IMAGERY, PSYCHOTHERAPY, AND DIRECTED RELAXATION:
PHYSIOLOGICAL CORRELATES

DISSERTATION

Presented to the Graduate Council of the University of North Texas in Partial Fulfillment of the Requirements

For the Degree of

DOCTOR OF PHILOSOPHY

By

Jeffrey T. Baldridge, B.A., M.A.

Denton, Texas

May, 1992
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Thirty outpatients being treated at Wilford Hall USAF Medical Center Department of Behavioral Health Psychology were randomly assigned to either a relaxation/imagery training class (R/I), a short-term psychotherapy group (P/G) or a no treatment control group. Subjects had psychological, physiological and immunological data taken before and after treatment. Results indicated that support for the hypothesis that relaxation/imagery training improves the psychological, physiological, and immunological functioning of participants was found. R/I participants exhibited decreased diastolic blood pressure, felt less fatigue and tension, reported decreased severity of symptoms, and exhibited an improved potential for immune response. This same support was not found for psychotherapy group participants. P/G subjects showed a tendency to exhibit increased diastolic blood pressure after treatment sessions, did not exhibit any significant psychological changes as measured by the POMS and SRRS, and exhibited some symptoms of immunosuppression and possibly the beginnings of infection.
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A number of studies have recently focused on the interaction patterns of the nervous system, the endocrine system and the immune system. This area of study has been termed "psychoneuroimmunology" (Ader, 1981). Evidence suggests that the immune system and the central nervous system "communicate" and affect each other through a variety of hormones, neuropeptides, and growth factors (e.g. Bonneau, Keicolt-Glaser, & Glaser, 1990). Support for the idea that the CNS and the immune system communicate and influence one another comes from research which has examined the effects of stress and major life changes on the immune system, as well as the effects of relaxation/imagery, and psychotherapy on these systems.

**Stress and its Various Effects**

Stress has been defined by Selye (1980) as the "nonspecific" way in which a body reacted to any demand. Selye described a three stage process which outlines the body's pattern of adjustment to stressors which he termed the General Adaptation Syndrome or GAS. The first stage of the syndrome called an Alarm reaction occurred when an individual encountered stimuli to which he or she has not adapted. Objective signs of the reaction included
tachycardia, loss of muscle tone, and decreased blood pressure. Selye reported that these changes were immediately followed by a reversal of these changes so that the individual would be mobilized for action during which increased blood pressure, increased heart rate, dry mouth, decreased blood flow to the extremities, and piloerection were experienced by the individual. Wilson and Schneider (1980) showed that this fight or flight response involved over 1,400 physiological and chemical changes. This alarm reaction typically involved the sympathetic nervous system and the secretion of adrenalin and noradrenalin from the adrenal glands. This prepared the individual for defensive or coping action.

Stage two of the GAS was termed Resistance. During this stage the body adapted to the stressor, and the physiological symptoms were reduced or are no longer apparent. This adjustment required and continues to require energy to maintain a semblance of homeostasis in the face of the stressor. The adjustment also decreased available resources for coping and adjusting to other stressors in the environment. During the course of this adaptation, Selye added that the physiological changes could lead to "diseases of adaptation" which included ulcers and hypertension. Achterberg (1985) stated that during periods of chronic stress the body tends to secrete corticosteroids which reduce the effectiveness of the immune system, and have wide
ranging effects on the cardiovascular system as well and kidney function. Selye's third stage of the GAS was termed Exhaustion. During this phase the body's finite store of energy had been used up, and it was no longer able to adapt to current stressors. Exhaustion was characterized by the inability of the pituitary and adrenal cortex to secrete further hormones (Sutrer, 1986). If the organism was subject to further stress death occurred.

The belief that the hypothalamus controls the autonomic nervous system and thus has wide ranging effects on the body has received considerable scientific attention. The hypothalamus is connected to the pituitary gland through chemical as well as neurological pathways (Kolb and Whishaw, 1986). This connection has been termed the hypothalamus-pituitary-adrenocortical axis. Under stress, the pituitary secretes adrenocorticotropin hormone (ACTH). ACTH stimulates the adrenal cortex to secrete corticosteroids. One of these types of steroids are the mineralcorticoids. This class of steroids act to enhance inflammation by encouraging the loss of potassium through the kidneys. This causes fluid retention which may lead to kidney damage as well as high blood pressure and impaired cardiac functioning (Sutrer, 1986). Glucosteroids have been shown to decrease inflammation, and an increase in blood glucose levels (Sutrer, 1986).
Stress and the Immune System

The current support for the idea that the central nervous system mediates the effects of stress has been grouped under the name of a new field termed psychoneuroimmunology. Schleifer, Keller, and Stein (1985) documented a decreased white blood cell production after such stressors as sleep deprivation, marathon running, and space flight. Holmes and Rahe (1967) developed a Social Readjustment Rating Scale on which high scorers (an indication high stress levels) were found to have an extremely high risk of major illness within a two year period. Jacobs et al., (1970) also found that individuals who reported high numbers of stressful life events were more likely to be diagnosed with diseases, and took longer to recover from them.

Bassen (1977) has reviewed a number of studies which show that high levels of corticosteroids interrupt normal immune functioning in humans. He showed that there is a negative correlation between blood levels of cortisol and blood concentrations of lymphocytes. Administrations of corticosteroids were followed by abrupt decreases in lymphocytes, and a slow return within 24 hours. Bassen (1977) also found that skin test reactions to various antigens were decreased following administrations of corticosteroids. Keicolt-Glaser et al. (1984) found significantly lower killer cell activity in medical students.
who had experienced significant life changes during the past year.

**Imagery and its Effects**

According to Achterberg (1985) imagery is a thought process which utilizes both the sensory and motor faculties of the brain. Imagery processes occur in such phenomenon as hypnosis, placebo effects, biofeedback, systematic desensitization, psychotherapy, memory, and fantasy. The physiological correlates of these images are significant and varied.

Luria (1968) documented a reported eideticker who was able to alter his pupil size, heart rate and cochlear reflex by imagining himself participating in certain activities. Barber et al. (1964) found that salivation was increased when subjects visualized eating a lemon, and White (1978) found similar results when subjects were simply asked to imagine an increased salivary flow. Weerts and Roberts (1976) found that highly charged emotional stimuli produced significantly higher blood pressure and heart rate when compared with more neutral stimuli.

Sutherland and Harrell (1986) conducted a unique study with fearful, racially noxious and neutral stimuli. Subjects were trained to image certain stimuli on cue during relaxation training. When the stimuli were imaged it was found that the racially noxious and fearful stimuli elicited more pronounced changes in heart rate and EMG responses than
did the neutral stimuli. Results also suggested that subjects who scored higher on measures of trait anxiety and Type A behavior patterns also tended to show a higher level of physiological reactivity to negative imagery.

Feher et al. (1989) conducted a study with mothers of premature infants. The authors reported that it was common for mothers of these infants to be unable to express milk because of the stress, and anxiety of their circumstances. Mothers were asked to listen to a short audiotape which included relaxation and imagery techniques. After only one exposure to the tape mothers expressed 63% more milk than a group of control mothers. Mothers of low birth weight infants who received mechanical ventilation increased their volume by 121%.

Keicolt-Glaser et al. (1986) contrasted medical students who were either assigned to a relaxation training group, or to a no treatment group. The groups were monitored before and during their midterm exams. During the exam period results indicated decreases in helper-inducer lymphocyte percentages, natural killer cell activity, and helper-inducer/suppressor-cytotoxic cell ratios. The authors found that frequency of relaxation practice was positively related to helper-inducer cell percentage. The authors also studied a geriatric population and found subjects who were assigned to a triweekly relaxation group for one month exhibited increased natural killer cell
activity, as well as decreases in antibody titers to herpes simplex virus. These subjects were compared to both a support intervention and a no treatment group, both of which showed no change.

Ryder and Achterberg (1989) performed a study in which they examined the effects of specific cell imagery. Two groups were trained in imagery techniques, and progressive muscle relaxation. One group focused on neutrophil specific imagery (morphology, location, movement) and the other on lymphocyte imagery. Results indicated that both groups showed significant changes in only the cell types that were imaged. Subjects did however show decreases in those cell percentages. The authors noted this may have been due to increased cell activation, and movement outside of the vasculature.

Achterberg (1984) reviewed her research with cancer patients and the associations between personality variables, blood chemistry, hematological factors and disease status two months after the data were collected. The author found that the only predictive variables were subject scores on measures of denial, locus of control, investment in self, and a combined measure of imagery vividness, symbolism, frequency of positive images, and perceived effectiveness of treatment. Of all the predictive variables, the combined image variable was most effective with a reported 93% accuracy for predicting later remission, and 100% accuracy
for patients who were dead or severely deteriorated at follow up. Achterberg also found that when patients imagined their cancer cells as dangerous, predatory, or impregnable the disease tended to spread, while those who saw the cells as weak and vulnerable tended to recover more often. Schneider, Smith and Whitcher (1983) also found significant correlations between imagery and white blood cell activity and number using similar imagery variables in healthy subjects. Crawford (1985) found significant increases in T-cell activity and number after a relaxation and imagery process. Hall, Longo and Dixon (1981) conducted a study in which hypnotized subjects were asked to image an increase in the number of white blood cells in their blood. Results showed that younger subjects showed a significant increase in their white blood cell count. The experimenters also found that subjects who scored higher on a measure of hypnotizability exhibited an elevated white blood cell count one hour after the imagery procedure while other subjects did not.

**Relaxation and its Effects**

Benson (1975) documented the physiological effects of assuming a comfortable position, ignoring distracting thoughts, closing the eyes, and the use of repetitive mental actions. Benson found that these activities elicited a relaxation response which included decreased oxygen consumption and heart rate, a lowered blood pressure and
respiration rate, as well as a decreased blood lactate level. Hoffman et al. (1982) studied the effects of stress on subjects who had been eliciting the relaxation response over a one month period, and compared them to subjects who had only been sitting quietly. Results showed that the relaxation response subjects had an increased level of norepinephrine in their blood after stress compared to controls, while physiological measures for both groups were not significantly different. The authors interpreted the results as showing that the relaxation response subjects required more NE to produce the physiological changes common with sympathetic nervous system arousal.

Gloor (1954), in his review of the work of the Swiss physiologist W. R. Hess, made use of the term ergotropic reflex to describe the fight or flight reaction of sympathetic arousal. The opposite reflex was termed trophotropic which described the return of homeostasis. Fee and Girdano (1978) found that subjects who practiced relaxation became more trophotropically dominant, and this caused them to return to a baseline level of relaxation much more quickly after a stressor than did those subjects who had not been trained in relaxation.

Biofeedback has been a common way in which patients have been trained to relax and affect differing physiological changes. Biofeedback not only allows the individual the opportunity to directly observe physiological
changes over which they have voluntary control, but it also allows the conditioning of physiological systems which have previously been thought to be involuntarily controlled. Biofeedback has been found to have measurable effects on such functions as heart rate (Levene et al., 1968), muscle tension (Shirley et al., 1982), EEG (Ray et al., 1977), and skin temperature (Lynch et al., 1976). Schwartz (1972) found that subjects reported feeling the greatest amount of relaxation when they were able to reduce both blood pressure and heart rate in unison. Biofeedback and relaxation training have been shown to be effective with a variety of psychosomatic disorders including essential hypertension, vascular headaches, dermatitis, eczema, peptic ulcers, diarrhea, irritable bowel syndrome, and vomiting (Basmajian, 1979; Fotopoulos & Sunderland, 1982; Olton & Noonberg, 1980; Pinkerton et al., 1982;).

Jasnoski and Kugler (1987) examined the effects of relaxation on salivary IgA levels. Thirty college students were either assigned to relaxation training groups or to a control group. After one session subjects in the relaxation intervention showed significantly higher IgA levels as compared to control groups.

Achterberg (1985) described a pain management program for severely burned patients which included the use of relaxation, biofeedback and imagery techniques. The authors compared a no treatment control group with: (1) a relaxation
treatment; (2) a relaxation and imagery treatment; (3) a relaxation, imagery and biofeedback treatment. Results showed that the combination of imagery and relaxation were more effective than the other treatments or the control conditions. Subjects who received the most effective treatment required less pain medication and sedative medication, and exhibited a significantly lower level of muscle tension.

Gruber, Hall, Hersch, and Dubois (1988) taught ten metastatic cancer patients skills in biofeedback, progressive muscle relaxation, and guided imagery. Results indicated subjects showed significant elevations in natural killer cell activity, erythrocyte rosetting, IgM, IgG, and interleukin II. Psychological changes that were measured included increased hostility and locus of control. No control group was used in the study.

Both Jacobsen's (1929) progressive relaxation and Schultz's (1932) autogenic training are effective ways of learning to induce a relaxed state in the individual. Jacobsen's technique involved relaxation of basic muscle groups through a process of tensing and relaxing. Autogenic training focused on allowing the body's natural homeostatic processes to come into play through passively focusing on physiological sensations such as "my right arm is heavy". Studies have shown that progressive relaxation techniques elicit muscle relaxation as well as a general decrease in
sympathetic arousal (Russell et al., 1976). Physiological correlates of autogenic training include increased skin temperature, increased blood volume/flow in the body area which is passively referred to, decreased heart rate, reduced serum cholesterol levels, reduction in iodine metabolism, and decreased blood pressure (Blizard et al., 1975; Harano et al., 1965;).

Other techniques for the induction of relaxation include hypnosis and meditation. Hypnotized subjects who were suggested to relax exhibit decreased sympathetic arousal, along with heightened EEG alpha waves, as well as decreased skeletal muscle tension (Wadden & Anderton, 1982). The reverse results are also attainable if the subject is simply suggested to tense up. Meditation includes such techniques as Zazen (Buddhist meditation), Yoga, and Transcendental Meditation. Baggchi and Wenger (1957) did some early observation and data collection with Indian Yogis. They found that during meditation, sympathetic arousal decreased as did respiration rate, air intake, and heart rate, while skin conductance increased. EEG readings indicated a predominance of alpha waves. Some of the Yogis appeared to be oblivious to external stimuli. Benson et al. (1982) studied the g Tum-mo practice of wrapping Yogis in sheets dipped in ice water. The experimenters reported that the Yogis produce enough heat to dry a number of sheets in
one evening through selective vasodilation without the expected dangerous drop in core temperature.

Practitioners of Transcendental Meditation have been widely available for experimental observation as the meditation technique has been commonly taught at the college level. Wallace (1970) documented physiological changes that occur during TM which included decreased autonomic arousal, lowered metabolism, and the predominance of alpha waves in measured EEG.

**Psychotherapy and its Effects**

Limited information exists on the direct physiological effects of psychotherapy, although a number of studies and reviews have examined the relationship between personality variables and physical illnesses (eg. Alexander, 1950; Jenkins et al., 1967; Carson, 1989; Farrell, 1984). These sources suggest that many of the so called "psychosomatic" illnesses are associated with psychological variables. Schmale (1964) reported for example, that a state of hopelessness and helplessness was frequently associated with the onset of disease. Weiner (1978) reviewed evidence that real or threatened loss was associated with diseases such as cancer, tuberculosis, and diabetes. This is not to say that illness has not in itself created emotional reactions in patients (Farrell, 1984).

Psychotherapy has been found to be helpful for a number of psychosomatic illnesses (Karasu, 1979). Brooks and
Richardson (1980) administered a treatment which included assertiveness training and anxiety management to a group of peptic ulcer patients. Results indicated that treated patients exhibited less pain and symptoms, required less medication, and exhibited less reoccurrence at a 42 month follow-up than controls. Friedman et al. (1984) achieved encouraging results with coronary heart disease patients through a program which utilized behavioral counseling, relaxation, meditation, and psychotherapy to reduce type A behaviors. The authors found that patients who received treatment not only reduced their type A behaviors, but were about 50% less likely to have a second heart attack than those who had not received the treatment.

Speigel and Glafkides (1983) examined the effects of group psychotherapy with female breast cancer patients. No association was found between the physical condition of the members, and the emotional tone of the meetings. Prognosis of the members did significantly affect the content of the discussions. Deterioration resulted in an increased discussion of issues related to death, and medical treatment. The authors also noted that improvement in group members resulted in increased "small talk" and discussion of familial circumstances. Gibbs and Achterberg-Lawlis (1978) also reported that cancer patients who had a close friend die exhibited less fear of death than controls.
Speigel et al. (1989) examined subject survival rates at a ten year follow-up. Results showed that the mean survival time for the subjects who received the group therapy intervention was found to be 36 months, while the subjects who had not received the intervention lived only an average of 18 months.

Glucksman (1983) reported on a number of patients who exhibited specific physiological reaction to issues in the psychotherapeutic process. One patient of the psychiatrist exhibited rises in blood pressure during what the author termed "separation anxiety and pathological dependency". The author also reported a case study in which a patient's skin conductance levels were monitored during the process of psychodynamic psychotherapy. Results indicated that increased skin conductance was associated with threatening and negative ideation. The author concluded that although physiological reactivity is highly individualized, negative affect is usually associated with autonomic activity.

**Purpose**

The focus of this study was to examine the mechanisms and previous information on how relaxation, imagery, and psychotherapy affect the body. Of specific importance in this study were the differential effects of relaxation, imagery and psychotherapy on physiological functioning (blood pressure, heart rate, immune functioning, physical symptoms), and psychological functioning (mood,
concentration, tension). These results were thought to be important as previous research has found evidence of possible relationships between mood states and physiological/psychological health (Halley, 1991; Keicolt-Glaser et al, 1986; Woods, 1985).

**Hypotheses**

A number of hypotheses were considered regarding the outcome of the study. It was hypothesized that: 1) significant decreases in hormones affected by stress (ACTH, Beta-endorphins, cortisol) would be apparent for both the psychotherapy and relaxation/imagery intervention compared to the control group; 2) Subjects in the relaxation/imagery intervention would exhibit significant decreases in blood pressure and heart rate. Subjects in the psychotherapy intervention would also exhibit significant decreases in heart rate and blood pressure with this difference being less than the relaxation/imagery intervention. This difference would be apparent across all treatment sessions as well as within each treatment session; 3) Subjects in both treatment interventions would exhibit improved emotional and physical functioning (as measured by the subscales of the POMS, and decreases in number and intensity of symptoms reported in the symptom checklist); 4) Immunological results would show significant immunological enhancement for subjects in both the relaxation/imagery group, as well as those in the psychotherapy intervention,
with the greatest enhancement being shown in the relaxation/imagery intervention.

Method

Subjects

The subjects consisted of 30 patients over the age of 18 seeking treatment at the Behavioral Health Psychology Clinic at WHMC. Prospective subjects filled out a subject information sheet (Appendix A) which included information about current exercise, number of medications, current and chronic medical problems, alcohol and caffeine intake, and reason for referral. Females were queried about the dates of their last menstrual cycle. Subjects were excluded from the study if they had any disease process, or were pregnant. Subjects were randomly assigned to one of three treatment groups after the study had been explained to them, they agreed to participate, and they signed a pre-approved consent form. The age range of the 25 female subjects was 24 to 72 with an average age of 41.7. The age range of the 5 male subjects was 25 to 61 with an average age of 38.0. 10 females were assigned to the relaxation/imagery group with an age range of 24 to 67 and an average age of 38.8. 8 females and 2 males were assigned to the psychotherapy group with an age range of 25 to 72, with an average age of 42.9 years of age. 3 males and 7 females were assigned to the control condition, with an age range of 26 to 67, and an average age of 41.5 years of age.
Instrumentation

**Social Readjustment Rating Scale (SRRS) (Adapted).** This scale was originally developed by Holmes and Rahe (1967), and was later adapted by Peavey (1982) to incorporate the subject's subjective assessment. The scale was composed of 43 life events and was designed to be a predictive measure of illness onset. In previous validation studies, subjects who scored 150 or below on the scale were found to have a 30% chance of severe physical illness within one year after testing, and a score of 300 or above predicted an 80% chance of severe illness (Rahe & Arthur, 1968). In this particular adaptation, subjects were asked not only to describe the date of the traumatic life event, but also rate their perceived ability to cope with the event in the past and presently. The subject rated his or her ability to cope on a ten point Licker scale. (Appendix B)

**Profile of Mood States (POMS).** This measure consists of 65 adjectives and a five point rating scale. Subjects rated the degree to which they had been feeling the particular adjective during a specified amount of time. The factor analysis in the initial validation provided six factors including: Tension-Anxiety, Depression-Dejection, Anger-Hostility, Vigor-Activity, Fatigue-Inertia, and Confusion-Bewilderment. Test-retest reliability was found to be .85 after a period of 3 months. This measure was used
to assess fluctuating mood states before and after treatment. (Appendix E).

**Symptom Checklist (SC).** This measure consisted of a list of 48 signs or symptoms which accompany feelings of stress. Subjects rated the intensity of the symptoms which they had been experiencing over the past week. A total score was derived for each subject before and after treatment to assess gross symptom changes across time. Changes in individual symptoms were also examined. (Appendix D).

**Brief Health Questionnaire (BHQ).** This measure was administered in order to help control for factors which affect the results of blood tests. The screen was given to each subject before blood was drawn, and covered areas such as medication/drug intake, exercise, illness, and extreme exposure to sun. (Appendix F).

**Coulter EPICs Profile II.** Surface marker analyses were performed using this instrument which was equipped with an argon laser tuned to 488nm. The optical filter combinations are 488nm dichroic 90LS (rectangular), 488nm long-pass, 550nm dichroic short-pass, 530mn short-pass interference, and a 590nm long pass absorbance filter. All cellular specimens were analyzed by the "Two Percent of Background Method"; that is the cursor is set using the negative control such that no more than 2% of the analyzed cells were positive.
Five ml of whole venous blood was collected by venipuncture into Vacutainer tubes containing EDTA (K$_3$) as anticoagulant (Becton Dickinson, Franklin Lanes, New Jersey). Complete blood counts on all the peripheral bloods were obtained from the Coulter STKR (Hialeah, Florida). The absolute lymphocyte counts were obtained by multiplying the total leukocyte count by the percentage of lymphocytes.

**Dual Color Staining for Lymphocyte Subsets.** Staining for CD3 (T3-FITC) and CD8 (T8-RD1); CD4 (T4-FITC) and CD2 (T11-RD1); CD4 (T4-FITC) and CD29 (4B4-RD1); CD4 (T4-FITC) and CD45R (2H4-RD1); CD19 (B4-FITC) and CD56 (NKH-1- RD1; Coulter Immunology, Hialeah, Fl.) was performed by taking 100 uL of the whole blood sample for each surface marker to be identified and incubating it with 10 uL of monoclonal antibody. Each surface marker monoclonal antibody was matched with the same vendor's isotypic control. The samples were mixed and incubated at room temperature for 30 minutes. The tubes were then processed through the Coulter Q-Prep Immunology Workstation (Coulter Corp. Hialeah, Fl.) on the 35 second cycle. All automated specimens were processed within 24 hours.

**Dual Color Staining for Lymphocyte Subset Activation Status.** Staining for HLA-DR (HLA-DR FITC; Becton Dickinson Immunocytometry Systems, San Jose, CA.) and CD4 (T4-RD1); HLA-DR (HLA-DR FITC) and CD8 (T8-RD1); was performed as in the Dual Color Staining for lymphocyte subsets except the
sample is incubated with 20 uL of the Becton Dickinson Monoclonal Antibody.

**Quality Control of the Staining Methodology.** All staining of cell surface antigens were processed in tandem with a "normal" whole blood specimen, and a cryopreserved lymphocyte suspension from a normal leukapheresed donor. The cell staining runs were considered acceptable and reported if both the "normal" whole blood specimen and the cryopreserved lymphocyte suspensions were within laboratory tolerance limits. The gating of selected cellular populations was done electronically on a forward versus right angle scatter plot. The quality of staining and gating procedures was verified by the CD45/CD14 combination.

**Instrumentation Quality Control.** The instrument was optically aligned, and the red and green fluorescence is optically standardized at the beginning of every shift.

**Calculations.** The absolute counts were obtained by multiplying the absolute lymphocyte counts times the percentage of the cell surface marker. The Helper:Suppressor ratio is calculated by Helper cell percentage and dividing it by the CD3+CD8%.

**Allegro Human Beta Endorphin Immunoassay Kit.** This kit was employed for use in determining beta-endorphin levels in EDTA plasma of subjects. It utilized a solid phase, two site immunoradiometric assay to quantify the polypeptide. 5 ml of whole venous blood was collected by venipuncture into
Vacutainer tubes containing EDTA (K_3) as anticoagulant (Becton Dickinson, Franklin Lanes, New Jersey). Samples were mixed gently by inversion. Samples were centrifuged under refrigeration, and plasma was separated from cells within 15 minutes of sampling. The plasma was immediately frozen for later assay. Procedural instructions for use with this particular kit were followed in the assay procedure (Nichols Institute Diagnostics, San Juan Capistrano, CA.)

**Allegro Highly Sensitive ACTH Immunoassay Kit.** This kit was employed for use in determining adrenocorticotropic hormone in EDTA plasma of subjects. It also Utilized a solid phase, two site immunoradiometric assay to quantify the molecule. 10 ml of whole venous blood was collected by venipuncture into 2 prechilled, siliconized glass Vacutainer tubes containing EDTA (K_3) as anticoagulant (Becton Dickinson, Franklin Lanes, New Jersey). Samples were centrifuged under refrigeration, and plasma was separated from cells within 15 minutes of sampling. The plasma was immediately frozen for later assay. Procedural instructions for use with this particular kit were followed in the assay procedure (Nichols Institute Diagnostics, San Juan Capistrano, CA.)

**Baxter Stratus Cortisol Fluorometric Enzyme Immunoassay.** The Baxter Stratus Fluorometric Analyzer was used for the analysis of samples. In this procedure enzyme-
labeled cortisol and cortisol in the subject samples compete for binding sites on molecules of cortisol antibody. The enzyme in the bound cortisol reacts with substrate in wash solution which produces fluorescence which was measured via front surface fluorometry.

Ten ml of whole venous blood was collected by venipuncture into Vacutainer tubes and allowed to clot. The samples were then centrifuged for 15 minutes at 900rcf. and stored between 2-8C. Samples were analyzed within 3-4 days of collection. Analysis procedure followed instructions provided with the assay.

**Coulter STKS Analyzer.** The Coulter STKS Analyzer is a quantitative, automated hematology analyzer and leukocyte differential counter. It performed complete blood count (CBC) and WBC differential. The analyzer counted and sized cells by detecting and measuring differences in electrical resistance when a particle in a conductive liquid passed through a small aperture. WBC differential analyses were performed using simultaneous quantification of cell volume, high-frequency conductivity, and laser light scatter. In this manner the volume, contents and structural characteristics of each cell were analyzed.

The Analyzer provided the following hematologic results for each subject: white blood cell count, red blood cell count, hemoglobin concentration, hematocrit, mean corpuscular volume, mean corpuscular hemoglobin, mean
corpuscular hemoglobin concentration, red cell distribution width, platelet count, mean platelet volume, lymphocyte percent, lymphocyte number, monocyte percent, monocyte number, neutrophil percent, neutrophil number, eosinophil percent, eosinophil number, basophil percent, basophil number.

Five ml of whole venous blood was collected by venipuncture into Vacutainer tubes containing EDTA (K₃) as anticoagulant (Becton Dickinson, Franklin Lanes, New Jersey). Samples were mixed gently by inversion. The analyzer automatically diluted, mixed and aspirated the samples and prepared them for analysis.

**Health Team Self Taking Blood Pressure Unit Model # DS-91**. Subjects in both treatment groups had their blood pressure and heart rate measured before and after each treatment session with the use of this unit. The unit provides both systolic and diastolic blood pressure as well as heart rate.

**Procedure**

All subjects were recruited from patients referred to the Behavioral Health Psychology Clinic. These patients were normally referred to the clinic by physicians. Subjects were informed about the need for random assignment, and the possibility that they might wait for treatment should they be assigned to the control group. Subjects were also informed that the nature of the study was to examine
the relationship between relaxation/imagery, psychotherapy, and physiology. Subjects were then asked to read and later sign a consent form which informed them of the nature and procedures of the study, where they could go for psychological help, and affirmed the voluntary nature of the study during all phases. Individuals who agreed to participate in the study were asked to refrain from taking nonessential medication or alcohol (with the exception of birth control pills) for a 72 hour period before blood was drawn (if possible), and were asked not to exercise strenuously for at least 24 hours prior to the blood sample. Subjects were also asked to have had three nights normal sleep, no extreme sun exposure, maintained their normal dietary habits, and not be physically ill. Blood was not drawn from women during their menses. Subjects who did not meet the sampling criteria were asked to return when they met them. Blood sampling was performed by licensed phlebologists at Wilford Hall USAF Medical Center.

All blood samples were drawn between the hours of 0800 and 1000 hours. The blood was obtained by venipuncture and a total of 35 ml of whole blood was taken from each subject at each sampling. Subjects were scheduled for specimen collection not more than 48 hours before the beginning of the their assigned intervention. When subjects came in for specimen collection, they were administered the SRRS, BHQ, SC, and POMS. Subjects waited at least 15 minutes prior to
having blood taken. Sampling was performed while subjects were in the prone position. After the intervention, (or after 28 days for control subjects) subjects were scheduled for specimen collection no longer than 48 hours after their intervention was completed. The same procedures for blood sampling and test administration were used in the pre and post specimen collection. Subjects received the results of any blood analysis performed in an individual appointment with the primary investigator.

Intervention Procedures

**Control Group.** Subjects who were randomly assigned to the control group were asked to appear twice during the study (day 1 and day 28) of their participation to have a blood sample taken and to take the psychological measures. These subjects were offered their treatment of choice after their participation in the control group.

**Group therapy intervention.** Subjects who were randomly assigned to this group were asked to attend four 1.5-2 hour psychotherapy sessions which proceeded along the following protocol (see appendix I for a full syllabus): 1) session one involved an introduction and focused on identifying the signs and symptoms of stress; 2) session two involved identification of situations and circumstances which elicit stress responses in the participants; 3) session three involved specific cognitive distortions and techniques for reducing stress reactions with specific
individual examples being examined; 4) session four involved a review of the previous sessions, further examination of specific personal examples, and an introduction to basic assertiveness techniques. Group therapy members had their blood pressure and heart rate examined before and after each group meeting. Subjects had a 5 minute adjustment period before initial blood pressure was taken. Subjects were informed where they could find further counseling services, and that they can discontinue their participation at any time without penalty. Subjects received no other psychological treatment during their participation in the study.

Relaxation/imagery group. Subjects who were randomly assigned to this group will also be asked to attend 4 one hour sessions during the 28 day period. The protocol for the relaxation group was as follows (see appendix G and H for a full syllabus): 1) session one introduced the rationale for learning relaxation, and one type of strategy for relaxing was taught which the participants were asked to practice at least once per day during the week before the next session; 2) session two introduced progressive muscle relaxation and allowed the participants to learn this strategy as well as its rationale. Subjects were encouraged to practice the technique at least one time per day during the week before the next session; 3) session three introduced a shortened progressive muscle relaxation
technique as well as a 15 minute imagery script (Achterberg & Lawlis, 1989). Subjects were encouraged to practice the relaxation technique at least once per day over the next week; 4) subjects were taught to relax in response to certain environmental cues in session four, and final questions were be answered. Subjects had their blood pressure and heart rate measured before and after each treatment session. Subjects had a 5 minute adjustment period before initial blood pressure was taken.

Results

Hypothesis I: Significant decreases in hormones affected by stress (ACTH, Beta-endorphins, cortisol) will be apparent for both the psychotherapy and relaxation/imagery intervention compared to the control group. Manova with repeated measures were performed for each hormone examining treatment effects by group (cortisol $F = .87$, $df = 2$; ACTH $F = .54$, $df = 2$; Beta Endorphins $F = 1.58$, $df = 2$). Levels of Beta Endorphins were found to have increased for all groups at postest ($F = 8.95$, $df = 1$, $p = .01$) with the psychotherapy intervention showing the greatest change ($t = 3.28$, $df = 9$, $p = .01$). No significant differences were found between groups in terms of their levels of ACTH, beta-endorphins or cortisol due to treatment effects. The data are shown in Table 1.
Table 1

Summary of Means and Standard Deviations for Levels of Cortisol (mcg/dl), ACTH (pg/ml) and Beta Endorphin (pg/ml)

<table>
<thead>
<tr>
<th>Hormone</th>
<th>Intervention</th>
<th>Mean Pretest</th>
<th>SD Pretest</th>
<th>Mean Postest</th>
<th>SD Postest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cortisol</td>
<td>Relaxation</td>
<td>20.4</td>
<td>(7.7)</td>
<td>20.1</td>
<td>(15.1)</td>
</tr>
<tr>
<td>Cortisol</td>
<td>Therapy</td>
<td>20.5</td>
<td>(8.5)</td>
<td>19.6</td>
<td>(8.2)</td>
</tr>
<tr>
<td>Cortisol</td>
<td>Control</td>
<td>18.2</td>
<td>(6.0)</td>
<td>21.4</td>
<td>(7.5)</td>
</tr>
<tr>
<td>ACTH</td>
<td>Relaxation</td>
<td>22.3</td>
<td>(13.9)</td>
<td>20.7</td>
<td>(11.8)</td>
</tr>
<tr>
<td>ACTH</td>
<td>Therapy</td>
<td>12.8</td>
<td>(10.8)</td>
<td>9.2</td>
<td>(7.8)</td>
</tr>
<tr>
<td>ACTH</td>
<td>Control</td>
<td>17.5</td>
<td>(12.5)</td>
<td>19.9</td>
<td>(17.5)</td>
</tr>
<tr>
<td>B-Endorphins</td>
<td>Relaxation</td>
<td>24.8</td>
<td>(22.8)</td>
<td>49.3</td>
<td>(27.8)</td>
</tr>
<tr>
<td>B-Endorphins</td>
<td>Therapy</td>
<td>21.8</td>
<td>(12.1)</td>
<td>67.5</td>
<td>(39.8)</td>
</tr>
<tr>
<td>B-Endorphins</td>
<td>Control</td>
<td>45.0</td>
<td>(49.6)</td>
<td>57.1</td>
<td>(39.1)</td>
</tr>
</tbody>
</table>

Hypothesis II: Subjects in the relaxation/imagery intervention will exhibit significant decreases in blood pressure and heart rate. Subjects in the psychotherapy intervention will also exhibit significant decreases in heart rate and blood pressure with this difference being less than the relaxation/imagery intervention. This difference would be apparent across all treatment sessions as well as within each treatment session.

Overall changes in systolic and diastolic blood pressure as well as heart rate were compared by averaging premeasures and postmeasures and contrasting these means by Manova (see Table 2). Results indicated no significantly different treatment effects for the psychotherapy and
relaxation/imagery groups using these methods for systolic blood pressure collapsing across sessions ($F = 1.4, \ df = 1$). Diastolic blood pressures did however decrease for both the relaxation/imagery group as well as the psychotherapy intervention. Diastolic blood pressure results indicated an overall treatment effect ($F = 6.39, \ df = 1, \ p = .02$), with post hoc analyses indicating the relaxation/imagery group showed a significant decrease across sessions ($t = 1.9, \ df = 9, \ p = .05$), while non-significant increases were found for the psychotherapy intervention. Analysis of heart rate results yielded no significantly different treatment effects ($F = .02, \ df = 1$). Heart rates for both groups were shown to decrease from pre to post measure ($F = 8.26, \ df = 1, \ p = .01$). Between groups differences were also found for heart rate at pre and post test ($F = 5.34, \ df = 1, \ p = .03$).

Table 2

Summary of Means and Standard Deviations for Physiological Measures Averaged Pre and Post Session.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Intervention</th>
<th>Mean Pre</th>
<th>SD Pre</th>
<th>Mean Post</th>
<th>SD Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systolic BP</td>
<td>Relaxation</td>
<td>125.3</td>
<td>(17.1)</td>
<td>119.9</td>
<td>(12.9)</td>
</tr>
<tr>
<td>Systolic BP</td>
<td>Therapy</td>
<td>126.8</td>
<td>(19.9)</td>
<td>125.5</td>
<td>(21.0)</td>
</tr>
<tr>
<td>Diastolic BP</td>
<td>Relaxation</td>
<td>87.3*</td>
<td>(7.9)</td>
<td>83.1*</td>
<td>(11.3)</td>
</tr>
<tr>
<td>Diastolic BP</td>
<td>Therapy</td>
<td>85.1</td>
<td>(13.0)</td>
<td>87.9</td>
<td>(9.9)</td>
</tr>
<tr>
<td>Heart Rate</td>
<td>Relaxation</td>
<td>85.3</td>
<td>(13.0)</td>
<td>81.9</td>
<td>(12.5)</td>
</tr>
<tr>
<td>Heart Rate</td>
<td>Therapy</td>
<td>74.7</td>
<td>(7.7)</td>
<td>71.5</td>
<td>(7.2)</td>
</tr>
</tbody>
</table>

*p<.05
Changes within session were also examined for measures of systolic and diastolic blood pressures as well as heart rate. Significantly different treatment effects were found for systolic blood pressure in session 1 ($F = 4.28$, $df = 1$, $p = .05$) and session 2 ($F = 5.44$, $df = 1$, $p = .03$). Results are shown in table 3A. Post hoc analyses indicated the relaxation/imagery group showed significant decreases during sessions 1 ($t = 2.1$, $df = 9$, $p = .03$) and session 2 ($t = 1.91$, $df = 9$, $p = .04$), while the psychotherapy intervention showed nonsignificant increases. In session 3, no significant effects were observed for systolic blood pressure. In session 4, no significantly different treatment effects were observed, however both groups were found to decrease over time ($F = 6.29$, $df = 1$, $p = .02$).

Table 3a
Summary of Means and Standard Deviations for Systolic Blood Pressure For each Treatment Session.

<table>
<thead>
<tr>
<th>Session</th>
<th>Intervention</th>
<th>Mean Pre</th>
<th>SD Pre</th>
<th>Mean Post</th>
<th>SD Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Relaxation</td>
<td>125.2*</td>
<td>(18.4)</td>
<td>119.7*</td>
<td>(15.0)</td>
</tr>
<tr>
<td>1</td>
<td>Therapy</td>
<td>120.3</td>
<td>(24.5)</td>
<td>124.1</td>
<td>(24.9)</td>
</tr>
<tr>
<td>2</td>
<td>Relaxation</td>
<td>125.6*</td>
<td>(18.5)</td>
<td>116.5*</td>
<td>(10.5)</td>
</tr>
<tr>
<td>2</td>
<td>Therapy</td>
<td>127.3</td>
<td>(20.5)</td>
<td>131.3</td>
<td>(21.1)</td>
</tr>
<tr>
<td>3</td>
<td>Relaxation</td>
<td>124.3</td>
<td>(14.5)</td>
<td>122.5</td>
<td>(13.3)</td>
</tr>
<tr>
<td>3</td>
<td>Therapy</td>
<td>127.8</td>
<td>(21.3)</td>
<td>126.2</td>
<td>(25.7)</td>
</tr>
<tr>
<td>4</td>
<td>Relaxation</td>
<td>126.1</td>
<td>(22.6)</td>
<td>120.7</td>
<td>(19.1)</td>
</tr>
<tr>
<td>4</td>
<td>Therapy</td>
<td>131.8</td>
<td>(20.8)</td>
<td>120.5</td>
<td>(18.4)</td>
</tr>
</tbody>
</table>

* $p < .05$
Table 3B shows results for diastolic blood pressure for each session. Significantly different treatment effects were found for session 1 ($F = 5.78$, $df = 1$, $p = .03$) and session 2 ($F = 5.88$, $df = 1$, $p = .03$). Post hoc analyses showed significant decreases in diastolic blood pressure for relaxation/imagery participants ($t =1.85$, $df = 9$, $p = .05$) with nonsignificant increases for psychotherapy participants in session one. In session two significant increases in blood pressure were found for the psychotherapy participants ($t =-2.9$, $df = 9$, $p = .02$) while the relaxation/imagery participants showed nonsignificant decreases. In sessions 3 and 4 no significant effects were observed.

Table 3b

Summary of Means and Standard Deviations for Diastolic Blood Pressure For each Treatment Session.

<table>
<thead>
<tr>
<th>Session</th>
<th>Intervention</th>
<th>Mean Pre</th>
<th>SD Pre</th>
<th>Mean Post</th>
<th>SD Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Relaxation</td>
<td>88.6*</td>
<td>(11.6)</td>
<td>84.7*</td>
<td>(6.6)</td>
</tr>
<tr>
<td>1</td>
<td>Therapy</td>
<td>80.1</td>
<td>(12.6)</td>
<td>86.5</td>
<td>(13.6)</td>
</tr>
<tr>
<td>2</td>
<td>Relaxation</td>
<td>84.2</td>
<td>(7.2)</td>
<td>78.3</td>
<td>(10.3)</td>
</tr>
<tr>
<td>2</td>
<td>Therapy**</td>
<td>88.8</td>
<td>(13.1)</td>
<td>94.5</td>
<td>(17.7)</td>
</tr>
<tr>
<td>3</td>
<td>Relaxation</td>
<td>88.0</td>
<td>(14.4)</td>
<td>81.7</td>
<td>(25.4)</td>
</tr>
<tr>
<td>3</td>
<td>Therapy</td>
<td>86.8</td>
<td>(18.6)</td>
<td>84.9</td>
<td>(8.2)</td>
</tr>
<tr>
<td>4</td>
<td>Relaxation</td>
<td>88.5</td>
<td>(14.6)</td>
<td>87.9</td>
<td>(20.3)</td>
</tr>
<tr>
<td>4</td>
<td>Therapy</td>
<td>84.8</td>
<td>(18.2)</td>
<td>86.0</td>
<td>(12.2)</td>
</tr>
</tbody>
</table>

**p<.01; *p<.05

Table 3C shows the results of heart rate measures by treatment modality for each session. Data for session 1
indicated no significantly different treatment effects ($F = .06, \, df = 1$), while both groups showed decreases in heart rate during the session ($F = 10.7, \, df = 1, \, p = .00$). Data also indicated a significant difference between groups for heart rate ($F = 6.9, \, df = 1, \, p = .02$). Data for session 2 indicated no significantly different treatment effects ($F = .04, \, df = 1$), and both groups showed decreases in heart rate during the session ($F = 4.3, \, df = 1, \, p = .05$). No significant treatment effects were found during session 3 ($F = .1, \, df = 1$). Data for session 4 also indicated no significantly different treatment effects ($F = .8, \, df = 1$), and both groups showed decreases in heart rate during the session ($F = 5.7, \, df = 1, \, p = .03$).

Table 3c

Summary of Means and Standard Deviations for Heart Rate For Each Treatment Session.
Hypothesis III: Subjects in both treatment interventions would exhibit improved emotional and physical functioning (as measured by the subscales of the POMS, and decreases in number and intensity of symptoms reported in the symptom checklist).

The results for the pre and post measures of the POMS are shown in Table 4 for all three levels of treatment. Results indicated significantly different treatment effects for the subscales of Tension ($F = 3.85$, $df = 2$, $p = .02$) and Fatigue ($F = 3.14$, $df = 2$, $p = .03$). Post hoc analyses indicated relaxation/imagery participants described significantly less tension ($t = 2.2$, $df = 9$, $p = .03$), and fatigue ($t = 2.2$, $df = 9$, $p = .03$), and control subjects approached significant increases in tension ($t = -1.79$, $df = 9$, $p = .10$, 2-tailed). Control subjects showed nonsignificant increases on these scales and psychotherapy subjects showed nonsignificant decreases on these scales.

Scores for the Depression scale approached significance ($F = 2.48$, $df = 2$, $p = .10$) with relaxation/imagery subjects showing nonsignificant decreases, control subjects increased nonsignificantly, and psychotherapy subjects maintaining their scores. Scores on the Anger scale indicated no significantly different changes due to treatment ($F = 1.44$, $df = 3$), and relaxation subjects showed nonsignificant decreases, while both psychotherapy and control subjects increased nonsignificantly. Results for the Vigor scale
were also nonsignificant ($F = .31, \, df = 9$) however both the psychotherapy and relaxation subjects changed in the hypothesized direction while control subjects maintained their scores. Analysis of the confusion scale also approached significance ($F = 2.42, \, df = 2, \, p = .10$). Control subjects showed significant increases on this subscale ($t = -2.4, \, df = 9, \, p = .04$), while both psychotherapy and relaxation subjects decreased nonsignificantly.

Analyses of the data for symptom severity and number of symptoms reported are shown in tables 5 and 6. Symptom severity was significantly affected by treatment ($F = 4.4, \, df = 2, \, p = .02$), and all groups showed decreased severity at posttest ($F = 7.68, \, df = 1, \, p = .01$). Post hoc analyses indicated the relaxation/imagery group showed significant decreases in symptom severity ($t = 4.0, \, df = 9, \, p = .00$), while both the control and relaxation interventions showed nonsignificant decreases.

Analyses of total number of symptoms approached significance ($F = 2.76, \, df = 2, \, p = .08$), and significant decreases were found for relaxation/imagery subjects ($t = 3.33, \, df = 9, \, p = .00$) although nonsignificant decreases were shown for the psychotherapy intervention.
Table 4
Summary of Means and Standard Deviations for Scores on the POMS.

<table>
<thead>
<tr>
<th>Subscales</th>
<th>Intervention</th>
<th>Mean Pretest</th>
<th>SD Pretest</th>
<th>Mean Posttest</th>
<th>SD Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tension</td>
<td>Relaxation</td>
<td>16.1*</td>
<td>(8.3)</td>
<td>10.2*</td>
<td>(4.6)</td>
</tr>
<tr>
<td>Tension</td>
<td>Therapy</td>
<td>16.3</td>
<td>(5.9)</td>
<td>14.6</td>
<td>(8.6)</td>
</tr>
<tr>
<td>Tension</td>
<td>Control</td>
<td>10.4</td>
<td>(5.6)</td>
<td>12.8</td>
<td>(7.2)</td>
</tr>
<tr>
<td>Anger</td>
<td>Relaxation</td>
<td>12.4</td>
<td>(8.4)</td>
<td>8.8</td>
<td>6.3</td>
</tr>
<tr>
<td>Anger</td>
<td>Therapy</td>
<td>10.9</td>
<td>6.6</td>
<td>11.2</td>
<td>(9.5)</td>
</tr>
<tr>
<td>Anger</td>
<td>Control</td>
<td>7.6</td>
<td>(6.3)</td>
<td>9.7</td>
<td>(6.8)</td>
</tr>
<tr>
<td>Confusion</td>
<td>Relaxation</td>
<td>8.9</td>
<td>(7.7)</td>
<td>6.0</td>
<td>(4.1)</td>
</tr>
<tr>
<td>Confusion</td>
<td>Therapy</td>
<td>8.4</td>
<td>(3.8)</td>
<td>8.1</td>
<td>(4.5)</td>
</tr>
<tr>
<td>Confusion</td>
<td>Control</td>
<td>5.7*</td>
<td>(4.3)</td>
<td>7.6*</td>
<td>(5.8)</td>
</tr>
<tr>
<td>Fatigue</td>
<td>Relaxation</td>
<td>12.0*</td>
<td>(6.5)</td>
<td>6.9*</td>
<td>(4.3)</td>
</tr>
<tr>
<td>Fatigue</td>
<td>Therapy</td>
<td>14.3</td>
<td>(9.0)</td>
<td>13.7</td>
<td>(9.6)</td>
</tr>
<tr>
<td>Fatigue</td>
<td>Control</td>
<td>8.6</td>
<td>(6.2)</td>
<td>10.4</td>
<td>(7.1)</td>
</tr>
<tr>
<td>Depression</td>
<td>Relaxation</td>
<td>16.2</td>
<td>(14.1)</td>
<td>11.5</td>
<td>(8.4)</td>
</tr>
<tr>
<td>Depression</td>
<td>Therapy</td>
<td>14.9</td>
<td>(9.6)</td>
<td>14.2</td>
<td>(11.1)</td>
</tr>
<tr>
<td>Depression</td>
<td>Control</td>
<td>7.7</td>
<td>(7.7)</td>
<td>12.0</td>
<td>(14.1)</td>
</tr>
<tr>
<td>Vigor</td>
<td>Relaxation</td>
<td>11.5</td>
<td>(7.5)</td>
<td>13.8</td>
<td>(5.8)</td>
</tr>
<tr>
<td>Vigor</td>
<td>Therapy</td>
<td>16.5</td>
<td>(7.7)</td>
<td>17.8</td>
<td>(8.5)</td>
</tr>
<tr>
<td>Vigor</td>
<td>Control</td>
<td>14.5</td>
<td>(6.5)</td>
<td>14.8</td>
<td>(9.1)</td>
</tr>
</tbody>
</table>

*p<.05

Hypothesis IV: Immunological results will show significant immunological enhancement for subjects in both the relaxation/imagery group, as well as those in the psychotherapy intervention, with the greatest enhancement being shown in the relaxation/imagery intervention.
Table 5

Summary of Means and Standard Deviations for Total Scores on the SCL (symptom severity).

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Mean Pretest</th>
<th>SD Pretest</th>
<th>Mean Postest</th>
<th>SD Postest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relaxation</td>
<td>58.8*</td>
<td>(23.4)</td>
<td>36.2*</td>
<td>(18.7)</td>
</tr>
<tr>
<td>Therapy</td>
<td>54.9</td>
<td>(20.9)</td>
<td>51.9</td>
<td>(35.5)</td>
</tr>
<tr>
<td>Control</td>
<td>35.6</td>
<td>(29.5)</td>
<td>34.2</td>
<td>(27.7)</td>
</tr>
</tbody>
</table>

*p<.00

Table 6

Summary of Means and Standard Deviations for Total Number of Symptoms Reported on the SCL.

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Mean Pretest</th>
<th>SD Pretest</th>
<th>Mean Postest</th>
<th>SD Postest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relaxation</td>
<td>26.6*</td>
<td>(11.6)</td>
<td>20.4*</td>
<td>(8.1)</td>
</tr>
<tr>
<td>Therapy</td>
<td>26.2</td>
<td>(9.4)</td>
<td>25.5</td>
<td>(12.2)</td>
</tr>
<tr>
<td>Control</td>
<td>17.3</td>
<td>(12.9)</td>
<td>17.8</td>
<td>(11.3)</td>
</tr>
</tbody>
</table>

*p<.00

Table 7 shows the significant results of analysis of cell percentages provided by flow cytometry. Analysis of pan B (cd19) and pan T (cd3) cell subsets were nonsignificant for different treatment effects on cell percentages (cd3-F = 2.31, df = 2; cd19-F = 2.15, df = 2) and as a result no further analysis was performed. T-suppressor cell percentages were significantly effected by treatment condition (F = 8.26, df = 2, p = .00) with post hoc analyses indicating a significant decrease for
relaxation/imagery participants ($t = 3.83$, $df = 9$, $p = .00$), and a significant increase for psychotherapy participants ($t = -2.84$, $df = 9$, $p = .01$), while no significant change was shown for control subjects. Helper cells were also shown to be significantly affected by treatment condition ($F = 4.13$, $df = 2$, $p = .03$) with post hoc analysis indicating a near significant decrease for psychotherapy subjects ($t = 1.94$, $df = 9$, $p = .08$), a near significant increase for control subjects ($t = -1.79$, $df = 9$, $p = .10$) while non significant increases were shown for relaxation subjects. Helper inducer subsets (cd45R/2h4) were also significantly affected by treatment condition ($F = 5.00$, $df = 2$, $p = .01$) with post hoc analyses indicating significant increases for the relaxation/imagery intervention ($t = -2.58$, $df = 9$, $p = .03$), with non significant changes in the other conditions. Neutrophil percentages were also significantly affected by treatment condition ($F = 3.68$, $df = 2$, $p = .04$) with post hoc analyses indicating significant decreases for control subjects ($t = 2.29$, $df = 9$, $p = .04$) while the other two groups showed non-significant changes. The relaxation/imagery participants also exhibited increased monocyte percentages ($F = 3.95$, $df = 2$, $p = .03$) ($t = -2.41$, $df = 9$, $p = .03$) while the other interventions showed nonsignificant changes. Between groups differences were also exhibited ($F = 4.19$, $df = 2$, $p = .03$) indicating the
control group showed significantly higher monocyte percentages overall.

Table 7

Summary of Means and Standard Deviations for Individual Cell Percentages.

<table>
<thead>
<tr>
<th>Cell Type</th>
<th>Intervention</th>
<th>Mean Pretest</th>
<th>SD Pretest</th>
<th>Mean Postest</th>
<th>SD Postest</th>
</tr>
</thead>
<tbody>
<tr>
<td>CD8 Supp.</td>
<td>Relaxation</td>
<td>34.7*</td>
<td>(7.7)</td>
<td>32.6*</td>
<td>(7.4)</td>
</tr>
<tr>
<td>CD8 Supp.</td>
<td>Therapy</td>
<td>27.9*</td>
<td>(10.4)</td>
<td>30.2*</td>
<td>(11.5)</td>
</tr>
<tr>
<td>CD8 Supp.</td>
<td>Control</td>
<td>28.5</td>
<td>(4.9)</td>
<td>28.3</td>
<td>(5.8)</td>
</tr>
<tr>
<td>CD4 Helper</td>
<td>Relaxation</td>
<td>44.0</td>
<td>(5.7)</td>
<td>46.1</td>
<td>(6.3)</td>
</tr>
<tr>
<td>CD4 Helper</td>
<td>Therapy</td>
<td>50.9</td>
<td>(11.7)</td>
<td>48.8</td>
<td>(11.6)</td>
</tr>
<tr>
<td>CD4 Helper</td>
<td>Control</td>
<td>48.5</td>
<td>(7.5)</td>
<td>50.6</td>
<td>(5.2)</td>
</tr>
<tr>
<td>CD45R</td>
<td>Relaxation</td>
<td>22.6*</td>
<td>(10.2)</td>
<td>31.2*</td>
<td>(13.3)</td>
</tr>
<tr>
<td>CD45R</td>
<td>Therapy</td>
<td>21.7</td>
<td>(7.8)</td>
<td>20.5</td>
<td>(8.7)</td>
</tr>
<tr>
<td>CD45R</td>
<td>Control</td>
<td>31.9</td>
<td>(7.8)</td>
<td>28.4</td>
<td>(10.4)</td>
</tr>
<tr>
<td>Neutrophil</td>
<td>Relaxation</td>
<td>56.6</td>
<td>(9.5)</td>
<td>57.8</td>
<td>(7.8)</td>
</tr>
<tr>
<td>Neutrophil</td>
<td>Therapy</td>
<td>58.3</td>
<td>(9.1)</td>
<td>61.1</td>
<td>(11.0)</td>
</tr>
<tr>
<td>Neutrophil</td>
<td>Control</td>
<td>55.4*</td>
<td>(7.6)</td>
<td>52.9*</td>
<td>(7.7)</td>
</tr>
<tr>
<td>Monocyte</td>
<td>Relaxation</td>
<td>4.4*</td>
<td>(1.1)</td>
<td>5.4*</td>
<td>(1.7)</td>
</tr>
<tr>
<td>Monocyte</td>
<td>Therapy</td>
<td>4.8</td>
<td>(1.0)</td>
<td>4.7</td>
<td>(1.1)</td>
</tr>
<tr>
<td>Monocyte</td>
<td>Control</td>
<td>5.9</td>
<td>(.8)</td>
<td>5.9</td>
<td>(.9)</td>
</tr>
</tbody>
</table>

*p<.05

Table 8 summarizes significant results of analyses of individual cell counts. CD2 counts were significantly affected by treatment condition (F = 3.65, df = 2, p = .04) with post hoc analyses demonstrating a significant increase for control subjects (t = -2.23, df = 9, p = .05), a near significant increase for psychotherapy subjects (t = 1.84,
df = 9, p = .09), and a nonsignificant decrease for relaxation subjects. Pan t cells also exhibited near significantly different treatment effects by group (F = 2.64, df = 2, p = .09), with control subjects showing significant increases (t = 2.62, df = 9, p = .03), psychotherapy subjects increasing nonsignificantly, and relaxation subjects decreasing nonsignificantly. B cell (cd19) counts were not found to be affected by treatment condition (F = .51, df = 2).

Helper cell activation (HLA-DR/CD4/T4) was also found to be affected by treatment condition (F = 4.2, df = 2, p = .03), with psychotherapy subjects showing near significant increases in cell activation (t = 2.11, df = 9, p = .06). These results were clouded by significant between group differences (F = 3.8, df = 2, p = .04) showing overall higher mean counts for the psychotherapy group. Overall t cell activation was not found to be affected by treatment condition (F = .20), and this was also the case for suppressor cell (CD8) activation (F = 1.88).

Suppressor cell counts were significantly affected by treatment condition (F = 5.74, df = 2, p = .00). Post hoc analyses revealed a significant decrease in total CD8 count for relaxation/imagery participants (t = 2.34, df = 9, p = .04), and a significant increase in total CD8 count for psychotherapy participants (t = -2.31, df = 9, p = .04).
Suppressor inducer counts (CD45R/2H4) were found to be affected significantly by treatment condition however ($F = 3.6, df = 2, p = .05$). Secondary analysis demonstrated significant increases for the relaxation/imagery intervention participants ($t = -2.34, df = 9, p = .04$) with nonsignificant changes for other groups.

Three results of the complete blood count were also of interest. Neutrophil counts increased significantly for the psychotherapy subjects ($F = 4.59, df = 2, p = .01$) ($t = 2.54, df = 9, p = .03$), as did overall platelet counts ($F = 4.26, df = 2, p = .03$) ($t = 3.28, df = 9, p = .01$) and white blood count ($F = 5.56, df = 2, p = .00$) ($t = 2.63, df = 9, p = .02$). Control subjects showed nonsignificant changes on these variables, while relaxation subjects showed nonsignificant decreases on all three variables.

Table 9 shows the results of analysis of helper suppressor ratios for pre and post treatment measures. Results indicated that this ratio was affected by treatment condition ($F = 5.75, df = 2, p = .00$), while secondary analysis revealed a significant increase in the ratio for relaxation/imagery participants ($t = -2.55, df = 9, p = .03$), while psychotherapy participants showed a decreasing trend ($t = 1.89, df = 9, p = .09$), and control subjects showed no significant change.
Table 8

Summary of Means and Standard Deviations for Individual Cell
Absolute Counts (Cell Percentage x Absolute Lymphocyte
Count x 10^3).

<table>
<thead>
<tr>
<th>Cell Type</th>
<th>Intervention</th>
<th>Mean Pretest</th>
<th>SD Pretest</th>
<th>Mean Postest</th>
<th>SD Postest</th>
</tr>
</thead>
<tbody>
<tr>
<td>CD2</td>
<td>Relaxation</td>
<td>162.9</td>
<td>(29.6)</td>
<td>153.6</td>
<td>(34.2)</td>
</tr>
<tr>
<td>CD2</td>
<td>Therapy</td>
<td>183.6</td>
<td>(58.0)</td>
<td>205.8</td>
<td>(74.5)</td>
</tr>
<tr>
<td>CD2</td>
<td>Control</td>
<td>181.1*</td>
<td>(69.1)</td>
<td>194.4*</td>
<td>(67.3)</td>
</tr>
<tr>
<td>CD3</td>
<td>Relaxation</td>
<td>138.3</td>
<td>(30.9)</td>
<td>133.2</td>
<td>(33.2)</td>
</tr>
<tr>
<td>CD3</td>
<td>Therapy</td>
<td>162.2</td>
<td>(49.2)</td>
<td>176.2</td>
<td>(62.1)</td>
</tr>
<tr>
<td>CD3</td>
<td>Control</td>
<td>149.6*</td>
<td>(57.0)</td>
<td>165.7*</td>
<td>(57.0)</td>
</tr>
<tr>
<td>CD4 Active</td>
<td>Relaxation</td>
<td>7.3</td>
<td>(3.5)</td>
<td>6.8</td>
<td>(3.0)</td>
</tr>
<tr>
<td>CD4 Active</td>
<td>Therapy</td>
<td>10.1</td>
<td>(2.9)</td>
<td>10.9</td>
<td>(3.4)</td>
</tr>
<tr>
<td>CD4 Active</td>
<td>Control</td>
<td>6.9</td>
<td>(3.4)</td>
<td>7.2</td>
<td>(3.4)</td>
</tr>
<tr>
<td>CD8</td>
<td>Relaxation</td>
<td>69.2*</td>
<td>(24.9)</td>
<td>62.8*</td>
<td>(24.2)</td>
</tr>
<tr>
<td>CD8</td>
<td>Therapy</td>
<td>64.9*</td>
<td>(36.8)</td>
<td>78.5*</td>
<td>(52.8)</td>
</tr>
<tr>
<td>CD8</td>
<td>Control</td>
<td>64.4</td>
<td>(29.1)</td>
<td>68.1</td>
<td>(29.8)</td>
</tr>
<tr>
<td>CD45R</td>
<td>Relaxation</td>
<td>43.3*</td>
<td>(17.2)</td>
<td>57.3*</td>
<td>(22.3)</td>
</tr>
<tr>
<td>CD45R</td>
<td>Therapy</td>
<td>48.4</td>
<td>(19.3)</td>
<td>49.4</td>
<td>(21.6)</td>
</tr>
<tr>
<td>CD45R</td>
<td>Control</td>
<td>68.6</td>
<td>(25.4)</td>
<td>62.2</td>
<td>(19.4)</td>
</tr>
<tr>
<td>Neutrophil</td>
<td>Relaxation</td>
<td>108.5</td>
<td>(16.3)</td>
<td>106.5</td>
<td>(15.7)</td>
</tr>
<tr>
<td>Neutrophil</td>
<td>Therapy</td>
<td>131.6*</td>
<td>(41.9)</td>
<td>151.2*</td>
<td>(59.1)</td>
</tr>
<tr>
<td>Neutrophil</td>
<td>Control</td>
<td>119.4</td>
<td>(37.3)</td>
<td>120.9</td>
<td>(35.8)</td>
</tr>
<tr>
<td>WBC</td>
<td>Relaxation</td>
<td>6.1</td>
<td>(1.1)</td>
<td>5.7</td>
<td>(.9)</td>
</tr>
<tr>
<td>WBC</td>
<td>Therapy</td>
<td>6.9*</td>
<td>(1.8)</td>
<td>8.1*</td>
<td>(2.8)</td>
</tr>
<tr>
<td>WBC</td>
<td>Control</td>
<td>6.5</td>
<td>(1.8)</td>
<td>6.5</td>
<td>(1.9)</td>
</tr>
</tbody>
</table>

**p<.01; *p<.05**
Table 8 - continued

Summary of Means and Standard Deviations for Individual Cell Absolute Counts (Cell Percentage x Absolute Lymphocyte Count x $10^{31}$).

<table>
<thead>
<tr>
<th>Cell Type</th>
<th>Intervention</th>
<th>Mean Pretest</th>
<th>SD Pretest</th>
<th>Mean Postest</th>
<th>SD Postest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platelets</td>
<td>Relaxation</td>
<td>284.8</td>
<td>(54.7)</td>
<td>272.0</td>
<td>(62.1)</td>
</tr>
<tr>
<td>Platelets</td>
<td>Therapy **</td>
<td>267.9</td>
<td>(39.4)</td>
<td>287.0</td>
<td>(42.6)</td>
</tr>
<tr>
<td>Platelets</td>
<td>Control</td>
<td>298.5</td>
<td>(41.8)</td>
<td>301.5</td>
<td>(52.3)</td>
</tr>
</tbody>
</table>

**p<.01; *p<.05

Table 9

Summary of Means and Standard Deviations for Helper/Suppressor Ratios Pre and Post Treatment (Absolute CD4/CD8 x $10^{31}$).

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Mean Pretest</th>
<th>SD Pretest</th>
<th>Mean Postest</th>
<th>SD Postest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relaxation*</td>
<td>1.35</td>
<td>(.4)</td>
<td>1.52</td>
<td>(.5)</td>
</tr>
<tr>
<td>Therapy</td>
<td>2.13</td>
<td>(1.1)</td>
<td>1.93</td>
<td>(1.1)</td>
</tr>
<tr>
<td>Control</td>
<td>1.77</td>
<td>(.5)</td>
<td>1.80</td>
<td>(.6)</td>
</tr>
</tbody>
</table>

*p<.05

Discussion

This study examined the effects of two different treatment conditions on the psychological and immunological functioning of subjects. Strong support was provided for the hypotheses that relaxation/imagery training would improve the psychological, physiological and immunological functioning of subjects. Little or no support was obtained
for the hypothesis that psychotherapy would positively affect these variables.

The first hypothesis that significant decreases in hormones affected by stress (ACTH, beta-endorphins, cortisol) would be observed in the treatment conditions was not supported. Results indicated that no significant treatment effects were observed for both cortisol and ACTH, and that beta-endorphins were significantly increased for all groups at post-test. This difference may have been due to increased proficiency with this particular assay kit on the part of laboratory technicians.

The second hypothesis put forth that subjects in the relaxation/imagery (R/I) intervention would exhibit decreased heart rate and blood pressure both across all sessions as well as within each individual session. This hypothesis was made primarily because of the large body of research supporting reductions in blood pressure, heart rate, and other effects of the parasympathetic nervous system through the use of biofeedback and relaxation training (Schwartz, 1972; Levene et al, 1968). Results indicated that R/I subjects did in fact exhibit significant decreases in diastolic blood pressure overall, indicating that vasodilation took place. Psychotherapy subjects showed a trend toward increased diastolic blood pressures, indicating that they may have experienced sympathetic arousal, and possibly vasoconstriction. Both treatment
groups showed decreasing trends in overall systolic blood pressures however. Heart rate results showed decreasing trends for both treatment groups also supporting the hypothesis.

Analysis of session data indicated decreasing trends for almost all sessions for both treatment groups. To control for the effects of subjects simply relaxing from a walking to resting state when the first blood pressure and heart rate measures were taken, subjects were given a 5 minute adaptation period before measurement. It seems reasonable then that the decreasing trend in heart rate may have been due to the effects of treatment.

Analysis of blood pressure by session showed support for hypothesis 2, but only for R/I subjects. Systolic blood pressure decreased significantly for R/I subjects in sessions 1 and 2 with decreasing trends for sessions 3 and 4. P/G subjects showed increasing trends in sessions 1 and 2, and decreasing trends in sessions 3 and 4. The psychotherapy group tends to focus on the physiological/emotional reactions to stressors, and the particular stressors themselves in sessions 1 and 2, and follows up in sessions 3 and 4 with strategies to help participants reduce their unhealthy reactions to stressors (e.g. assertiveness, cognitive emotional management). Thus it makes sense that psychotherapy subjects might experience more sympathetic arousal while thinking about their
particular stressors in session #2, and their physiological and emotional reactions to stress in session #1. Diastolic blood pressure of R/I subjects also showed significant decreases for session #1 with decreasing trends for sessions 2-4 supporting the hypothesis. P/G subjects exhibited significant increases in diastolic blood pressure in session #2 (focusing on stressors during this session), as well as increasing trends in sessions 1 and 4.

Overall, it appeared that R/I subjects experienced decreases in both systolic and diastolic blood pressure, while the results were mixed for P/G subjects. This difference appeared to be due to a difference in the focus of the treatments with the psychotherapy treatment exposing subjects to imagery and thoughts and images about stressful situations and their reactions to those situations. Heart rate results did not appear to be affected by treatment condition, and these results were further obscured by significant between group differences at pretest. Relaxation subjects tended to have higher heart rates in general when compared with psychotherapy subjects.

Hypothesis III predicted improvement in psychological functioning as measured by the POMS as well as reductions in symptom severity and number of symptoms reported in treated subjects. Mood states as measured by the POMS showed significant decreases on the subscales of Tension and Fatigue for R/I subjects. This indicated that R/I subjects
in general felt less tired, more energetic, and less worried, anxious and tense after treatment when compared with control or P/G subjects. R/I subjects also tended toward hypothesized improvements on the subscales of Anger, Depression, Vigor, and Confusion. Control subjects showed no significant differences, but tended toward a worsening in psychological functioning on subscales of Tension, Anger, Fatigue, and Depression with significant increases noted on the Confusion subscale. Therapy subjects exhibited no significant improvements or changes, only trends toward increased Tension, Confusion, Fatigue, Depression and Vigor.

Symptom severity and frequency also supported the hypothesis that relaxation training would enhance physiological functioning of treated subjects. R/I subjects reported a decreased number of symptoms after treatment, while P/G and control subjects showed no significant changes. No significant between group differences were noted for symptom severity or number of symptoms at pretest indicating that the groups were essentially equal. Both R/I and P/G subjects tended to have higher scores of symptom severity, and number of symptoms when compared to control subjects. R/I subjects also reported significantly decreased symptom severity at postest with P/G and control subjects exhibiting no significant changes. Thus it appeared that R/I subjects began the study reporting high numbers of symptoms with moderate intensity of discomfort
and ended the study with a decreased number of symptoms as well as significantly decreased severity of those symptoms. These results support previous work in which psychotherapy, biofeedback and relaxation training have improved the physiological and psychological functioning of participants (Speigel & Glafkides, 1983; Brooks & Richardson, 1980; Smith et al, 1979).

The fourth hypothesis, that both treatment groups would experience increased immune functioning with the greatest increases being shown in the R/I intervention was also supported only for the R/I intervention. R/I participants showed irrefutable evidence of immune enhancement. They showed significant decreases in T-suppressor (Ts) absolute cell counts and percentages, as well as significant increases in the ratio of T-helper cell counts (Th) to Ts counts. Control subjects showed no significant changes in these values, while P/G subjects exhibited significant increases in Ts counts and percentages, and decreasing trends in the Th/Ts ratio. Analysis of helper inducer T-cell subsets also showed a significant (8.6%) increase for R/I participants, while both control and P/G subjects showed nonsignificant changes. These indicators point to amplification of the immune response initiated by T-helper inducer/T-helper cells in the presence of fewer T-suppressor cell which initiate modulation of the immune response.
Other results of interest showed that P/G participants exhibited significant increases in total white blood cell counts, neutrophil counts, and platelet counts. This indicates that P/G participants may have been showing the initial signs of infection as neutrophils are phagocytic cells which react quickly to the first signs of bacteriological infection, and are quickly followed by lymphocytes at the source of an infection (Sell, 1987). Increased numbers of platelets may be consistent with infection as they are increased during inflammatory reactions to prevent hemorrhaging. Platelets have also been shown to increase as a results of an increased presence of adrenaline presumably to enhance coagulation during injury (Selye, 1982). Both R/I and control participants showed no significant changes on these variables.

In summary, this study presents support for the hypothesis that relaxation/imagery training improves the psychological, physiological, and immunological functioning of participants. The R/I treatment condition was found to be a superior treatment to the P/G treatment in terms of psychological, physiological and immunological assessments performed in this study. R/I participants exhibited decreased diastolic blood pressure, felt less fatigue and tension, reported decreased severity of symptoms, and exhibited improved immune functioning. This study did not provide support for the hypothesis that psychotherapy
improved the psychological, physiological or immunological functioning of participants with the measurement techniques employed in this study. P/G subjects showed a tendency to exhibit increased diastolic blood pressure after treatment sessions, did not exhibit any significant psychological changes as measured by the POMS and SRRS, and exhibited a decreased potential for immune response and possibly the beginnings of infection.

The effectiveness of the relaxation/imagery intervention appears to be due to a number of factors. First, participants begin the training with simple, short exercises, and are encouraged to practice and document their level of tension or relaxation during practice. The length of the training (4 sessions over a 1 month period) seems to allow participants enough time to acquire relaxation skills in one specific technique before they move on to a more complex technique. Also, the addition of the imagery in session three occurred after subjects had two weeks to practice basic relaxation skills, and one week practicing progressive muscle relaxation. This may have enabled subjects to stay relaxed more easily during the 15-20 minute immune imagery script.

Future research might focus on examining the same variables at a predetermined follow-up point to evaluate if the apparent gains in functioning were maintained, and if psychotherapy techniques helped the P/G participants cope
more effectively with future stressors. Psychotherapy participants may suffer a short functional impairment as a result of treatment, but may show improvement later as a result of putting their skills to use. Future researchers may also choose to use a more specific surface marker for natural killer cells other than the one that was used for this study (CD56/NKH-1 LGL) as this marker also detects other type of suppressor cells.
APPENDIX A

INFORMED CONSENT DOCUMENT
1. I hereby volunteer to participate as a test subject in this experimental study. This study which will enroll 30 patients over the next six months will require that I make 4 visits to the treatment group to which I am assigned over the 4 week period of my participation. If I am assigned to the control (no treatment) group, I will only be asked to report 2 times over the 4 weeks of my participation. The purpose of this study is to examine the relationship between psychotherapy/relaxation training and physiology (blood pressure, heart rate, and immune function).

2. As a participant, I understand that I will give a blood sample at 2 points during the study on days 1 and 28 of my participation. Blood will be collected by venipuncture (blood will be drawn from a vein in my arm with the use of a needle). The amount of blood collected will be approximately 10 cc's (2 tablespoons, or 4 teaspoons).

3. I understand that as a participant I will be assigned randomly to one of 3 treatment plans (schedules). By randomization, I understand that I will have an equal chance of being assigned to one of the 3 treatment groups. The 3 treatment groups are as follows:

(1) Control (no treatment): Subjects who are randomly assigned to the control group will be asked to appear twice during the study (day 1 and day 28) to have a blood sample taken and to take the psychological measures.

(2) Psychotherapy intervention: Subjects who are randomly assigned to this group will be asked to attend 4 1.5-2 hour psychotherapy sessions which will proceed along the following protocol: A) session one will involve an introduction and will focus on identifying the signs and symptoms of stress; B) session two will involve identification of situations and circumstances which elicit stress responses in the participants; C) session three will involve specific cognitive distortions and techniques for reducing stress reactions with specific individual examples being examined; D) session four will involve a review of the previous sessions, further examination of specific personal examples, and an introduction to basic assertiveness techniques. Group therapy members will have their blood pressure, and
heart rate examined before and after each session. Subjects in this treatment condition will also be asked to give a blood sample on days 1 and 28 of their participation, and to complete the psychological measures before and after their participation.

(3) Relaxation/imagery training group: Subjects who are randomly assigned to this group will also be asked to attend 4 one hour sessions during the 28 day period. The protocol for the relaxation group will continue as follows: A) session one will introduce the rationale for learning relaxation, and teach one type of strategy for relaxing which the participants are to practice during the week before the next session; B) session two will introduce progressive muscle relaxation and allow the participants to learn this strategy as well as its rationale, and will be encouraged to practice the technique during the week before the next session; C) session three will introduce a shortened progressive muscle relaxation technique as well as a 15 minute imagery script (Achterberg & Lawlis, 1989). Subjects will be encouraged to practice the technique over the next week; D) subjects will be taught to relax in response to certain environmental cues in session four, and final questions will be answered. Subjects will have their blood pressure and heart rate measured before and after each treatment. Subjects in this treatment condition will also be asked to give a blood sample on days 1 and 28 of their participation, and to complete the psychological measures before and after their participation.

4. Risks: I realize that I may experience discomfort, bruising and soreness at the site where blood is drawn.

5. Benefits: positive outcomes I might experience from my participation in the study include: 1) improvement in my feeling of being able to better manage my physical symptoms and/or stress; 2) feedback about my immune function, blood pressure, and heart rate as a result of treatment; 3) the addition of new skills which I could use to help manage future stressful situation. However, there is no guarantee that the treatment/training will be useful and that it may not add to my feeling of being able to better manage my physical symptoms or the stress currently evident in my life.

6. Alternative Treatment: I understand that treatment with another procedure such as individual therapy or talking with my priest/friend/spouse/rabbi/pastor/doctor may be equally of more beneficial to me. Talking with others might in some cases help me improve my psychotherapy or relaxation skills. Individual psychotherapy might also provide more individual attention to my current problem, I understand that I may
not engage in individual therapy during the course of my participation in this study.

7. I understand that should I decide to terminate my participation in the study, that I may do so at any time without any penalty. I will not receive feedback on psychological measures which I have not completed, or blood samples which I have not given.

8. Records of my participation in this study may only be disclosed in accordance with federal law, including the Federal Privacy Act, 5 USC 552a, and its implementing regulations. DD form 2005 contains the Privacy Act Statement for the records. I understand that records of this study may be inspected by the U.S. Food and Drug Administration (FDA).

9. I understand that my entitlement to medical and dental care and/or compensation in the event of injury are governed by federal laws and regulations, and if I have questions about my rights or if I believe I have received a research-related injury, I may contact the Medical Center Patient Representative CMSGT. Lloyd W. Hegwood, and/or Capt. Jeff Baldridge.

10. I understand that any clinical or medical misadventure will immediately be brought to my attention, or if I am not competent at the time to understand the nature of the misadventure, such information will then be brought to the attention of my guardian or next of kin.

11. The decision to participate in this study is completely voluntary on my part. No one has coerced or intimidated me into participating in this program. I am participating because I want to. Capt. Baldridge has adequately answered any and all questions I have about this study, my participation, and the procedures involved. I understand that Capt. Baldridge will be available to answer any questions concerning procedures throughout this study. I understand that if significant new findings develop during the course of this study which may relate to my decision to continue participation, I will be informed. I further understand that I may withdraw this consent at any time and discontinue further participation in this study without prejudice to my entitlements to care. Should I choose to withdraw, my condition will continue to be treated
in accordance with acceptable standards of medical treatment. I also understand that the investigator of this study may terminate my participation in this study at any time if he feels this to be in my best interest.

A copy of this form has been given to me.

________________________________________________________________________
(VOLUNTEER'S SIGNATURE AND SSAN) (DATE)

________________________________________________________________________
(ADVISING PHYSICIAN'S SIGNATURE AND SSAN) (DATE)

________________________________________________________________________
(WITNESS) (DATE)
(Must witness all signatures above)

Privacy Act of 1974 applies. DD Form 2005 filed in Clinical/Medical Records.

SGO #: 91-170 (C-117)

Date of IRC Approval: 26 March 1991
APPENDIX B

ADAPTATION OF SOCIAL READJUSTMENT RATING SCALE
Adaptation of Social Readjustment Rating Scale

Instructions

Below is a list of life events which you may have encountered in the last two years. Each of these events required you to cope in some way. To the right of the 43 life events are three columns. Each of the columns is labeled. In column 1 give the month and year you encountered the life event. If you have encountered any event more than once in the last two years gives the dates for each occasion.

After you furnish the dates for the life events, we would like you to rate your coping ability on a scale from 1 to 10 (given below) for each event. Rate your ability to cope with each life event at the time it occurred, and place your rating in column 2. If you listed more than one date for a life event, please rate your coping ability for each occasion. Then, please rate your present ability to cope with each of the events for which you furnished dates. Place your present coping rating in column 3.

One way of envisioning how well you were able to cope with a particular event at a particular time is to think or imagine what sort of animal the event represented to you and then think on a scale from 1 to 10: "How well was I able to cope with that animal?" For instance, if a divorce occurred 4 months ago it may have seemed like a tiger at that time, and presently the divorce seems like a St. Bernard puppy. With this example you would rate how well you coped with the tiger and place your rating in column 2. Then you would rate how well you are able to cope with the St. Bernard puppy and place your coping rating in column 3.

Please use the following rating scale for coping ability:

<table>
<thead>
<tr>
<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>
</tr>
</thead>
<tbody>
<tr>
<td>coped</td>
<td>coped</td>
<td>coped, but</td>
<td>coped with</td>
<td>did not cope</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>very well</td>
<td>with some problems</td>
<td>great difficulty</td>
<td>well at all</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Life Events

<table>
<thead>
<tr>
<th>Life Events</th>
<th>Column 1 (Mo./Yr.)</th>
<th>Column 2 (Past)</th>
<th>Column 3 (Present)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death of a Spouse</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Divorce</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Marital Separation</td>
<td></td>
<td></td>
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<tr>
<td>Jail Term</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Death of a Close Family Member</td>
<td></td>
<td></td>
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<tr>
<td>Personal Injury or Illness</td>
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<tr>
<td>Marriage</td>
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<td></td>
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<tr>
<td>Fired at Work</td>
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<tr>
<td>Marital Reconciliation</td>
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<tr>
<td>Retirement</td>
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<tr>
<td>Change in Health - Family Member</td>
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<td></td>
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<tr>
<td>Pregnancy</td>
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<tr>
<td>Sex Difficulties</td>
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<td></td>
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<tr>
<td>Gaining New Family Member</td>
<td></td>
<td></td>
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<tr>
<td>Business Readjustment</td>
<td></td>
<td></td>
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<tr>
<td>Change in Financial State</td>
<td></td>
<td></td>
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<tr>
<td>Death of a Close Friend</td>
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<tr>
<td>Change to Different Line of Work</td>
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<tr>
<td>Change in # Arguments - Spouse</td>
<td></td>
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</tr>
<tr>
<td>Mortgage over $10,000</td>
<td></td>
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<tr>
<td>Foreclosure of Mortgage or Loan</td>
<td></td>
<td></td>
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<tr>
<td>Change in Responsibilities at Work</td>
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<td></td>
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</tbody>
</table>
### Life Events

<table>
<thead>
<tr>
<th>Life Events</th>
<th>Column 1 (Mo./Yr.)</th>
<th>Column 2 (Past)</th>
<th>Column 3 (Present)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Son or Daughter Leaving Home</td>
<td></td>
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<tr>
<td>Trouble with In-Laws</td>
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<tr>
<td>Outstanding Personal Achievement</td>
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<tr>
<td>Spouse Begin or Stop Work</td>
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<td></td>
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<tr>
<td>Begin or End School</td>
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<td></td>
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<tr>
<td>Change in Living Conditions</td>
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<tr>
<td>Revision of Personal Habits</td>
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<td></td>
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<tr>
<td>Trouble with Boss</td>
<td></td>
<td></td>
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<tr>
<td>Change in Work Hours or Conditions</td>
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<tr>
<td>Change in Residence</td>
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<tr>
<td>Change in Schools</td>
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<tr>
<td>Change in Recreation</td>
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<tr>
<td>Change in Church Activities</td>
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<td></td>
<td></td>
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<tr>
<td>Change in Social Activities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mortgage or Loan Less Than $10,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change in Sleeping Habits</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Change in # of Family Get Togethers</td>
<td></td>
<td></td>
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<tr>
<td>Change in Eating Habits</td>
<td></td>
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<tr>
<td>Vacation</td>
<td></td>
<td></td>
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<tr>
<td>Christmas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor Violations of the Law</td>
<td></td>
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</tbody>
</table>
PATIENT QUESTIONNAIRE
Privacy Act 1974 Applies

NAME: ____________________________  AGE: ______

SSN (SPONSOR): ____________________  PHONE (HP) ______
(DP) ______

ADDRESS: _______________________________________

WHO REFERRED YOU TO THE CLINIC? ______________________________________

WHAT IS THE REASON FOR REFERRAL? ______________________________________

PLEASE LIST THE MEDICATIONS YOU ARE CURRENTLY TAKING OR WILL BE TAKING DURING THE YOUR PARTICIPATION IN THE STUDY (INCLUDE ASPIRIN, BIRTH CONTROL, OVER THE COUNTER MEDS AS WELL AS PRESCRIPTION MEDS)

CURRENT AND CHRONIC MEDICAL PROBLEMS

HOW MANY CAFFEINATED DRINKS DO YOU CONSUME PER DAY? ______
CIRCLE ONE OR MORE - (COFFEE/TEA/SODA)

HOW MANY ALCOHOLIC DRINKS DO YOU CONSUME PER WEEK? ______
(1 DRINK=1 12OZ BEER=1 4OZ GLASS OF WINE= 1 MIXED DRINK)

IF FEMALE, WHAT DATE WAS THE FIRST DAY OF YOUR LAST MENSES? (THIS MAY AFFECT BLOOD RESULTS) _______________________

IF FEMALE, ARE YOU CURRENTLY PREGNANT? ______
DO YOU EXERCISE? _____ TIMES PER WEEK _____ TIME PERIOD _______

WHAT TYPE OF ACTIVITY? ________________________________
APPENDIX D

SYMPTOM CHECKLIST
Symptom Checklist

People report different ways of experiencing stress. The following is a list of stress signals. While no one ever experiences all the signals, it is not uncommon for one to find several or even many of them present when one is tense, anxious, or under stress. Please indicate the extent to which you presently experience each of the symptoms. Rate each sign according to the following scale:

1—Did not notice it
2—Weak but aware of it
3—Mild
4—Intense
5—Very intense

Please circle the appropriate number following each stress signal.

<table>
<thead>
<tr>
<th>Symptom</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nausea</td>
<td></td>
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<tr>
<td>Migraine HA</td>
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<tr>
<td>Tension HA</td>
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<tr>
<td>Constipation</td>
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<tr>
<td>Temper Outburst</td>
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<tr>
<td>Chills</td>
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<tr>
<td>Aches/Pains</td>
<td></td>
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<tr>
<td>Restlessness</td>
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<tr>
<td>Frequent Urination</td>
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<tr>
<td>Irregular Eating Habits</td>
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<tr>
<td>Acid Stomach</td>
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<tr>
<td>Difficulty Sleeping</td>
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<tr>
<td>Jaw Clenching</td>
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<tr>
<td>Rapid Heartbeat</td>
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<tr>
<td>Grinding Teeth</td>
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<tr>
<td>Feelings of foreboding</td>
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<tr>
<td>Dizziness or Faintness</td>
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<tr>
<td>Muscle Tension</td>
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<tr>
<td>Bloating</td>
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<tr>
<td>Clammy Hands</td>
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<tr>
<td>Hot Flashes</td>
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<tr>
<td>Shakiness</td>
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<tr>
<td>Listlessness</td>
<td></td>
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<tr>
<td>Crying Easily</td>
<td></td>
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<tr>
<td>Difficulty Concentrating</td>
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<td></td>
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<tr>
<td>Confusion</td>
<td></td>
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<tr>
<td>Dryness of Mouth</td>
<td></td>
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<tr>
<td>Spasm, Twitches, Tics</td>
<td></td>
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<tr>
<td>Cold Hands or Feet</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
30. Stomach Cramps
31. trembling
32. Forgetfulness
33. Diarrhea
34. Neck Pain
35. Itching
36. Irritability
37. Weakness in Legs
38. Skin Problems
39. Perspiration
40. Flushing
41. Chest Pains
42. Difficulty Swallowing
43. Ragged Breathing
44. Tingling or Numb Feelings
45. Stammering Speech
46. Feeling Hurried
47. Swelling
48. Other
APPENDIX E

PROFILE OF MOOD STATES
Profile of Mood States

Below is a list of words that describe feelings people have. Please read each one carefully, then fill in ONE circle under the answer to the right which best describes how you have been feeling during the past week including today.

The numbers refer to these phrases:

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Not at all</td>
</tr>
<tr>
<td>1</td>
<td>A little</td>
</tr>
<tr>
<td>2</td>
<td>Moderately</td>
</tr>
<tr>
<td>3</td>
<td>Quite a bit</td>
</tr>
<tr>
<td>4</td>
<td>Extremely</td>
</tr>
</tbody>
</table>

1. Friendly                           19. Energetic
2. Tense                              20. Panicky
3. Angry                              21. Hopeless
4. Worn Out                           22. Relaxed
5. Unhappy                            23. Unworthy
7. Lively                             25. Sympathetic
9. Sorry for things done               27. Restless
10. Shakey                            28. Unable to concentrate
11. Listless                           29. Fatigued
12. Peeved                             30. Helpful
13. Considerate                        31. Annoyed
14. Sad                                32. Discouraged
15. Active                             33. Resentful
16. On Edge                            34. Nervous
Please read each one carefully, then fill in ONE circle under the answer to the right which best describes how you have been feeling during the past week including today.

The numbers refer to these phrases:

0 = Not at all  
1 = A little  
2 = Moderately  
3 = Quite a bit  
4 = Extremely

35. Lonely
36. Miserable
37. Muddled
38. Cheerful
39. Bitter
40. Exhausted
41. Anxious
42. Ready to fight
43. Good Natured
44. Gloomy
45. Desperate
46. Sluggish
47. Rebellious
48. Helpless
49. Weary
50. Bewildered
51. Alert
52. Deceived
53. Furious
54. Efficient
55. Trusting
56. Full of pep
57. Bad tempered
58. Carefree
59. Forgetful
60. Terrified
61. Guilty
62. Vigorous
63. Uncertain
64. Bushed
APPENDIX F

BRIEF HEALTH QUESTIONNAIRE
Brief Health Questionnaire

Name __________________________ Date __________________

1. Have you had alcohol, aspirin, medication or drugs, including marijuana or drugs in the past 72 hours?  
   Yes ____  No ____

2. Has your diet changed recently?  Yes ____  No ____

3. What has your average night's sleep been the last 72 hours? __________________________

4. Have you exercised extensively in the last 24 hours?  
   Yes ____  No ____

5. Have you been out in the sun for longer periods of time than usual sunbathing?  
   Yes ____  No ____

6. Have you felt ill in any way in the last 10 days?  
   Yes ____  No ____

If yes, please describe symptoms.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
APPENDIX G

RELAXATION TRAINING CLASS SYLLABUS
Relaxation Group

The Stress Response
Behavioral Relaxation Exercises
Session 1

Purpose: 1. Introductions Review the Course Syllabus (Handout Syllabus)
2. Reasons for wanting to learn relaxation
3. How relaxation can help a number of problems
4. Teach Behavioral Relaxation (BRT)
5. Homework Assignment

I. Introductions
A. Why are we all here?
   Have patients discuss their understanding of why they were referred to this group and something about what they hope to gain from learning Relaxation Skills.
B. Review Syllabus (Handout Syllabus)
C. Stress importance of attendance and practice.
D. Daily practice is optimum for best results.
E. Ask patients to relate reasons for being in group. --Help patient identify objective goal upon which assess the benefit they are receiving from the group.

II. Relaxation???
1. The ways in which you are responding to your environment are problematic.
2. Benefits of Relaxation can reduce
   a. anxiety
   b. stress
   c. arousal
   d. distractibility
Relaxation Group
Session Two

1. Review Homework: Behavioral Relaxation Exercises
   a: Review Homework Logs for difficulties in relaxing.

2. Briefly review Behavioral Relaxation for the recliner. Give Handout

3. Review conditions necessary for any relaxation:
   a. Passive Attitude
   b. Focus on Breathing
   c. Quiet
   d. Decreased Muscle Tone

4. Introduce Progressive Muscle Relaxation (8 muscle groups)
   (Progressive Muscle Relaxation Handout)

5. Discuss Deepening Exercise

"Now I want you to relax all the muscles of your body; just let them become more and more relaxed. I am going to help you to achieve a deeper state of relaxation by counting from one to five. As I count you will feel yourself becoming more and more deeply relaxed;...farther and farther down into a deep, restful state of deep relaxation. One...you are going to become more deeply relaxed. Two...down into a very relaxed state. Three...four...more and more relaxed...five. Deeply relaxed."

Ask: Concentrate on your breathing.

Breathe through your nose and concentrate on your breathing so that as you inhale you can feel the cool air and as you exhale you can feel the warm air.

Think to yourself the word RELAX as you exhale.

Allow about one or two minutes for this and repeat the instructions at least once.

6. Do Progressive Relaxation Exercises and Deepening Exercise.

7. Homework: Practice PMR 2X daily. Use BRT prior to training.

8. Handout Relaxation Logs.
Relaxation Group
Progressive Muscle Relaxation (PMR 8)
Cue Controlled Relaxation
Session Three

1. Review Homework: PMR 8
   a. Review Homework Logs for difficulties in relaxing.
   b. Review Monitoring Charts.

2. Review conditions necessary for any relaxation:
   a. Passive Attitude
   b. Focus on Breathing
   c. Quiet
   d. Decreased Muscle Tone

3. Discuss Cue Controlled Relaxation
   a. Take a deep breathe.
   b. Consciously exhale.
   c. Say to oneself "relax".
   d. If convenient close eyes and relax for a little bit.

4. Do Cue Controlled Relaxation

5. Introduce Progressive Muscle Relaxation (8 muscle groups)
   (Progressive Muscle Relaxation (8 Muscles) Handout)

6. Do Progressive Relaxation Exercises and Deepening Exercise.

7. Homework: Practice PMR 8 2X daily. Use Cue Controlled Relaxation.

8. Handout Relaxation Logs.
Relaxation Group
Cue Controlled Relaxation
Relaxation by Recall
Session Four

1. Review Homework: PMR 8 and Cue Controlled Relaxation
   a: Review Homework Logs for difficulties in relaxing.

2. Review Cue Controlled Relaxation
   a. Take a deep breath.
   b. Consciously exhale.
   c. Say to oneself "relax".
   d. If convenient close eyes and relax for a little bit.

3. Do Cue Controlled Relaxation
   a: Review times/situations/cues for performing relaxation.

4. Discuss Relaxation by Recall
   In this procedure the therapist need only provide for:
   (1) careful focusing of the patient's attention on any tension in a particular muscle group,
   (2) instruction to the patient to recall the feelings associated with release of that tension.

   IE. Therapist: "OK, now I'd like you to focus all your attention on the muscles of the arms and very carefully identify any feelings of tightness or tension that might be present there now. Notice where the tension is and what it feels like."

   Following the focusing of attention.

   Therapist can go directly into the relaxation mode by saying: "OK, and relax, just recalling what it was like when you released these muscles, just letting them go and allowing them to become more and more deeply relaxed."

   Continue patter for about 30-45 seconds.

   This procedure is similar to the tense-relax exercises with the only difference being that the actual production of tension is eliminated.

   Then move on to the next muscle group. Remember to use the 8 muscle group exercises suggestion for this exercise.
4. Do Relaxation by Recall.

5. Discuss benefits of group and attainment or failure to attain goals. Offer suggestions about further training/treatment.

Encourage all patients to discuss their progress with their therapists.
APPENDIX H

IMMUNE IMAGERY SCRIPT
IMMUNE ODYSSEY

An Imagery Script

You are about to embark on the most incredible journey imaginable, a journey through your own immune system. Touching your body's healing forces with your mind; you will sense, feel, envision a miracle. A miracle of defense and protection. A miracle of the billions of honorable, persistent warriors within that have but one mission: you, guarding you from disease and injury and invasion.

To fully appreciate this odyssey, which is as complex as it is magnificent, it is important to clear and focus your mind; to relax your body. The bridge between mind and body is most easily crossed when distractions are released, when a sense of peace and calm spreads warmly from the top of your head to your toes. Relax, now, as you participate and observe your own healing process.

Take a moment. . . get in a very comfortable position.... Release, if you can, all distracting thoughts. Let them move away from you, one by one. Clearing, releasing. Letting go. . . If troubling or intrusive thoughts return, just acknowledge their presence. And release. . . As your mind clears, begin to place your attention on your breathing. That's all, just becoming aware of the breath. . . the gentle rise and fall of your abdomen. . .

Breath comes and goes more slowly as you begin to relax. . . Let your awareness move through your body now, beginning with your feet. Any tightness, and tension that you find... just acknowledge that it is present and then release. Moving your attention up your legs, letting go. . . through back and abdomen. . . arms, hands. . . let go. Note any tightness in shoulders and neck. . . as it melts away feel your face relax, smooth out. Whenever you feel distracted by body or mind tensions throughout this journey, remember to just calmly note the interference and let it pass on, away from you.

As your mind becomes clearer and clearer, feel it becoming more and more alert. In the depths of your brain, a brilliant light begins to glow. Sense this happening. The light grows brighter and more intense. This is the mind/body communication center. Breathe into it. Energize it with your breath. The light is powerful and penetrating, and a beam begins to grow out of it. The beam shines into any area of your body you choose. It is your search light, your bridge into the glorious mysteries about to unfold. Practice shining it into your body. Sometimes this is easier to do than other times. Just allow it to happen.
The immune journey begins deep inside your bones. So take this most intelligent beam of light and shine it into a long bone—a leg bone perhaps. Penetrate deeply into the marrow. There is the birthing center for all your blood cells. Just imagine if you can, feel if you can, billions of young cells being born... many kinds, each with a task to nurture and protect you. As we go through this exercise, we will focus on a few types of cells believed to be vital to defending you. They have names: Neutrophils. Macrophages. T-cells. B-cells. Natural Killer Cells. One by one, we'll shine the light on them, watching them work to guard and protect and remove all alien, and enemy substances, all old and discarded cells which no longer serve you.

The most numerous cells are called neutrophils. They are called phagocytes because they eat or engulf the enemy in a most ingenuous way. Imagine them maturing, moving into your blood stream, floating, ever alert for a call to work in your defense. As a call warns them of an invader, they become exceedingly alert. No longer swimming freely, millions, billions of them sense the danger and move methodically, directly, preparing for attack. The blood vessels become sticky, attracting the neutrophils to their surfaces. The small openings in the blood vessel walls dilate in the vicinity of the attack. Imagine the neutrophils being attracted to the walls. They, themselves have gotten stickier. They move quickly along the vessel walls until they know with absolute certainty that the invader is near. Now, they extend a small foot, a pseudopod, into the walls, and changing shape, they slither through, entering your tissues. Moving forward now, as they approach the invader, they send another small foot out, surrounding the enemy, shooting caustic chemicals into it, wearing it thin. The enemy is halted, destroyed, may even explode into harmless bits. Imagine this happening, constantly, protecting you from the dangers of living in a hostile world. Billions and billions of neutrophils born every day.

Now, shining the beam of light back into the bone marrow, imagine the macrophages, or the giant eaters. Fewer of them, but long-lived, these phagocytes have special talents. As they mature, watch them move into tissues and organs and blood. They line the walls of lungs and liver. Waiting, surveying, watching, every ready to move. Bacteria, viruses, yeast cells, even cancer cells trigger the alarm. As the warning of an invader sounds, the macrophages swell up, becoming large and powerful. They may even mesh together with other macrophages, moving rapidly in a powerful, connected flank. They, too, reach out for the enemy, lassoing it with their pseudopods, they bring the
invader into their body, injecting it with potent enzymes. With lightning speed, less than 1/1000th of a second they consume an enemy. What they can't destroy, they encircle and preserve, protecting you from its dangerous acts. The macrophages are also your scavengers. They can and will digest anything and everything in your body that you no longer have use for—old red blood cells, and damaged tissue, the remains of battles past, bits of bone that have been replaced by new and vigorous cells. Macrophages prowl and cleanse into every nook and crevice of your body. Imagine this happening for a moment.

The macrophages and neutrophils are non-specific, non-discriminating in their attack and clean up activities. Other cells, the lymphocytes, or the T cells and the B cells, have an assigned function, a target that spend their entire lives stalking. It might be a special virus, or bacteria, or cancer cell or other foreign tissue. Let's look at these cells in action.

Shining the beam, again, into the bone marrow, observe the T-cells being born. Millions—more than you could possibly count--move from infancy to adolescence each minute. The T-cells will each be given a special task as they are processed in the thymus gland. Shine your imaginary light into the middle of your chest--here is the thymus gland. Feel it pulsating with energy. Watch, now, as the adolescent t-cells flow in rapidly, each touched with a spark of wisdom, each challenged with a mission. Some will be killers, assassins with a single target. Others will be helpers for your B-cells, still others will be suppressors, signaling that the battle is over, protecting your body from excessive immune activity. Imagine these, the killers, the helpers, the suppressors, maturing quickly and with glorious specificity in your thymus. When each has been imprinted, they leave the thymus to go about their tasks. The T-cells keep a wakeful vigil in your lymph nodes, your spleen, other lymph tissue. There, listening for the call to arms, they can also reproduce themselves if needed.

Back in the bone marrow once again, the B-cells are highlighted by the beam. They mature and move into the lymph tissues and blood, waiting for the encounter. Each has a specific enemy to protect you from, and they can wait patiently for years, patrolling, waiting and watching. When the encounter finally takes place, the B-cells change, like cocoons into butterflies, becoming a plasma cell. The plasma cells manufacture magic bullets, which are proteins called antibodies. Each antibody is like a guided missile—it moves directly for its target, and hooks on to it, like a key in a lock. The enemy is paralyzed and its surface
damaged. Other chemicals are liberated in the blood by this action, and they burn holes in the wall of the enemy, causing an explosion. The B-cells also clone themselves, creating whatever number is needed to do pure and perfect battle in your defense.

One last time, peering into the birthing center of the immune system, the light shines onto Natural Killer Cells. The Natural Killers are a wondrous defense against cancer. Cancer cells, like viruses and bacteria, are not especially unusual in the human body. The body simply recognizes them as invaders, and sends out the forces of defense. Only in most unusual circumstances, like when the cancer cells wear a disguise, does the immune system fail to find them. Watch now, as the Natural Killer Cells are born and move into the blood stream. Take the light and shine it on one cell, and watch its action. Ever alert, it senses a cancer cell in the vicinity. Moving at lightning speed, it collides into the cancer cell. Its mere touch paralyzes the cell. Fingers of the Natural Killer Cell reach into the cancer cell, already paralyzed, develops blisters, peels like an orange. Its cellular matter dissolves leaving only harmless skeletal remains. The Natural Killer Cell, alive and well, continues its alert patrol of your body.

Let us go over the immune process one more time, sensing all the immune cells working in a superbly coordinated team of defense. In the bone marrow billions of cells are being born, in exactly the numbers and combinations you need to stay healthy. As the white blood cells mature, each develops a remarkable intelligence. Each has a dedicated task. Witness them moving out of the bone marrow, into blood and tissues; watching for the opportunity to protect and cleanse you. Feel, if you can, in your body, the presence of these magnificent guardians. Imagine, now, the neutrophils and macrophages swiftly and accurately seeking out the invader, engulfing it, digesting it. The T-cells, sparked with energy from the thymus begin their specialized mission. Some recognize the invader and attack it; others help orchestrate the immune system, and still others decide when the action is done. Now the B-cells with their magic bullets, ready to defend and multiply if needed. And finally, the Natural Killer Cells, attaching themselves to cancer cells, immobilizing them, using their special chemicals to remove all substance, all danger from the cancer cells.

As you finish this imagery exercise, sense the power and dedication of these white blood cells, your immune system. These dedicated warriors, this system of defense, have a universe of their own—that universe is you. By relaxing, as you have just done, and concentrating on this
process, you have actively participated in keeping yourself healthy.

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APPENDIX I

PSYCHOTHERAPY GROUP SYLLABUS
SESSION ONE: Introduction to Stress Management
Physiology of Stress and Relaxation Responses

I. INTRODUCTION
A. Patient Count Sheets
B. Health Psychology Overview
C. Introduction of Self and Schedule of Group
   1. Review topics included in group
   2. Normalize that pts already know much about managing stress
   3. Introduce self and reasons for participation in the group with members doing the same:
      WHAT ABOUT A STRESS MGMT GROUP WAS APPEALING? EXPECTATIONS? HOPES? ANTICIPATIONS?

II. INITIATE GROUP
A. SIGNS OF STRESS = Theme for the day
   1. List 2-3 ways of recognizing when someone is stressed (self or others)
   2. Ask group: WHY WOULD WE BE INTERESTED IN RECOGNIZING STRESS IN SELF OR OTHERS?
      Acknowledge idea that sooner you recognize it, the earlier you can manage stress.
   3. List SIGNS OF STRESS (at top of board) organizing into three columns. Have pts guess titles of categories and generate more items in each column

<table>
<thead>
<tr>
<th>PHYSICAL</th>
<th>EMOTIONAL</th>
<th>BEHAVIORAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>headaches</td>
<td>anxiety</td>
<td>yell</td>
</tr>
<tr>
<td>heart pounding</td>
<td>irritability</td>
<td>sleep alot</td>
</tr>
<tr>
<td>indigestion</td>
<td>worry</td>
<td>Smoking/drinking</td>
</tr>
<tr>
<td>clammy hands</td>
<td>depression</td>
<td>overeating</td>
</tr>
</tbody>
</table>

4. ARE THESE COLUMNS SEPARATE? HOW DO THEY INTERACT?
5. Handout: Early Warning Signs

B. EMOTIONAL RESPONSES HIGHLIGHTED
   1. ARE ALL THESE EMOTIONAL RESPONSES BAD?
   2. HOW MUCH EMOTION IS THE RIGHT AMOUNT?
   3. HOW CAN WE KNOW IF EMOTIONAL RESPONSE IS HEALTHY AMOUNT?
   4. Discuss degree of emotion: Introduce 0-10 scale for intensity of emotional response

0=none, 10=consumed by it, 3-7=optimal
5. Research on anxiety level and test performance shows that moderate level of anxiety led to best test scores.

6. Intense emotions impact physical well-being and behaviors

7. Distribute Homework: Monitoring Responses to Stress

BREAK

III. Elaborate on Physical Responses to Stress
A. Physio of Stress: brief overview

1. Two branches of nervous system regulate the vital organs
   - Sympathetic (stress response, emergency reaction system, or fight or flight) and Parasympathetic (relaxation response)
   - Prehistoric Cavemen in response to life-threatening stressor evoked stress response. Currently, we continue to experience stress R

WHAT DO WE EXPERIENCE PHYSICALLY IN THE STRESS RESPONSE?

<table>
<thead>
<tr>
<th>VITAL ORGANS</th>
<th>STRESS RESPONSE</th>
<th>RELAXATION RESPONSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart</td>
<td>rate, stronger</td>
<td>rate, milder</td>
</tr>
<tr>
<td>Lungs</td>
<td>rapid, shallow</td>
<td>slower, deeper</td>
</tr>
<tr>
<td>Stomach</td>
<td>digestion stops</td>
<td>digestion resumes</td>
</tr>
<tr>
<td>Muscles</td>
<td>tighten</td>
<td>loosen, relax</td>
</tr>
<tr>
<td>Sweat glands</td>
<td>perspiration</td>
<td>normal</td>
</tr>
<tr>
<td>Adrenal glands</td>
<td>flow, stimulates</td>
<td>normal</td>
</tr>
<tr>
<td>Immune system</td>
<td>suppressed</td>
<td>normal</td>
</tr>
</tbody>
</table>

4. Use Examples: What happens physically when you see someone run a stop sign?

5. DOES THIS WORK FOR US OR AGAINST US?
   IS THE STRESS RESPONSE ALWAYS UNHEALTHY?
   WHAT INCIDENTS DOES THE GROUP HAVE IN WHICH STRESS RESPONSE WAS NECESSARY
   THEN WHEN IS IT UNHEALTHY? (when frequent and of long duration)
   DO SOME OF US GET INTO A STRESS RESPONSE EVEN WHEN "LIFE OR DEATH SITUATIONS" ARE NOT IMMINENT? EVEN AHEAD OF TIME?

6. HANDOUT: Potential Stress Related Disease
IV. RELAXATION
A. WHAT DO YOU DO TO HELP YOURSELF RELAX? (list on board)
B. How often should we relax? Are relaxing activities sometimes stressful?
C. What can we do to reduce stress response incidence?
D. Diaphragmatic Breathing Exercise
E. Handouts: Monitoring Relaxation
   Diaphragmatic Breathing
   Bibliography
STRESS MANAGEMENT GROUP

Session Two: Stressors - Individual Differences
ABC's of Emotional, Behavioral, and Physical Responses

I. REVIEW PREVIOUS SESSION
A. Quiz
1. WHAT ARE 3 GENERAL CATEGORIES OF RECOGNIZING STRESS? (Physical, Emotional, and Behavioral)
2. What is an example of each of these three types of reactions if, for example, you brought a car in to be fixed and it broke down on the way home from the service station?
3. What would be a healthy emotional response to this incident be? To what degree of intensity?
4. T or F: The fight or flight response is good for animals but it does little good for humans?
5. How does our heart function differently in the stress response than in the relaxation response? Our lungs?
6. What can we do, then, to help ourselves relax?
7. In order to do any good we need to do a minimum of how many hours straight relaxing?

B. Review Homework Exercise: Monitoring Stress
1. Discuss incidents that group may have listed and review physical, emotional, and behavioral responses to the incident. Leader may begin by sharing own incident and responses.
2. Ask: to what degree of emotional response was experienced? (reinforce idea that emotions don't stay at a particular level, we keep them at a specific level)
3. What did group members do to relax since last session?

II. Stressors: Individual Differences
A. Write down 2-3 things we get ourselves stressed about or that we perceive others to get themselves stressed about. WHAT ARE SOME OF THE STRESSORS IN OUR LIVES?
1. List items on the board grouping by categories with general headings:

SOCIAL  OCCUPATIONAL  FINANCIAL  HEALTH  FAMILY
2. What is one word that sums up what we can find stressful? ANYTHING (write across board of responses)

3. Do we always get ourselves stressed the same amount to each of these stressors?

4. Does everyone get stressed to the same degree for the same stressor?

5. WHO or WHAT DETERMINES WHETHER OR HOW MUCH THESE THINGS ARE STRESSFUL??? (We as individuals regulate how stressful we find things)

BREAK

B. To illustrate individual differences in stress responses, hand out LIFE EVENTS RATING.

1. Record ratings from 1-10: how stressful you find each event. Do not use the same number twice. (i.e. rank order from least to most stressful with 1 being least stressful and 10 being most stressful).

2. Record group members ranges of responses on the board.

   Divorce
   Performance Reports/Final Exams
   Dental Work
   Death of a spouse
   Moving
   Trouble with boss
   Retirement
   Getting married
   Dieting
   Sexual difficulties

3. Do these results determine specifically how stressful each of these things can be?

4. Would these events be rated the same tomorrow?

5. Would they be rated the same way by the same individual everyday?

6. What do these results tell us? What can we conclude about WHO OR WHAT DETERMINES HOW STRESSFUL WE BECOME IN RESPONSE TO EVENTS?

7. Doesn't a 10 depend upon the interpretation of the situation? The attitude of the individual? Events don't make one stressed, it is our perception.
8. There tends to be a MYTH in our society that the situation makes us stressed... In reality, it is ourselves that determine/interpret the stress. WE ARE RESPONSIBLE FOR THE STRENGTH OF OUR REACTIONS. (Process this with group)

III. [ERASE BOARD] Perhaps a simpler explanation
A. Present ABC Model: We tend to think something happens at A, and we respond with an emotional reaction/consequence at C. In actuality there is an intervening belief or thought B that precedes the C.

1. Pass out ABCs of Emotional, Behavioral, and Physical Responses
   a. Activating Event (Incident)
   b. Beliefs (Thoughts, Interpretations)
   c. Consequences (Responses which can be physical, emotional or behavioral)

2. Illustrate with example from previously discussed homework OR own example OR the following:
   a. Incident = You are rushing to a meeting and become stuck in a traffic jam at the 410 1-10 interchange.
   b. GENERATE CONSEQUENCES WITH THE GROUP: PHYSICAL, EMOTIONAL AND BEHAVIORAL
   c. THEN, PROCESS BELIEFS WITH THE GROUP:

B. Introduce difference between ALARMING vs REASSURING BELIEFS. What is an alarming belief? A reassuring belief? Use example above to discuss.
   1. Pass out CARTOON to assist with illustration.
   2. Have group generate alarming and reassuring beliefs for each occupant of cars in cartoon.

3. Pass out HOMEWORK: Identifying the ABCs of stressful Situations: Record physical, emotional, and behavioral responses to WORST CASE of scenario represented. Record degree of emotional response and generate beliefs between A and C.

C. Next week, we'll discuss Alarming vs. Reassuring Beliefs more thoroughly, focusing on specific types of beliefs: Expectations, Predictions and Evaluations and how to begin managing stress by moderating beliefs.
STRESS MANAGEMENT GROUP

Session Three: Alarming vs. Reassuring Thoughts

I. Review Previous Session
   A. Quiz
      1. What are the stressors? Give three examples.
      2. T or F. Certain events, like a person breaking in while we are waiting in a line, always makes us feel a certain way to a certain degree?
      3. What is the ABC model for understanding our responses to situations?
      4. Does A cause C?
      5. Who or what determines how stressed we become?
   B. Review Homework: Identifying ABC of Stressful Situations
      1. Take worst case scenario for each of the incidents.
      2. For each, generate the possible physical, emotional, and behavioral consequences to the scenario.
      3. Generate the potential beliefs preceding Cs.

II. Alarming vs. Reassuring Beliefs
   A. Discuss Alarming vs. Reassuring Beliefs
      1. What makes a belief an alarming one? (an alarming thought alarms the system and stimulates extreme reactions). What physical, emotional, and behavioral responses are we likely to experience with alarming thoughts?
      2. What are reassuring thoughts? (beliefs which calm the system and assist us in maintaining moderate responses).
      3. What is important about recognizing alarming vs reassuring thinking? (If we recognize alarming thoughts, we can begin to manage stress by managing our reactions and beliefs)
      4. New definition: Stress = Demand + Interpretation + Response. Let's focus more closely on these interpretations (ie beliefs underlying reactions).
B. Look more closely at the kinds of thoughts we have regularly and what we can do to increase our skills at using reassuring thoughts and decrease use of alarming ones. Most common for us to have three kinds of thoughts: Expectations, Predictions, and Evaluations/Ratings.

1. **Expectations** refer to the expectations or standards we have for ourselves, others, or general groups of people.
   a. What degree of perfection do you demand from yourself?
   b. How many mistakes will allow yourself to make in a day?:
   How you answer these questions indicates what standard or expectation you have for yourself or others and can influence the degree of stress response you set yourself up for.
   c. For example: If your boss informs you that you have been selected for a special project due in two days, what expectations might you have for yourself?

2. **Predictions**: what we forecast will happen in the future with regard to certain events. We often make guesses about what will happen next and base decisions/actions on these guesses. What might be some predictions we would make about the project the boss just handed us?

3. **Evaluations/Ratings**: How we evaluate or rate an event or person on a scale from "awful" to "wonderful".
   a. What influence does media have on this tendency?
   b. Often hear people rated as "good" or "bad". Are all people good/bad all the time? Can actions be independent of a person's characteristics?
   c. If we evaluate others in extremes, how then do we rate ourselves and what is the potential liability? (self-deprecation, guilt, depression)
   d. What evaluations might we make of our boss in the above example? Of ourselves?
C. Discuss common mistakes or certain words we use in alarming expectations, predictions, and evaluations that we can begin to watch for.

1. Pass out **Alarming vs. Reassuring Expectations Handout** and review with group.
   a. Alarming expectations emphasize words used such as "must", "have to", "should", "need to", "can't" which characterize the rigid demands, lack of exceptions, desperate consequences if expectations not met.
   b. Reassuring expectations imply standards that are realistic and achievable with words such as "prefer", "would like", "wish", "want".

2. Pass out **Alarming vs. Reassuring Predictions Handout** and review with group.
   a. Alarming predictions are characterized by disastrous predictions of the future, catastrophizing, "what ifs", "suppose", "always", "never" which tend to lead to extreme reactions.
   b. Reassuring predictions include recognitions that we can only guess about the future, do not imply disaster, and may be accompanied by a statement of how we could cope or options we might have.

3. Pass out **Alarming vs. Reassuring Evaluations Handout** and review with group.
   a. Alarming evaluations are characterized by extreme ratings: Draw a line across the board with "awful" at one end and "wonderful" at the other. Have group generate other extreme words that illustrate ratings including terrible, horrible, disaster, followed by generating more moderate ratings.
   b. Reassuring evaluations may include words such as unfortunate, disappointing, frustrating rather than awfulizing.

D. Pass out **Cartoon: Waiting for the bank teller**.

1. Have group generate alarming expectations, predictions, and ratings for characters in cartoon.

2. Have group generate more reassuring expectations, predictions, and ratings for characters.
III. Homework: Pass out Recognizing Alarming or Unhealthy Self-Talk Handout

A. Want group members to begin recognizing and changing their own alarming beliefs: expectations, predictions, and evaluations.

B. Pass out Stress Management Assignment: Identifying Self-Talk and encourage group to record ABCs with focus on identifying alarming expectations, predictions, and evaluations, and changing alarming thoughts to reassuring ones.
STRESS MANAGEMENT GROUP

Session Four: Assertion Training
Review and Evaluation of Group

I. Review previous session
A. Quiz
1. True or False: Thinking you must be totally competent and perfect will have no noticeable effect on your response to a stressor (such as being asked to lead a stress management group)?

2. True or False: How stressful we find something totally depends on the circumstances of a situation? If false, who or what does determine this?

3. What is the ABC model for understanding stress?

4. Does A cause C? If not, what else might determine C?

5. What is an alarming thought? What is a reassuring thought?

6. Give an example of an alarming prediction or an alarming evaluation.

7. How would you change the alarming thought "I must never make a mistake" into a reassuring thought?

B. Review Homework: Identifying Self-Talk
1. Ask group members for examples of stressors encountered during the week?

2. What were physical, emotional, and behavioral consequences to these stressors?

3. What were examples of alarming predictions, evaluations, and expectations related to the stressor?

4. How could these alarming thoughts be modified into reassuring thoughts?

II. Introduce ASSERTIVE RESPONDING
A. 80% of stressors in daily life involve interactions with others

1. One of the ways we can reduce stress is to develop skills for communicating with others.

2. Assertive responding can enhance our communication and increase the chances that others will consider our preferences in an interpersonal interaction.
3. What is assertiveness?
   H: Honest
   A: Appropriate (time and place)
   R: Respectful
   D: Direct

4. Synonym for assertiveness may be tactful.

III. Assertive vs Non-assertive Aggressive Communication
   A. How would you describe Non-assertive or Passive responses to others?
      Dishonest
      Indirect
   B. How would you describe Aggressive responses to others?
      Inappropriate
      Disrespectful
   C. If someone in the commissary cut in front of you in line what would an example of a non-assertive response be? An aggressive response? An assertive response?
   D. Notice that what we are describing is responses NOT people—the particular response at a particular time may be described in these ways. No one person is assertive, non-assertive, or aggressive all the time.
      1. When might one choose to be non-assertive, for example?
      2. Notice that assertive communication is a skill to be learned and practiced, not something that comes naturally or innately.
      3. Hand-out: Types of Communication Responses

   A. Hand-out Simple Assertive Response
      1. Review with group members
      2. Have group members read examples aloud
   B. Hand-out Empathic Assertive Response
      1. Review with group members
      2. Have group members read examples aloud
   C. Hand-out Confrontive Assertive Response
      1. Review with group members
      2. Have group members read examples aloud
D. **Hand-out Assertive Training Assignment: Composing Responses**

1. Work through first example with group
2. "You have been patiently waiting for a car to pull out of a parking spot at WHMC when another car pulls into the spot ahead of you."
4. Suggest that group members complete homework on their own.

V. **REVIEW of GROUP**

A. Generate discussion about the progression of the group

1. Questions about any of the previous sessions?
2. Which session was most useful? The Stress Response, Individual Differences in Responding to Stress, The ABCs of Managing Stress, Assertive Responding?
3. How will group members maintain gains and continue to manage stress? (Remind them of the Stress Management II group on the second Monday of each month at 1500 hours, encourage them to review homework assignments, read from Bibliography, follow-up as needed with provider in BHP).
4. **Hand-out Group Evaluation Sheets** and say good-bye and thanks for participation.
REFERENCES


