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The Impact of a Stress Management Training Program on Symptoms of Fibromyalgia

Robert J. Sheppard
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THE IMPACT OF A STRESS MANAGEMENT TRAINING PROGRAM ON SYMPTOMS OF FIBROMYALGIA

by

Robert J. Sheppard

A Dissertation
Submitted to the
Faculty of The Graduate College
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THE IMPACT OF A STRESS MANAGEMENT TRAINING PROGRAM ON SYMPTOMS OF FIBROMYALGIA

Robert J. Sheppard, Ph.D.
Western Michigan University, 1992

Fibromyalgia is a noninflammatory rheumatic disorder characterized by musculoskeletal pain, nonrestorative sleep, and mood disturbance. Emotional stress is frequently reported as a factor that exacerbates symptoms. This study was designed to assess the impact of stress management training on perceived stress and fibromyalgia symptoms. Four female subjects with fibromyalgia participated on an individual basis in a 10 week stress management training program, which was administered in the fixed sequence of training in self-monitoring, relaxation, cognitive behavioral skills, and assertion. The effects of the training on self-report measures of perceived stress, pain, functional disability, sleep disruption, daytime fatigue, and depression were assessed using a multiple baseline across subjects design. It was hypothesized that stress management training would produce clinically significant improvements across these variables.

Two subjects displayed notable decreases on measures of stress, pain, and depression. The other two subjects displayed no sustained decreases on these measures. None of the four subjects displayed sustained reductions on measures of physical disability, sleep disruption, or fatigue. These findings offer qualified support
for the efficacy of this stress management training program in decreasing stress, pain, and depression for some fibromyalgia patients.

The question remains as to whether specifically targeting stress was the key to the positive changes observed in the two subjects who responded to treatment, because one of these subjects displayed decreases in depression before her stress level decreased. The wide range of techniques used in the training program may have directly impacted pain and depression, rather than pain and depression decreasing as a secondary response to diminished stress. Subject characteristics were examined in an attempt to explain the differences in response patterns between the responders and nonresponders. Implications for treatment strategies were discussed in light of the qualified support of the hypothesis.
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The impact of a stress management training program on symptoms of fibromyalgia

Sheppard, Robert J., Ph.D.

Western Michigan University, 1992
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Robert J. Sheppard
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CHAPTER I

INTRODUCTION

Description of Fibromyalgia

Definition and Prevalence

Fibromyalgia is a noninflammatory rheumatic disorder involving the soft tissue that is manifested by musculoskeletal pain and aches, as well as specific body areas of exaggerated tenderness (Ahles, Muhammad, Riley, Bradley, & Masi, 1984; Bennett, 1986; Rimon & Laakso, 1985). While the disorder has been referred to as "fibrositis" in the past, Payne et al., (1982) observed that this term is a misnomer, as the disorder is not characterized by inflammation. Ahles et al. (1984) clarified that the term "primary fibromyalgia syndrome" refers to the condition in which there is no alternative underlying cause revealed in the etiology or in laboratory test results. For the purpose of this study, and remaining with the conventional use in the literature, the term "fibromyalgia" will be used to refer to the form of the disorder in which no other identifiable pathogenesis is found.

While the prevalence of fibromyalgia remains unknown, estimates range from 3 to 6 million Americans (Heins, 1988), to possibly 12.5 million Americans (Bennett, 1989a). While Wolfe's (1986) review of the literature suggested that 6% to 15% of
new patients in rheumatology practices are diagnosed to have the disorder, Bennett (1989a) reported that fibromyalgia is involved in 15% to 40% of referrals to rheumatologists. Despite these estimates, Campbell, Clark, Tindall, Forehand, and Bennett (1983) hypothesized that the disorder is often unrecognized in clinical settings. Fibromyalgia is more common in females, with men making up less than 10% to 15% of fibromyalgia patients (Heins, 1988; Jeanes, 1985; Wolfe, 1986). The age range of greatest prevalence is between 20 and 60 years of age (Campbell et al., 1983; Heins, 1988; Jeanes, 1985; Wolfe, 1986).

Symptoms

In the introductory section to their 1982 MMPI study of fibromyalgia patients, Payne and colleagues observed that fibromyalgia has been a controversial diagnosis since it was first recorded (as fibrositis) in 1904. They observed that physicians remained split over whether or not fibromyalgia was a valid organic diagnosis. While this controversy remains alive in the medical establishment today, mounting evidence reveals a unique constellation of symptoms which has led to the recognition of fibromyalgia as a defined clinical syndrome (Ahles et al., 1984; Bennett, 1986; Campbell et al., 1983; Moldofsky, Scarisbrick, England, & Smythe, 1975; Wolfe, 1986). Wolfe's evaluation of patients revealed 40% reporting localized areas of musculoskeletal pain, while 60% reported generalized pain. Related symptoms include an aching sensation (Ahles et al., 1984; Campbell et al., 1983; Wolfe, 1986) and stiffness, which is most prominent in the morning hours (Bennett, 1986; Campbell
et al., 1983; Hess, 1985; Wolfe, 1986). A cornerstone in diagnosing this disorder is the presence of a unique specific set of localized areas of exaggerated tenderness (Ahles et al., 1984; Moldofsky et al., 1975), which can be identified by the application of pressure. These areas are commonly referred to as "trigger points" (Rimon & Laakso, 1985).

Another cluster of symptoms includes sleep disturbance and fatigue. Nonrestorative sleep was reported by Campbell et al. (1983), Moldofsky et al. (1975), and Moldofsky (1976). Wolfe (1986) identified this as the experience of waking up still feeling tired. Chronic daytime fatigue was also cited as a common symptom (Bennett, 1986; Campbell et al., 1983; Hess, 1985; Moldofsky, 1976; Moldofsky et al., 1975).

Mood disturbance is a controversial diagnostic sign. This will be discussed in detail in the literature review section. Mood disturbance, such as depression and anxiety, was identified as a common symptom by Moldofsky and his colleagues (Moldofsky, 1976; Moldofsky et al., 1975; Moldofsky, Tullis, Lue, Quance, & Davidson, 1984). While Payne et al. (1982) described their sample of fibromyalgia patients as moderately depressed (based on MMPI scores), they did not see this symptom as prevalent enough to support its use as a differential diagnostic sign.

Fibromyalgia is often associated with other disorders, most notably irritable bowel syndrome and tension headaches. Campbell et al. (1983) found that 50% of the fibromyalgia patients sampled experienced irritable bowel disease symptoms and 55% experienced tension headaches.
Etiology and Course

The etiology of fibromyalgia remains unknown (Ahles et al., 1984; Bennett, 1986; Campbell et al., 1983; McGain, Bell, Francois, & Halliday, 1988; Smythe, 1972; Trout, 1968; Wolfe & Cathey, 1983; Wolfe et al., 1984; Yunus, Masi, Calabro, Miller, & Feigenbaum, 1981). Available evidence suggests it is not related to neuropathy or local pathology (Wolfe, 1986), and there are no consistently identifiable anatomic abnormalities (Smythe, 1979). There is some agreement that the etiology involves a systematic pain regulation dysfunction (McGain et al., 1988; Smythe, 1979; Wolfe, 1986). Fibromyalgia can occur secondary to other rheumatic disorders, such as rheumatoid arthritis (RA), lupus, or osteoarthritis (Bennett, 1986). That is, the fibromyalgia may be seen as essentially a byproduct of the primary existing disorder. However, Bennett noted that in many cases this may actually reflect a separate and distinct primary fibromyalgia disorder coexisting with another rheumatic disorder, rather than being an actual secondary disorder.

A number of physiological etiological factors have been hypothesized, including low back and neck stress (Smythe, 1980), defects of peripheral tissue (Campbell et al., 1983), viral infection (Heins, 1988), and microtrauma to muscle tissue (Bennett, 1989b). Moldofsky and his colleagues are developing a strong line of research which supports a non-REM sleep disturbance as an etiological factor (Moldofsky, 1982; Moldofsky & Scarisbrick, 1976; Moldofsky et al., 1975; Moldofsky et al., 1984).
Psychological factors have also been hypothesized to play a role in the etiology of the disorder. These hypotheses have been based primarily on indications of increased psychological disturbance in fibromyalgia patients compared to RA controls on the MMPI (Wolfe et al., 1984), retrospective self-report data on the relationship between psychosocial variables and the onset of symptoms (Wolfe, 1986), and anecdotal observations of the histories of fibromyalgia patients (Heins, 1988; Rimon & Laakso, 1985). These data fail to meet the more rigorous experimental standards often associated with medical research and adequately designed psychological research. In addition, as will be elucidated in the literature review section, there are also studies in which the association between fibromyalgia and psychological disturbance is less clear. Consequently, until research with more rigorous standards is carried out, the hypothesized role of psychological variables in the etiology of fibromyalgia must be viewed only as speculative at most.

It appears most likely that, as Bennett (1989b) concluded from his review of the literature, there is probably a combination of variables at work in the etiology of fibromyalgia, rather than there being a single causative factor. Bennett suggests that one should evaluate the possible influence of variables most relevant to each particular patient as an individual, such as physical trauma, microtrauma, stage 4 sleep disturbance, fatigue, effects of inactivity on muscle tissue, psychosocial stressors, and affective disturbance.

Wolfe (1986) found that 16% of the fibromyalgia patients sampled reported childhood onset of symptoms. Twenty-four percent of the fibromyalgia patients
sampled identified onset as occurring directly subsequent to some form of trauma. He reported that "emotional factors, such as 'stress,' 'emotions,' family change, and fatigue" (p. 8) were the most prominent events patients identified as being related to onset. Fibromyalgia is a chronic disorder within which the patient may experience periods of remissions and relapses (Bennett, 1986; Heins, 1988; Wolfe, 1986). Twenty-three percent of Wolfe's (1986) patients reported remissions of at least two months duration. Six percent reported repeat remissions. Hawley, Wolfe, and Cathey (1988) tracked fibromyalgia patients over the course of one year and found symptoms to be generally stable across that time period. There is no evidence that this disorder is degenerative over its course (Hess, 1985). Cathey, Wolfe, Kleinheksel, and Hawley (1986) found that 6.3% of the patients they studied were disabled by the disorder.

Modulating Factors

A number of factors have been reported to exacerbate or lessen fibromyalgia symptoms. Cold or humid weather may exacerbate symptoms, while hot or dry weather improves symptoms (Campbell et al., 1983). While the local application of heat may improve symptoms to some degree, Bennett (1986) reported that the benefit of such treatment is only transitory. Altered sleep physiology (Moldofsky et al., 1984) and fatigue (Campbell et al., 1983) have been found to exacerbate symptoms. The Campbell et al. subjects reported increased pain during morning hours. These subjects also reported that less pain was associated with periods of rest. While
increased exertion or exercise was associated with increased pain (Campbell et al., 1983), Jeanes (1985) suggested that immobility may also aggravate symptoms.

Tension and emotional stress are frequently reported as factors which exacerbate symptoms, particularly pain and fatigue (Bennett, 1986; Campbell et al., 1983; Moldofsky, 1982; Muller, 1987). Ahles et al. (1984) found a significant positive association between fibromyalgia and elevated scores on the Holmes Rahe Life Events Inventory (Holmes & Rahe, 1967). Fibromyalgia patients scored significantly higher on this scale of life stressors than did subjects from a matched normal control group and a group of RA subjects with a similar duration of pain symptoms. This association was strongest with a subgroup of fibromyalgia patients who showed more disturbance on the MMPI.

**Traditional Medical Intervention**

Physicians have attempted to treat fibromyalgia with medication. Campbell et al. (1983) found that 72% of their fibromyalgia subjects had been treated with narcotics, compared to only 18% of their general medical sample. However, pharmacotherapy offers some symptom relief for about one-half of fibromyalgia patients (Wolfe, 1986). There is growing agreement that, aside from facilitating sleep, medication may have little value in treating fibromyalgia (Bennett, 1986). Sleep medications may be helpful in diminishing symptoms to some degree by facilitating sleep (Bennett, 1986).
Pharmacotherapy found to be of little or no benefit includes local anesthetic injections (Bennett, 1986), nonsteroidal anti-inflammatory drugs (Bennett, 1986; Campbell et al., 1983), acetaminophen, salicylates, narcotics, and minor tranquilizers (Campbell et al., 1983).

There have been some favorable results with tricyclic antidepressants in decreasing symptoms (Bennett, 1986). Half of the fibromyalgia subjects given tricyclics in the Campbell et al. (1983) study reported some improvement in symptoms. Carette, McGain, Bell, and Fam (1986) carried out a double-blind study with a placebo control in which a tricyclic was given to fibromyalgia patients. There was no improvement at trigger points in either group. However, the tricyclic group displayed improved sleep patterns, decreased morning stiffness, and decreased pain analog scale scores in comparison to pre-medication measures. The placebo group exhibited no significant changes.

Holistic Medical Approaches

While tricyclic antidepressants appear potentially promising, physicians are increasingly turning their attention to environmental and lifestyle changes as the primary focus of treatment (Bennett, 1986). In addition to providing a thorough review of the literature on fibromyalgia, Wolfe (1986) evaluated 81 fibromyalgia patients. This evaluation included structured questionnaire interviews, physical examinations, and self-report assessments of pain, disability, and global health. Wolfe's fibromyalgia subjects reported that lifestyle changes, such as rest and
relaxation, were more helpful in decreasing pain than any other form of intervention, including medications. Bennett (1986) concluded from his review of the literature that modulating variables such as exercise, mobility, fatigue, and emotional stress may be more accessible and more amenable to intervention efforts in attempting to manage fibromyalgia symptoms, in comparison to a more traditional medical approach. He suggested that this perspective requires that the patient take on the role of active participant in his or her own treatment, rather than being a passive recipient of interventions. Bennett observed that this perspective also defines the physician's role as one of advocate, support person, educator, and trouble-shooter, in addition to prescribing medications to facilitate sleep.

While this approach has not yet been the subject of sufficient empirical investigation, several authors have made recommendations which are theoretically grounded in this holistic philosophy. Obviously, as Bennett concluded, this recent philosophy of treatment requires that patients become educated about this disorder and its modulating variables. Several authors, while not actually carrying out research, have nevertheless recommended that the fibromyalgia patient remain active and improve general physical fitness through a moderate exercise program (Bennett, 1986; Heins, 1988; Hess, 1985; Jeanes, 1985). Other recommendations with the same theoretical foundation include massage (Bennett, 1986), muscle relaxation training (Campbell et al., 1983; Rimon & Laakso, 1985), and behavioral changes which facilitate sleep (Hess, 1985).
Several of these same authors (Bennett, 1986; Hess, 1985; Jeanes, 1985; Rimon & Laakso, 1985), as well as the Arthritis Foundation (1986), have also recommended that fibromyalgia patients may decrease symptom exacerbations by reducing or eliminating stresses and tension in their lives. This recommendation may be viewed as having good face validity; however, it is only minimally supported in the literature. As Bennett (1986) observed in his review, very little has been done in the way of formal evaluations of stress management applications. In fact, the little support that there is has come out only after many authors made these recommendations. The primary current support for the recommendation of decreasing stress is in the findings of Wolfe (1986), in which subjects identified lifestyle changes such as rest and relaxation to be the most effective way to decrease pain. A recent review of the literature disclosed only one study that evaluated the efficacy of a relaxation stress management procedure with fibromyalgia patients. Ferraccioli et al., (1987) found that EMG–biofeedback training with fibromyalgia subjects resulted in decreases in muscle tension, pain, and stiffness for about two-thirds of the fibromyalgia subjects treated. This study, which did not contain a cognitive component, will be described in more detail in the literature review section.

Bradley (1989) found no published studies that evaluated cognitive behavioral therapy interventions with fibromyalgia patients in his review. However, in working with chronic pain patients, Turner (1982) found that a combination of relaxation training plus cognitive behavior therapy was more effective than relaxation training alone in managing pain. It remains to be seen if a stress management training
approach that includes cognitive behavior therapy would produce superior improvements in fibromyalgia patients than the improvements produced in the Ferraccioli et al. (1987) study. The current study included cognitive behavioral interventions in the stress management training package.

While sleep disturbance and daytime fatigue are associated with fibromyalgia, Ferraccioli et al. did not address these symptoms as dependent variables. Consequently, empirical evidence on the effect of stress management training on sleep disturbance and daytime fatigue in fibromyalgia patients remains nonexistent. The current study addressed this gap of information.

While mood disturbance has been identified as a common symptom associated with fibromyalgia, Ferraccioli et al. simply identified depressed fibromyalgia subjects as nonresponders to EMG–biofeedback relaxation training. Since depression is believed to be a common symptom among fibromyalgia victims, this aspect of the syndrome should be addressed in treatment. The current study evaluated the hypothesis that a stress management training program that includes a cognitive behavioral component will improve the response rate across measured symptoms of depressed fibromyalgia patients.

It is possible that a decrease in pain severity could occur without a concurrent improvement in physical functioning. Conversely, functioning could improve as a result of the intervention with no concurrent decrease in pain severity. The current study evaluated the effect of stress management training on both pain level and measures of functional disability.
Purpose of the Study

Given the hypothesis that stress plays a modulating role in fibromyalgia symptoms, authors and practitioners have recommended that patients learn to better cope with stress in order to decrease symptoms. However, the only evidence that a stress management intervention is associated with some decreased symptoms in some fibromyalgia patients is isolated to the Ferraccioli et al. (1987) study. Given this limited support, the summary question posed by the current study is as follows: Will a stress management training package produce clinically significant decreases in the symptoms of fibromyalgia? Given the assumption that stress is a modulating factor in fibromyalgia, the hypothesized answer is that stress management training will produce decreases in symptoms. In summary, it is hypothesized that stress management training will result in clinically significant improvements in measures of (a) perceived level of daily stress, (b) pain, (c) functional ability, (d) sleep patterns, (e) daytime fatigue, and (f) depression.

The knowledge base regarding the impact of stress management training on symptoms of fibromyalgia is very limited at this time. It would be premature to attempt to evaluate the impact of one specific component of stress management training at present. Consequently, the current study focused on the impact of an integrated package stress management training program on fibromyalgia symptoms. Additional studies may play the role of ruling out unnecessary training components and identifying critical components.
CHAPTER II

REVIEW OF RELATED LITERATURE

The Theoretical Basis of Stress, Pain, and Illness

Definition of Stress

Stress may be defined as an individual's physiological and psychological reactions to stimuli which are perceived as threatening to the individual's physical or psychological well-being (Krantz, Contrada, Hill, & Friedler, 1988; Lazarus, 1966; Lipowski, 1977). These reactions may also be triggered by stimuli that signal the need for change or adaptation (Daly, 1988). A number of physiologic stress reactions have been identified. These have been summarized (Catalano, 1987; Daly, 1988; Lipowski, 1977) as including increased heart rate, increased blood pressure, peripheral vasoconstriction, increased respiratory rate, increased muscle tension, increased perspiration, increased gastrointestinal acid secretion, decreased digestion, and decreased sexual response. In the endocrine system, the adrenal gland increases output of epinephrine and norepinephrine (Brantley, Dietz, McKnight, Jones, & Tulley, 1988; Vaernes, Ursin, Darragh, & Lambe, 1982; Ward et al., 1983).

This wide range of physiological responses clearly shows that stress has a widespread and significant physiological impact. As Lipowski (1977) and Catalano
(1987) observed, these physiological reactions have the potential to threaten health when they are prolonged. Examples of medical disorders shown to be stress related include recurrent genital herpes (Longo, Clum, & Yaeger, 1988), coronary heart disease (Krantz et al., 1988), spasticity and involuntary movement disorders (Middaugh, 1982), headaches (Kottke, 1971), and low back pain (Feuerstein, Sult, & Houle, 1985).

**Psychological Theories of Stress and Illness**

Psychological factors play a direct or indirect role in a number of physiological disorders. Stress plays a particularly important role, probably due to the wide range of associated physiologic reactions. Since these reactions are modulated by an individual's appraisal of a potentially stressful event, cognitive factors can play a modulating role in physiological disorders.

Lipowski (1977) proposed that the effect of a stressful stimulus can be modulated by the individual's coping capacity and cognitive appraisal of the event. These appraisals and coping tactics can determine the individual's subsequent emotional response, such as anxiety or depression. These emotional responses directly influence physiological responses, and influence health indirectly via the individual's behavior. For example, a depressed individual may emit a decreased activity level which exacerbates an illness, such as when depressed cardiac or arthritic patients do not participate in activities designed to maintain or improve their physical status.
Beckham, Gustafson, May, and Annis (1987) utilized Bandura's (1984) social learning model and Lazarus' (1966) cognitive coping model to further explain the relationship between stress, cognitive appraisal, and illness. They reported that Lazarus proposed stress and illness were linked by an individual's cognitive appraisals of events. That is, one's perceptions and appraisals of daily events mediate reactions to those events. For example, appraising an event as a threat may produce physiological stress responses, while not appraising the same event as threatening would not lead to stress responses. Lazarus proposed that these appraisals could function as predictors of health outcome. Beckham et al. (1987) observed that Lazarus' approach also incorporated what Bandura (1984) would refer to as reciprocal determinism. Reciprocal determinism refers to the process in which one's beliefs and subsequent actions influence one's environment, while environmental events concurrently shape one's beliefs and actions. In a similar manner, Lazarus suggested that while cognitions play a role in determining somatic outcomes, somatic events concurrently shape one's cognitions and coping actions. For example, one fibromyalgia patient may experience a flare-up of symptoms and appraise this flare-up as an extremely disturbing or threatening event. The response may be increased autonomic arousal, increased muscle tension, and a cessation of attempts to manage the symptoms. Another fibromyalgia patient may assess the same flare-up as a normal event related to the illness, and continue constructive attempts to manage symptoms.
There is support for the notion that relatively small and frequent daily stressful events have as much or more of an impact on physical and psychological health as major life stressors. Holmes and Rahe (1967), in a benchmark article, provided some empirical support for the conclusion that major life events (such as the death of a loved one, job change, marital status change, etc.) were important predictors of detrimental health status. However, as Kanner, Coyne, Schaefer, and Lazarus (1981) observed, subsequent research indicated that these major life events were only weakly correlated with health status (Rabkin & Struening, 1976). More recently, as Brantley and his colleagues pointed out (Brantley et al., 1988; Brantley, Waggoner, Jones, & Rappaport, 1987), researchers have suggested that relatively minor and more frequently occurring stressors may also have a significant impact on physiological and psychological health status (DeLongis, Coyne, Dakof, Folkman, & Lazarus, 1982; Kanner et al., 1981; Lazarus, 1984; Lazarus, DeLongis, Folkman, & Gruen, 1985; Monroe, 1983). For example, DeLongis et al. (1982) found that health outcomes were significantly related to the intensity and frequency of daily hassles. They suggested that major life events may be significant primarily because they disrupt daily activities, rather than focusing on their impact as one single event. Brantley et al. (1988) found that minor stress was associated with higher endocrine levels. Kanner et al. (1981) demonstrated that minor stressors, identified as irritating and frustrating demands that occur in daily interactions with one's environment, were more potent predictors of psychological symptoms than were measures of major life events, such as those identified by Holmes and Rahe (1967). Gannon and Pardie (1989) found that
the number of daily stressors proved to be good predictors of physical symptoms for both men and women. Knowing the chronicity and controllability of these stressors further enhanced predictability of symptoms for women, although not for their male subjects.

Longo et al. (1988) evaluated the impact of stress management on recurrent genital herpes, a disorder identified as related to stress. Their intervention package consisted of education on the disorder, identification of stressors, relaxation training, imagery, and problem solving training. This treatment group was compared to social support and waiting list control groups. The social support control explored interpersonal conflicts without stress management training. Six weekly 90-minute groups were held. While there were no pre-treatment group differences, the stress management group showed fewer and shorter episodes of herpes, and less symptom severity at post-treatment in comparison to the two control groups. The stress management group also evidenced significantly less depression at post-treatment in comparison to the control groups, as measured by the Zung Depression Scale (cited in Longo et al., 1988).

Theories of Stress and Pain

Pain is identified by researchers and clinicians as the most consistently reported symptom associated with fibromyalgia. Stress is a variable that is hypothesized to mediate the symptom of pain in fibromyalgia patients. The "Stress-Pain Hypothesis," as described by Keefe and Gil (1986, p. 778), proposes that
stressful events induce autonomic arousal and may increase muscle activity. This arousal and increased muscle activity produces pain and may also produce emotional responses which further increase stress, thereby completing the cycle. A related model is the "pain–spasm–pain cycle" (Catalano, 1987, p. 20). According to this model, individuals tend to tense muscles as a reaction to pain. Prolonged muscle tension decreases blood flow to the muscle tissue, which in turn maintains or exacerbates pain (Daly, 1988; Turk & Rudy, 1986). Pain may also prompt decreased activity, which enhances this tension–pain cycle (Turk & Flor, 1984). It has been hypothesized that psychological stress may play a role in the development of trigger points through such processes (Catalano, 1987; Turk & Rudy, 1986).

Cognitive variables are likely to play a role in this tension–pain process. Turk and Rudy (1986) reported that there is support for the concept that pain is both a perceptual and sensory phenomenon in which cognitions, evaluations, emotions, and motivational factors play a role (Melzack & Casey, 1968; Melzack & Wall, 1965; Turk, Meichenbaum, & Genest, 1983). Other authors echo the viewpoint that psychological factors and perceptions influence the experience of pain (Beecher, 1972; Daly, 1988; Fernandez, 1986; Flor & Turk, 1988; Hill, Kornetsky, Flanary, & Wikler, 1952; Turner & Chapman, 1982). The interrelationship of cognitions, emotions, and pain is illustrated by Gross and Collins' (1981) report that there are physiological responses common to both anxiety and pain. Direct evidence of the role of stress is found in the Feuerstein et al. (1985) demonstration of a relationship between stress and low back pain severity. The interrelationship of cognitions, stress, and pain...
comes full circle with Catalano's (1987) observation that chronic pain may often function as a stressor itself.

Turk (1975) evaluated the impact of a "stress inoculation" package on pain tolerance in an ischemic arm test. This package consisted of imagery, relaxation training, and diversion. The stress inoculation group displayed increased pain tolerance, while a control group demonstrated no improvements. Turner and Clancy (1988) administered a similar stress management training program to subjects diagnosed with chronic low back pain. Their eight-week training program included relaxation training, imagery, and cognitive restructuring. This group was compared to a group receiving operant training and a waiting list control group. While the operant group showed faster initial gains, both treatment groups displayed significant and equivalent gains at a 12-month follow-up period in comparison to the control group on self-report pain measures, observer ratings of pain behavior, and a measure of physical and psychosocial dysfunction. In an earlier chronic low back pain study, Turner (1982) found that a combination of cognitive behavior therapy and relaxation training was superior to relaxation training alone.

The Role of Stress in Rheumatoid Arthritis

Rheumatoid arthritis (RA) and fibromyalgia are both rheumatic disorders associated with chronic pain. Leavitt, Katz, Golden, Glickman, and Layfer (1986) found that these two disorders share the properties of bilateral pain, multiple sites, and equivalent pain intensity. However, they found that fibromyalgia pain was less
localized to joints, was more widely dispersed over the body, and was associated with a wider range of qualitative pain reports in comparison to RA pain. Since RA has been more widely studied, the theoretical foundations of a link between stress and RA may be relevant to fibromyalgia as well.

Cognitive processes have been identified as a relevant variable in rheumatic disorders (Smith, Peck, Milano, & Ward, 1988; Turk & Rudy, 1986). Some of the hypotheses that link cognitive processes with rheumatic disorders appear to have a basis in Seligman's (1975) learned helplessness model. Seligman postulated that individuals who perceive a lack of control over their behavior and the consequences of their behavior may cease attempts to change their behavior and their environment. Bradley (1989) observed that individuals with rheumatic disorders are living with a disorder of uncertain cause and course, with no known cure. These individuals develop the expectation that "the pain, disability, and other consequences of their diseases are uncontrollable" (p. 132). As a result, they make fewer attempts to cope effectively with their symptoms and they reduce daily living activities. This may result in sleep disturbance, affective disturbance, and increased pain. Nicassio, Wallston, Callahan, Herbert, and Pincus (1985) developed and validated a self-report measure called the Arthritis Helplessness Index. The development of this scale was based on the assumption that the unpredictable nature of the exacerbations and remissions of RA symptoms was likely to produce a history for the patients in which the severity of symptoms was not contingent upon their attempts to control the arthritis symptoms. They suggested that this history may lead to beliefs of
helplessness and dysfunctional coping techniques, such as passive resignation. The Arthritis Helplessness Index scores, which measured the patients' perceptions of their inability to control their RA symptoms, correlated with measures of depression, anxiety, functional incapacity, and pain. Flor and Turk (1988) also found that perception of a lack of control on the part of arthritis patients was significantly related to self-reports of pain severity and disability. They also suggested that beliefs of helplessness in controlling pain may contribute to a cycle of pain and helpless behavior.

Other cognitive behaviors have also been identified as influencing RA symptoms, although these findings have been somewhat mixed. Flor and Turk (1988), in addition to their findings on perceived control, also found a significant relationship between pain-related self-statements and reports of pain severity and disability. In fact, disease-related variables did not significantly improve the amount of variance accounted for by cognitive variables alone. Smith et al. (1988) found that cognitive distortion was related to depression and self-report of disability in RA patients. However, cognitive distortion was not significantly related to a physical therapist's rating of the subject's levels of disability. Sawyer (1983) also found no relationship between self-perceived control and RA symptoms.

The Arthritis Foundation (1987) suggests that stress can trigger flare-ups of arthritis symptoms, and they recommend that relaxation be used to decrease muscle tension. This direct link between stress and arthritis symptoms does have some support in the literature. Sawyer (1983) found a relationship between the intensity of...
daily stressors and physician health ratings of RA patients. Gottschalk, Serota, and Shapiro (1950) found that RA subjects had greater EMG muscle tension levels in a resting state, exhibited stronger muscle tension responses to stressful stimuli, and took longer to return to baseline muscle tension levels after this stress response when compared to healthy and hypertensive subjects. A similar study by Moos and Engel (1962) produced similar results, although they found that these differences occurred only in symptomatic muscles.

Given the similarities between RA and fibromyalgia, some of the same processes could be at work in fibromyalgia. Bennett (1989b) noted that the process in which stress leads to muscle contraction, local ischemia, the accumulation of waste products, and increased pain, has been hypothesized as a possible dynamic in fibromyalgia pain. However, he also reported that Kraft, Johnson, and LaBan (1968) found no increased electrical activity in the muscles of subjects diagnosed with fibrositis.

While there is a paucity of data on psychological interventions with fibromyalgia, the literature does offer support for such interventions with other rheumatic disorders, particularly RA. While these interventions are described as pain management programs, they share many characteristics with stress management training. Cognitive behaviorally based pain management programs resulted in decreased pain levels for RA subjects in studies by Randich (1982) and McDaniel et al., (1986). The McDaniel et al. study was a particularly strong demonstration, since the experimenters relied on an objective pain behavior observation procedure in
assessing the impact of training, as opposed to self-report measures. O'Leary, Shoor, Lorig, and Holman (1988) trained RA subjects in relaxation, cognitive pain management, and goal setting. A control group was provided reading material on arthritis self-management. The cognitive behavioral treatment group displayed reduced pain, reduced joint inflammation, and improved psychosocial functioning in comparison to the control group.

Less dramatic improvements were found by Parker et al., (1988). RA patients were treated with a package program that included education about pain and arthritis, problem solving training, relaxation training, and social skills training. This intervention was compared to an attention placebo group and a control group. While the treatment group displayed significant improvements on a measure of coping skills, only minimal benefits were found on visual analog pain scores and other measures related to arthritis.

Bradley et al., (1987) refer to a group of studies in which biofeedback played a role in producing significant decreases in self-reported pain in RA subjects. These studies include Achterberg, McGraw, and Lawlis (1981), Burke, Hickling, Alfonso, and Blanchard (1985), Denver et al., (1979), and Mitchell (1986). Bradley et al. (1987) noted, however, that these studies contained methodological shortcomings, including a reliance on self-report measures and inadequate follow-up.

Bradley et al. (1987) carried out a study designed to account for these deficits. RA subjects were randomly assigned to one of three conditions. One group received thermal feedback, education, relaxation training, behavioral goal setting training, and
training in self-rewarding. The remaining two groups served as attention and no contact controls. At post-treatment, the treatment group displayed less pain behavior in comparison to the attention and no contact control groups. While the treatment group also showed lower pain intensity and pain unpleasantness self-ratings than the attention group, there were no differences between the treatment group and the no contact control group on these measures. The authors suggested that equivalent depression levels between these two groups accounted for this lack of difference in self-reported pain, as McDaniel et al. (1986) found that self-reported pain levels were associated with depression levels. Subjects reported that the relaxation training was the most helpful part of the package intervention. The biofeedback training played a relatively minor role in the treatment group's improvements. Subjects produced only very small temperature increases, and they were unable to produce temperature increases when they were not hooked up to the biofeedback equipment.

The Role of Stress and Other Psychological Factors in Fibromyalgia

As discussed in the introduction, stress has been hypothesized to play a role in the etiology and modulation of fibromyalgia symptoms. The previous section established a theoretical base for considering that psychological variables, such as cognitions and stress, may play a role in fibromyalgia. This section will look at more direct evidence of the role of psychological variables in fibromyalgia. These variables include psychological dysfunction in general, the association between depression and
fibromyalgia, sleep disturbance, and non-medical interventions with fibromyalgia subjects.

**Psychological Dysfunction and Fibromyalgia**

Evidence of a connection between fibromyalgia and psychological dysfunction in general is contained within a group of studies utilizing the MMPI. Payne et al. (1982) found that hospitalized fibromyalgia patients produced statistically significantly higher scores on 6 of the 10 clinical scales in comparison to hospitalized RA patients. They noted that this was consistent with an early study by Ellman, Savage, Wittkower, and Rodger (1942), in which 70% of the fibrositis patients studied were identified as experiencing psychological disorders. Ahles et al. (1984) found that outpatient fibromyalgia subjects were equally divided between MMPI profile categories described as normal, moderate disturbance, and severe disturbance. They also found that significantly more fibromyalgia subjects fell into the severe category in comparison to a group of RA subjects and matched normal controls. They concluded that psychological factors are associated with fibromyalgia, although severe disturbance is only associated with a minority of fibromyalgia patients. Wolfe et al. (1984) found that subjects with fibromyalgia produced 20% fewer normal or somatic concern profiles, and 15% more psychologically disturbed profiles, than did a RA group. They also found a distribution of profiles similar to that found in the Ahles et al. study. Each of these studies resulted in the conclusion that there was evidence of an association between fibromyalgia and psychological disturbance.
Smythe (1984) questioned the validity of MMPI findings on patients with disorders involving chronic pain. He noted that the MMPI was validated on physically healthy patients and that certain scales on the test are likely to produce false positives in patients experiencing chronic pain. However, Leavitt and Katz (1989) followed the lead of Payne et al. (1982), Ahles et al. (1984), and Wolfe et al. (1984), and compared the responses of fibromyalgia patients to those of RA patients. They found that 32 MMPI items differentiated fibromyalgia patients from RA patients. Fibromyalgia patients endorsed more symptoms, reflecting a more complex syndrome. The fibromyalgia patients produced significantly more abnormal MMPI profiles than did the RA patients, even when controlled for pain intensity. Finally, they concluded that physical illness alone was not sufficient to produce such elevated profiles.

The evidence of an association between fibromyalgia and psychological dysfunction has not gone unchallenged. Campbell et al. (1983) applied a different set of personality measures and found no significant differences between a fibromyalgia group and a general medical population group. Goldenberg (1986) and Hudson, Hudson, Pliner, Goldenberg, and Pope (1985) carried out controlled interviews with fibromyalgia patients. They concluded that the majority of these patients did not meet the criteria for any psychiatric diagnosis.

In reviewing the literature, Goldenberg (1989a) concluded "there is no stereotypic personality type in fibromyalgia and a minority of patients exhibit a variety of psychiatric disorders" (p. 12). However, in their review, Hudson and Pope (1989) concluded "the weight of the evidence suggests that fibromyalgia is associated
with psychopathology, particularly affective disorders, and possibly with anxiety disorders and somatization disorder" (p. 17). The studies reviewed here suggest that, while a majority of fibromyalgia patients do not exhibit severe psychological disorders, fibromyalgia is more strongly associated with psychological dysfunction than are similar painful disorders, such as RA.

**Depression and Fibromyalgia**

There is agreement that fibromyalgia is not simply a masked form of depression (Ahles et al., 1984; Bennett, 1986; Clark, Campbell, Forehand, Tindall, & Bennett, 1985; Wolfe et al., 1984). However, a large body of evidence does reflect an association between fibromyalgia and depression. Along with clinical observations of this association (Rimon & Laakso, 1985), controlled clinical interviews revealed an unusually high prevalence of depression in fibromyalgia patients and in their immediate family members (Hudson et al., 1985). However, Hudson et al. did not find a majority of these patients to be depressed. Goldenberg (1986) also found an association between depression and fibromyalgia through standardized diagnostic interviews, although no causal relationship could be identified. Wolfe et al. (1984) observed that the MMPI depression scale was one of the scales most frequently elevated to a clinical level in fibromyalgia patients. As noted previously, Hudson and Pope's (1989) review produced evidence of an association between fibromyalgia and affective disorders.
Two studies challenge these findings. In the Campbell et al. (1983) study, the Beck Depression Inventory revealed no significant differences between a fibromyalgia group and a general medical population group. Clark et al. (1985) administered standardized psychological tests in a blinded controlled study and found that fibromyalgia patients scored no differently than matched medical patient controls on measures of depression and anxiety.

Another group of studies found that while depression is associated with fibromyalgia, it is equally associated with RA. The Payne et al. (1982) MMPI study showed no difference in depression between arthritis and fibromyalgia subjects. Both groups appeared moderately depressed, although the mean depression score for fibromyalgia subjects "was not in the pathogenic range" (p. 216). In the Ahles et al. (1984) MMPI study, the fibromyalgia group scored significantly higher on the depression scale than a normal control group, although not significantly higher than a RA group. Ahles, Yunus, and Masi (1987), administering the Zung Self-Rating Depression Scale, found no differences between a fibromyalgia group and a RA group on this measure. They identified 28.6% of the fibromyalgia subjects and 31% of the arthritis subjects to be experiencing significant levels of depression. Finally, Kirkmayer, Robbins, and Kapusta (1988) compared fibromyalgia and RA patients on the variables of psychiatric diagnosis, symptom self-report, and illness behaviors. They found that fibromyalgia patients did not receive a diagnosis of major depression or report depressive symptoms at a significantly higher rate than RA patients.
In summary, studies suggest that there may be a relationship between fibromyalgia and depression, although there is a similar relationship between depression and RA. Goldenberg (1989b) suggested that the confusion over this issue may be due to a failure to differentiate depressive symptoms from a depressive illness, noting that depressive symptoms would be expected with many medical conditions. He observed that "There may be a significant association of fibromyalgia and depression or depressive symptoms, but the meaning and mechanism of this association is not yet known" (p. 130). While depression appears to be associated with fibromyalgia, Payne et al. (1982) concluded that the data do not support the use of depression as a differential diagnostic sign for fibromyalgia. This association suggests a need for psychological interventions in treating fibromyalgia. The presence of depression may also play an important role in the outcome of some interventions with fibromyalgia.

**Sleep Disturbance and Fibromyalgia**

Moldofsky et al. (1984) found an alpha EEG disturbance during non-REM sleep in fibromyalgia subjects. They concluded that this was an arousal disturbance that may contribute to disturbed sleep patterns, daytime fatigue, musculoskeletal pain, and mood disturbance. Fibromyalgia subjects in their study exhibited more frequent sleep stage changes than non-fibromyalgia subjects. They suggested this may make them more easily aroused during sleep. They also hypothesized that "an internal sleep
arousing mechanism possibly triggered by emotional distress" may be responsible for this difficulty (p. 145).

The importance of sleep disturbance was illustrated by Moldofsky and Scarisbrick's (1976) study, in which stage 4 NREM sleep was disrupted by noise in normal subjects. These subjects subsequently exhibited a similar alpha EEG sleep disturbance, musculoskeletal pain, and mood disturbance. This suggests that fibromyalgia symptoms can be induced through sleep disruption. However, sleep disruption does not appear to be the only influence on pain and mood disturbance in fibromyalgia. The symptoms of pain and mood disturbance in fibromyalgia can change even when there has been no change in sleep patterns. McGain et al. (1988) provided cardiovascular fitness training to fibromyalgia subjects and found that, while there were no significant improvements in sleep difficulty, the training produced improvements in pain threshold at trigger points and emotional status.

As reported in the introduction, tricyclic antidepressants improved self-reported restfulness in fibromyalgia subjects. However, outside of McGain et al. (1988) there is no research on the effect of nonmedical interventions on sleep disturbance in fibromyalgia patients. Given the Moldofsky et al. (1984) hypothesis that an internal arousal mechanism may be triggered by emotional distress, one could hypothesize that stress management training may decrease sleep disruption in fibromyalgia patients. The present study will build on this research by evaluating the effect of stress management training on sleep and fatigue in fibromyalgia patients.
Stress and Fibromyalgia

There is a paucity of research to either support or refute the hypothesis that stress plays a role in fibromyalgia symptoms. Bradley (1989) found no published studies on the impact of cognitive behavioral therapy with fibromyalgia patients. A current search of the literature for this research found only one study that evaluates a stress management technique with this population.

Ferraccioli et al. (1987) evaluated the impact of frontalis–placed EMG–biofeedback training with fibromyalgia subjects in a two-part study. In the first part, described as an "open study," 15 female subjects were given EMG–biofeedback relaxation training for 15 sessions on a twice-weekly basis. Six follow-up sessions occurred at a gradually decreasing frequency across 80 days. Nonparametric statistical analyses showed significant improvements at Session 15 in decreasing muscle tension, the number of tender points identified, scores on a visual analog pain scale, and duration of morning stiffness. Improvement was defined as at least a 50% decrease in comparison to baseline measurements. These results were maintained at the six-month follow-up.

The group statistical design clouded some important details in these results. Despite the positive overall picture, 9 of the 15 subjects displayed improvement, while 6 (40%) showed no benefit. Despite the positive changes, the authors reported that there was no relationship between the EMG recorded muscle tension and the visual analog pain scale ratings or the number of tender points identified. This finding may
be seen as bringing the putative relationship between muscle tension and fibromyalgia into question. However, Bradley (1989) criticized Ferraccioli et al. (1987) for basing their training on the frontalis, citing Burish's (1981) observation that frontalis EMG training does not result in generalized relaxation effects.

Another theoretically relevant finding in the Ferraccioli et al. (1987) open study was that there were no inter-session changes in the subjects' anxiety scores on the Spielberger State-Trait Anxiety Inventory (STAI XI). This measure was administered immediately before and after each biofeedback training session. While this measure did reveal decreases in anxiety immediately after each session (intrasession decreases), there were no inter-session changes across treatment contacts. The training did not generalize across time or across settings. Furthermore, this finding dampens any support for the notion that relaxation training was responsible for diminished fibromyalgia symptoms. This could suggest that emotional stress or anxiety plays less of a role in fibromyalgia symptoms than has been hypothesized. However, Ferraccioli et al. did not include a cognitive intervention component that might address the cognitive facet of stress. The Ferraccioli study also relied on one specific relaxation training technique of questionable utility for training general relaxation skills. It remains to be seen if additional improvements in fibromyalgia symptoms would be achieved if these factors were addressed. The present study will address these issues by including a cognitive behavioral component and by training a variety of relaxation techniques.
The second half of the Ferraccioli et al. (1987) study was referred to as the "controlled study." Twelve female fibromyalgia subjects were divided into either a "true" or "false" EMG-biofeedback group. In the false condition, the subjects were given no instructions on relaxation and the biofeedback equipment provided no feedback signal. In the true condition, instructions and a feedback signal were provided. Again, 15 twice-weekly sessions were administered, although the follow-up training was not included. The subjects were also instructed to practice the same relaxation procedure at home.

Using the same statistical analyses and dependent variables as in the open study, the results of this controlled study revealed significant improvements across all the dependent variables for the true EMG-biofeedback group. There were no significant improvements in any of the dependent variables for the false EMG-biofeedback group, although there was some decrease in the number of tender points. The benefits for the true EMG-biofeedback group were maintained at a six-month follow-up. The authors suggested that these findings ruled out a placebo effect as responsible for the noted improvements. Only one true EMG-biofeedback subject failed to exhibit benefits.

As in the open study, there were no decreases in anxiety across the 15 sessions and follow-up, although there were intra-session decreases. This raises the same questions regarding generality and the role of anxiety in fibromyalgia. Along with his critique of the frontalis placement method, Bradley (1989) provided additional criticisms of the controlled study. First, he questioned the adequacy of the sample
size. Second, he noted that the procedure for allocating subjects to different conditions was not clearly identified, and may have not been random. Thirdly, he suggested that the no feedback condition may have decreased the subjects' expectations for success.

The nonparametric statistical analyses produced somewhat misleading conclusions. While the statistics suggested significant overall improvements, a breakdown of the results reveals that 7 of the 21 subjects who received actual EMG–biofeedback across the open and controlled studies obtained no benefit. The fact that 33% of the treated subjects received no benefit is a clinically significant discrepancy from the conclusion one might reach by simply looking at the overall statistical outcome. The authors are to be credited for pointing out the actual number of patients who did not benefit from treatment. In order to provide a close examination of actual response rate, the current study will focus on only four subjects, using a single subject design. The interpretation will focus on the identification of observable clinically significant changes, rather than statistical changes.

Ferraccioli et al. (1987) are also to be applauded for identifying common characteristics of subjects who failed to respond to the intervention. Four of these subjects were identified as depressed on the MMPI, while two other subjects had elevated hypochondriasis scores. The authors recommended that a psychiatric interview and personality testing be utilized to identify patients who will be likely to benefit from EMG–biofeedback. However, since some relationship between depression and fibromyalgia has been identified, depressed individuals cannot simply
be excluded from treatment. The current study will address this concern by including a cognitive behavioral component in the treatment package.

The only other nonmedical intervention found in the literature evaluated the recommendation that fibromyalgia patients engage in an exercise program. McGain et al. (1988) randomly assigned 42 fibromyalgia subjects to either a cardiovascular training group (CVR) or a flexibility exercise training group (FLEX), which functioned as a control. The CVR group met 3 times a week for 20 weeks and participated in exercises producing "sustained heart rate elevation" (p. 1136). The FLEX group met at similar intervals and participated in flexibility maneuvers that did not produce increased heart rate. Outcome measures were scored in a blind manner and the data were statistically analyzed.

Criterion cardiovascular fitness scores were attained by 83% of the CVR subjects, indicating these subjects did actively participate in the program. Treatment effects were varied. Sixty-seven percent of the CVR subjects showed improved pain threshold scores at trigger points while only 15% of the FLEX subjects showed improvements. Global assessments of disease activity were completed by a physician and each subject. The CVR and FLEX groups both exhibited improvement on these scores, although none of these improvements was marked. Visual analog pain intensity ratings, the percentage of body areas affected by fibromyalgia symptoms, average hours of nightly sleep, and number of nights of sleep difficulty showed no significant improvements. Interestingly, both groups showed equivalent significant
improvements on the Symptom Checklist–90–Revised (SCL–90–R), a measure of psychological distress.

These findings are particularly interesting when viewed in combination with the Ferraccioli et al. (1987) study. In both studies, only two-thirds of the treatment condition subjects showed some significant improvement. No cognitive interventions were employed in either study. While no changes in emotional distress occurred in the EMG study, the CVR study showed improvement in emotional status for both intervention and control subjects. The fact that this occurred despite no changes in sleep quality challenges the Moldofsky et al. (1984) hypothesis that mood disturbance in fibromyalgia is a byproduct of nonrestorative sleep.

The decrease in emotional distress for both the CVR and FLEX groups prompts the hypothesis that the helplessness/self-efficacy factor may play a role in these results. The subjects' perception that they could take some action to deal with fibromyalgia symptoms may have attenuated any mood disturbance related to a sense of helplessness. With respect to the direct putative role of stress, it is interesting to note that both the FLEX and CVR groups participated in activities involving increased muscular flexibility and diversion. All of these characteristics play a role in stress reduction. While the authors did not address these issues directly, they proposed that socializing, inherent in both groups, could have played a role in emotional improvements.
Summary

Psychological factors play a direct or indirect role in a number of physiological disorders. Stress plays a particularly important role, probably due to the wide range of associated physiologic reactions. Since these reactions are modulated by an individual's appraisal of a potentially stressful event, cognitive factors can play a modulating role in physiological disorders. There is support for the notion that smaller, more frequent stressors have as much or more of an impact on health as do major life stressors. Such stressors impact upon pain disorders by increasing muscle tension and autonomic arousal. Stress and perceived helplessness also appear to exacerbate self-reported pain and disability in subjects with rheumatic disorders. Given this basis, it is likely that similar psychological factors play a role in fibromyalgia.

Pain management packages with RA patients and stress management training packages share many common features. Pain management training with RA patients has generally resulted in decreased pain levels, particularly when measured by objective pain behavior rating techniques. Stress management training has been successfully used in decreasing the symptoms of other medical disorders as well. While relaxation training appears to be a critical component common to these intervention packages, Turner (1982) found that relaxation training plus cognitive behavior therapy was superior to relaxation training alone. The current study utilizes these package programs as models in applying stress management training to
fibromyalgia patients. Fibromyalgia symptoms are hypothesized to be related to stress. Like RA, fibromyalgia is a rheumatic disorder. Consequently, these findings suggest that stress management training may have a similar positive impact on fibromyalgia symptoms.

Psychological variables appear to play a significant role in fibromyalgia. While a majority of fibromyalgia patients do not exhibit severe psychological disorders, fibromyalgia is more strongly associated with psychological dysfunction than are similar painful disorders, such as RA. While depression appears to be associated with fibromyalgia, depression is also associated with similar disorders, such as RA. There remains some controversy over the use of depression as a differential diagnostic sign for fibromyalgia. Sleep disturbance has been identified as an associated symptom with fibromyalgia, and it has also been demonstrated to play a possible role in the etiology of fibromyalgia. However, there has been very little research on the effect of nonmedical interventions on sleep disturbance in fibromyalgia patients.

Ferraccioli et al. (1987) treated fibromyalgia subjects with EMG–biofeedback training, resulting in significant improvements in some symptoms for two-thirds of the subjects treated. The authors identified depression as one characteristic that was common to most of the subjects who did not respond to treatment. However, Ferraccioli et al. relied on only one specific relaxation training technique, which was of questionable utility for training general relaxation skills, and they did not include a cognitive behavior therapy component in their intervention. To account for these
deficits, the current study was designed to evaluate the efficacy of a stress management training package that includes a variety of relaxation training techniques, as well as a cognitive behavior therapy component. In addition, the current study addressed the symptoms of sleep disturbance and daytime fatigue, which were not assessed in the Ferraccioli et al. study.

Given the evidence that stress and other psychological variables influence the symptoms of rheumatic disorders, and the limited findings of Ferraccioli et al., the current study attempted to assess if a stress management training program would produce clinically significant decreases in the symptoms of fibromyalgia. Based on the information discussed in this review, it is hypothesized that a comprehensive stress management training program will produce clinically significant improvements in measures of (a) perceived level of daily stress, (b) pain, (c) functional ability, (d) sleep patterns, (e) daytime fatigue, and (f) depression.
CHAPTER III

METHOD

Subjects

The subjects were four Caucasian women, ranging from 28 to 53 years of age. Subject 2 was a homemaker. The other three subjects were employed full-time outside of the home; however, Subject 4 had recently decreased to half work days due to pain. All subjects were screened through the Minnesota Multiphasic Personality Inventory (MMPI) (Hathaway & McKinley, 1943) to rule out a thought disorder or bipolar affective disorder.

The subjects volunteered for this study after being informed about it by their rheumatologist. All four were referred from the same rheumatology practice. Before participating, the subjects signed a consent form which outlined the program, the purpose of the study, the activities they were expected to perform, and the potential risks and benefits of participation. A copy of this form is included in Appendix B.

All subjects were diagnosed with primary fibromyalgia syndrome by their rheumatologist. The time of initial diagnosis ranged from 4 months to 10 years prior to the study. Subject 1 had experienced one symptom-free period of two weeks duration. The other three subjects had never experienced a period of one week or more without symptoms. Subjects 1 and 3 had no other rheumatic disorders. Subject
2 had an additional diagnosis of bursitis and Subject 4 had additional diagnoses of osteoarthritis and temporomandibular joint pain. However, these two subjects were also diagnosed with a primary fibromyalgia disorder, as opposed to having a fibromyalgia disorder that was secondary to these other rheumatic disorders. Subject 3 also experienced migraine headaches.

Subjects 2 and 4 occasionally attended a monthly arthritis support group. Subject 4 was also participating in biofeedback training prior to participation in this study, which continued throughout the course of the study. None of the subjects participated in any other treatment for fibromyalgia, other than routine rheumatology appointments.

All four subjects were prescribed pain medications. Three of the subjects (Subjects 1, 2, and 4) also received antidepressants. Antidepressant medications often do not have a pronounced clinical effect during the first few weeks of administration. Consequently, the initiation of an antidepressant medication or a significant dosage change in antidepressant medication could have had a confounding effect in this study. That is, it would not be clear if any changes in depression level were the result of the training or the result of delayed medication effects. To control for this, those subjects receiving antidepressants remained on the same antidepressant medication at the same dosage for at least four weeks prior to the onset of the intervention, and no dosage increases occurred once the intervention was initiated. In addition, all medication levels were monitored throughout the course of the study to identify if dependent
variable changes could have been a function of medication changes, as opposed to being the result of intervention efforts.

Setting

The study was completed in a midwestern city of approximately 90,000 people, in cooperation with a comprehensive mental health clinic and a rheumatology practice that served the city and surrounding rural area. Subjects were trained on an individual basis in a psychologist's office on the campus of a medical center. However, they also carried out self-monitoring assignments and practiced newly learned skills in their natural environments. The subjects' natural environments included setting such as the home, workplace, stores, restaurants, and so on. Dependent variable assessment measures were administered across two settings. Those measures that were administered only once a week were completed by the subjects in the experimenter's office. Measures that had to be completed one or more times a day were completed by the subjects in their natural environments. Subjects were provided at least one week's worth of forms to use in their natural environments to facilitate and structure that process. The only exception to this process was that weekly measures for Subject 2 were completed in her home during baseline and follow-up due to transportation difficulties.
**Procedure**

**Independent Variable**

The independent variable was a package stress management training program consisting of four treatment phases: (1) identification of personal signs of stress and the role of stress in fibromyalgia, (2) relaxation training, (3) cognitive behavioral training, and (4) assertion training. This study rested on the assumption that the stress management training program functioned as a coordinated unit of these four phases. Each training phase builds on skills taught in the prior phase. No phase was totally independent of the other, and the putative effect would be cumulative. Each phase marked the beginning of a new training focus, but the content of the prior phase still overlapped the new phase. While it is acknowledged that the sequence of training phases may play a role in stress management training with fibromyalgia patients, it is beyond the scope of this study to systematically evaluate various sequence arrangements. Rather, the focus of this study was to identify the impact of a stress management training program on fibromyalgia symptoms.

The subjects participated in 10 weekly 90-minute training sessions on an individual basis with the primary investigator of this study, a male clinical psychology doctoral student, who served as the trainer. The general format for each class, consisting of a number of tasks presented in sequence, was essentially the same. The first task was that the trainer collected the dependent measure forms that the subject had completed throughout the prior week in her natural settings. The next task was
that those dependent measures which were administered only once per week were administered to the subject. These were administered before any new training began, in order to assess the effects of the prior week's training before they could be confounded by new training activities. The formal training portion of the class then began with a brief review of the material and skills that had been presented in the prior class. Homework assignments were collected and discussed, including identifying problems in completing the assignments and generating solutions. No consequences were provided for homework compliance, although subjects were encouraged to complete assignments and to monitor their compliance on homework compliance forms throughout the week. The next step in the class was to present information pertaining to new topic areas. Both new and previously trained techniques were practiced in class with supervision from the trainer. Each training session ended with the presentation of new assignments. Outlines of the 10 classes are presented in Appendix C.

Subjects were contacted by the trainer by phone once a week to prompt data recording and homework completion, and to assist the subject with any difficulty she may have encountered in understanding and applying new material. Subjects were encouraged to initiate phone contacts if questions arose during their data recording or assignments.

The general strategy of training across all four phases was to provide information and teach specific skills. Techniques were practiced in a progressively more challenging manner, moving from coached in-class practice to independent
home-based practice to application in actual stressful situations. They were taught a variety of skills and techniques, and were encouraged to use those that worked best for them. Self-monitoring skills were emphasized to assist subjects in evaluating the efficacy of the skills and techniques.

The training was presented through a variety of modalities. Information was presented in a didactic format, including both oral presentation and written outlines of the lecture material. Training in the techniques was administered using written materials, demonstrations, in-class practice with corrective feedback, audiotaped instructions, behavior rehearsal, and role playing. Checklists assisted the subjects in identifying current functioning. Homework assignments were made at each class, including brief readings, checklists, self-monitoring, in-home practice, and in-vivo use of skills and techniques. Assignments were structured through written directions and recording forms. Subjects were provided audiotapes for practicing relaxation.

The stress management training program content was divided into four phases. Each phase identified the period in which a specific topic was introduced and emphasized. Phase I (classes 1 and 2) focused on the role of stress in fibromyalgia and on assisting subjects in identifying their own experiences of stress, primarily through self-monitoring techniques. Subjects continued to self-monitor stress throughout the remainder of the program. Phase I included education about fibromyalgia, pain, and stress. Subjects were taught self-monitoring techniques, which would help them identify their own specific stressors, stress reactions, and
stress levels. The strategy of intervening before stress levels escalate to an extreme level was also introduced.

Phase II focused on relaxation training. This topic was initiated in class 3, and continued through class 7. Subjects were taught the rationale and techniques of progressive muscle relaxation (classes 3 and 4), passive relaxation (classes 4 and 5), respiratory–based relaxation (classes 4 and 5), meditation relaxation (classes 5 and 6), and imagery–based relaxation (classes 6 and 7). Progressive muscle relaxation was taught first because it emphasized recognizing the contrast between tensed and relaxed muscles. It was believed that this would assist the subjects in recognizing when a stress response was occurring, as well as forming the basis for learning other relaxation techniques. Respiratory–based relaxation was one of the techniques taught early in the sequence because it was viewed as a quick and portable relaxation technique that also formed the basis of other relaxation techniques, such as meditation. This sequence was designed to train prerequisite relaxation skills that would be used in subsequent relaxation techniques. Subjects practiced these techniques in class and in their natural environments.

Phase III extended from class 5 through class 7 and centered on cognitive behavioral training. The skills developed in this phase were discussed and practiced through the remainder of the program. The training was based on the theory and techniques of Rational Emotive Therapy (RET) (Ellis & Harper, 1973). In addition to discussing the rationale of this approach, subjects were taught to distinguish between rational and irrational self-talk, to dispute irrational self-talk, and to replace
irrational self-talk with rational self-talk. Other tactics, such as using self-talk to mediate difficult tasks, were also discussed briefly. During Phase III, coping imagery/cognitive rehearsal was also taught.

Assertion training was the focus of Phase IV, occurring in classes 8 through 10. Subjects were provided basic information on this topic. They used self-monitoring techniques between classes in their natural environments to identify situations in which they did or did not respond assertively. Assertion techniques were taught with subjects role playing these techniques in class. In addition, subjects were assigned to practice these learned assertive behaviors in some real life situations in an attempt to facilitate response generalization to the natural environment. Subjects continued to employ relaxation, self-talk, and cognitive rehearsal during the development of assertion skills. The final class of Phase IV also offered a brief outline and discussion on ways to maintain skills they had been taught throughout the 10 weeks.

**Dependent Variables**

**General Description**

The effects of the intervention were assessed through the use of a number of self-report instruments that produced measures of the targeted symptoms and behaviors related to fibromyalgia. These measures were obtained on a daily or weekly basis, encompassing the categories of stress, pain, physical functioning, sleep
patterns, fatigue, and depression. The private or subjective nature of these perceived symptoms led to a focus on self-report data, since direct observation was either impossible or impractical. Direct observation of the other targeted behaviors, such as sleep patterns, would have been not only impractical to obtain, but would also have been too intrusive for the subjects. Given this reliance on self-report measures, only those with demonstrated validity and reliability were utilized. To provide additional information regarding the impact of the intervention, subjects also kept weekly logs on medication changes, work days missed, number of physician office and emergency room visits, and number of symptom-free days. A sampling of compliance with homework assignments drawn from each class was also monitored.

While some of the instruments assessing the dependent variables were administered on only a once-a-week basis, others were completed by the subjects on a daily basis. The weekly-administered instruments were distributed by the trainer at the start of each class, before new training began, to measure the impact of the prior week's training. Subjects were supplied forms for completing daily measures of symptoms that included prompts on what time of day entries were to be completed. They were instructed to complete the forms only at the specified times, and to leave entries blank if they forgot or were unable to make an entry at the specified time. The importance of recording data at specified times was discussed at each contact to emphasize the need for accuracy. Weekly telephone prompts were also made by the trainer throughout the baseline, intervention, and follow-up conditions. Those subjects completing at least 75% of the scheduled weekly entries were awarded
instant win lottery tickets. During baseline and follow-up periods the trainer met briefly once a week with each subject to collect daily measures, provide new forms, troubleshoot data collection, and administer those instruments designed to record weekly data. No coping techniques were discussed at baseline or follow-up.

**Stress**

Each evening subjects recorded daily levels of stress by completing the Daily Stress Inventory (Brantley et al., 1987). This is a combined checklist and rating scale that lists relatively minor and frequently occurring events that many individuals perceive as stressful. The authors provide strong evidence of its concurrent validity, construct validity, and divergent validity (Brantley et al., 1987, 1988). This measure, which was administered across the baseline, intervention, and follow-up conditions, was included to identify if the subjects were able to demonstrate a decrease in their perceived level of stress.

Subjects responded by reviewing a list of 58 potentially stressful events, plus two open spaces that allowed the responder to identify stressors not included in the list, and indicating which of these events occurred in the previous 24 hours. The subject also indicated the amount of stress the event caused her, on a range from 1 ("occurred but was not stressful") to 7 ("caused me to panic"). The average impact rating (AIR), which is derived by dividing the total of the recorded stress levels by the number of potentially stressful events occurring, reflects the average stress level recorded.
Pain

Fordyce (1976) concluded that pain is not a directly observable phenomenon, and that one must rely on verbal or nonverbal communications from patients to learn about their pain. Kerns, Finn, and Haythornthwaite (1988) noted that knowledge of a patient's idiosyncratic experience and appraisal of pain is highly relevant in terms of the cognitive behavioral perspective. They also claimed that the advantages of self-report pain data, "clinical relevance, ease of collection, and low cost" (p. 72), outweigh the problems of relying on self-report data for many researchers.

The McGill Pain Questionnaire (Melzack, 1975), one of the most frequently used self-report pain intensity assessment instruments (Flor & Turk, 1988; Kerns et al., 1988; Turk & Rudy, 1986), was chosen as the instrument to measure pain for a number of reasons. It has been identified as a valuable tool in studying clinical pain (Turk & Rudy, 1986). It has been used in a number of studies, including research on chronic low back pain (Feuerstein et al., 1985; Turner & Clancy, 1988), RA (Parker et al., 1988), and chronic low back pain and arthritis (Flor & Turk, 1988). There is a body of evidence that convincingly supports its reliability and validity (Melzack, 1975; Syrjola & Chapman, 1984). The McGill was judged to be more widely used and more extensively studied than visual analog scales, while providing at least equivalent information (Turner & Clancy, 1988).

This instrument presents sets of pain descriptors, with each set composed of words that have been empirically ordered on the basis of pain intensity. The subjects
endorse words in those sets of descriptors which most closely describe their experience of pain. In this study, two components of the McGill composed the measure of pain intensity. Subjects were directed to rate their overall pain level, rather than attempting to isolate and rate only fibromyalgia related pain. It was believed this would result in more objective ratings than if subjects were asked to attempt to differentiate the sources of their pain.

Once a week subjects completed the previously described task of endorsing the descriptors that best described their pain at that time. A Pain Rating Index (Rank) score, referred to as the PRI(R), was derived by adding the rank values of the descriptors endorsed. Descriptors reflecting higher levels of pain have rank scores represented by larger numbers.

The second component is the Present Pain Intensity score (PPI). To obtain the PPI, subjects endorsed one of six descriptors which range from 0 ("no pain") to 5 ("excruciating"). This was completed four times each day (morning, noon, dinner, and bedtime) on a Home Recording Form (adapted from Melzack, 1975). Melzack described the PPI as a valid measure that correlates well with other components of the McGill Pain Questionnaire. It has been found by Melzack to be highly susceptible to short-term changes in pain perception.

Physical Functioning

The Disability Index Questionnaire, developed by Fries, Spitz, Kraines, and Holman (1980) was used as the measure of physical functioning. Fries et al.
evaluated this self-report instrument with RA patients. They found satisfactory reliability in comparing scoring between an assessor and self-scoring. Validity was established by comparing questionnaire scores to in-home observations of the respondent's ability to do the tasks described in the questionnaire. The resulting agreement scores ranged from 0.47 to 0.88. Ninety-three percent of the in-home observations agreed within one point of the self-administered score for each question. The authors concluded that the instrument was a practical and accurate tool for arthritis patients. They also suggested "It seems likely that these attributes will hold for other rheumatic disease syndromes as well" (p. 138). The authors found that this instrument was also useful in evaluating individuals with osteoarthritis, although that population generally endorsed lower levels of disability than did the RA patients. Given these observations, one could expect that this instrument may also be a useful tool for assessing disability in fibromyalgia patients.

Once a week each subject rated the level of difficulty she had in carrying out each of a number of activities over the prior week. Scoring ranges from 0 ("without difficulty") to 3 ("unable to do"). Nine categories of functional ability were measured, including dressing and grooming, arising, eating, walking, hygiene, reach, grip, outside activity, and sexual activity. The highest score in each category is the score for that category. A final index score is derived by adding the category scores and dividing that sum by the number of categories.
Sleep Patterns

Subjects completed a Daily Sleep Diary each morning, as soon as possible after awakening. They estimated the time they fell asleep, the time they awakened for the day, the number of times they awakened between these two times, and the total number of minutes they were awake during the night. These measures provided the basis for estimating the number of hours of sleep per night, the number of times sleep was disrupted each night, and the percentage of time awake during planned sleeping hours.

Daytime Fatigue

The Stanford Sleepiness Scale (SSS) (Hoddes, Dement, & Zarcone, 1972; Hoddes, Zarcone, Smythe, Phillips, & Dement, 1973) was used to measure daytime fatigue. This instrument provides a self-report measure of the level of fatigue and alertness experienced by the subject. Subjects completed the SSS by recording ratings of their level of alertness on a 1 to 7 scale, which ranges from "active and vital; alert; wide awake" (1) to "almost in reverie; sleep onset soon; lost struggle to remain awake" (7). Entries were made three times each day on the Home Recording Form (morning, noon, and dinner).
Depression

Depression was measured by the Beck Depression Inventory (Beck, 1967). This is a widely used self-report scale on which the subjects endorse sentences that reflect their functioning in areas related to depression. Sentences in each of 21 categories are given rank value, with higher numbers reflecting more depression. The highest endorsed values in each category are added to obtain a final total score. Subjects completed this measure once a week, endorsing items based on how they felt that day.

Design

A multiple baseline across subjects design (Baer, Wolf, & Risely, 1968) was employed to assess the effects of the intervention. The effects of the independent variable are demonstrated by applying the intervention to different baselines at staggered points in time (Kazdin, 1982). Kazdin states "If each baseline changes when the intervention is introduced, the effects can be attributed to the intervention rather than to extraneous events" (p. 126). The multiple baseline across subjects indicates that the intervention was introduced to each of the four subjects at different points in time.

This design allows one to evaluate irreversible treatment effects. If the training provided in this study is effective, the subjects would be learning skills that could change their behavioral repertoires indefinitely. As with many single subject
designs, the analysis of data in this study is carried out by visual inspection. This analysis involves looking for changes from baseline levels of responding as the intervention is applied across the four subjects in a staggered manner. As Kazdin (1982) suggested, this analysis is facilitated by plotting the means in different phases and looking for changes in direction and rate of response across phases. In most cases, this involves examining the differences between data in the baseline and intervention phases. However, in this study the visual analysis is further enhanced by breaking the intervention component itself into the four phases described previously (self-monitoring, relaxation, cognitive behavioral, and assertion). The reliance on visual analysis in this study was to emphasize an evaluation of the clinical significance of the intervention. An assumption at the basis of this design is that any clinically significant effect of the intervention on stress level, pain, physical functioning, sleep, fatigue, and depression should be apparent by visual inspection of the data.

The stress management training was introduced to Subject 1 following four weeks of baseline data collection. The intervention was initiated with the remaining subjects at subsequent two-week intervals, resulting in six weeks of baseline for Subject 2, 8 weeks of baseline for Subject 3, and 10 weeks of baseline for Subject 4. Ideally, the timing of interventions should be based on the stability of the baseline data and the stability of the data in any preceding intervention. However, in the present study the baseline lengths were predetermined in order to maintain the participation of all four subjects by initiating training as soon as practically possible.
This design also kept the data collection workload of each subject to a minimum. Kazdin (1982) reported that concerns arise with protracted baselines, including clinical and ethical issues, as well as the observation that prolonged repetition of a task is likely to become tedious to the subject.

One concern that was anticipated with this design was that the training program was likely to have cumulative and/or delayed effects. Consequently, changes in the dependent variables may not be noticeable soon after the intervention was initiated. However, there are ways to identify changes in the data that can be attributed to the independent variable. First, it was expected that any delayed effect would be fairly consistent across the four subjects. Changes would be apparent at approximately the same post-baseline time intervals. Second, Subject 1 would be well into the intervention while Subjects 3 and 4 remained in their extended baselines, allowing for a direct comparison of intervention to baseline functioning. Third, the four different intervention phases can be delineated in the graphic representation of the data. These phases would act as reference points for observing changes in the dependent measures across the four subjects. Finally, mean and trend analyses would clarify intervention versus baseline functioning across the four subjects, even if effects were delayed.
CHAPTER IV

RESULTS

MMPI Screen

The four subjects in this study met the screening criteria of no evidence of a thought disorder or bipolar affective disorder on the MMPI. In addition to serving as a screening measure, the MMPI produced information regarding other relevant clinical characteristics. Subject 2's profile indicated moderate to severe depression (Scale 2 = 86T), while the remaining subjects produced subclinical scores on the depression scale. Despite the reported links between anxiety and fibromyalgia, only Subject 2 produced a profile indicative of clinical anxiety (Scale 7 = 78T). The profiles for Subjects 1 and 3 were within normal limits (T scores below 70). Subjects 2 and 4 both produced profiles with scores over 70T (Scales 2, 3, and 7 for Subject 2, and Scales 1 and 3 for Subject 4). They both shared significant elevations on Scale 3, often associated with histrionic characteristics. Subject 2 produced the most clinically remarkable profile, indicative of moderate to severe depression and anxiety, as well as possible histrionic features.

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Compliance Measures

Homework Compliance

Although subjects were encouraged to complete every homework assignment, not all were completed. Subjects did not record homework compliance information for every assignment; however, the following data were based on activities which made up the majority of the assignments. These activities included readings, self-monitoring, relaxation practice, and cognitive rehearsal practice. A compliance measure was obtained for at least one homework assignment activity for each subject at each class. Compliance data were obtained for each subject on two or more homework activities in six of the ten classes. The percentage of compliance for all monitored assignments combined ranged from a low of 92%, attained by Subject 2, to a high of 98%, attained by Subjects 1 and 3. Subject 4 completed 95% of all the homework assignments.

Self-Report Compliance

The following values represent compliance with self-report data collection. These values were obtained by dividing the number of recordings subjects actually made by the number of scheduled recordings across the course of the study. When all dependent measure recordings are combined (daily and weekly measures), the range of completion extends from a low of 92% (Subject 3) to a high of 100% (Subject 2). Subjects 1 and 4 each completed 99%. Subjects 1, 2, and 4 completed
100% of the scheduled weekly dependent variable entries, while Subject 3 completed 95%. For daily measures, the range extends from a low of 92% of scheduled entries completed (Subject 3) to a high of 100% (Subject 2). Subjects 1 and 4 each completed 99%. The lowest rate of completion for any single dependent measure was 92% by Subject 3 on the Daily Stress Inventory, the PPI, and fatigue ratings.

Perceived Stress Level

The Average Impact Rating (AIR) score from the Daily Stress Inventory reflects the average stress level recorded by the subject. The rating scale is based on the following values and descriptions (Brantley et al., 1987, p. 73).

1 = occurred but was not stressful
2 = caused very little stress
3 = caused a little stress
4 = caused some stress
5 = caused much stress
6 = caused very much stress
7 = caused me to panic

Figure 1 presents the AIR weekly averages, calculated by dividing the total rating score for the week by the total number of items endorsed during the week. The dashed lines reflect the phase means. The range of the AIR has been collapsed to a maximum rating of 5 on Figure 1 since none of the weekly averages exceeded 4.4.

Subjects 2 and 4 showed little variation in perceived stress across time from baseline through the one-month follow-up. Subject 2 produced a baseline mean AIR of 3.9, a combined mean of 3.5 in Phases I, II, and III, a Phase IV mean of 3.4, and a follow-up mean of 3.1. While these data reflect a mild decrease in perceived stress,
Figure 1. Weekly Means of the Average Impact Rating (AIR) From the Daily Stress Inventory.

Dashed lines represent phase means. Higher scores reflect higher levels of perceived stress.
all of these values remain in the "caused a little stress" range. Subject 4 produced a baseline mean of 2.7, a combined mean of 2.6 in Phases I, II, and III, a Phase IV mean of 2.8, and a follow-up mean of 2.4. Subject 4's mean AIR scores remained in the "caused very little stress" range.

Like Subjects 2 and 4, Subjects 1 and 3 showed little variation in perceived stress from baseline through Phase III. However, Subjects 1 and 3 exhibited notable decreases in AIR from Phase III to Phase IV. Subject 1 had a baseline mean of 3.5, a combined mean of 3.1 in Phases I, II, and III, a Phase IV mean of 2.3, and a follow-up mean of 2.3. These values represent a drop from the "caused a little stress" range to the "caused very little stress" range when the baseline and first three intervention phases are compared to Phase IV and the follow-up. Subject 3 had a baseline mean of 2.3, a combined mean of 2.5 in Phases I, II, and III, and a mean of 1.7 during Phase IV. AIR ratings were essentially maintained at the same level as Phase IV during follow-up, with a follow-up mean of 1.6. These values represent a decrease from the "caused very little stress" range during the baseline and Phases I, II, and III, to the "occurred but was not stressful" range during Phase IV and the follow-up. While the numerical magnitudes of the decreases for Subjects 1 and 3 at Phase IV are not large decreases, these appear to be clinically meaningful decreases in AIR ratings because they involve a drop to a descriptor reflecting lower perceived stress levels.
Fibromyalgia Symptoms

Pain

The first of two pain measures used in this study was the Pain Rating Index (Rank), or PRI(R), of the McGill Pain Questionnaire. Once a week subjects endorsed descriptors that reflected their current pain level. Low pain level descriptors have low numerical rank scores, while descriptors reflecting higher pain levels have higher scores. The PRI(R) reflects the sum of these rank values. Figure 2 shows the weekly scores for each subject. While the potential range of the PRI(R) is from 0 (no descriptors endorsed) to 78 (all the highest descriptors endorsed), scores produced in this study ranged from 0 to 40. The dashed lines reflect the baseline and intervention means for each subject.

There were no consistent or sustained changes in the pain ratings for Subjects 2 and 4. The pain ratings for Subject 2 were stable across the baseline and intervention, as illustrated by a baseline mean of 17.5 and an intervention mean of 16.7. The follow-up rating on the PRI(R) was 12.0. While the pain ratings for Subject 4 varied from week to week, the mean values of these ratings across the baseline, intervention, and follow-up periods were very similar. Subject 4 produced a mean PRI(R) score of 22.4 during baseline, 21.7 during intervention, and 24.0 at the follow-up.
Figure 2. The Summed Values of Pain Descriptors From the PRI(R) of the McGill Pain Questionnaire.

Dashed lines represent baseline and intervention means. Higher pain levels have higher scores.
In contrast to Subjects 2 and 4, Subjects 1 and 3 showed a decrease in perceived pain during the intervention phases. An initial look at the means for Subject 1 may suggest no notable decreases in pain ratings. Subject 1 produced a baseline mean of 22.8 and an intervention mean of 22.3. However, closer examination reveals a significant drop in pain ratings during Phase IV, which constituted the final three weeks of intervention. The mean for Phase IV was 10.0, a decrease of over 50% in the level of perceived pain from that observed to have occurred during baseline and intervention combined. This level of pain ratings was maintained at follow-up, with a PRI(R) rating of 11.0. As Figure 2 illustrates, while there was a concurrent brief decrease in pain ratings for Subject 4 (weeks 12 and 13), this decrease was not maintained during subsequent weeks. There were no concurrent decreases in ratings for Subjects 2 and 3 during that same period.

The decrease in pain ratings for Subject 3 is much more dramatic. Subject 3 produced a mean baseline PRI(R) ratings of 10.9, an intervention mean of 2.4, and a follow-up rating of 0.0. These ratings stabilized around 1 and 0 during the last six weeks of the intervention and follow-up. In qualitative terms, these low ratings reflect a maximum of only one descriptor endorsed per week, with that descriptor indicating the mildest pain rating.

The second pain measure employed in this study was the Present Pain Intensity (PPI) score from the McGill Pain Questionnaire. Four times each day subjects rated their pain level on a scale of 0 to 5. As illustrated below, descriptors associated with higher ratings reflect higher pain levels (Melzack, 1975, p. 298);
0 = no pain
1 = mild
2 = discomforting
3 = distressing
4 = horrible
5 = excruciating

Figure 3 displays the weekly mean PPI ratings. This was calculated by adding all PPI ratings in a given week and dividing that sum by the number of ratings made that week. Intervention phases are delineated in Figure 3 so that changes in rating levels can be correlated more clearly with the different intervention phases. The dashed lines represent the mean values for each phase.

The data in Figure 3 replicate the PRI(R) data (Figure 2), although on a milder scale. Subjects 2 and 4 display no consistent declines in pain ratings. Subject 2 produced a baseline mean of 3.3 and an intervention mean of 3.2. Despite a very small temporary decrease in pain ratings during Phases II and III, her mean ratings never dropped below the "distressing" category during the intervention. Subject 4 produced a mean PPI rating of 2.3 during baseline and 2.7 during intervention. She showed a mild increase in pain ratings, although her mean ratings never varied from the "discomforting" descriptor.

Subject 1 produced a baseline mean PPI of 2.2 and a Phase I mean of 2.1, followed by an increase in Phase II to a mean of 2.6. During Phase III the mean rating returned to 2.1, followed by a drop in Phase IV to 1.7. This downward trend continued to a mean rating of 1.0 at follow-up. In qualitative terms this change reflects a shift from the "discomforting" to "mild" pain descriptors on the PPI.
Figure 3. Weekly Average Present Pain Intensity (PPI) Ratings From the McGill Pain Questionnaire.

Dashed lines represent phase means. Higher scores reflect higher pain levels.

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Subject 3 displayed a mild, but notable, decrease in pain ratings during the final six weeks of the intervention. She displayed a PPI mean of 2.0 during baseline, 2.1 during Phase I, 1.9 during Phase II, 1.4 during Phase III, and 1.1 during Phase IV. This also reflects a drop from the "discomforting" to "mild" descriptors of pain. The follow-up mean PPI rating of only 0.4 reflects the fact that 67% of her pain ratings were 0 during that week.

Subjects 1 and 3 displayed small decreases in PPI ratings. The post-baseline timing of the decreases for both subjects was similar. While the numerical decreases for these two subjects appear small, these decreases reflect a drop in described severity levels. The subjects' perceived pain level decreased from "discomforting" to "mild." The pain descriptor level for Subjects 2 and 4 did not decrease.

Physical Functioning

The Disability Index Questionnaire measured the level of difficulty in carrying out activities in nine categories of functional ability. Subjects completed this self-report instrument once a week. They indicated the level of difficulty in each category using the following scale (Fries et al., 1980, p. 138):

\[
\begin{align*}
0 &= \text{without difficulty} \\
1 &= \text{with difficulty} \\
2 &= \text{with some help from another person} \\
3 &= \text{unable to do}
\end{align*}
\]

A composite Disability Index score was derived by adding the category scores and dividing by the number of categories. Figure 4 depicts the Disability Index scores.
Figure 4. Weekly Index Scores on the Disability Index Questionnaire.

Higher scores reflect higher levels of difficulty in carrying out tasks.
obtained by each subject each week during the baseline, intervention, and follow-up conditions.

There were no significant changes in index scores for any of the subjects. This is partially due to the fact that all scores start out low—essentially the opposite of a ceiling effect. Subject 1 never entered a score above 1, and Subjects 2 and 3 never entered scores above 0. In addition to these index scores, an analysis of each of the nine functional categories that make up the index also revealed no significant changes in scores across time for any of the subjects.

Sleep Patterns

Average Hours of Sleep

Hours of sleep per night were calculated by determining the amount of time between falling asleep and awakening for the day, minus the amount of time awake between these two times. Figure 5 presents the weekly averages of the hours of sleep per night. The dashed lines reflect the mean hours of sleep during the baseline and intervention conditions.

Figure 5 reveals little variability, with phase means ranging from a low of 6.3 hours to a high of 8.6 hours. Subject 1 displayed an average gain of one-half hour of sleep during the intervention but this gain was not maintained at the follow-up. She displayed a baseline mean of 8.1 hours, an intervention mean of 8.6 hours, and a follow-up mean of 8.0 hours. Subject 2 showed no significant changes, with a
Figure 5. Weekly Means for the Number of Hours of Sleep Obtained Each Night.

Dashed lines reflect baseline and intervention means.
baseline mean of 7.2 hours, an intervention mean of 7.1 hours, and a follow-up mean of 6.9 hours. Subject 3 displayed no changes, with baseline and intervention means of 6.7 hours and a follow-up mean of 6.8 hours of sleep per night. Subject 4 showed little change, with a baseline mean of 7.0 hours and an intervention mean of 6.7 hours. The follow-up mean of 6.3 hours reflects a decrease of almost three-quarters of an hour of sleep compared to baseline.

There were no significant sustained changes in the amount of sleep each subject received. However, the measure of average sleep time may not have reflected the amount of sleep disruption that occurred throughout the night. Two measures of sleep disruption are presented next.

**Number of Times Awakened**

The first measure of sleep disruption is each subject's estimate of how many times she awakened between initially falling asleep and getting up for the day. Figure 6 presents the weekly means for the number of times each subject awakened each night. Dashed lines represent the means for the baseline and intervention conditions.

As with the hours of sleep, these data also reveal no significant sustained changes across the four subjects. Subject 1 displayed a baseline mean of 4.0 awakenings each night, an intervention mean of 3.8 awakenings, and a follow-up mean of 4.1 awakenings. While she displayed a brief decrease during the final four weeks of intervention, there was a trend back toward baseline levels which was maintained at follow-up. Subjects 2 and 3 showed relatively little disruption,
Figure 6. The Number of Times Per Night Each Subject Awakened, Presented as Weekly Means.

Dashed lines reflect baseline and intervention means.
averaging around one to two awakenings per night. Subject 2 had a baseline mean of 1.2, an intervention mean of 1.7, and a follow-up mean of 1.6. Subject 3 had a baseline mean of 1.4 awakenings, 0.9 awakenings during the intervention, and only 0.3 awakenings per night during the follow-up. While her follow-up data reflected only two nights of disrupted sleep during that entire week, the significance of this decrease is attenuated by the presence of only one data point. There was no replication of this decrease across the remaining subjects. Subject 4 displayed no notable changes, with a baseline mean of 2.2 and intervention and follow-up means of 2.0.

Percent of Time Awake During the Night

A second measure of sleep disruption is the percent of time the subject was awake between initially falling asleep and getting up for the day. Each morning subjects estimated the cumulative time awake, regardless of how often they awakened. Figure 7 presents the weekly means of the nightly percent of time awake for each subject. Dashed lines represent the means for the baseline and intervention conditions.

Figure 7 reveals no sustained decreases in percent of time awake for any of the subjects across the course of the study. Subject 1 showed a decrease from a mean of 6% during baseline to a mean of 2% during the intervention. This decrease was not maintained at follow-up, nor was it replicated across the other subjects. Subject 2 displayed a mild increase from a baseline mean of 3% to an intervention mean of
Figure 7. The Percent of Time Awake Between Initially Falling Asleep and Awakening for the Day, Presented as Weekly Means.

Dashed lines reflect baseline and intervention means.
5% and a follow-up mean of 4%. Subject 3 recorded a rate of 4% time awake during both the baseline and intervention periods. During follow-up she was awake only approximately one percent of the time. Subject 4 showed no notable changes, with baseline and intervention means of 7% and a follow-up mean of 5%.

Daytime Fatigue

Figure 8 presents the results of the measure of daytime fatigue as represented by the Stanford Sleepiness Scale. This rating scale ranges from a score of 1 ("active and vital; alert; wide awake") to 7 ("almost in reverie; sleep onset soon; lost struggle to remain awake"). Ascending scores reflect increasing levels of sleepiness. Figure 8 displays the weekly means for three daily ratings (morning, noon, and dinner). The dashed lines represent the means for the baseline and intervention conditions.

All subjects, except Subject 2, maintained ratings around 2, which is associated with the descriptor "functioning at high level, but not at peak; able to concentrate." This level reflects minimal dysfunction, even during baseline. Subject 1 produced a baseline mean of 2.8, an intervention mean of 2.2, and a follow-up mean of 2.1. There was a qualitative change during the last four weeks of intervention for this subject, with scores falling into the 1 range. However, this was not maintained at follow-up and there were no similar changes for the other subjects. Subject 3 produced means of 2.5 at baseline, 2.2 during intervention, and 1.9 during follow-up. Subject 4 produced means of 2.4 during baseline, 2.6 during intervention, and 2.5 at the one month follow-up. The noted exception, Subject 2, produced a baseline mean
Figure 8. The Weekly Average (Mean) Daytime Fatigue Ratings From the Stanford Sleepiness Scale.

Dashed lines represent baseline and intervention means. Higher scores reflect higher levels of fatigue.
of 4.1, an intervention mean of 4.1, and a follow-up mean of 4.0. A rating of 4 is associated with the descriptor "a little foggy, not at peak; let down."

**Depression**

The results of the weekly Beck Depression Inventory are displayed in Figure 9. The descriptors associated with the Beck scores are those reported by Lewinsohn, Munoz, Youngren, and Zeiss (1978, p. 20). Scores from 0 to 4 reflect the "none or minimal" range of depression; scores from 5 to 7 suggest "mild" depression; "moderate" depression is reflected by the 8 to 15 range; and scores of 16 or more are associated with "potentially serious" depression.

There are clearly identifiable decreases in depression ratings for Subjects 1 and 3, while Subjects 2 and 4 showed very mild increases in ratings. Subject 1 and 3 both exhibited decreases in measured depression from the "moderate" range to the "none or minimal" range. The significance of the decreases for these two subjects is reflected in three characteristics of the data. First, depression scores stabilized at a low level during the latter half of the intervention. Second, both subjects showed similar patterns of scores during the intervention, with decreases in rating levels occurring at similar intervals of time following the initiation of the intervention condition for each of them. Third, clinical significance is reflected in changes in the descriptors associated with these decreases. Subject 1's baseline mean of 12.3 is associated with the "moderate" depression level. While this decreased to an overall
Figure 9. The Scores From Weekly Administrations of the Beck Depression Inventory.

Higher scores reflect higher levels of depression. Dashed lines represent baseline and intervention means.
intervention mean of 6.3 ("mild" depression), the mean rating dropped to 1.0 ("none or minimal" depression) during the last four intervention weeks. A score of 0 was obtained at the follow-up. Subject 3 displayed a similar decrease. While her mean baseline rating was 11.9 ("moderate"), the overall intervention mean was only 1.7 ("none or minimal"). The last four weeks of intervention resulted in a mean of 0.5 ("none or minimal"). She also produced a score of 0 at follow-up.

Subject 2 produced the highest depression ratings, with baseline, intervention, and follow-up means falling in the "potentially serious" range. This includes a baseline mean of 17.8, an intervention mean of 20.4, and a follow-up mean of 18.0. Subject 4's responses in all conditions remained in the "moderate" range. This includes a baseline mean of 9.6, an intervention mean of 13.1, and a follow-up mean of 12.0.

Practical Impact Variables

Four variables that reflected the practical, vocational, and economic impact of fibromyalgia were tracked across the course of the study. Subjects maintained weekly logs on medication changes, the number of work days missed, the number of visits they made to a physician's office or to the emergency room, and the number of days that they experienced no fibromyalgia symptoms at all.
**Medication**

Subject 1 developed a shoulder injury that was not associated with fibromyalgia during the intervention. This was treated with localized administrations of cortisone and lidocaine during weeks 9 through 13. While these medications may have played a small role in reported pain decreases during those weeks, reports of decreased pain continued after this treatment was discontinued. Bennett (1986) reported that local anesthetic injections are of little or no benefit to fibromyalgia symptoms. This would suggest that there is little likelihood that this treatment significantly affected Subject 1's pain reports. She was able to discontinue a pain medication (Ansaid) at week 7, although this was reinstated at the time of follow-up.

Subject 3 was also able to have one pain medication (Dolobid) discontinued during the intervention. This medication had been part of her fibromyalgia treatment regimen prior to this study. It was discontinued at week 12 with no replacement medication thereafter. She was also given Inderal for migraine headaches. Some increases in this medication occurred between weeks 10 and 12; however, at week 12 the dosage returned to baseline levels. These changes did not affect any pain ratings during the final eight weeks of intervention.

Subject 2 did not receive any decreases in medication. In fact, at week 16 a new pain medication (Darvon) was added. Subject 4 had no changes in medication until the follow-up period, when a new pain medication (Parafon) was added.
In summary, Subjects 1 and 3 did have some pain medications discontinued during the intervention, although the medication was reinstated for Subject 1 at follow-up. Subjects 2 and 4 had new pain medications added before the conclusion of the study, however, they did not exhibit any sustained decreases in reported pain. While the changes noted for Subjects 1 and 3 indicate a possible decrease in the need for pain medications, this effect was not observed for Subjects 2 and 4. An analysis of medication changes shows that these changes did not have any significant impact on the reported pain decreases for Subjects 1 and 3 on the PRI(R) and PPI.

**Work Days Missed**

Subject 2 did not work outside the home. The three remaining subjects showed no decreases in the number of work days missed. While Subject 1 reported no absences during baseline, she missed an average of 2.8 days per week during the intervention period. However, this was due to the previously described shoulder injury, which was not related to fibromyalgia. She returned to 0 work days missed at the one-month follow-up period. Subject 3 missed an average of 0.4 work days per week during baseline, 0.8 work days per week during intervention, and 0 days at the follow-up. However, she attributed these missed days to migraine headaches, rather than to fibromyalgia symptoms. Subject 4 missed an average of 2.3 work days per week during baseline, 2.0 work days per week during intervention, and 0.8 work days at the follow-up. While the follow-up data for all three subjects reflect a decrease in the number of work days missed, these data are isolated indications of
improvement. There were no maintained positive changes in the number of work days missed.

**Physician Office/Emergency Room Visits**

Subjects recorded the number of physician office and emergency room visits made for any reason, whether or not fibromyalgia was involved. The intent of incorporating these measures was to determine whether participation in the stress management training was associated with a decrease in the frequency of contacts for medical services for fibromyalgia symptoms. None of the subjects had emergency room visits during the study. Subjects 1 and 2 displayed no changes in the frequency of physician office visits. Subject 1 averaged 0.3 visits per week during both the baseline and intervention phases. Subject 2 averaged 0.2 visits per week during both phases. Subject 3 cut office visits in half, with an average of 0.8 visits per week during baseline and 0.4 visits per week during the intervention. Subject 4 showed a mild decrease, averaging 0.6 visits per week during baseline and 0.4 during intervention.

**Symptom-Free Days**

There were no sustained significant changes in the frequency of fibromyalgia symptom-free days. All subjects recorded no symptom-free days during the baseline and intervention conditions. Subject 1 reported five symptom-free days during the follow-up week, and Subject 3 reported two symptom-free days during her follow-up
week. Subjects 2 and 4 each had no symptom-free days during their follow-up periods.
CHAPTER V

DISCUSSION

Overview of Results

It was hypothesized that stress management training would produce a decrease in fibromyalgia symptoms in subjects with this disorder. Compliance rates suggest that the subjects participated actively in the treatment program and completed a large majority of the dependent variable measures. Subjects 1 and 3 displayed notable decreases in perceived stress level, self-reported pain, and depression. These decreases were delayed in the case of stress and pain measures. Subjects 2 and 4 displayed no sustained decreases in these measures. None of the four subjects displayed sustained reductions in physical disability, sleep disruption, or fatigue ratings. There were also no sustained changes in sleep patterns for any of the subjects. Also, none of the subjects displayed notable sustained decreases in work days missed or frequency of physician office visits. There were no sustained increases in the number of symptom-free days.

Training Effects on Perceived Stress

In order to demonstrate that decreases in fibromyalgia symptoms were the result of a reduction in perceived stress, it must first be demonstrated that subjects
reduced their perceived stress levels as a result of the training. It was hypothesized that stress management training would produce reductions in perceived levels of daily stress in persons experiencing fibromyalgia symptoms. While there is some support for attributing the decreases in perceived stress exhibited by Subjects 1 and 3 to the training, it is clear that this hypothesis was not supported for Subjects 2 and 4.

It is important to examine if the decreased stress exhibited by Subjects 1 and 3 is clinically significant. In this study, clinical significance is defined as a change in the experience or perception of stress that is clearly recognized by the subject. Clinical significance is not readily apparent through a simple visual inspection of the perceived stress rating numbers presented in Figure 1. However, the qualitative descriptors associated with these perceived stress ratings offer evidence of clinically significant changes. Subjects 1 and 3 each dropped one intensity level during the intervention. Subject 1 dropped from "caused a little stress" to "caused very little stress," while Subject 3 dropped from "caused very little stress" to "was not stressful." Neither Subjects 2 or 4 exhibited decreases associated with qualitatively different stress descriptors.

One concern that was anticipated with this design was that the training program was likely to have cumulative and/or delayed effects. Consequently, changes in the dependent variables may not be noticeable soon after the intervention was initiated. While the decreases in stress for Subjects 1 and 3 did not occur at exactly identical post-baseline intervals, both exhibited their lowest mean stress scores during Phase IV of the intervention (see Figure 1). The fact that each of these decreases was
initiated without simultaneous decreases across the remaining subjects diminishes the likelihood that extraneous variables produced the decreases in perceived stress for these two subjects. These temporal characteristics provide at least qualified support of a training effect, and are consistent with the suggestion put forth by Cook and Campbell (1979) that delayed causation can occur where "no effect is apparent at the point of the intervention but an effect may have occurred at some plausible later date" (p. 228). While the delays in effect exhibited by Subjects 1 and 3 may attenuate the conclusion that changes can be attributed to the training, this investigator takes further note of Cook and Campbell's observation that the threat to control can be reduced if "replications show similar delay intervals between the treatment onset and the manifestation of an effect" (p. 228).

The cause of the delay in training effects for Subjects 1 and 3 cannot be ascertained with certainty given the design of this study. However, since the intervention was administered as a package of components which were sequenced to have cumulative effects, there are at least two plausible explanations for this delayed effect. One possibility is that the later aspects of training (cognitive behavior therapy in Phase III and/or assertion training in Phase IV) had more impact on perceived stress than did the initial two components (stress education and self-monitoring in Phase I and relaxation training in Phase II). Based on the sequencing of the training components, a more likely explanation is that the delay was the result of cumulative training effects. That is, Subjects 1 and 3 did not accumulate enough skills to
effectively diminish perceived stress until the last few weeks of training. The delayed
effect would then be seen as the product of all of the prior weeks of training.

Bailey (1977) reported that demonstration of experimental control in a multiple
baseline design "depends upon approximately equal effects of the treatment being
observed with each baseline" (p. 156). This did not occur with the stress data, as only
half of the subjects displayed significant decreases. However, Kazdin (1982) argues
that when several baselines are used, all the baselines need not change in order to
identify independent variable effects. He suggests that a pattern of changes may
signal intervention effects. There was a replication of effects across Subjects 1 and
3. Both of these subjects displayed an observable decrease in AIR ratings around the
period of the onset of Phase IV. Each of their decreases occurred in a temporal
pattern that was consistent with the staggered timing of the intervention. This pattern
of responding may be seen as evidence of an intervention effect within the multiple
baseline design. Possible explanations for the lack of change in Subjects 2 and 4 will
be discussed in a later section.

Training Effects and Reduced Symptoms

While there is evidence that Subjects 1 and 3 decreased stress as a result of
training, the efficacy of this approach in decreasing fibromyalgia symptoms rests on
a demonstration that symptom decreases are also attributable to the intervention.
Improvements occurred in two symptom areas, pain and depression, for Subjects 1
and 3. The following sections will examine if these improvements can be attributed to the training.

**Training Effects on Pain**

It was hypothesized that stress management training would result in clinically significant improvements in measures of pain. A clinically significant decrease in pain was defined as a decrease in pain that was perceptible to the subject. Subjects 1 and 3 exhibited clinically significant decreases on the Pain Rating Index (Rank) or PRI(R), and Present Pain Intensity ratings (PPI), while Subjects 2 and 4 displayed no improvements. Subject 1 exhibited a 50% reduction in perceived pain intensity ratings on the PRI(R), dropping from a baseline mean of 22.8 to a mean of 10.0 during the final intervention phase and 11.0 at the follow-up. Subject 3 exhibited a decrease in perceived pain intensity ratings on the PRI(R) from a mean of 10.9 during baseline to a mean of only 2.4 during the intervention and 0 during the follow-up. Subject 3's ratings included ratings of only 1 or 0 during the final six weeks of the intervention, indicating minimal or no pain. On the PPI both subjects decreased their ratings from "discomforting" to "mild" pain. These improvements were maintained at follow-up. While both of these subjects displayed a decrease of only one pain intensity level in terms of the descriptors used ("discomforting" to "mild"), this is judged to be a clinically significant change. They began with relatively low pain ratings on the PPI (hovering around the rating of 2 or "discomforting"), thus, leaving room for only fine tuning pain levels rather than dramatic shifts from high ratings of
pain. Attributing the PRI(R) and PPI improvements to the training also involves the same concerns encountered in attributing perceived stress decreases to the training.

Given the nature of the training package, it was anticipated that if the intervention had any impact, its effects could be delayed. These results were evident on both pain ratings for Subjects 1 and 3. With respect to the PRI(R) ratings (see Figure 2), there were dissimilar response patterns. While both of these subjects displayed their most dramatic improvements during the latter half of the intervention, their dissimilar response patterns attenuate confidence in attributing the decreased pain to the training. In order to show a more convincing demonstration of intervention effects, the onset of the delayed effects would have had to occur at approximately the same post-baseline point in time. In addition, further evidence for the qualified confidence in attributing improvements to the intervention comes from the observation that Subject 4 exhibited an unexpected transitory decrease in PRI(R) pain ratings at the same time that Subject 1 exhibited decreases.

The PPI data (see Figure 3) are more convincing of an intervention effect. Subjects 1 and 3 both exhibited similar delay patterns. It was anticipated that were there any significant influences from variables operating from outside of the intervention program, they would have had a similar and simultaneous impact across all four subjects. The fact that this did not occur diminishes the likelihood that extraneous variables were responsible for the improvements exhibited by Subjects 1 and 3.
The demonstration of an intervention effect could be questioned since only two of the four subjects displayed improvements. However, the fact that there was a replication of improvement across Subjects 1 and 3 on the PRI(R) and a replication of improvement across the same subjects on the PPI would be evidence of an intervention effect. There is reliability of effects across the two pain measures.

The qualified support for the conclusion that stress management training resulted in decreased pain is consistent with the theory that decreasing stress results in a decrease in fibromyalgia symptoms. That is, only the two subjects who exhibited a decrease in stress in response to training also showed decreases in perceived pain. Conversely, those two subjects who did not obtain a decrease in stress levels also failed to display any decrease in pain. In short, there exists a positive correlation between stress decreases and decreases of pain.

The result of a positive response to training by only some of the treated fibromyalgia subjects may be seen as weakening the demonstration of intervention effects. However, mixed outcome appears to be the norm in intervention studies with fibromyalgia subjects to date. The results of the present study are similar to the results Ferraccioli et al. (1987) obtained in EMG–biofeedback relaxation training with fibromyalgia subjects. Forty percent of the subjects in their open study showed no decreases on a visual analog scale pain measure, while the remaining subjects showed significant decreases. McGain et al. (1988) found that a cardiovascular fitness training program for fibromyalgia subjects resulted in only two-thirds of the treatment subjects showing some positive response. Research on tricyclic antidepressant
medication intervention with fibromyalgia subjects (Campbell et al., 1983) resulted in improvements in only about half of the treated subjects. While the results of the present study were limited in terms of the number of subjects who displayed improvements, the history of intervention research suggests that this is a challenging population in which to bring about change. The response rate obtained in the current study was similar to the response rate obtained in prior intervention efforts.

The use of self-report measures offers important information in terms of the clinical relevance of research data on pain. As Kazdin (1982) and Zlutnick and Taylor (1982) observed, the individual's subjective perception of pain is a valuable gauge of the efficacy of an intervention. It could be argued that improvements in observable behaviors believed to reflect pain intensity may be of little value if the subject still experiences the same subjective experience of pain. In addition, Feuerstein et al. (1985) identified that self-report pain measures have the advantages of being practical and economical to administer, as well as decreasing the potential reactive effects that the presence of observers may produce with direct observation techniques. Nevertheless, self-report measures of pain are subject to possible responder bias (Kazdin, 1982) and pain self-report measures may be influenced by depression (McDaniel et al., 1986).

While self-report pain measures are important in terms of clinical relevance, future research in this area may be enhanced by supplementing such measures with objective pain assessment techniques. The addition of such measures may further illustrate the effects of stress management training on pain responses in fibromyalgia.
subjects. Direct observation pain assessment techniques are illustrated in studies by Bradley et al. (1987), Keefe and Block (1982), Richards, Nepomuceno, Riles, and Suer (1982), and Turk, Wack, and Kerns (1985). Other objective pain assessment techniques include up-time clocks and pedometers (Sanders, 1979), and dolorimeter readings, as illustrated in Carette et al. (1986) and McGain et al. (1988).

**Training Effects on Depression**

The Beck Depression Inventory (Beck, 1967) findings lead to qualified support for the hypothesis that stress management training resulted in decreased ratings of depression. These findings follow the pattern of stress and pain scores. Once again, Subjects 1 and 3 displayed notable improvements while Subjects 2 and 4 did not. The decreases for Subjects 1 and 3 are judged to be clinically significant, as both dropped to the "none or minimal" range. While these improvements were delayed, depression levels stabilized well during the later half of the intervention for both subjects (see Figure 9). Each decrease began without simultaneous decreases across other subjects, diminishing the likelihood that nontreatment variables produced the changes. While the decrease in depression ratings was not replicated across all four subjects, there was a replication of the decrease in depression ratings across Subjects 1 and 3.

The depression data reveal a possible confound in attributing symptom decrease to decreased stress. Based on the assumption that stress has a significant influence on the severity of fibromyalgia symptoms, it was anticipated that intervention effects would be characterized by decrease in perceived stress ratings.
occurring prior to decreases in depression. This anticipated outcome did not occur across both subjects that demonstrated decreases in depression. Stress levels for Subject 1 decreased before her depression decreased, as expected. However, the reverse happened for Subject 3 who displayed a decrease in depression almost eight weeks before her stress level decreased. These findings are mixed in that they show different sequences of effects for the two subjects. Given these sequences of effects, it is not clear if this intervention package actually had its primary impact on stress or on depression. These findings suggest that the stress management techniques utilized in this program could impact individuals in different ways; initially decreasing stress for some, initially decreasing depression for some, and having no impact on others.

It is possible that the wide range of techniques employed in the training package had a direct impact on depression, resulting in depression ratings decreasing as a direct result of the intervention, rather than depression ratings decreasing as a secondary response to diminished stress. As discussed earlier, while it is clear that there is an association between fibromyalgia and depression, the exact nature of this association remains unclear. While depression has often been cited as a direct symptom of fibromyalgia, these current results suggest that depression may have an interactive role with other variables associated with fibromyalgia, such as stress and pain. Targeting an intervention to decrease depression may be as effective as targeting stress in order to reduce fibromyalgia symptoms, especially pain. Future research may shed some light on this issue by evaluating the efficacy of depression management programs with fibromyalgia patients and by clarifying what characteristics differentiate those
fibromyalgia patients who respond best to a focus on depression as opposed to a focus on stress.

Fibromyalgia Symptoms Not Affected by Treatment

The hypothesized improvements in the areas of physical functioning and fatigue did not occur for any of the subjects. Of the four subjects, only Subject 1 displayed improvements on measures of sleep duration and disruption. These facts may be seen as adding doubt to the hypothesis that stress management training is an effective intervention for fibromyalgia. However, this is an unwarranted conclusion. Like any disorder, a number of variables play a role in the etiology, presentation, course, and treatment of fibromyalgia. As Bennett (1989b) concluded, "it seems unlikely that a single factor will be found as the cause of fibromyalgia syndrome, thus a cure/treatment by elimination of a prime cause will not be possible" (p. 189).

Disability/Physical Functioning

It was anticipated that the fibromyalgia subjects would display significant levels of functional disability associated with rheumatic disorders during the baseline phase of this research. Furthermore, it was hypothesized that the subjects would display clinically significant improvements on the measure of functional ability following the onset of stress management training. Neither outcome occurred. As discussed in the methods section, the Disability Index Questionnaire (Fries et al., 1980) was employed as the measure of disability based on the conclusion of its
authors that it was likely to be relevant for a number of rheumatic disorders, although it had been studied only with rheumatoid arthritis and osteoarthritis subjects. Since there are no disability measures available that are specific to fibromyalgia, this measure was employed in the current study.

The vast majority of scores fell in the "without difficulty" range for the activities evaluated on the Disability Index. This response level occurred across all of the experimental conditions, as well as the baseline phase. One can speculate a couple of possible explanations for these unanticipated results. First of all, it is possible that these subjects were not significantly disabled to start out. Consequently, there would not be a noticeable decrease in symptoms. A second possibility is that fibromyalgia patients experience different topographies or levels of disability in comparison to the rheumatoid arthritis and osteoarthritis patients for whom this instrument was designed. If this second explanation is true, the Disability Index may not be sensitive enough to detect impairments in fibromyalgia patients. Future research would need to assess the utility of the Disability Index with this population.

These findings make it difficult to draw any clear conclusions on the role of stress management training programs in decreasing functional disability in fibromyalgia subjects. However, this remains an important question for researchers to address in evaluating the efficacy of interventions with fibromyalgia patients.
Sleep Patterns

It was hypothesized that stress management training would result in clinically significant improvements in measures of sleep patterns in fibromyalgia subjects. That is, it was anticipated that the subjects would display notable increases in the number of hours of sleep per night and/or display a decrease in sleep disruption, as reflected by fewer awakenings or a decrease in the duration of these awakenings. The results did not support this anticipated outcome. While one of the subjects (Subject 1) did display the anticipated improvements, this effect was not replicated across any of the remaining subjects. Consequently, there is insufficient evidence to attribute those improvements to the intervention.

The measure of sleep disruption utilized in this study was not identical to the measures used in prior research on sleep disruption with fibromyalgia subjects. The current research relied on the more overt behavioral definition of sleep awakening in contrast to physiological indices of sleep disruption, as defined by changes in EEG measured sleep stage changes (Moldofsky et al., 1984). The current study may not have focused on the appropriate measure of sleep disruption. This issue may be clarified by research on the effects of stress management training on EEG sleep stage changes, rather than focusing on the overt measures used in the present study.

Daytime Fatigue

It was anticipated that fibromyalgia subjects would exhibit baseline ratings on the Stanford Sleepiness Scale (SSS) (Hoddes et al., 1972, 1973) that reflected
heightened levels of daytime fatigue. The unanticipated results were that three of the four subjects produced baseline scores that reflected no significant daytime fatigue. These subjects, Subjects 1, 3, and 4, maintained baseline ratings around the range of 2, which was associated with the descriptors "functioning at high level, but not at peak; able to concentrate." Only Subject 2 displayed baseline ratings that reflected significant fatigue. Her ratings centered around 4, which was associated with the descriptors "a little foggy, not at peak; let down."

The hypothesis that stress management training would result in clinically significant improvements in measures of daytime fatigue was not supported. While one subject, Subject 1, displayed a mild decrease in fatigue ratings, this was a very mild change and it was not replicated across any of the other subjects. Consequently, there is insufficient evidence to attribute even this mild change to the intervention. The only subject who displayed significant fatigue, Subject 2, displayed no improvements. The overall low level of baseline fatigue ratings may have precluded the demonstration of any potential effects. Since subjects started out displaying little fatigue, there was essentially no room for improvement in three of the four subjects. Once again, alternative measures of fatigue assessment may help to clarify the question of whether or not stress management training can have any impact on the often reported daytime fatigue in this population.
It was anticipated that the stress management training program would affect all four subjects in basically the same manner. While this did not occur, the data were striking in that an obvious pattern of responding did occur across the subjects. As the previous descriptions of the results revealed, Subjects 1 and 3 were the only subjects showing any positive response to the intervention, with both of them responding positively on the measures of stress, pain, and depression. Subjects 1 and 3 will be referred to as the responders. Conversely, Subjects 2 and 4 did not display any notable improvements across any of the dependent measures. These two subjects will be referred to as the nonresponders. Since the baseline values of the dependent variables were not predictive of the subjects' responses to the intervention, subject characteristics were examined in an attempt to explain the differences in response patterns between these two sets of subjects. It is speculated, based on this review of subject characteristics, that the following variables may have impeded a positive response for Subjects 2 and 4.

The nonresponders each had an additional rheumatic disorder, even though fibromyalgia was diagnosed as a primary disorder. Subject 2 had an additional diagnosis of bursitis, while Subject 4 had additional diagnoses of osteoarthritis and temperomandibular joint pain. The responders each experienced additional nonrheumatic pain disorders. Subject 1 experienced a muscle tear during the study and Subject 3 experienced migraine headaches. The established position concerning the relationship between fibromyalgia and other rheumatic disorders suggests little or
no reciprocal impact between these disorders. Rice (1986) contended that fibromyalgia symptoms are not related to associated disorders and, therefore, associated disorders should not affect outcome in fibromyalgia studies. Bennett (1986) reported that, even when there are other rheumatic disorders, fibromyalgia is usually a discrete coexisting disorder. Despite these claims, the present results raise the possibility that a coexisting rheumatic disorder may have played a role in the ability of Subjects 2 and 4 to benefit from training. The ongoing and similar nature of the pain associated with these other rheumatic disorders, which were not targeted by the intervention, may have masked the effects of the training program on fibromyalgia pain. By implication, this continued pain may have also diminished the subjects' ability to experience less stress and depression. The result of this is the appearance of the failure of the intervention program. These results suggest that more active research should be carried out on how coexisting rheumatic disorders may impact each other, and on how coexisting disorders affect intervention strategies and outcomes.

Ferraccioli et al. (1987) found that their nonresponders produced elevated MMPI profiles. In the present study, both responders had subclinical MMPI profiles, while both nonresponders produced some clinical elevations. In particular, nonresponders shared an elevation on Scale 3, generally associated with histrionic characteristics. The MMPI Scale 3 elevation is often associated with response patterns that may interfere with intervention efforts. Graham (1977) observed that individuals producing Scale 3 elevations often obtain secondary gain from their
physical symptoms. Active attempts to decrease these symptoms may be perceived by the individual as a threat to an important source of social reinforcement. Green (1980) and Graham both observed that these individuals exhibit an enthusiastic initial response to treatment due to their desire to elicit positive feedback from others. However, over the long run they have difficulty relating their behavior to their difficulties, and they may passively resist attempts to address their difficulties in psychological terms. Future research could test the speculative relationship between measured personality features and response to stress management training, identify how these characteristics may impede response, and explore intervention tactics which may neutralize these impeding variables.

Implications for Treatment

Studies to date, including the present study, suggest that stress management training is effective for approximately one-half to two-thirds of individuals treated, and only some symptoms are affected. The current study and Ferraccioli et al. (1987) both showed decreased pain levels as one improvement. This collection of findings also suggests that the clinician should expect that improvements will consist of a decrease in symptom severity rather than symptom removal.

Based on Turner's (1982) findings with chronic pain patients that a combination of relaxation training and cognitive behavior therapy was superior to relaxation training alone, a cognitive behavioral component was included in the current intervention, in addition to relaxation training. Additional intervention
components of self-monitoring training and assertion training were also added in an attempt to provide more comprehensive training in stress management skills. Since Ferraccioli et al. (1987) relied solely on a relaxation training procedure in their intervention (EMG–biofeedback), it was hypothesized that the intervention in the present study would produce clinical improvements that were superior to their findings. This was not the case with respect to pain measures. However, Ferraccioli et al. did not evaluate depression as an outcome measure. Since the responders to the present intervention did display decreases in depression, it is still possible that the self-monitoring, cognitive behavioral, and assertion training components may be a beneficial addition to the treatment package. However, given these limited findings, the utility of adding these components remains an open question. The delayed effects made it impossible to clarify the relative impact of each intervention component on perceived stress levels and fibromyalgia symptoms. Future studies may enhance our understanding of the impact of each of these components. This may occur by evaluating the efficacy of individual intervention components alone, evaluating the effects of rearranging the sequencing of the intervention components, and evaluating the efficacy of cognitive behavioral approaches other than the RET approach used in this study.

While the current intervention package was similar in length to many others reviewed, some interventions involve much more extensive contact. For example, Parker et al. (1988) carried out a 12-month cognitive behavioral pain management training program with RA patients. Parker et al. also found mixed results on pain...
measures despite measured improvements in coping skills. More is not necessarily better. It is interesting to note, however, that the limited follow-up data in the present study look promising. It is not clear if these were good-bye gifts to the researchers (i.e., self-report bias), continued cumulative effects, or longer delayed effects. These observations raise the possibility that more prolonged training may facilitate greater clinical change. At a minimum they point to a need for more extensive follow-up in such research and suggest that a longer term training program be studied. Additional intervention techniques may facilitate change. Bradley (1989) recommended training fibromyalgia subjects in goal setting, problem solving, and self-reinforcement as additional coping skills. While these are worthwhile issues to study, the addition of interventions also emphasizes the importance of cost-benefit analyses.

Final Comments

In 1986, Bennett stated that "Until the study of fibrositis rests upon a firmer scientific foundation, the prescription for effective treatment will remain elusive" (p. 18). Research on psychological interventions with fibromyalgia is in its infancy, and Bennett's comment remains relevant today. The ground breaking Ferraccioli et al. (1987) study and the current study have laid the first few bricks of this foundation with regard to psychological interventions. However, the primitive level of this exploration at present is obvious. While both studies provide some support for the
efficacy of stress management training with fibromyalgia, neither was able to identify the specific avenue of influence.

The current study offers qualified support at best for the efficacy of stress management training in decreasing fibromyalgia symptoms. These improvements were limited to stress levels, pain symptoms, and mood disturbance. While the multiple baseline demonstration of effects is weakened by these mixed results, the mixed results also produced some serendipitous construct validity. Subjects who did not show decreases in stress also showed no fibromyalgia symptom decreases, while subjects who exhibited a decrease in stress also exhibited a decrease in some fibromyalgia symptoms. These findings are consistent with the theory that stress plays a modulating role in fibromyalgia and successful stress management training will result in a diminution of fibromyalgia symptoms.

Much more research is needed before the role of psychological interventions in fibromyalgia becomes clear. Stress is likely to be only one of a multitude of variables that affect symptoms. As the current results suggest, for example, there is some question as to whether depression should be viewed as a symptom or as a coexisting variable that interacts in a reciprocal manner with the disorder. Hudson and Pope (1989) have proposed that fibromyalgia may be part of a cluster of disorders that share overlapping symptoms and comorbidity. They refer to this as the Affective Spectrum Disorder, and they include major depression and panic disorder among the eight disorders currently proposed to fit in this cluster.
Regardless of the specific nature of fibromyalgia, stress management is likely to play some role in treatment. As a holistic view of physiological dysfunction is becoming more prevalent, the line between physiological and psychological influence is becoming more blurred and the need for lifestyle changes is becoming more clear. While it would be erroneous to identify this study as proof positive that fibromyalgia symptoms can be diminished through stress management training, the use of stress management training in the reduction of fibromyalgia symptoms remains a valid and fruitful area for future study.
Appendix A

Approval Letter From the Human Subjects
Institutional Review Board
Date: November 1, 1989

To: Robert J. Sheppard

From: Mary Anne Bunda, Chair

This letter will serve as confirmation that the HSIRB has approved your initial application of August 29, 1989, and has approved the amendments to the protocol as specified in the memo of October 23.

Thank you for your attention to this matter.

xc: C. Koronakos, Psychology

HSIRB Project Number 89-08-13
Appendix B

Consent Forms
Purpose: The Positive Action Stress Management Project is a research project designed to study the effect of stress management training on "trigger points," pain, physical and social impairment, sleep disturbance, fatigue, and depression in fibromyalgia patients. The purpose of this program is to teach the participant techniques to use in decreasing stress. Secondly, since it is believed that stress increases symptoms of fibromyalgia, this study will evaluate if using these techniques decreases fibromyalgia symptoms.

Description of Study: You will participate in a 10 week stress management training class in which you will be taught techniques shown to be useful in decreasing stress. You will meet individually with the trainer once a week for approximately 90 minutes each time. Two to three other individuals will also be completing the same training during the course of this study, but the trainer will meet with each individual separately.

During the 10 weeks you will do homework assignments and complete brief questionnaires. The assignments will include brief readings and daily activities, such as practicing relaxation techniques and taking notes about stressful situations. You will also complete brief daily and weekly questionnaires for a period of time before training begins. This amount of time will be randomly assigned and can vary from three to nine weeks before the training begins.

The training program will teach you a set of techniques that help reduce stress. The first part will focus on learning about stress, including identifying your own stressors and your reactions to these stressors. The second part will teach you different methods of relaxation. The third part will teach you to recognize and change stress-increasing thoughts. The final part will teach you how to stand up for yourself in difficult situations: These techniques will be taught through readings, demonstrations, in-class practice, and homework assignments.

Since this is a research project, you will help the researcher evaluate how well the program works. You will do this by:

1) filling out questionnaires once a week that describe your pain, disabilities, and mood;

2) completing daily questionnaires about pain, stress, sleep, and fatigue; and

3) having measures of tender spots (dolorimeter) completed by your doctor three times - before the study, after the final class, and one month later. You will allow the researcher to obtain the results of these readings.
Positive Action Stress Management Project Consent

While this may seem like a lot to do, each questionnaire and rating form is very brief. The daily rating activities can be easily incorporated into your daily routine.

Risks
Using stress management with fibromyalgia is experimental because it has not been proven to decrease fibromyalgia symptoms. However, one prior study using relaxation training with fibromyalgia patients did result in some improvements in symptoms. The stress management techniques to be used are not experimental. They have been shown to decrease stress. None of the studies on stress management have reported any problems being caused by learning stress management techniques.

Since you will be learning new skills to use in your daily life, it is possible that this may affect your relationships with others. For the most part, this should be a positive change. However, some people may have to adjust to your new behaviors. This possible problem will be discussed, and the training will include ways to minimize this possible problem.

Benefits
First, you will learn techniques to decrease the amount of stress you experience. Second, since it is believed that fibromyalgia symptoms may be increased by stress, it is possible that there may be some decrease in your fibromyalgia symptoms. This is the main question of this study. Consequently, this second benefit is not certain. This study will also help rheumatologists and psychologists learn how they can and cannot help people with fibromyalgia.

Other Treatments
This program is not a replacement for your ongoing medical care. You are strongly encouraged to maintain your regular contacts with your doctor during the study. It is asked that no new experimental treatments or drastic medication changes be made during the study, unless your physician believes such changes are necessary. Stress management training can also be obtained through other counseling services if you do not choose to participate in this study.

Confidentiality
Information will be collected by you, the researcher, and the physician. All the information will be kept by the researcher. Only the researcher, study assistants, faculty supervisor, and doctor will see the information.

The classes will be held at DeLano Clinic, which is an outpatient psychology clinic in Kalamazoo. You will not be a client of DeLano Clinic. DeLano is only providing a room for the class, in addition to clerical processing of the MMPI you took during the selection process. DeLano Clinic assumes no liability for your participation in this research. Your participation in this study will be kept confidential by the DeLano staff.

The information collected in this study will be the basis for
Positive Action Stress Management Project Consent

a doctoral dissertation by the primary researcher. This information may be submitted for publication and be used in public presentations. During any publication or presentation your identity will not be revealed. After the study is completed, unnecessary forms will be destroyed. Any remaining forms or information will be coded (i.e. Subject A) and identifying information will be blacked out.

Contacts
If you have questions about the study, you may contact the researcher and trainer, Robert Sheppard, at (616) 388-6807. This research is supervised by Dr. Chris Koronakos of the Psychology Department at Western Michigan University (387-4479).

Voluntary Participation
Your participation in this research is voluntary. You may refuse to participate in the study at any time. This refusal would not affect your ongoing treatment outside of this project.

Financial Considerations
There is no financial charge for participating in this study. Your participation in this study will not result in payment or in financial coverage for other services you seek. You should refer to your own health insurance for payment of medical expenses incurred while participating in this research project.

Volunteer Statement
I acknowledge that I have read a description of this study and understand its contents. I acknowledge that I have been able to ask questions about the study and that these questions have been answered to my satisfaction.

In giving my consent, I acknowledge that my participation in this research project is voluntary and that I may withdraw at any time.

I hereby authorize the investigators to release information obtained in this research study to scientific literature and public presentations provided that my identity is not revealed.

Subject __________________________________________  Date _____________
Witness _________________________________
Investigator _____________________________
Positive Action Stress Management Project

The Impact of Stress Management Training on Symptoms of Fibromyalgia

MMPI CONSENT FORM

I would like to be considered for participation in the Positive Action Stress Management Project for individuals with fibromyalgia. I understand that the Minnesota Multiphasic Personality Inventory (MMPI) is being administered as part of the process to select participants for this research project.

I voluntarily agree to take the MMPI. I hereby authorize the investigator to use the results of this personality measure to evaluate whether or not I am an appropriate candidate for this particular research, and to describe characteristics of study participants.

I give my permission for clerical staff of DeLano Clinic, Inc. to score my responses on this test. I understand that the role of DeLano Clinic, Inc. is only 1) to provide test material; 2) to provide a site for taking this test; and 3) to score test responses. The test interpretation, and all decisions regarding the test results will be made by the primary investigator of this study, independent of DeLano Clinic, Inc. I also understand that there will be no financial charge to me for this process.

I give this consent with the understanding that the results are to be used only for this study, and that my anonymity is guaranteed. I also acknowledge that the results of this measure may be described in presentations of the research, provided that anonymity is guaranteed.

NAME ____________________________ DATE ____________

WITNESS __________________________ DATE ____________

Revised 9/22/89

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Appendix C

Outline of Classes
Class 1: Phase I

1. Introduction
2. Review program
3. Review first two classes
4. Troubleshoot daily data collection
5. Administer weekly dependent measures
6. Collect daily dependent measures from past week
7. Hand out daily dependent measure forms for coming week
8. Lecture on fibromyalgia
9. General discussion of fibromyalgia
10. Identify patterns of stressors from Daily Stress Inventory
11. Reading assignments

Class 2: Phase I

1. Administer weekly dependent measures
2. Collect daily dependent measures
3. Hand out daily dependent measure forms
4. Troubleshoot dependent variable data collection
5. General question and answer period regarding program
6.* Review last class
7. Education regarding stress
   A. Complete and discuss "Signs of Stress" checklist

*Steps 1 – 6 remain the same for all subsequent classes.
B. Teach "Stress Scan" = recognizing stress in body through day
C. Lecture on stress with outline handout
8. Lecture on relationship between stress and pain
9. "Stressor Spotter" assignment = form to self-monitor stressors
10. Additional assignments
   A. Readings
   B. Practice "Stress Scan"

Class 3: Phase II

1–6.
7. Lecture on the relationship between stress and fibromyalgia
8. Review "Stressor Spotter" assignment
9. Train progressive muscle relaxation
10. Assignments
   A. Monitor stressors and practice Stress Scan
   B. Practice progressive muscle relaxation with audiotape
   C. Reading

Class 4: Phase II

1–6.
7. Review and practice progressive muscle relaxation
8. Review "Stressor Spotter" assignment
9. Train respiratory-based relaxation
10. Train passive relaxation
11. Review reading assignments

12. Assignments
   A. Monitor stressors, do Stress Scan, and try relaxation in-vivo
   B. Practice relaxation techniques (includes audiotape for passive)
   C. Brief reading

   **Class 5: Phase III**

1–6.

7. Review progressive muscle, passive, & respiratory relaxation

8. Review assignment – using relaxation in-vivo

9. Train meditation relaxation

10. Summarize relaxation procedures to date

11. Begin cognitive behavioral training
    A. Discuss reading assignment
    B. Introduce ABC model of RET – lecture with handouts

12. Assignments
    A. Monitor 2 identified stressful situations
    B. Use relaxation in-vivo
    C. Practice relaxation techniques
    D. Monitor self-talk (forms provided) = just identify it occurring
    E. Brief reading

   **Class 6: Phase III**

1–6.
7. Review relaxation techniques.
8. Review real life relaxation use
9. Train imagery–based relaxation
10. Review ABC model of RET
11. Checklist: Identify their Basic Irrational Beliefs
12. Train differentiating between rational and irrational beliefs
13. Review assignment on monitoring self–talk using ABC model
14. Assignments
   A. Practice relaxation techniques
   B. Brief reading
   C. Monitor self–talk & label as rational/irrational – form provided

Class 7: Phase III

1–6.
7. Review relaxation procedures
8. Train coping imagery/cognitive rehearsal
9. Review results of assignment to discriminate rational/irrational self–talk
10. Train disputation of irrational self–talk
11. Review reading assignment
12. Discuss additional ways to use self–talk to decrease stress
13. Assignments
   A. Practice coping imagery/cognitive rehearsal
   B. Monitor self–talk & dispute irrational self–talk (form provided)
C. Brief reading

**Class 8: Phase IV**

1–6.

7. Review relaxation techniques
8. Review coping imagery/cognitive rehearsal
9. Discuss disputation assignment results
10. Review additional ways to use self-talk to decrease stress
11. Introductory lecture on assertion
12. Discuss subject's beliefs about assertiveness

13. Assignments
   A. Practice coping imagery/cognitive rehearsal
   B. Self-monitor assertion opportunities & behavior in these situations
      (form provided)
   C. Complete "Assertion Inventory" from Gambrill & Richey (1975)

**Class 9: Phase IV**

1–6.

7. Discuss Assertion Inventory results
8. Discuss assertion opportunities self-monitoring results
9. Handout & discussion on troubleshooting attempts at assertion
10. Discuss results of coping imagery/cognitive rehearsal assignment
11. Lecture on additional assertion skills
12. Role play/behavior rehearsal of assertion skills
13. Assignments

A. Practice coping imagery/cognitive rehearsal
B. Self-monitor assertion opportunities & behavior in the situation
C. Try at least one real life assertive response

Class 10: Phase IV

1–6.

7. Discuss results of coping imagery/cognitive rehearsal assignment
8. Discuss results of assertion opportunities self-monitoring assignment -- includes discuss attempt at assertive response
9. Role play/behavior rehearsal of assertion skills
10. Review all class material
11. Lecture/discussion on maintenance of learned skills


