these and told E that she hated her scars. S2 has a pretty face, is vivacious, has warm brown eyes that sparkle, a low sensuous voice and many boy friends. She said she feels that the only thing she is "good at is getting boy friends." Inspite of her popularity with the opposite sex, her father says she seems to need constant reassurance about her physical appearance.

S2's target behaviors, that could influence or be influenced by EMG assisted relaxation training, were:

1. frontalis area tension
2. anxiety
3. low self image
4. lack of self discipline
5. anger/frustration.

The hope was that improvement in these areas would combat her desire to alternately wage war with and retreat from reality. Perhaps, she could replace her fight/flight response with a relaxation response which might in turn prompt more self constructive behaviors. Perhaps, her head strong quality could become a positive inner directedness.

Outcome Of Training For S2

Highlights from sessions relating to target behaviors

1. Frontalis tension: S2's pre-training baseline reading averages were 2.89 and 2.63 uV. Her post training baseline average was .38 uV. Her within session pre-training baseline profile also demonstrated an across session training effect. See table number three.

2. Anxiety: she began experiencing pleasant relaxed sensations in her first training session. In the second session her microvolt level dropped to .64 for one, two minute time sample. She described the feeling as, "I couldn't move; I didn't have to control it. I enjoyed letting go . . . . If I let go, things come a lot easier." In training session five she reported feeling loss of body contact with the chair. "One minute I was sitting in the chair and the next, I couldn't feel it." She reported afterward feeling like she "did not have any worries."
### Table 3

<table>
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<th>Readings</th>
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Second order factor for anxiety on the CAQ showed a drop from 8.2 to 5.0 on post training re-test, which conflicted with results on the Speilberger scale. On the day that she took the Speilberger, she was upset. Her father, she said, had told her he did not trust her anymore. Her state anxiety score was in the 98th percentile and trait anxiety was in the 75th percentile. Previous scores had been 68% and 72% respectively. However, her CAQ again conflicted with this in revealing a drop from her slightly elevated apprehensiveness score of 7 down to a serene sten of 2 and feelings of untroubled adequacy.

3. Self image: at training session eight, E used a guided meditation designed to prompt self images held subliminally by the client. S2 was able to see images of her family but none of her in the present. "They were my parents, sister, and friends," she said, "but not me." Later in the exercise she described, "me and my Dad as we were when I was younger, playin' frizbee or sitting goofing off." But, "I know those times have gone," she added, "for both our lives changed. So no more good times with Dad." E wondered if the loss of relationship with her father is in some way a loss of self for her which was perhaps demonstrated by her inability to see herself at the point that she felt separated from her father. Once during EMG training when she saw images of black, yellow, blue, and green butterflies, she associated the black one with her relationship with her father. She talked about the relationship with her father, then, and sounded like she felt sad and hopeless. This relationship appeared unchanged throughout training, but post-test scores revealed conflicting results regarding changes in self image. Her POI showed a 2 plus sten jump in self regard and a 1 sten move up in self acceptance, but her CAQ did not support this, as feelings of inferiority and unworthiness were one sten lower than at pre-test time.

4. Self discipline: at training session six, S2 talked about having to settle down and pay attention in class: "Well I know what I gotta do," she said sounding resigned, "what I don't wanna do but I still gotta do it." She reported that she was doing her homework now. In the remaining sessions she continued to describe verbal encounters.
with one teacher, but CAQ post-test showed a jump of 5 sten points into the norm on self discipline. Three months after EMG training her father reported to E that she had come home with "A"s and "B"s in all classes but one where she had received a "D."

5. Anger/frustration: throughout the sessions S2 seemed to hang on to her anger. She would come in angry over some event at school or over an encounter with her father. Anger with her father, appeared as a theme across sessions. When asked to describe the ideal dad, she said, "He'd wanna do things with his kids and he'd talk to us kids. He talks to ___ all the time; she's his pride and joy. I'm angry with Dad 'cause he picks on me. He treats me like I'm not even his kid . . . Sometimes, I think I'm adopted 'cause they hardly have any baby pictures of me. I got plenty of places to run to though." Asked if she would be interested in family therapy, she said, "no," and explained that, although she did not like the situation with her parents, it had become workable for her in that her parents had "gotten off" her back, seemingly perplexed as to what to do with her. Although she appeared to feel pretty smug about this, she also seemed to feel sad and scared. She owned the "sad" but not the "scared" feelings.

E worked with her anger and frustration empathically early in the sessions before hooking her up to the EMG. Several times while relaxed, she would see images or the color black that sometimes represented anger for her. At other times the blackness appeared to have more to do with her mental rather than emotional state, wherein she seemed to have achieved the "mental stillness and space between thoughts" similar to the Zen meditative state that accompanies "interhemispheric alpha synchronization" described by Mikuriya (1979). Afterwards, she would appear to have accepted her anger and its source. She would seem quite relaxed and said she liked the feeling. Her post-test CAQ revealed a 4 sten drop from a high frustration/tension level of 10 to a normal sten of 6.

Post test scores not discussed in the highlights show mixed results. She was more sensitive and less tough, which for her appears to be a positive change. She felt less persecuted, less resentful (2 sten
difference), less self destructive (2 sten difference), less hurt by
criticism (3 sten difference), more time competent, less erratic and
less headstrong, and more inclined to cooperate socially. However, she
also appeared more aloof, more critical, more sober (4 sten drop) and
less sensitive to her own needs and feelings. She also showed less ego
strength, weaker super ego, and still desired to escape from reality.
Locus of control shifted to internal at midpoint in training and back
to external at post-training with her believing that much of what hap­
pens to her is due to chance rather than to powerful others. However,
whereas she felt control of what happened to her 33% of the time before
training, at post-training she felt she had control 45% of the time.

Summary

Although her tests showed mixed results, her parents reported
seeing positive changes in S2 at home. Three months after training,
her father said, they "had been marveling at the changes in her."
He reported that in addition to raising her grades, she had been having
fewer temper flare ups and was getting along with everyone remarkably
well. To summarize, then, it seems S2 had become more self disciplined,
less tense, less frustrated, and, though somewhat aloof, more inclined
to cooperate with society. She still became angry and frustrated on
occasions, but was able to alleviate this via relaxation practice. As
she still desired to escape from reality, perhaps, the relaxation re­
response would provide a safe means of doing this.

See Table 4 for synopsis of above.
Table 4
Summary Of Results For S2

1. Frontalis Area Tension: Pre-training baseline averages were 2.89 and 2.63 µV. Post training baseline average was .38 µV.

2. Anxiety: CAQ results showed a drop in second order factor anxiety to 5.0, post-test, from 8.2, pre-test, and a move from an apprehensiveness score of 7, pre-test, to an untroubled adequacy score of 2, post-test. However, Speilberger scale taken on a day of high stress showed increases: state anxiety of 75%, pre-test, moved up to 98%, post-test, and trait anxiety of 68%, pre-test, moved up to 72%, post-test.

3. Low self image: POI showed a 2 plus sten jump up in self regard and a 1 sten move up in self acceptance. However, CAQ results conflicted showing a 1 sten increase in feelings of inferiority and unworthiness.

4. Self discipline: CAQ showed a 5 sten improvement. Three months after training, parents reported grades had risen from "D"s and "E"s to "A"s and "B"s, with the exception of a "D" in one course.

5. Anger/frustration: S2 remained angry through out training, but from session six, she began to feel detached, tranquil, pleasant after the relaxation sessions and by the end of training, appeared better able to accept her anger and the source. Post-test CAQ revealed a 4 sten drop from high frustration/tension level of 10 to a normal 6.
Subject Three

S3 was a 30 year old male teacher, who had had a life threatening disease since age 12. One of his physical symptoms was a skin rash, which had become worse several weeks prior to EMG training. He was under medical treatment for his disease, which will not be described in this paper to protect S3's anonymity. According to the Physician's Desk Reference (1979) side effects of his medication could include irritability, nervousness, weakness, an elevated blood pressure, and insomnia, all of which S3 appeared to be experiencing. According to Glasser (1976) this particular disease may be precipitated by and/or exacerbated by environmental stress. When asked if S3 had experienced any life crises just prior to becoming ill, he said that his father, who had been away at work most of the time, had changed jobs and was, then, home every night. His father, he said, had a violent temper, flew into frequent rages; S3 reported, "I always felt tense, when my father was around; I never knew when he would blow." S3 was about 11 years old at this time and his mother would discuss her troubles in the marriage with S3 and "cry on" his shoulder. He felt like he had to defend her but always felt like he never could.

S3 described a heavy dependence on his family which he seemed to have transferred to his room mate, after his whole family had moved to another state. He said he donated to the kitty, for example, but his room mate paid all the bills, and did all the grocery shopping and cooking. If the room mate was not there for meal time, S3 would eat cold hot dogs.

In the initial interview, he said he had not felt good since he had travelled to Europe about seven months prior to relaxation training. He said he had had recurring nightmares, since the vacation and reported that his energy was low and he frequently could not stand to be around people. He said that he was afraid to go to sleep at night for fear that he would die. He claimed he was terrified of death and frequently took valium or a "couple stiff drinks" to knock himself out at bedtime. He complained of sleep onset insomnia and said he was only getting six to six and one half hours of sleep a night which for him
was not enough. He said that he was chronically anxious. He used "oughts" and "shoulds" frequently in regard to himself and said that he was often late for appointments and had almost lost his job because of tardiness. He said he was messy and that his room mate had put a condemned sign up on his bedroom door. He appeared to have a heavy, internalized controlling parent that the desire to be tardy/messy part of him was rebelling against. S3 also described feeling guilty when he did things that were nurturing for him. He expressed a fear of being like his father and said that he had been "blowing up" at his students. He seemed to fear that he was losing much control in his life. About midway through the training, S3 disclosed that he was a homosexual.

According to pre-training test scores, S3 had a low sense of self worth. He showed extremely low regard for his abilities, but was more accepting of his weaknesses. Self regard was 2.5 sten scores below the norm and self acceptance was 2 stens below the norm. Acceptance of agression was highest with a score 2/3rd sten below the mean. Capacity for intimacy was 1 and 1/2 stens below the norm and inner directedness was 2 stens below the norm. His CAQ revealed him to be highly anxious, unsure, demoralized, nervous, exciteable, possibly at his wits end. Socially, he was calculating, possibly to compensate for insecurity, but this was probably ineffective due to self conflict. He was struggling to find a consistent pattern of socially approved behavior. These results were confirmed by his acknowledgement that he was having difficulty finding a social role with which he felt comfortable. He felt he had been playing a hokey role and wanted to be able to be more himself. He enjoyed companionship but was socially dependent, timid, sensitive, hurt by criticism, and extremely concerned for his health. Results showed he was also listless, discouraged, depressed, agitated, and had little energy.

His locus of control was external. He believed 65% of the time that what happened to him was either due to powerful others or chance. State anxiety was in the 88th percentile and trait anxiety in the 94th. Baseline EMG readings were 1.55 and 1.07 uV.
S3 seemed highly motivated to make changes as long as these did not mean changing his homosexual orientation. Target behaviors that might influence or be influenced by training were:

1. frontalis area tension
2. anxiety
3. sleep onset insomnia
4. self control
5. fear of dying
6. self dislike.

Outcome Of Training For S3

Highlights from sessions relating to target behaviors

1. Frontalis area tension: S3's baselines were fairly low suggesting that most tension was cognitive but he wanted to go ahead with training as he seemed highly motivated to become more self aware and hoped the combination of relaxation training and therapy would help. Baseline averages were 1.55 and 1.07 uV over two 20-minute periods. His post-training baseline was .61 uV over a 20 minute period. In addition his within session pre-baselines moved from 1.78 and 1.93 down to .97 uV suggesting that training occurred across sessions as well as within sessions. See Table 5.

S3 appeared to demonstrate early in training an ability to achieve a low level of muscle tension, but at sessions three, four, and five, he hit a plateau, and at session six, his microvolt reading exceeded his second baseline. E suspected by session four and five that S3 was feeling threatened and seemed afraid to allow himself to drop into a deeper state of relaxation. The disclosure of what was pressing him came at session six after his least "successful" EMG session. S3 had previously described images to E, in which he was being shot at by male figures. During training session six, as E observed S3's higher than normal microvolt reading, she sensed that something was pressing for expression, and S3 had hinted in training session five that he had something he wanted to discuss. After the EMG training part of session six, he described another scene containing a male figure "coming at" him in a red truck and just barely missing" him. E drew parallels between this
Table 5

EMG Training Results For S3

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</tr>
<tr>
<td>Average</td>
<td>1.55</td>
<td>1.07</td>
<td>1.05</td>
<td>1.16</td>
<td>.81</td>
<td>.85</td>
<td>.87</td>
<td>1.03</td>
<td>.73</td>
<td>.64</td>
<td>.61</td>
<td></td>
</tr>
</tbody>
</table>
and his other images, pointed out the higher microvolt readings and said that sometimes when the readings run higher than usual, this means that "either the client needs to get up and run around the building several times to run off restlessness, or it means that the client has something that he wants to talk about but feels uncomfortable with it." Appearing nervous, he said he was a homosexual and described difficulties he was having in his love relationship. He said that he had wanted therapeutic help but had been afraid to initiate a discussion of his problems. S3 feared his lover/room mate would abandon him. He was dependent upon ____. He seemed much like the dependent wife who resents her husband's dominance. He described loss of sexual interest and orgasmic impairment with anal intercourse which he felt was caused by (1) his hemorroids (psychosomatic?) and (2) his abhorrance of being penetrated which he associated with the following. He was appalled as a child when his brother told him about sex and said that their parents "did it." He said his parents explained the whole thing to him again to try to calm him as he was "very upset." He appreciated his parents attempt, but he could not accept the fact of his father's penetration of his mother. He appears to have rejected his harshly punitive, volatile, and capricious father and preferred to identify with his mother.

He also described in this session a dream he had had in which the figures were he, his lover, and another man in black leather. He said he was attracted to the man in black leather and not to ____. He also described deliberately aggravating ____ to try to get him "to scream and yell at" him instead of being "so good." He appeared to be tempted, if not already involved, to sadomasochistic; as well as homosexual expression. This seemed related to his relationship with his father and a need to internalize and accept his father who seemed to S3 to be sadistic. His extremely low self acceptance seemed also tied to the rejection of his father in himself and his identifying with his mother, who allowed herself to be both mistreated and sexually penetrated by his father. After this session S3's microvolt averages moved down steadily to his baseline finishing average of .61 uV.
2. Anxiety: at baseline two, S3 described trouble sleeping the night before and having drunk two stiff night caps to get to sleep. He discussed feeling frustrated in dealing with one of his students. He feared loss of control in the classroom and said his behavior had reminded him of his father. He said he was nervous about his rash which had become worse. At his first training session he reported having practiced telling himself to "let go" which had been suggested to him at baseline two. He said he had been able to avoid blow ups all week and had felt more calm. E noticed, as she attached the electrodes, that his rash seemed better. He reported feeling refreshed at the end of the session. At training session two, he reported still maintaining his cool inspite of mishaps that would normally have set him off, and by training session four, he said he had noticed that since he had been more calm, his students were also more calm. At session five, his anxiety seemed up and he questioned E about her credentials and seemed to have something that he wanted to say but said he would bring it up next time. At training session six, in addition to discussing his homosexuality, he discussed fear of letting himself go into a deeper relaxation. He said that when he lowered his microvolts to a certain point, the sensation was like falling into a hole which was similar to the way he had felt when he had been close to death three times, previously, and had received the last rites.

At training session seven, he reported that his energy level had been high. He seemed to have let go and decided to allow himself to go into a deeper relaxation: he said, "I noticed I started feeling warm in the beginning of the session, which was new. I saw an eye and went into the pupil of it. Then there was another eye and I went into the pupil of it and then another eye and I went into it. The pupil was open. There wasn't any color. I was just floating. There was no reflection in the pupil like there would have been in reality. I just went through it and then there was another, but the second was different from the first somehow." He liked the feeling and believed he could recapture the image to help him enter this state of quietude again. At his post-baseline he compared feelings after napping with
his feelings after relaxation and said he felt less groggy, had more energy, and was more contented after relaxation than he felt after a nap.

On his self report form he stated, "I just feel good that things that bothered me before, don't bother me now." His POI revealed time competence up over 1 sten score suggesting less guilt/anxiety were preoccupying him. His CAQ revealed his second order factor score on anxiety was in the norm at 5.9, as opposed to 7.6 pre-test, and showed a 4 sten reduction in compulsivity to the low side of the norm. State anxiety dropped from 88% to 1%, post-test and trait anxiety from 94% to 9%.

3. Sleep onset insomnia: though insomnia may be a side effect of S3's medication, anxiety about work also seemed to contribute to this problem. He reported that he could count on having insomnia in anticipation of starting a new teaching week. By the end of training his insomnia had improved significantly.

4. Self control: in baseline two, S3 described feeling loss of control in his classroom. By training session four, he became aware that even though he came into the session feeling agitated, he was able to bring his muscle tension under control. In training session seven we explored frustration he was experiencing due to being unassertive and rehearsed ways in which he could be more assertive. At post-test his CAQ revealed a one sten improvement on assertiveness and his second order factor score for independance had moved up from 3.4 to 5.4. His inner directedness scale score on the POI moved up over 2 stens to slightly above the norm. In his post training baseline he discovered he could stop his nose from itching so he would not have to tense his muscles by scratching it: he merely instructed his nose to, "stop itching." He appeared to have been able to enter that state of quietude that Mikuriya (1979) describes, as a "portal to the perception of internal physiologic states" (p. 24).

Test results showed a jump of 2 stens into the norm in self discipline on the CAQ. On the self report form he stated, "I can handle
my problems better because I know myself better . . . my mind is in
control of my body and I let my mind control me rather than letting
others control me and my mind." Initially he felt he controlled 35% of
what happened to him; powerful others controlled 35%; and chance
controlled 30% of what happened in his life, according to the Levenson
scales. At mid training he believed that he controlled 50% of what
happened to him; 33% was controlled by powerful others; and 17% by
chance. By post-training he believed 74% of his life was self con-
trolled; 17% was controlled by powerful others and 9% was controlled
by chance. At post-baseline, he was able to maintain .62 uV without
feedback over 20 minutes, in spite of being excited over the fact that
his parents were moving back to the area. His microvolt range moved
from 1.50 on the first training session down to .18 at post-base.

Assuming his elevated BP at baseline of 130/90 was drug induced,
E was surprised to discover S3 lowering his BP over time. His read-
ings at post-base were 128/82 pre-relaxation and 20 minutes later,
118/68 post-relaxation.

5. Fear of dying: sometime after training session seven, when
S3 let go and maintained a microvolt level of .73 over 20 minutes, he
began to lose his fear of dying. He had also been given a reading
assignment, which had helped alleviate his fear. Citing Garfield,
Robert C. Leslie Jr. (1976) suggests that states of altered awareness
produce experiences which involve ego-dissolution resembling death,
they may make death more "knowable, acceptable, and ultimately trans-
cendable." He describes this as practicing immortality, which he says
requires continually "letting-go." In addition to achieving what ap-
peared to be altered states of consciousness during relaxation train-
ing, S3 practiced letting-go throughout training and by the last ses-
sion he said that he felt he no longer feared dying.

6. Self dislike: during the initial baseline he described his
father, his dislike of being like his father, and saw his irritability
which could also have been a side effect of his medication, as being
like his father. Again in session six, he spoke of his intense dislike
of his father and his identification with his mother. However, towards the end of the session, he began to speak of some of his father’s positive qualities. At the end of training session seven, he wrote on the self report form: "I’m beginning to like me." Perhaps, as he had begun to exercise more control over his life, and had begun to feel less anxious, he was able to be more accepting of himself.

Post-test results showed self regard and self acceptance had both moved up 1 and 1/2 stens, approximately, on the POI and his CAQ showed a 1 sten improvement on feelings of adequacy and a 2 sten move towards happy go lucky. He had also moved away from a hypochondriasis score of 10 into the norm with 6.

Remaining test results revealed a move toward more extroversion from 5.0 to 6.6 on the CAQ second order factor. S3 was less sensitive, and had moved from a second order factor "tough poise" score of 4.4 to 6.2, and had moved into the norm on every scale except surgery where he is 1 sten beyond the norm on enthusiasm. His POI revealed most scores in the self actualizing range with the lowest score in self regard, but there was almost a 2 sten improvement here. Self actualizing values showed a 1 sten increase, capacity for intimacy revealed a 1 sten rise and his view of the nature of man was about 2 stens more positive. Evidently, he was spending considerably more time in the here and now, being free of much guilt and anxiety.

**Summary**

S3, then, was able to show the following progress:

1. gained control of his fear of dying
2. alleviated partially but not completely his sleep onset insomnia
3. regained a feeling of self control in his classroom and improved relationship with his students
4. gained an internal locus of control
5. brought his anxiety level into the norm
6. demonstrated a remarkable physiological control
7. greatly enhanced his self image,
8. gained a self actualizing as opposed to his earlier non-self actualizing profile.
In addition to the above, about two weeks after training S3 reported in a phone call that he had seen friends out of town who had not seen him since pre-training and that they had remarked on well he looked. See Table 6 for summary of above.
<table>
<thead>
<tr>
<th>1. Frontalis area tension:</th>
<th>Pre-training baseline averages were 1.55 and 1.07 uV. Post-training baseline average was .61 uV.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Anxiety:</td>
<td>POI time competence score moved up 1 plus sten to a point just below the norm. CAQ second order factor anxiety score moved from 7.6, pre-test, into the norm at 5.9, post-test. Compulsivity was reduced 4 stens to the low side of the norm. State anxiety moved from 88% to 1% and trait anxiety from 94% to 9%.</td>
</tr>
<tr>
<td>3. Sleep onset insomnia:</td>
<td>This occurred several nights per week pre-training and at post training was occurring only one night per week.</td>
</tr>
<tr>
<td>4. Self control:</td>
<td>CAQ showed 1 sten improvement in assertiveness, independance moved into the norm with a 2 sten improvement. Self discipline improved by 2 stens. POI results showed inner directedness moved up 2 plus stens to just above the norm. Locus of control moved from external to internal. And he demonstrated an ability to reduce his BP in a single session by as much as 10mm systolic and 18mm diastolic (30 minutes between readings).</td>
</tr>
<tr>
<td>5. Fear of dying:</td>
<td>S3 claimed at post-baseline that he had lost his fear of dying sometime during the last third of training and related this both to the reading assignment and to the pleasant but what he thought were death-like feelings of deep relaxation.</td>
</tr>
<tr>
<td>6. Self dislike:</td>
<td>POI results showed self acceptance and self regard up 1 and 1/2 stens at post-test. CAQ showed a 1 sten improvement in feelings of adequacy and a 2 plus sten move toward happy-go-lucky.</td>
</tr>
</tbody>
</table>
Subject Four

S4 was a 40 year old mother of three grown children. In a second marriage, she was attempting to help raise a step son. Her home situation had been tense since the step son had come to live with them several months prior to S4's entering relaxation training. She expressed fear that the boy was ruining what had been a good marriage. It appeared that she and her husband felt angry and tense with each other due to the frustration of trying to deal with ____ and due to the stress resulting from their dissimilar value and belief systems regarding the rearing of him.

In addition to the stressful family situation, S4 was having physiological problems. She had had a hysterectomy six years prior to biofeedback training and nine months previously had decided to stop hormone maintenance, as she feared an enhanced risk of cancer. She was not sleeping well in that she was experiencing restless awakenings 8 to 10 times a night. She was also experiencing hot flashes. She said she had ugly moods at these times during which no one could please her. She also reported feeling apprehensive just before a hot flash and embarrassed that her face became flushed. If she were in public when these occurred, she would have an urge to run and hide.

She also has a heart problem. She was under medical care, and taking medication to regulate her blood pressure. Her blood pressure response was unusual in that physical exertion lowered rather than raised it.

During pre-training testing S4 appeared childlike, and docile, frequently asking permission in regard to something related to instructions: "Can I fill this in after I take the test?"--"Is it okay if I . . .?" were typical questions. She revealed much tension, fear of inadequacy, and a constant need for approval, but was spontaneous and open about her feelings. During baseline on the EMG, she appeared to engage in cognitive agitating and thus became more tense rather than more quiet over the 20 minute period.

Her pre-base CAQ revealed apprehension, resentment and self blame. She was experiencing both low energy and agitated depression, and com-
pulsivity. She seemed to demonstrate a conflict: while being group
dependent, warmhearted, and naively trusting, she was also threat sen-
sitive and uncomfortable with people. Thus, her social need/fear
placed her in a double bind. Swayed by sentiment, she was not a logical
problem solver. POI results generally supported the above in that inner
directedness was 1/2 sten below the norm; capacity for intimate contact
was a bit above the norm. However, self acceptance was 2 stens below
the norm. Sensitivity to needs and feelings, sponteniety, and capacity
for intimacy were in the self actualizing range. Time competence was
about 1 and 2/3 stens below norm. This supports her description of her-
self as worrying about both past and future. Much energy was going into
guilt and/or apprehension in the form of cognitive obsessing and, thus,
she experienced much difficulty being in the here and now. Overall, her
POI profile was not a self actualizing one. Trait and state anxiety were
both up, being in the 90th and 80th percentiles respectively. Unex-
expectedly, the Levenson scale showed her to have an internal locus of
control, which conflicted with the group dependance, and the other
directed scores on the CAQ and POI. However, the scores on the Levenson
appeared unusually low: out of a possible 48 points on each scale, she
received 14 (Internal), 1 (Powerful Others), and 5 (Chance). Perhaps
her conservative response suggests that the results are not an accur-
ate indication of her true locus of control. EMG baselines revealed
frontalis area tension to be running at 3.37 and 3.71 uV over two 20
minute periods.

Target behaviors that might influence or be influenced by EMG
training were:

1. frontalis area tension
2. cognitive obsessing
3. anxiety
4. facets of self image including: self blame, self regard, self
acceptance, and assertiveness
5. hot flashes—S4 felt that her hot flashes were exacerbated by
tension and hoped relaxation training would alleviate them
6. depression
7. sleep restlessness.

Outcome Of Training For S4

Highlights from sessions relating to target behaviors

1. Reduction of frontalis area tension: S4 became aware during her first training session that she was holding her whole body rigid much of the time—clenched fists, tight jaw, etc. Thus, she was assigned the Stroebel 30 second generalization exercise (see Appendix F) to practice in addition to daily relaxation sessions. At training session four, frustrated at her lack of success in lowering her microvolts, E tried the Lester Fehmi, "Open Focus" technique hoping this might facilitate S4's attempt to achieve relaxation which, once experienced, might help her relax more easily in the future. E moved into the room with her to read the script. S4 was not able to concentrate on the instructions long enough to follow them, but E discovered that while S4 was supposed to have been sitting quietly, she had instead been tensing her body from head to toe every 30 to 60 seconds and had been unaware of what she was doing. At this point E used a brief Jacobsen exercise to help S4 become aware of the feelings of muscular tension as opposed to the feelings of muscular relaxation. During the second half of the session, she maintained quiet legs but was aware of tension in her arms and chest. S4 was also chest breathing in that her muscles around her diaphragm were too tight to allow her to breath deeply. E assigned her to practice deep breathing at home while lying on her back on the floor with a book on her diaphragm.

Although her average for her last training session was only 2.29 uV, as compared to 3.50 uV for her first training session, her post-training baseline average was up to 2.69 uV which she maintained over 20 minutes without feedback, representing a reduction of only .85 uV. See Table 7.

2. Cognitive obsessing: at first S4 had so much noise in her head that she was unable to attend to the autogenic phrases long enough to attempt what they suggested. In training session one, she observed that worry over ____ and, prior to this, worry over her daughters, and prior to this, worry over something else had "consumed" most of "her life."
Table 7

**EMG Training Results For S4**

<table>
<thead>
<tr>
<th>Readings</th>
<th>B1</th>
<th>B2</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>Post-B</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>3.58</td>
<td>4.53</td>
<td>3.91</td>
<td>3.45</td>
<td>3.12</td>
<td>3.22</td>
<td>3.08</td>
<td>2.99</td>
<td>3.07</td>
<td>2.60</td>
<td>2.44</td>
<td>2.69</td>
<td>2.50</td>
<td>2.79</td>
</tr>
<tr>
<td>Low</td>
<td>3.04</td>
<td>3.12</td>
<td>3.19</td>
<td>2.88</td>
<td>2.92</td>
<td>2.54</td>
<td>2.78</td>
<td>2.51</td>
<td>2.78</td>
<td>2.26</td>
<td>2.18</td>
<td>2.52</td>
<td>2.10</td>
<td>2.51</td>
</tr>
<tr>
<td>Range</td>
<td>.54</td>
<td>1.41</td>
<td>.72</td>
<td>.57</td>
<td>.20</td>
<td>.68</td>
<td>.30</td>
<td>.48</td>
<td>.24</td>
<td>.34</td>
<td>.26</td>
<td>.17</td>
<td>.40</td>
<td>.28</td>
</tr>
<tr>
<td>Average</td>
<td>3.37</td>
<td>3.71</td>
<td>3.50</td>
<td>3.07</td>
<td>3.05</td>
<td>2.99</td>
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<td>2.76</td>
<td>2.90</td>
<td>2.51</td>
<td>2.34</td>
<td>2.62</td>
<td>2.30</td>
<td>2.69</td>
</tr>
</tbody>
</table>
"Why would I have spent so much of my time doing this?, she asked, "It has no good effect on anyone." In an attempt to explore payoffs, only the prices became apparent to her. "Escape from self into worry for others," she said did not fit, but she said she never felt she could be good to herself. "I feel guilty if I do something for me... I always feel I should put my children first," she said. At session three she described having difficulty enjoying a neighbor's company over a cup of coffee claiming that it made her feel claustrophobic and she continually wondered what the neighbor was thinking about her. She appeared to continue to obsess throughout training on thoughts such as, "What will others think?"—"How will my children react to ___'s behavior?"—"How will my husband's ex-wife react to the way we have allowed ___ to dress?" etc. She continued to take 20 to 30 minutes to settle down and begin reducing microvolt readings rather than raising them in each session. This was inspite of practicing thought stopping whenever she caught herself obsessing.

However, POI post testing revealed a 1 sten improvement in time competence suggesting that she was spending more time in the here and now and less on regrets and apprehensions. On the self report form she stated that she had "learned how, in so many instances, if I change my attitude and thinking it doesn't really matter what the other person is doing or thinking." Her M plus on her CAQ suggested that, although she still felt unaccepted, she was unconcerned about it.

3. Anxiety: in early sessions, she frequently broke out in hives during training, but by sessions ten and eleven, she had no hiving incidents. She claimed she was feeling much less anxiety inspite of the situation having become worse at home. Her post-test scores support her belief, in that anxiety scores had dropped from the 86th and 91st percentiles to the 6th and 60th percentiles for state and trait anxiety respectively.³

4. Self image: in training session seven S4 described her mother as being a martyr to her children and to her alcoholic father. She seemed to become aware in this session of having modelled herself after her mother and observed that one of her daughters had also assumed the
martyr-mother role, and said that she would like to change the pattern. On her final self report form, S4 stated, "I think my self esteem has improved with biofeedback but still would like to feel just a little bit better about myself and feel that I will, given more time and practice." However, post-test results appeared to show more improvement than the client felt was there. Her POI profile moved from non self actualizing into the self actualizing range with the exception of the self acceptance scale which, although it had moved up one sten, was still one sten below norm and perhaps was an indication of the self critical attitude she continued to maintain. Time competence and synergy are a bit below norm, but represent an improvement of between 1 and 1/2 and two stens; self acceptance moved into the norm; assertiveness showed a 2 sten improvement; and she was less hypochondriacal, having moved 1 sten closer to the norm for a score of 7. Her second order factor score for independence moved towards the norm from 3.7 to 4.4.

5. Hot flashes: at baseline one S4 decided she would like to keep a chart on her hot flashes and the circumstances in which they occurred. After one week she discovered she was unable to pinpoint any precipitating environmental stimuli but said that one day after she had "blown up" at ____ , she had had fewer hot flashes. After two weeks of checking she found that the number of flashes seemed to remain less after that day and that ____ had been behaving towards her with more respect, also. At training session four, she reported she was having fewer hot flashes at home but discovered she would "flash" on her way to biofeedback training. We explored her self talk and found that she worried about being successful in learning to relax and worried about what E would think of her. From that time on, she had no more pre-session hot flashes. By training session eight, she discovered that she could relax when she had a hot flash and was only having them three times per day whereas before she had been bothered with them ten to twelve times per day. During training session eleven, when she reduced her microvolts to a new low of 1.73, she had an intense hot flash. She described the sensation afterwards as "feeling like something was released... a relief of pressure, somewhat." It would be
difficult to say if the alleviation of her hot flashes was due to relaxation, especially in view of her having had one while quite relaxed, or if her body was merely acclimating to a reduction in hormones, or if the hot flash that occurred, while she was relaxed, was a type of autogenic discharge. However, they became markedly reduced during the six weeks of EMG training.

6. Depression: early in training S4 expressed feelings of hopelessness and helplessness regarding her home situation since ____ had come to live with them. E attempted to explore, with her, ways in which S4 might carve out a space for herself in which she could live somewhat more comfortably in an environment that had suddenly become very displeasing to her and which could conceivably remain unpleasant until ____ was grown. These attempts never seemed productive, as S4 appeared to feel that she could not compromise on anything. However, her post-test scores showed a move from "depression" into more "zest for living," with a 4 sten move away from high anxious depression toward the "poised confident" side of the norm, and a 1 sten improvement, moving into the norm on low energy depression.

7. Sleep restlessness: during baselines S4 reported awakening 8 to 10 times a night and feeling tired in the morning. After we discovered her body tensing every 30 to 60 seconds during training session four, we explored the possibility that she might be doing this in her sleep at night. By training session eight, she reported awakening only once or twice a night and feeling considerably more rested.

The post-test results not discussed above show that S4 was relating more comfortably with people and was less compulsive, having moved 3 stens into the norm. However, she was more serious. Her situation at home had become more unhappy as she felt they would surely gain permanent custody of ____ which she did not want. She also did not feel that she should refuse custody, and thus, felt she was in for a tough situation until he would be grown.

Comments she made during training and her post test G plus score suggest that she saw herself as a guardian of manners and morals, especially as far as ____ was concerned. After becoming aware, during
training that her husband did not agree with her and was, therefore, not likely to support her, she decided to back off, and leave all responsibility for ___ to him. But then she became angry with the way he was not handling the situation to her liking. Her high M score and her dramatic 6 sten shift from a dogmatic L plus to an extremely adaptable L minus could suggest either a readiness to forget difficulties and an acceptance of her unpleasant situation, or an attempt to give up and dissociate herself from the situation, or a vacillation between these two postures. The last possibility appeared to fit best, as statements made by S4 in her last sessions suggested vacillation between a stance of permissive tolerance and, when that ran out, attempting to separate herself psychologically, as well as physically, from the situation. She talked about moving out till ___ grew up, or getting a job to give her an alternative environment for short periods, and decided she would try the latter. She was attempting to find employment when she finished EMG training.

Summary
Although S4 lowered her frontal area tension by only .95 uV over eleven training sessions, she was able to alleviate some of her cognitive obsessing, bring her anxiety level into the norm, and relieve both her low energy and high anxious depression. She was enjoying enhanced assertiveness, self awarenessness, self regard, and self acceptance, though there was still room for improvement on the last criterion. She was enjoying a reduction in hot flashes, improved sleep, and less hypochondriasis. All occurred inspite of her continually stressful environment and the lessening hope that this stress would be alleviated for some time to come.

See Table 8 for synopsis of results.
Table 8
Summary Of Results For S4

<table>
<thead>
<tr>
<th>1. Frontalis area tension:</th>
<th>Pre-training baseline averages were 3.37 and 3.71 µV. Post-training baseline average was 2.69 µV.</th>
</tr>
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<tbody>
<tr>
<td>2. Cognitive obsessing:</td>
<td>POI post-test results showed a one sten improvement in time competence suggesting S4 was spending more time in the here and now and less on guilt and fear. A high M on her post-test CAQ suggest that although she still feels unaccepted, she is less concerned about it.</td>
</tr>
<tr>
<td>3. Anxiety:</td>
<td>Speilberger scale results showed a drop from 86th percentile to 6th, state, and from 91st to 60th, trait, anxiety. Her CAQ post-test second order factor score for anxiety moved from 7.8 into the norm of 5.8.</td>
</tr>
<tr>
<td>4. Facets of self image:</td>
<td>S4's post-test POI showed a move from non self actualizing into self actualizing for all scales except synergy and self acceptance. Self acceptance moved up 1 sten but was still 1 sten below norm and synergy moved up 1 sten to just below norm. Her CAQ results show a 5 sten improvement in self regard. Self acceptance moved into the norm for a 4 sten improvement. Assertiveness moved into the norm, improving 2 stens, and a 1 sten improvement showed in hypochondriasis. Second order factor score for independence moved from 3.7 to 4.4.</td>
</tr>
<tr>
<td>5. Hot flashes:</td>
<td>S4 reported experiencing 10 to 12 hot flashes per day prior to training and reported experiencing about 3 per day at the end of training.</td>
</tr>
<tr>
<td>6. Depression:</td>
<td>High anxious depression improved 4 stens moving into the calm poised side of the norm. Low energy depression improved one sten.</td>
</tr>
<tr>
<td>7. Sleep restlessness:</td>
<td>At the start of training S4 reported restless awakenings 8 to 10 times per night. At the end of training she reported awakening only 1 or 2 times per night.</td>
</tr>
</tbody>
</table>
Discussion

Implications Of Results

Gardner and Montgomery (1977) stress the importance of the therapeutic relationship between biofeedback therapist and client. They describe the qualities essential to the biofeedback therapist as a cheerful, positive, friendly encouraging attitude, which demonstrates concern and empathy for the client. Results of this study suggest that the relationship between biofeedback therapist and client should go beyond these recommendations in that the therapist must be prepared to initiate psychotherapy when needed to facilitate training, or, when needed, in response to client experiences during training.

Early in the experiment, E discovered that each S was experiencing stress which affected cognitions which influenced the training process. In each case working with these cognitions therapeutically, whenever the client was motivated to do so, before working with the EMG, facilitated training. For example, an early discovery with the first two Ss was that, if they came into a session agitating over lack of money or over an encounter with a teacher, these stressors or combination of stressors had to be dealt with therapeutically before the clients (early in training) could lower their muscle tension. This finding provided an important lead to cognitive stress as a source of variability in remaining Ss. At the end of training, Ss 1, 2, and 3 appeared to be able to lower their microvolts inspite of undealt with stressors, as if they were able to choose not to allow cognitive stress to affect them somatically. S4, who was least successful in lowering her muscle tension, did not achieve the low readings that the first three subjects achieved, and did not demonstrate this control.

Often when the S was not motivated to work through stressors prior to working on the EMG, the resulting unsuccessful EMG session changed the client's self talk, he or she became motivated to work, and a successful therapy session followed. Frequently, the S's subsequent EMG session, then would be his most successful up to that point in training. Examples of this are seen in S3's training session seven, described in the results section, and in S2's training session four.
In training session three, S2 was obsessing over an unpleasant encounter with a teacher, while trying to relax. Her average of 2.25 uV was higher than her previous session of 1.87. We worked with her problem after the EMG session and in training session four, S2 hit a new average training low of 1.27 uV.

Not only did therapy enhance EMG training, but EMG training frequently facilitated therapy. Spontaneous images occurring during the relaxation session often provided clues to Ss's problems, feelings, values, and beliefs of which the Ss may previously have been only subliminally aware, but which were operating in their lives. Test results on Ss 2, 3, and 4 suggest that awareness resulting from the relaxation state and from the pre and post session therapy/processing, seemed to enable them to make new decisions and gain enhanced control over their lives, even when the reduction in frontal area tension was slight as in the case of S4. For example, S3 discovered that not only could he remain calm with his students merely by telling himself "let go", but that he could change his feelings so that he no longer wanted to "blow," i.e. he could choose to feel the way he wanted to feel.

June Singer (1976) points out that: "Because biofeedback training instrumentation has the special advantage of being capable of monitoring some unconscious processes, as well as conscious processes, it possesses a special affinity for analysis or depth psychology" (p. 115). S2's experiences provided an example of this possibility. In her first training session, she saw images of a close family friend, her dog, her pet hamsters, and a grandmother, all of whom had died prior to S2 taking EMG training. Then she saw herself slipping into a deep hole filled with water. She felt pleasantly relaxed but wondered why she had seen the dead figures. In Training session six, she saw strange egg-shaped creatures that she described as "scairy". They had long green hair, blue faces, red eyes, yellow teeth, and one had an ear coming out of his nose. She said, "It was like I was in a fantasy. There were purple birds and a black sun, but the sun was nice and warm. Then I saw myself with an ice cream cone when I was little. It was fun to be a kid again." Cirlot (1962) describes the black sun, the "sol niger", as symbolizing "prime matter, or the unconscious in its
base 'unworked state' where the sun is in its nadir out of which it must, slowly and painfully ascend toward its zenith" (p. 304). This ascension symbolizes, he says, the transmutation of prime matter into gold. The journey of the sun from black to gold symbolizes the individuation process. The beginnings of this process are symbolized and/or triggered by rebirth images such as the black sun, or the small child. Says de Laszlo, (1958) "The image of the child is a symbol par excellence of the reborn psyche" (p. xxxii). However, before the psyche can be reborn, it has to experience a ritual death, frequently symbolized by a trip into an underworld, or down a well, or through death imagery. Thus, with little imagination S2's imagery could be seen as indicating beginning movement toward individuation and provides an example of how use of biofeedback assisted relaxation training could facilitate depth psychology.

It seems that reducing somatic and/or cognitive noise, clears the air for receiving other signals that prior to relaxation training can not get through. In addition to subliminal awarenesses growing out of the relaxation session, some awarenesses seemed to pop into consciousness during post-training discussion or during quiet periods one or two days later, as if relaxation had not only opened the S to new awarenesses but that this openness remained for some time after EMG practice. Perhaps, as the poet T.S. Eliot stated in "Burnt Norton" (1943), awareness is related to time competence:

Time past and time future
   Allow but a little consciousness
To be conscious is not to be in time (p. 16)

Three of the four Ss' time competence improved markedly suggesting that to some extent they had been able to free themselves of time past and time future. During the relaxation response where the S achieves, however temporarily, a mental state where he is totally in the here and now, he seems to become more fully conscious. It is as if he arrives at a "portal" not only to "internal physiological states," as Mikuriya (1979) points out, but also to internal psychological states and self talk.
S4's difficulty learning muscle relaxation and body awareness during eleven EMG training sessions suggest another implication of this study. That is, autogenic feedback relaxation training is probably not appropriate for all clients. The short success she had with brief use of alternately tensing and relaxing muscles suggested that prolonged use of a progressive relaxation training technique would have been more successful for her. Although the literature indicates that autogenic feedback training is the most successful treatment for muscle tension, for some clients it appears not to be the treatment of choice.

Finally, not only is it necessary for the client to overlearn the relaxation response in order for the behavior to maintain and generalize to situations outside the training setting, but it is also essential that the client overlearn the appropriate cognitive changes for these to maintain and generalize. It further appears that the psychotherapeutic processing of the relaxation experience is where the overlearning of cognitive changes occurs. This implication is suggested by the experiences of SI, who was successful at learning to control muscle tension, but who resisted therapy, and whose self image worsened.

Recommendations For Further Investigation

Single subject studies "cannot provide final indications of causality because of the possibility of confounding effects from extraneous variables that can not be controlled in a single subject approach," says Christensen (1977, p. 234): It can, however, he says be an "initial probing process to investigate promising experimental treatment conditions to determine if they are functionally related to behavior" (p. 234). Discoveries made during this probing process indicate some experimental treatment conditions that could be assessed in appropriately controlled group studies which are listed as follows:

1. Investigate Ss whose relaxation response generalizes to their cognitive behaviors and Ss who learn a high specificity of
response in that they maintain cognitive tension inspite of achieving physiological relaxation and try to discover variables determining which way Ss will respond. Is one of these variables, for example, an overlearning (or failure to overlearn) the cognitive changes that occur at the time of training?

2. Investigate whether (1) EMG assisted relaxation training without a therapy assist or (2) whether therapy without an EMG relaxation training assist or (3) whether a combination of EMG relaxation training with therapy is most effective in enhancing self image. The experiences of (1) S1, who became deeply physiologically relaxed but who was resistant to therapy and whose self image became worse, and (2) S4 who did not become deeply relaxed, but who was receptive to therapy and whose self image improved, suggest that working therapeutically with cognitions is essential to enhanced self image; and (3) the experiences of S3 who achieved low muscle tension, was receptive to therapy, and showed improvement in all areas of self image suggests a combination is most effective. But, of course this needs further study.

3. Investigate the effect of attending to idiosyncratic response and cognitions on biofeedback relaxation training using a controlled study.

4. Explore biofeedback relaxation training as a facilitator in the use of depth psychology.

5. All four Ss whose environments either became more tense, as with S1, 2, and 4, or remained as tense as with S3, appeared to learn a healthier physiological response to stress as demonstrated by improved sleep, or lowered blood pressure, or less muscle tension, or less rash, etc. However, in order to begin to determine the functional relationship between symptom change and treatment condition, future studies should include careful behavioral assessment of physical symptoms.

Regarding future replications of this study
Results of this experiment indicate the following changes should be incorporated into any further replications:
1. Allow, as would be essential in a clinical setting, time to engage in several weeks of progressive relaxation training, concomitant with body awareness exercises, for any S who experiences difficulties such as S4 demonstrated.

2. Carefully assess all symptomatic behaviors that might be affected by EMG relaxation training so that, if change occurs, the relationship between behaviors and change agents can be described specifically via correlational studies.
Footnotes

1 This interpretation was given by Richard R. Williams, Ph.D, Chairman of the biofeedback certification committee for the state of Michigan and co-director of the Center for Holistic Medicine, Borgess Medical Center and Western Michigan University in Kalamazoo.

2 This was suggested to E in a conversation with Charles Stroebel, M.D., Ph.D., a presenter at the workshop of the Biofeedback Society of America at Indianapolis in June 1979.

3 The state anxiety post-test score of 6% resulted from an assessment two months and six days after the rest of the post-testing was completed. Assigned the tests as a take home, she had overlooked the state anxiety portion of the Speilberger scale at post-test time.
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Appendix A: Consent Form
Consent Form

Purpose of the Study

The purpose of this research is to investigate the effects of biofeedback relaxation training on self image.

Study Design

This study will be done in two phases.

1. Pilot study: one individual will be given autogenic biofeedback relaxation training and assessed for suitability for this study. Other assessment measures will also be taken pre-, post-, and during training.

2. Replication phase: three individuals will be given autogenic biofeedback relaxation training and assessed for suitability for this study. Other assessment measures will also be taken pre-, post-, and during training.

During each training session, you will have electrodes affixed to the frontalis muscle of the forehead. EMG recordings will be made as you attempt to decrease muscle tension. There will be 9 to 12 sessions over a course of 6 weeks.

Risk and/or Benefits

Risks to human subjects from biofeedback procedures are extremely low. There have been virtually no reports of damage or injury to subjects anywhere in the country.

Benefit to the subjects may result from extensive biofeedback training.

Anonymity

Presentation of this data will maintain subjects' complete anonymity.

Volunteer Statement

I acknowledge that I have been given an opportunity to ask questions regarding this research study and that these questions have been answered to my satisfaction.
In giving my consent, I acknowledge that my participation in this research project is voluntary and that I may withdraw at any time.

I hereby authorize the investigators to release the information obtained in this research study to scientific literature. I understand that I will not be identified by name.

Subject ___________________________ Date ___________________________

Witness ___________________________ Date ___________________________

Parent Statement (if subject is a minor)

I acknowledge that I have been given an opportunity to ask questions regarding this research study and that these questions have been answered to my satisfaction.

In giving my consent, I acknowledge that my child's participation in this research project is voluntary and that I may withdraw him/her at any time.

I hereby authorize the investigators to release the information obtained in this research study to scientific literature. I understand that my child will not be indentified by name.

Parent ___________________________ Date ___________________________
Appendix B: Physiological Report
PHYSIOLOGICAL REPORT

Name___________________________________________________ Age______ Sex______

Address_________________________________________________________________________

Phone_____________________________________________________________________________

Please check any of the following ailments which you frequently experience:

______ Sinusitis
______ Eye trouble
______ Ear, nose, throat trouble
______ Insomnia
______ Frequent anxiety
______ Worry or nervousness
______ Recurrent headache (tension)
______ Migraine headache
______ Recurrent colds
______ Hay fever, asthma
______ Tuberculosis
______ Shortness of breath
______ Allergy — if checked, what type?
______ Pain/pressure in chest
______ Chronic cough
______ Heart problem. Name the type of heart problem
______ High or low blood pressure; which?
______ Heart murmur
______ Diabetes
______ Kidney disease
______ Arthritis
______ Stomach or intestinal trouble
______ Epilepsy
______ Gallbladder trouble or gallstones
______ Any other: list ____________________________________________

Do you take any medication regularly?________________________________________________
If yes, what is it and what is it for?________________________________________________
Appendix C: Breathing Exercises and Autogenic Phrases
BREATHING EXERCISES AND AUTOGENIC PHRASES

Assume a comfortable position. Keep the body still. Do not strain the lungs by exhaling or inhaling more deeply than is comfortable. The capacity of the lungs and the control of the breath will increase as you progress.

Take five slow, full breaths, exhaling and inhaling through both nostrils. Then begin "equalized" breathing.

Equalized or even breathing: exhale and inhale through both nostrils slowly and smoothly, with no pause between the exhalations and inhalations. Concentrate attention on the flow of breath past the space between the nostrils. If the mind wanders, bring it back to the space between the nostrils. Breathe slowly, but not so slowly that the diaphragm jerks in order to get more air into the lungs. Continue for four minutes . . . .

Now silently repeat these phrases: breathing calm and regular . . . . My breathing is calm and regular . . . . breathing calm and regular . . . . It is as if my whole body were breathing . . . . my whole body is breathing . . . . calm and regular . . . . It breathes me . . . . It breathes me . . . . calm and regular . . . . It breathes me . . . . (pause two minutes).

Now forget the breathing entirely and focus attention on the autogenic exercises for quieting the body (low muscle tension), quieting the emotions (warmth in the hands), and quieting the mind (inward-turned attention).

Quiet the body: take time to visualize, imagine, and feel the relaxation of each part of the body as you silently repeat the phrases; then just "let it happen:"

I feel quite quiet . . . I am beginning to feel quite relaxed . . . . My feet, my ankles, my knees, and my hips feel heavy, relaxed and comfortable . . . . The whole central portion of my body feels relaxed and quiet . . . My hands, my arms, and my shoulders feel heavy, relaxed and comfortable . . . . My neck, my jaws, and my forehead feel relaxed. They feel comfortable and smooth . . . . My whole body feels quiet comfortable, and relaxed.
Quiet the emotions: as you remain comfortable and relaxed, use the following phrases in the same manner as above, visualizing, imagining and feeling the warmth:

my arms and hands are heavy and warm . . . I feel quite quiet . . . My arms and hands are relaxed, relaxed and warm . . . My hands are warm . . . Warmth is flowing into my hands; they are warm . . . warm . . . My hands are warm . . . relaxed and warm. My legs and feet are heavy and warm . . . I feel quite quiet: my legs and feet are relaxed and warm . . . I am at peace: warmth is flowing into my legs and feet; they are warm . . . warm . . . My feet are warm . . . relaxed and warm.

Quiet the mind and turn attention inward: on each phrase imagine and feel the quietness and the withdrawal of the attention inward:

I feel quite quiet . . . My mind is quiet . . . I withdraw my thoughts from the surroundings and I feel serene and still . . . Deep within myself I can visualize and experience my self as relaxed, comfortable and still . . . I am alert but in an easy, quiet, inward-turned way . . . My mind is calm and quiet . . . I feel an inward quietness . . . . Maintain inward quietness for as long as you desire.

Reactivate, when ready, by taking five slow, full breaths. Stretch and feel energy flowing through your body.

Note: this material is from Autogenic Therapy, 1 by J.H. Schultz and W. Luthe (1969) and from Beyond Biofeedback by Elmer and Alyce Green (1977).
Appendix D: Experience Checklist
EXPERIENCE CHECKLIST

Name

Date

Before Session

Overall, how do you feel now? good 2 3 4 poor
How did you sleep? well 2 3 4 poorly
Energy level refreshed high 2 3 4 low
Worries low 2 3 4 high
Moods euphoric good 2 3 4 depressed
Emotions mad sad glad scared detached
(You may circle more than one.)

After Session

Overall, how do you feel now? good 2 3 4 poor
Energy level refreshed high 2 3 4 low
Worries low 2 3 4 high
Moods euphoric good 2 3 4 depressed
Emotions mad sad glad scared detached
(You may circle more than one.)

Physical Sensations

1. heaviness: arms, legs, total body
2. tears (physical sensation only: not emotional)
3. pressure mid forehead
4. loss of contact with chair or part of chair
5. feeling of loss of part of the body
6. feeling of total loss of the body
7. floating
8. spinning
9. feeling that your hands are somewhere that they aren't
10. other

Describe briefly:
Thoughts

Spontaneous imagery

Deliberately invoked imagery, sounds, feelings

New awarenesses
Appendix E: Biofeedback Relaxation Training: Self Report
Biofeedback Relaxation Training: Self Report

Circle the phrase that best describes you.

1. I feel as relaxed as I was prior to training.
   - more relaxed than
   - about as much as
   - less relaxed than

2. I have about the same energy as I had prior to training.
   - more energy than
   - about as much as
   - less energy than

3. I feel as content as I was prior to training.
   - more content than
   - about as much as
   - less content than

4. I worry about my problems about as much as I did prior to training.
   - less than
   - about as much as
   - more than

5. I feel angry about as often as I did prior to training.
   - less often than
   - about as often as
   - more often than

6. I feel afraid about as often as I did prior to training.
   - less often than
   - about as often as
   - more often than

7. I feel depressed about as often as I did prior to training.
   - more often than
   - more patience
   - less often than

8. I have about as much patience with those around me than/as I had prior to training.
   - more patience
   - about as much patience
   - less patience

9. I have about the same anxiety than/as I had prior to training.
   - more
   - about the same anxiety
   - less

10. Regarding my sleep habits, I feel as satisfied as I did prior to training.
    - more satisfied than
    - as satisfied as
    - less satisfied than

11. I believe I have as much self knowledge as I had prior to training.
    - more self knowledge than
    - as much self knowledge as
    - less self knowledge than

(If you answered more or less, please explain your answer.)
12. I believe I have \{more control \} about the same control \} over myself than/as I had \{less control \} prior to training.

(If you answered more or less, please explain your answer.)

13. Overall, I feel \{better \} about the same \} regarding myself than/as I did prior to training. (Please explain your answer.)

Appendix F: Summary Quieting Response Exercise
Summary Quieting Response Exercise
Charles Stroebel, Ph.D., M.D.

Whenever you encounter a stressful situation and wish to relax, check your breathing. If it is shallow, indicating tension, smile and say to your self, "Leave my body out of this." Next, take a slow easy deep breath, a count of four in, and easy count of four out. Now take another easy breath, a count of four in, and as you exhale to an easy count of four, let your body go totally limp, dropping your jaw, letting it go completely limp, letting your lips go limp, imaging feelings of warmth and heaviness flowing from your neck down to your toes, reaching your toes at about the same time you have finally let the breath out. Then carry on your normal activity.

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