12-1989

Behavioral Treatment of Headaches

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BEHAVIORAL TREATMENT OF HEADACHES

by

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A Dissertation
Submitted to the
Faculty of The Graduate College
in partial fulfillment of the
requirements for the
Degree of Doctor of Education
Department of Counselor Education
and Counseling Psychology

Western Michigan University
Kalamazoo, Michigan
December 1989

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Western Michigan University, 1989

Headaches are common and frequent forms of pain, and are classified on the basis of inferred physiological factors (Ad Hoc Committee on the Classification of Headache, 1962).

Behavioral treatment of headaches was the subject of this study which focused on improving our understanding of the psychophysiological mechanisms of head pain. It is believed that understanding the physiological and psychological mechanisms of head pain assist in designing treatment using effective behavioral and cognitive methods (Olton & Noonberg, 1980).

Twenty-four headache patients diagnosed as muscle contraction (tension), or migraine headache sufferers were chosen as subjects. The length of the study was one week baseline plus seven weeks for the treatment phase, and eight weeks for the follow-up phase. Twelve migraine headache patients and 12 muscle contraction headache patients were assigned randomly into four treatment groups. Treatment groups received electromyograph (EMG) biofeedback, skin temperature biofeedback, relaxation training, and no treatment. Five headache index measures

(pain intensity level, EMG level, skin temperature, duration of headache bout, and number of bouts per week) were dependent variables.

The main result of this study shows that biofeedback treatment was as effective as relaxation training in reducing headache activity for the subjects. The combination of the two strategies might provide patients with an optimal treatment protocol.

Order Number 9015721

Behavioral treatment of headaches

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Western Michigan University, 1989

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ACKNOWLEDGEMENTS

I wish to express my deepest appreciation and a debt of gratitude to Dr. Robert Betz, Dr. Dale Brethower, and Dr. Thelma Urbick. I credit their scholarly influence and responsiveness to my needs as both an individual and international student for the academic and professional accomplishments I have enjoyed under their tutelage.

I wish to acknowledge Three Star General, Dr. David Hanania, The Director of the Royal Medical Services in Jordan, for his support of the project and the opportunity to continue pursuing my educational goal of a doctoral degree.

Each has made a unique contribution that has truly played a significant role in my development as a counselor and scientist.

For reasons which are known to them alone I would add that their enduring sense of humane treatment has been an oasis in a vast desert.

Walid S. Salah Kailane

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CHAPTER I

INTRODUCTION

The behavioral medicine field considers head pain as a psychophysiological disorder which is caused by underlying etiological factors and is associated with changes in the autonomic nervous system (Dudley, Martin & Holmes, 1965). Different psychological factors are assumed to increase the perception of and the reaction to pain (Fordyce, 1976). These factors include emotions, attitudes, and other environmental stressors which may attenuate head pain. Even in the absence of pain behavior, stressors may be accompanied by changes in autonomic activity. On the other hand, feeling a specific kind of pain will determine the kinds of reactions that will be expressed by the patient. Moreover, individual pain reactions will determine the way each patient will behave in expressing his/her pain.

Behavioral therapies have been used recently in conjunction with medical treatment processes for managing and controlling pain behaviors (Fischer-Williams, Nigl & Sovine, 1981). When behavioral modification principles were developed, they were used in understanding and in treating the underlying symptoms of pain behaviors.

Behavioral therapists view pain as a behavior that must be observable and measurable. Viewing pain as behavior is important in evaluating and screening pain, which relies heavily on the patient to participate in assessing pain behavior by monitoring and recording the symptoms of pain disorders.

Behavioral theorists (e.g., Fordyce, 1976) view pain as an resultant of different responses and different stimuli which they describe as a pain cycle: certain stimuli (antecedents, reinforcers) will control certain responses (expressions, pain reactions). Behavior will or will not be learned according to whether or not basic behavioral processes occur. The learning of pain behavior may be arranged by the patient as a continuing cycle of pain. The cycle of pain, which is identified specifically by a specific subject, makes the pain experience subjective rather than objective. In addition, the expressions of pain (responses) may vary along different dimensions such as a pain intensity level, duration of attack, and frequency of attacks.

Regarding pain assessment procedures, in the diagnosis and treatment of pain patients three, internal factors must be considered: physiological, psychological and cognitive. Physiological factors include all organic and physical factors causing the underlying symptoms of pain behavior such as chemical agents, physicochemical agents, and constriction of the blood supply system. In general, the organic factors are considered the main perpetuating factors for respondent pain (Barber & Adrian, 1982). Psychological factors include factors associated with the psychological life of the patient, especially those emotional or personality components which tend to exaggerate or decrease the pain. Cognitive factors include the factors associated with the cognitive components such as internal dialogues, attitudes, and belief systems. In addition to the internal factors just described, other external environmental factors must be considered in determining the quality and quantity of pain behavior such as social stressors and cultural factors.

The primary purpose of using behavioral methods in treatment of headaches is to teach the patient how to relax muscles believed to cause pain as a result of sustained muscle contraction, or as a result of dilation of the cranial arteries. Several behavioral methods may be used in treating head pain, such as electromyograph (EMG) biofeedback and relaxation training procedures.

The behavioral methods contrast with an illness model which provides treatment with medication which the patient believes will provide immediate release from head pain symptoms. Any kind of chemical agents prescribed for treating headache patients may be perceived by the patient as effective for decreasing the severity and the activity of head pain. For example, the muscle relaxant, Ergotamine, is prescribed for relieving pain of migraine headache sufferers. However, any usage of chemical agents in treating headaches must consider the possibility of negative side effect such as addiction and habituation.

Clinical application of behavioral treatment methods in treating head pain assumes that pain is accompanied or preceded by psychological and physiological changes; therefore, providing the patient electronically (biofeedback) with information about these changes can assist the patient in developing the process of self-control to manage or reduce the pain.

In this study, two kinds of behavioral therapy were used in treating two kinds of headaches: (1) biofeedback treatment ordinarily used for treating migraine headache patients, and (2) nonbiofeedback (relaxation) ordinarily used for treating the muscle contraction headache patients. The study investigated the effectiveness of EMG biofeedback, hand warming biofeedback, and relaxation techniques in treating headache patients.

The Problem and Its Background

Recently, behavioral treatment has gained popularity in treating psychophysiological disorders. Several studies have reported on underlying mechanisms relevant to the effectiveness of using biofeedback and relaxation training in treating headaches. The theoretical rationales for using behavioral methods in the treatment of headaches are based on learning principles, self-control, and operant conditioning (e.g., Thompson, Haber, Figueroa, & Adams, 1980; White & Taylor, 1967).

Most headache types have been related to two major kinds, vascular and muscle contraction headache. Wolff (1948) concluded that intracranial and extracranial arteries are the important regions associated with two important pain phases which are known as a vasoconstriction and a vasodilation phase. It was suggested by Nigl (1984) that the vasoconstriction phase in headache patients is correlated with a low level of stimulation and the vasodilation phase is correlated with a high level of stimulation. Friedman (1979) concluded that the primary physiological sources of headache stimulation are skull skin, pain receptors, scalp muscles, blood supply system, and traction sources. Blood pumped by the heart muscle supplies blood all over the body. During headache attack (migraine) the blood flow will be resisted by the constriction of cranial arteries resulting in a decreasing of the amount of blood volume provided to the scalp tissues then level of pain stimulation increases and head pain begins. During the initial phase of the arterial vasodilation phase, and/or during the recovery from the previous vasoconstriction phase, the level of pain stimulation increases again which causes the attack onset. Pharmacological agents in treatment of headache are assumed to reduce the pain intensity level that precedes the initial vasodilation phase which terminates the effects of constriction of arteries in order to increase the amount of blood volume and to decrease the pulsation amount. Nigl (1984) stated that:

> The pain of migraine is believed to be caused by excessive pulsation of temporal arteries (which are known to be overly reactive to dilation stimuli in those prone to migraines). Before vasodilation, however, the prodromal [SIC] phase of classic migraine is associated with vasoconstriction or reduced blood flow. This reduction in blood flow is very severe and results in anoxia in some areas of the brain. (p. 211)

Behavioral treatment of headaches assumes that cognitive behavioral strategies can relieve head pain intensity by inducing relaxation of muscles believed to cause pain, either as a result of sustained muscle contraction during the attack phase, or during the initial phase of the vasodilation of arteries (Dudley et al., 1965). These treatment techniques must be accompanied by an understanding of cognition (imagery, visualization), which play an important role in the development of modern behavioral therapy. The psychological factors that include systematic social reinforcement must also be highlighted as a factor in maintaining pain behaviors.

All types of behavioral treatment methods depend on behavioral modification principles, which help in modifying the underlying symptoms of pain behavior. Behavioral treatment methods are divided into five major categories; imagery, relaxation, modeling, cognitive strategies, and self reinforcement (Mahoney, 1980).

Relaxation Treatment of Headaches

Psychological approaches for controlling pain behavior, particularly behavioral therapy, have been studied in depth. Nigl (1984) stated that "relaxation is used by behavior therapists to counteract the effects of anxiety on thoughts and behaviors allowing more appropriate thoughts/behaviors to be learned" (p. 22).

Three factors emerged as important in the treatment of headaches. The first factor is the concept of pain as a complex resultant of reciprocal influences of cognitive, motivational, and sensory components. The second factor is the somatic (medical and surgical) factors that make the treatment only partly effective in eliminating pain; moreover, somatic treatment has side effects on the patient. The third factor is the absence of effective response to traditional psychiatric techniques (Turner & Chapman, 1982a).

Behavioral therapy approaches usually used psychological techniques in reducing pain behaviors by depending on the application of principles of classical conditioning in the treatment of abnormal behaviors. The main concentration was on the relation between stimuli and response where the anxiety responses were learned through the elicitation of thoughts and images (e.g., phobias).

Relaxation training has been used to relax tense muscles and to reduce the effectiveness of musculo-skeletal pain, by not allowing excess responses to stress (Connor, 1974; Goldfried & Trier, 1974). To overcome the problem of stress-arousal responses, patients are taught to make contact with current body sensations and break down any pre-occupying thoughts (Jacobson, 1970). Relaxation training is used to control feelings and reduce physical sensations, reaching a state in which stress and anxiety seem far away: tension is the opposite to relaxation. Beeson and McDermott (1967) found that the relaxation response might be distinguished by the following: "decrease in oxygen consumption, carbon dioxide eliminations; heart rate, minute ventilation, and arterial blood lactate; increases in skin resistance and skeletal muscle blood flow, slow alpha waves and occasional theta wave activity; and no changes in blood pressure or rectal temperature" (p. 130). Studies show that various types of progressive muscle relaxation training procedures are effective in reducing head pain, and may be used in combination with electromyograph (EMG) biofeedback, or alone as a treatment method for eliminating psychophysiological disorders (e.g., migraine and tension headaches).

Biofeedback Treatment of Headache

Nigl (1984) reported that biofeedback training procedures were developed by (Budzynski & Stoyva, 1969) as follows: (a) detecting and amplifying a specific internal physiological response; (b) translating electronically these detected responses into visual or auditory signals; and (c) feeding back this information to the patient immediately.

In the present study, the main purpose of using the biofeedback training methods in combination with relaxation training methods was to decrease the negative effects of somatic disorders, by providing the patient with information about tension and relaxation states. According to Blanchard, Jurish, Andrasik and Epstein (1981), the patient becomes able to discover the association between physiological responses and tension relief, and the patient learns how to control the regulation of voluntary responses that had broken down due to the somatic diseases. The patient learns, also, how to use self-control skills by identifying stressful situations and by coping with his problematic behavior. The purpose of using biofeedback techniques with headache patients is based on the assumption that the pain behavior is experienced as a consequence of different cognitive factors that strengthen sympathetic and somatic skeletal arousal, where skull and neck muscles have sustained contraction (Dalessio, 1972). Selecting one kind of biofeedback technique instead of another depends on the headache mechanisms, and on the procedures that may increase the vasodilation responses, and decrease the vasoconstriction responses of the intracranial and extracranial artery system (e.g., hand warming biofeedback) (Nigl, 1984; Wolff & Jarvik, 1963). Gaarder and Montgomery (1977) listed the following 11 variables that according to (Diamond, Diamond-Falk, & Deveno, 1978) must be considered in selecting the biofeedback technique: (1) Philosophy of treatment, (2) the strength of ego, (3) characteristics of personality, (4) patient's motivation, (5) nature of symptoms, (6) priority of treatment, (7) past history of the patient, (8) previous biofeedback experiences, (9) duration of treatment, (10) placebo effects, (11) the experimenter.

Nigl (1984) concluded that four types of biofeedback techniques are being used with chronic pain symptoms: (1) EMG feedback for decreasing the EMG frontalis level,

(2) thermal feedback (hand warming) for increasing skin temperature, and the amount of blood flow through temporal arteries, (3) electroencephalogram (EEG) feedback to produce alpha and theta waves, and (4) cephalic blood volume pulse feedback (BVP) to increase the activities of cephalic responses.

Muscle contraction headaches are associated with the patient's reactions to psychological factors which cause musculoskeletal pain, while migraine headaches are associated with a deficit of recovery responses from stress-arousal states, and with the initial vasodilation phase of the cranial arteries which preceded the vaso-constriction phase (Cuevas et al., 1980). Traditional biofeedback techniques have been employed for treatment of headaches, in combination with relaxation training or not, as a kind of behavioral treatment method. EMG biofeedback treatment is used for treating the muscle contraction headaches, while hand warming biofeedback technique is used for treatment of migraine headaches.

Statement of Problem

The purpose of this study was to determine the effectiveness of biofeedback (EMG, finger temperature) techniques and relaxation training procedures, in treatment of head pain.

Wolff (1948) indicated that cranial arteries are involved in the arterial disease headache that may come from outside of the cranium (vascular headache) or from inside of the cranium (tension headache). In general, headache symptoms are caused by processes of traction and inflammation within the cranium. All the arteries of the scalp were found to be sensitive to pain, and the skin of the scalp was found to be sensitive to all forms of thermal, chemical, mechanical, and electrical stimulation. Wolff (1971) and Friedman, Von Storch, and Merritt (1954) concluded that mechanisms of the preheadache phenomena are different from headache itself. Most of the studies that investigated vascular headache treatment methods indicated that a vasoconstriction phase of the cranial arteries never preceded the vasodilation phase, but no explanation was provided about the causal relationship between the preheadache vasoconstriction phase and the cranial vasodilation of migraine. Migraine patients used to report that vasomotor changes and the feeling of depression were experienced during 18 to 72 hours prior to the starting of headache's attacks, which means that cerebral vasoconstriction must be terminated before extracranial vasodilation has begun. In addition to that, it is uncertain whether the differences in the awareness may influence the subject's ability to prohibit the pain behavior (Silver, Blanchard, Williamson, Theobald, & Brown, 1979). In addition to the physiological etiologies just noted, both migraine and muscle contraction headaches are associated with emotional factors, which are considered major causal agents in headaches (Ad Hoc Committee on Classification of Headache, 1962; Dalessio, 1972; Martin, 1966).

Emotional factors relate to tension and contraction of the cranial arteries which are the arteries most likely to produce a combination of muscle contraction and vasoconstriction phases that facilitate and increase head pain. But again it is not known whether the previously described factors must always be present to induce headache (Davis, 1968).

Finally, Wolff (1948) divided headache prevention strategies into seven classes: (1) Procedures that prolong rest such as electrical shock, (2) surgical procedures that are used to eliminate the source of head pain, (3) chemical agents, (4) cognitive behavioral therapies, (5) relaxation training procedures, (6) procedures that induce vasoconstriction (hand warming biofeedback), and (7) procedures that reduce the reactivity of the vasomotor centers. Wolff indicated that the last four strategies are the most prevalent strategies used by behavioral therapists in treatment of headaches.

Variables to be Examined

The following variables are important considerations in the study:

1. Subject variables: Headache symptoms are varied across subjects and the same subject at different times. Headache symptoms must be distinguished from other physiological disorders. In order to differentiate symptomatological characteristics, it has been assumed that similarities and differences in symptoms of headaches could be identified among diagnostic groups.

2. Nature of headache: Head pain may move quickly and change in position of recurrence, while headache is variable in its duration and intensity.

3. Assessment factors: In this area, several factors must be considered. Among these factors are instrumental and procedural process factors. Assessment factors are associated with the kind of measure that may be used. Absolute differences in measures may be seen; these differences come from different groups of muscles that are involved in the process of measuring.

4. Psycho-social factors: Psycho-social factors are considered as important in exacerbating headache problems and effective in prolonging head pain. Fordyce (1976) assumed that certain pain behaviors are observed in the interaction between the patient and the environment. He

indicated that the arousal of headache activity is due to the decrease of blood supply (migraine) or to the contracted muscles (tension headache).

5. Procedural variables: Selection of methods and measurement procedures are important considerations that must be verified carefully. When measurements are selected, similarities and differences of headache symptomology must be considered. Usually, pain behavior is measured by indirect procedures, and for achieving accurate measures, care should be taken to verify the assessed pain level that had been experienced.

Limitations

The following factors must be considered in the research, as variables that might have a significant effect on the results:

1. Similarities of headache symptoms: In this study, two major kinds of headaches (migraine, muscle contraction) were treated by two different strategies (biofeedback and relaxation training). It was assumed that different physiological and psychological mechanisms underlie the two types of head pain. Nevertheless, while the signs and symptoms of headaches are good indicators for pain existence, they may not differentiate headaches neatly into two classifications.

2. Methodological limitation: These limitations may be considered in three categories: subjects, selection of measures, and instrumentation problems.

A. Subjects: Headache symptoms may vary across the same individual as well as between individuals.

B. Selection of Measures: Measures of pain behaviors usually rely upon self-report measures, and the pain assessment scales provide some information about the quality and the quantity of pain, which is described in the patient's own words. One class of self-report instrument that was used in this study, is the pain intensity rating card. Using this scale in assessing pain activity has several advantages (easy and inexpensive) but at the same time, its validity and reliability are still under question because the process of evaluating the accuracy of a patient's self-report depends on a spouse report and other observations.

C. Instrumentation Problems: Instrumentation problems arise from recording equipment that is available in the market and from improper use of the equipment. For example, it has been assumed that EMG activity level for one muscle cannot be used as index of the general level of muscle activity (Thompson, Raczynski, Haber & Sturgis, 1983). EMG frontalis resistance level must be minimized by cleaning the electrodes which then are applied over the appropriate muscles. For example, for accurate EMG recording of the frontalis muscles, the electrodes must be placed above each eye in a proper application.

3. Limitation of Behavioral Methods: The present study is predicated on the assumption that pain is a very complex phenomenon and is influenced by different factors such as biochemical, psychological, and social factors. Therefore, pain is likely to be attenuated by different mechanisms (Fordyce, Roberts & Strenbach, 1985; Tan-Yang, 1982; Thompson & Adams, 1984). Accordingly, pain should be assessed with subjective behavioral and physiological indices (Sisuter, 1978). In this study behavioral methods were used for evaluating and measuring pain behavior and even though every effort was made to assure objectivity of behavioral measures used, they do not measure pain experiences directly. In addition to that, behaviors that are critical may change with illness and other disorders.

4. Clinical and Non-Clinical Subjects: There are many differences between patients who are suffering from headache who seek pain elimination treatment, and those who are non-clinical subjects who are voluntarily assigned in studies.

5. Age and Sex: Merskey et al. (1985) concluded that female subjects generated a EMG frontalis level higher than the male level. Wolff (1971) indicated that

muscular headache occurs more frequently during the aging period more than during youth. Thus the results of this (or any) study need to be replicated with other populations of subjects.

Significance of the Study

Pain is the most prevalent health symptom ever known (Fordyce, 1976). Pain is an unpleasant experience termed as chronic or acute according to the time of continuity and to the amount of intensity.

Turner and Chapman (1982a) stated that "Bonica estimates that 86 million Americans suffer with some form of chronic pain" (p.1). Turner and Chapman added that there are "35 million with chronic recurrent headaches, 18 million with chronic painful back disorders, 1 million with cancer pain, and millions more with other chronic pain states" (p. 2). In addition to that they estimated that chronic pain problems cost the Government of the United States of America $60 billion each year. Related to the prevalence of the head pain problem, Nigl (1984) stated that:

> Headache is the major complaint of about 50 percent of the individuals who consult a physician (Friedman, and Merritt, 1959). Waters (1970) estimated that out of a large sample of adults surveyed, 65 percent of the males and 79 percent of the females reported having at least one headache in the previous year. Appenzeller (1973) indicated that over 80 percent of all headache sufferers treated in

> headache clinic, have tension headache. According to Budzynski, the estimates of the number of people in the United States who suffer from tension headache range from 50 to 100 million. (Budzynski, p. 175)

Usually, traditional medical treatment of headache focuses on the physiological mechanisms that underlie head pain and ignores the importance of the psychological factors that are participating in the causes of symptoms, and in relieving pain syndromes. Recently, behavioral and cognitive-behavioral therapies have been used extensively in treatment of headache disorders. Behavioral treatment techniques derive their processes from behavioral modification and psychological intervention principles (e.g., biofeedback treatment, and relaxation training).

The assumptions underlying use of biofeedback training in the treatment of headache disorders were described by Neuchterlein and Holroyd (1980) as follows: (a) The underlying etiology of pain syndromes relies heavily on psychophysiological causes, and (b) a subject may learn how to control his/her internal disorder responses if provided with immediate auditory or visual information by biofeedback techniques. Nielsen and Holmes (1980, pp. 235-238) offered three assumptions be-hind the rationale for using biofeedback techniques in treatment of headaches: First, EMG biofeedback frontalis training is effective in treating muscle contraction headache by decreasing tension of associated frontalis muscles. Consistent with that assumption, many studies reported the effectiveness of EMG frontalis biofeedback in producing muscular relaxation with muscle contraction headache patients (Budzynski, Stoyva, Adler, & Mullaney, 1973; Cox, Freundlich, & Meyer, 1975; Hutchings & Reinking, 1976). However, using electromyograph (EMG) alone in the treatment of vascular headaches had not been investigated (Diamond et al., 1978).

The second assumption offered that during frontalis feedback training the effects will generalize to other muscle groups. In addition to that, Nielsen and Holmes (1980) assumed that EMG biofeedback was more affective than thermal and electromyograph feedback (temperature) training in reducing heart rate and skin temperature. No evidence had been reported about the transferring of trained relaxation from one group of muscles to another (e.g., face, scalp, and neck muscles). The facilitating effect of EMG frontalis biofeedback training from one muscle to the second one is still under question (Alexander, White, & Wallace, 1977).

Alexander et al. (1977) assumed that EMG biofeedback was not found to be more effective than rleaxatin training in increasing skin temperature (Finger temperatures) when used with a vasomotor training in the treatment of vascular headaches. By using finger temperature biofeedback in treatment of migraine headache a subject will learn how to increase skin temperature, and how to control the warmth of the hand. This kind of vasomotor training will be easier if the patient is in a relaxed state (Culver & Hauri, 1972). Moreover, various studies support the hypothesis that the finger temperature biofeedback strategy is effective in reducing migraine headache activity (e.g., Fahrion, 1977). However, studies did not support existence of a significant correlation between changes in finger temperature and headache severity, nor did they clearly support the rationale which stands behind using a finger temperature biofeedback treatment strategy with migraine headache sufferers (Turner & Chapman, 1982a).

The third assumption was that a combination of successful EMG biofeedback with progressive muscle relaxation training will be more effective in treatment of muscle contraction headache than using one technique alone. Many studies preferred the usage of the combination of both biofeedback and relaxation training treatment of tension headache (e.g., Cox et al., 1975; Haynes, Griffin, Mooney, & Parise, 1975; Holroyd & Andrasik, 1978). No evidence to date supports the effectiveness superiority hypothesis for one behavioral treatment strategy over another (Turner & Chapman, 1982).

The previously described hypotheses led to the conclusion that biofeedback techniques have become a major tool for treatment of headaches, if used in combination with cognitive behavioral patterns (e.g., relaxation, imagery techniques). The basic assumption behind using cognitive-behavioral procedures in pain prevention strategies is that pain experience is associated with a subject's cognitive components (attitudes, beliefs, and expectations), and determined by emotional and behavioral reactions to environmental events. According to that logic, using behavioral methods in teaching the subject how to identify his/her cognitive components will help him/her to increase awareness of stressful-arousal events that are associated with muscle relaxation and muscle tension (Budzynski, Stoyva, & Adler, 1970). Turner and Chapman (1982b) stated, "if the patient can learn to control his or her cognitive and emotional reactions to specific stressful situations, headache reduction should result" (p. 37).

Research Objectives

In the present study, six main questions were to be investigated.

Question 1: Is biofeedback more effective in treatment of headaches than non-biofeedback approaches? Budzynski (1978) indicated that studies proved the effectiveness of EMG biofeedback treatment in alleviation of tension headache. Kewman and Roberts (1980) stated: "Despite the many studies seeming to confirm the therapeutic efficacy of finger-warming feedback training in the treatment of migraine headaches, many questions remain unanswered" (p. 329). In addition, Cox et al. (1975) and Haynes, Griffin, Mooney, and Parise (1975) concluded that biofeedback treatment seemed equally effective as other non-biofeedback strategies. To try to answer such previously unanswered questions, the present study was aimed at evaluation of the effectiveness of biofeedback and non-biofeedback approaches in treatment of headaches.

Question 2: Does biofeedback (training) generalize in treatment of headaches? Despite the fact that the answer to this question is not clear, Budzynski (1978) indicated that results of most studies suggested that biofeedback is more effective at least in the short run. Budzynski and Stoyva (1969) assumed that the effect of biofeedback training would generalize to other situations. However, Holroyd, Andrasik and Westbrook (1977) found that there is no evidence showing that other muscle groups were influenced by biofeedback training of one specific muscle group.

The goal of biofeedback training is to teach the patient a process of coping skills and to make him develop these sets of skills in order to transfer them from the training situation to natural environments (home, school) and into everyday life situations. For example, one of the main objectives to be achieved by the present study is to evaluate the effectiveness of treatment strategies that use home practice, in decreasing headache activity. Haynes, Moseley and McGowan (1975) indicated that there is indirect evidence that a successful training strategy will assist and interrelate with other strategies (e.g., EMG and relaxation).

Question 3: Are treatment methods developed primarily in the United States effective with another population? Nearly all the research reviewed has been done in the United States and in that broad cultural context. Systematic replication of such research in other cultures can help understand the generality and robustness of treatment effects.

Question 4: Is head pain associated with muscle tension? Henryk-Gutt and Rees (1973) assumed that the purpose of using biofeedback strategies in the treatment of headaches is to modify the underlying physiological disorders. EMG biofeedback studies did not show if the change in headache activities is associated with change in muscle tension, but it was expected that the strength of the pain component will be decreased by muscle relaxation, whether pain is related to muscle tension or not. To answer the above question, the present study trained the headache patient in the process of controlling his physiological responses associated with the problematic disease. Dalessio (1972) investigated the effectiveness of temporal artery vasoconstriction in elevating head pain during muscle contraction headache attacks. He found that the success of training the patient in a process of controlling his physiological responses depends on the way that vasoconstriction occurred or not in the particular muscles. From the previous discussion, we may raise the following unanswered question for future research "Are there other variables than relaxation of frontalis that play roles in EMG biofeedback mechanism action?" (Kaganov, Bakal, & Dunn, 1981).

Question 5: Does vasoconstriction contribute to the migraine pain? The purpose of employing biofeedback treatment methods in this study is to teach patients how to relax their muscle groups if they are suffering from muscle contraction headache, and to help the migraine headache sufferers to alter artery dilation. In determining the efficacy of the biofeedback treatment strategies on the vasoconstriction and dilation phases of headaches, Dalessio (1972) and Wolff (1948) found that pain is associated with concurrent reduction of blood supply to the involved muscles, while the reduction in circulation can occur in muscles without inducing any pain.

Kewman and Roberts (1980) stated that:

> Migraine is thought to be related to a dysfunction of the cranial arteries prior to onset of headaches, followed by dilation and distation of the extracranial carotid arteries during the headache phase (Schumacher & Wolff, 1941). Most treatment modalities appear to be directed toward the vasodilation phase of the disorder, which is accompanied by pain, rather than the prodromal vasoconstriction phase" (p. 328).

Accordingly, most migraine treatment techniques are designed to produce vasoconstriction of the temporal artery in order to increase the peripheral blood flow which results in decrease of cranial sympathetic activity.

Question 6: Do behavioral cognitive strategies reduce pain by producing muscle relaxation and do they reduce reports of pain? For answering this question, Fahrion (1977) assumed that hand temperature decreases during stress and increases with relaxation. Taub and Emurian (1971) emphasized the effectiveness of the emotional state on hand temperature. In the present study the quality and the quantity of head pain were examined before and after introducing the treatment strategies. Reliable changes in autonomic activity accompanied by changes in the quality of pain were expected.

Definition of Terms

The purpose of this section is to present a brief definition for several terms that were used in this study.

1. Biofeedback: Biofeedback is comprised of physiological responses electronically amplified and fed back visually or auditorially to the patient. Nigl (1984) indicated that there are four basic types of biofeedback measures: Electromyograph (EMG), Electroencephalographic (EEG), Electrothermal (skin temperature), and Electrodermal (EDR) (pp. 8-11). The main goal of using the biofeedback measures is to increase the patient's awareness of his/her internal physiological responses.

2. Behavioral medicine: As defined by Doleys, Meredith and Ciminero (1982) behavioral medicine is comprised of the use of behavioral science techniques and principles in clinical application for the purpose of facilitating the use of medically therapeutic techniques. It involves diagnosis, prevention of illness, and treatment of physical disorders.

3. Pain threshold: A pain threshold is the lowest point or level of pain which is required to be perceived as pain by the individual. The individual must perceive the pain threshold level before he expresses his reaction to pain stimulation.

4. Pain tolerance: Pain tolerance refers to the point at which the individual does not wish to tolerate more pain and is not willing to accept more painful stimulation.

5. Pain: Pain is an extremely unpleasant sensory and emotional experience. This experience can be observed according to the way that it may be expressed (posture, vocalization), and it is reported by the subject himself. Pain behavior is mainly influenced by mood, analgesic requirements, and psychological variables. Among psychological factors are anxiety, depression, stress, coping style and fears. Generally speaking, much pain is related to emotional changes; these changes are associated with psychological causes that promote pain. Findings indicate that emotionally disturbed people suffer from headache more than others, and they consult physicians more than stable individuals (Blanchard, Theobald, Williamson, Silver, & Brown, 1978).

6. Operant conditioning: Operant conditioning is a type of conditioning which refers to Skinnerian conditioning which differs from Pavlovian conditioning. In operant conditioning behaviors are emitted and reinforcers follow. It is the basic learning theory applied by several psychologists in treating chronic pain. Fordyce has differentiated between operant pain that is learned by operant conditioning processes and respondent

pain that is elicited by the antecedent stimulus (Fordyce, 1976). The treatment focus is on behavioral changes and environmental contingencies in which desired behaviors are rewarded while pain behaviors are not.

7. Psychogenic pain: Psychogenic pain is a neurogenic pain not caused by tissue damage stimulation. It is associated with learning factors and is subject to influence by other psychological factors (emotions, attitudes). Primary causes for psychogenic pain are personality characteristics and environmental factors (Fordyce, 1976).

8. Respondent Pain: Respondent pain is an organic pain called a real pain or explicit pain which is reflex in nature and elicited by an antecedent stimulus. Tissue damage and noxious stimulation are the main causes for respondent pain.

9. Operant pain: Operant pain is similar to psychogenic pain. It has no identifiable organic sources. Operant pain is associated with, and modifiable by, contingency management operations.

10. Chronic pain: Pain has been divided into two major kinds, chronic and acute pain. Crue (1976) defined chronic pain as a continuous and functional pain which comes from underlying etiological factors. Chronic pain is usually associated with depression and anxiety.

11. Cognitive behavioral approaches: Cognitive

behavioral therapies are concerned with teaching subjects how to observe their own thoughts, feelings, and behaviors to make them aware of their adaptive and maladaptive responses, resulting in inducing subjects to change their cognitions wherever necessary. Cognitive methods attempt to modify the patient's beliefs and thoughts to reduce the severity of pain. Cognitions are based on attitudes and beliefs that have developed from previous experiences. Cognitive behavior refers to thinking, acting and feeling; these can be measured mainly by observation and are affected by various kinds of variables such as experiences and environment.

CHAPTER II

REVIEW OF LITERATURE

Relaxation Training

Many years ago relaxation was identified and used as an important technique (e.g., yoga) for decreasing the psychophysiological stressors and for inducing a muscle relaxation to manage etiological underlying causes. Relaxation training procedures have been considered as important factors in behavior treatment methods (Benson, Greenwood, & Klemchuck, 1975; Sternbach, 1978) and for decreasing stress-related disorders (e.g., Beeson, & McDermott, 1967; Jacobson, 1938).

Relaxation has been included in and facilitated by biofeedback training techniques (Budzynski & Stoyva, 1969; E. Green, Walters, A. Green, & Murphy, 1969; Pinkerton, Hughes, & Wenrich, 1982). Relaxation has also been used in order to facilitate the biofeedback training. A combination of strategies from both techniques (biofeedback and relaxation) has emerged for treatment of psychosomatic diseases such as tension and migraine headaches (Sargent, Green, & Walters, 1973a, 1973b; Wickramasekera, 1973).

Budzynski and Stoyva (1973) suggested that accurate use of biofeedback training techniques in combination with relaxation training procedures may help in overcoming the limitations and difficulties that come from using relaxation alone.

In clinical application, relaxation training was used the first time by Jacobson (1938) for treating stress-related disorders. Jacobson concluded that relaxation techniques are associated with the sympathetic nervous system. He used progressive relaxation procedures as effective techniques for treating psychosomatic disorders. Wolpe (1959), in his relaxation theory, depended heavily on Jacobson's work. When Wolpe developed the systematic desensitization technique, he applied it in treating phobia and psychosomatic disorders (Davidson, 1976; Wolpe & Lazarus, 1966).

Mathew, Kralik, and Claghorn (1979) concluded that relaxation training procedures which are used in treating of psychophysiological disorders, will decrease the frontalis EMG level. Turner and Chapman (1982a) identified the relaxation training procedures as a major branch of cognitive behavioral therapies.

Accordingly, Hiebert, Cardinal, Dumka, and Marx (1983), provided a study in which the effectiveness of a self-instructed relaxation program was investigated. A self-report anxiety scale and psychophysiological stress profile (frontalis EMG, GSR, heart rate and finger temperatures) were provided to the subjects to aid in monitoring the stress-arousal level, during and after the treatment phase. Results indicated that home practice with a self-instructed relaxation program was effective in increasing the ability of subjects to relax under stress conditions.

Doleys et al. (1982) identified four major methods for relaxation: physical relaxation, imaginal relaxation, biofeedback for relaxation, and hypnosis. No evidence of superiority of one method over another has been reported.

Cognitive Behavioral Therapy

The cognitive approach emphasizes the role of cognitive factors and their relation to psychosomatic disorders. Turk and Genest (1979) stated, "the recent cognitive movement in psychology is based on the theoretical rationale that an individual's affect and behavior are largely influenced by a process of cognitive appraisal whereby he or she interprets events in terms of their perceived significance" (p. 13). For applying cognitive behavioral therapy in managing a pain problem, Turk, Meichenbaum, and Genest (1983) stated:

> The patients are taught to focus on (1) the cues that trigger tension and anxiety, (2) how they responded to these (often with anxiety),

> (3) thoughts prior to and following tension, and (4) the ways in which these cognitions contributed to their pain problems. Patients were taught how to interrupt deliberately, at the earliest possible point, the sequence preceding their emotional response and to engage in cognitive control techniques incompatible with further stress (e.g., cognitive reappraisal, attention deployment, and fantasy). (p. 122)

Cognitive behavioral therapy emphasizes the role of cognitive factors and their relation to the psychosomatic disorders. The subject is taught how to create and develop specific coping skills such as relaxation training procedures. Accordingly, Reeves (1976) investigated the importance of cognitive factors in reducing headache activity for one tension headache patient. The author established the baseline by collecting data regarding EMG level and headache activities. In the first phase of treatment he used the cognitive-skills training approaches. This treatment resulted in a 33% reduction in headache activity. In the second treatment phase, the author used the EMG biofeedback training procedure alone, which resulted in 66% reduction of headache activity.

Turner and Chapman (1982b) concluded that cognitive variables (attention, beliefs) are associated with the pain variables. Regarding the importance of cognitive factors in patient's perception, and reaction to pain behavior, Brown (1984) conducted a study for examining the effectiveness of two imagery strategies against one placebo (expectation) strategy in treatment of migraine headache patients. Thirty-nine migraine sufferers were divided into three groups (response imagery, stimulus imagery, and placebo control group). After the baseline phase (four weeks) had been established, patients participated in the treatment phase for four weeks. Results indicated that response and stimulus imagery groups were successful in controlling both kinds of pain (cold pressor, clinical pain) than the placebo control group.

Biofeedback Combined With Relaxation

Bakal, Demjen, and Kaganov (1981), as well as Wickramasekera (1973), investigated the effectiveness of relaxation training combined with EMG biofeedback in the treatment of tension headache patients. Results indicated no superiority for one technique over another. Similarly, Sargent et al. (1972a, 1973b) used a combination of finger temperature biofeedback with cognitive approaches (autogenic training) in treatment of migraine patients. The results were promising and positive, except that no statistical data were available. A similar study to that one described above was reported by Bakal and Kaganov (1977), and resulted in preferring autogenic relaxation training over the hand warming biofeedback in treatment of migraine patients.

Tarler-Benlolo (1978) reviewed all of the 85 available studies concerning the effectiveness of the biofeedback strategies with cognitive approaches (relaxation training) in treatment of psychophysiological disorders, such as migraine and muscle contraction headaches. She concluded that results obtained from reviewed studies were varied according to the following variables: Kind of techniques, number of subjects, kind of experimental groups, presence or absence of control group, length of treatment, kind of information provided to the subjects, presence or absence of follow-up phase, and whether the study dealt with generalization or not.

Kremsdorf, Kochanowicz, and Costell (1981) compared the effectiveness of cognitive-skills training with EMG biofeedback in the treatment of tension headache. Two-single case design experiments were used. Results indicated that the EMG biofeedback training approach was effective with both subjects in reducing the EMG frontalis level, but the reduction of headache activity level was dependent on whether or not the subject used cognitive skills training.

In summary, previous reviews of the literature of behavioral treatment methods have divided treatment's methods into biofeedback (Blanchard, Jurish, Andrasik & Epstein, 1981) and non-biofeedback (Epstein & Blanchard, 1977). Three major non-biofeedback methods have been reviewed: Relaxation training, cognitive behavioral therapy, and the combination of cognitive therapy with biofeedback training.

Relaxation training procedures such as coping skills methods have been found to be effective in reducing headache activities, so too, have biofeedback training approaches been found effective.

Regarding the comparative studies, Holroyd, Andrasik, and Noble (1980) argued that any success of biofeedback techniques in treating of psychophysiological disorders such as migraine or tension headache relies heavily on cognitive behavioral methods that are developed by patients.

Biofeedback Training

Studies suggested that biofeedback treatment can diminish headache syndromes. Wolff and Jarvik (1963) estimated that reducing cranial blood supply will cause a pain onset with migraine patients. Tarler-Benlolo (1978) indicated that most biofeedback treatment of migraine headaches has been combined with relaxation training components. Many researchers indicated that no superiority of using biofeedback in treatment of headache patients over relaxation training had been found (Blanchard, Andrasik, Ahles, Teders, & O'Keefe, 1980; Jessup, Neufeld, & Merskey, 1979; Martin, 1980).

Regarding the effectiveness of biofeedback training in treating of migraine headache patients, Nigl (1984) argued that whether or not biofeedback is an effective treatment is no longer in question. Biofeedback is effective. He quotes Kewman and Roberts (1983) as saying that the question is, "How biofeedback works when it does work and what will improve its efficacy" (p. 235). Dalessio (1972) assumed that the pain mechanism in migraine headache is vascular in nature and is associated with the cephalic vasomotor responses, and the pain mechanisms in muscle contraction headache is a muscle contraction of the skeletal musculature in face and neck. Feuerstein and Adams (1977) reported a single case multiple baseline design across subjects and responses. The study investigated the cephalic vasomotor responses (CVMR) and the effectiveness of the biofeedback training methods in treating four headache patients (two migraine, and two muscle contraction headache subjects). All patients received six sessions for each EMG and CVMR feedback training; during the sessions of cephalic vasomotor response training, the EMG frontalis level and blood pressure were measured. Results indicated that significant physiological activities changes had occurred depending on type of feedback used, and significantly improved headache activities were maintained for all, except one patient who revealed a consistent reduction in frequency and duration of headaches.

Kewman and Roberts (1980) reported a double blind study in which the effectiveness of skin temperature biofeedback upon migraine headache patients was investigated. Thirty-four migrainers, were assigned into three groups; group 1 (11 patients) were taught to increase their skin temperature; group 2 (12 patients) were taught to decrease their skin temperature; no treatment was introduced to the remaining subjects who served as a control group. A significant improvement during a 6-week follow-up period was obtained. The results can be summarized as follows:

1. All groups showed significant improvement in number of symptoms, amount of impairment, and medication consumption during attacks.

2. No significant improvement was achieved in the frequency or duration of attacks.

3. All groups showed little improvements in number of attacks.

4. No significant differences were shown among groups.

In a similar study to the one just described, Blanchard, Andrasik, Jurish, and Teders (1982) conducted a one-year follow-up study for evaluating the effectiveness of two treatment strategies (biofeedback, relaxation training) in treating 26 migraine patients. Results revealed that during the experimental phase the progressive relaxation training was more effective in reducing migraine headache activities than biofeedback training procedures, but no differences were found between the effects of the two strategies, during the follow-up phase.

For evaluating the effectiveness of behavioral treatment methods of migraine headaches with multi-biofeedback strategies, Gamble and Elder (1983) used a combination of three behavioral strategies (temporal cooling, frontalis relaxation, and progressive relaxation) for treating 24 migraine headache patients. Results indicated that there was more improvement of headache activities among subjects who received more than one treatment.

The previously discussed results have been supported by a well designed study conducted by Gauthier, Doyon, Lacroix, and Drolet (1983), who evaluated the effectiveness of blood volume pressure (BVP) biofeedback on migraine headaches. Twenty-one female migraine patients were divided into three experimental conditions: Dilation feedback, constriction feedback, and waiting list. After 15 biofeedback training sessions during an 8-week period results showed that both of the feedback groups (constriction, dilation) were equally effective in reducing the migraine headache activities; however the mechanism is still in question.

The relation between changes in vasomotor and migraine headache activities was investigated in a study conducted by Gauthier, Lacroix, Cote, Doyon, and Drolet (1985). The authors used the finger warming and BVP biofeedback strategies in the treatment of 22 female migraine patients. Subjects were assigned to three groups: Temporal artery constriction feedback, finger temperature feedback or waiting list group. All groups reported headache activities, and medication consumption during a six-week period. Results indicated that both biofeedback techniques used in treatment of migraine headaches were effective in controlling migraine headache; in addition, the relevant changes of medication consumption and headache activities were associated with changes of vasomotor activity.

A similar study was conducted by Hoelscher and Lichstein (1983), who used BVP biofeedback in treating a 61-year-old chronic cluster headache patient, for a seven-week treatment phase, preceded by an 18-day baseline. Results indicated that BVP biofeedback strategy reduced severity of 45% of the headaches, reduced headache frequency by 70% and resulted in a large decrease in migraine medication consumption.

Regarding pre-headache symptoms, Harrigan, Kues, Ricks, and Smith (1984) investigated the relationship between mood change and migraine headaches. The authors requested the 17 volunteer migraine subjects to record their headache activities (duration, pain intensity level, and number of attacks) for periods ranging from 21 to 75 days. In addition to that, the authors used 10 mood indicators, three times daily, for recording the changes of subject's mood. Results indicated that changes of mood states occurred during 12-36 hours prior to headache onset, which means that a mood state is a good predictor for coming migraine attacks.

Nielsen and Holmes (1980) conducted a study to evaluate the influence of EMG biofeedback in modifying the mood state, and in reducing the self report of stress arousal for 35 participants.

The authors used EMG biofeedback training in a treatment phase and instructions for relaxation were provided to the subjects during three control conditions. During pretreatment sessions, the viewed arousal stress was measured for all subjects. Results indicated that frontalis EMG level was not reduced during the treatment phase, but evidence of the effectiveness of EMG biofeedback during anticipating stressful situations was reported.

In summary, the results of studies reviewed so far indicate that biofeedback is effective with migraine symptoms, the same as relaxation training with tension headache symptoms. The combination of both techniques appeared more effective with both types of headache than using one technique only. No superiority of one technique over the other had been reported by any reviewed study.

Several studies have been conducted to find the effectiveness of relaxation and frontalis biofeedback procedures in handling the headache problem. In using these procedures a significant reduction in headache activity was obvious.

All of the previously reviewed studies were designed to help headache patients reduce head pain activity. Nigl (1984) provided a summary of studies covering the period of 1970 to 1982, that used biofeedback in treatment of tension headaches, and the period of 1973 to 1981, that used biofeedback in treatment of migraine headaches (see Table 1).

Previous reviews concluded that many studies had used cognitive behavioral therapies in treating headache patients. The cognitive approaches emphasize the role of cognitive factors and their relation to pain behavior. The task of the behavioral therapist is to urge the patient to create and develop specific coping skills such as relaxation process.

Table 1

Biofeedback Treatment of MCH, Summary of Research, 1970 - 1982

AUTHORS	YEAR	PATIENTS	FEEDBACK TECHNIQUE
Budznski, Stoyva & Adler	1970	5	EMG
Wickramasekera	1972	5	EMG
Budzynski, Stoyva & Mullaney	1973	18	EMG
Raskin & Johnson	1973	4	EMG
Sergent and Green	1973	6	EMG
Wickramasekera	1973	5	EMG
Epstein, Hersen & Hemphill	1974	1	EMG
McKensie, Ehrisman, Montgomery & Barnes	1974	6	EMG
Cox et al.	1975	9	EMG
Haynes et al.	1975	16	EMG
Chesney and Shelton	1976	16	EMG
Hutchings and Reinking	1976	12	EMG
Montgomery and Ehrisman	1976	13	EMG
Reeves	1976	1	EMG
Feuerstein and Adams	1976	1	EMG
Rehmaun and Lang	1976	-	EMG
Kondo and Canter	1977	5	EMG
Peck and Kroft	1977	18	EMG

Table 1--Continued

AUTHORS	YEAR	PATIENTS	FEEDBACK TECHNIQUE
Phillips	1977	7	EMG
Fried and Sheed	1977	1	GSR
Backal and Kaganov	1977	10	EMG
Sturgist et al.	1978	2	EMG
Acosta and Yamamoto	1978	14	EMG
Hoffman	1979	4	EMG
Epstein et al.	1979	8	EMG
Diamond et al.	1979	19	EMG
Russ and Hammer	1979	16	EMG + GSR
Gray, Lyle, McGuire & Peck	1980	10	EMG
Kumaraiah	1980	10	EMG
Schlutter, Golden & Blume	1980	32	EMG
Steger and Harper	1980	9	EMG
Andrasik and Holroyd	1980	39	EMG
Cram	1980	16	EMG
Borgeat, Hade, Larouche & Bedwant	1980	16	EMG
Hard and Chilanski	1981	24	EMG
Kremsdorf and Costell	1981	2	EMG
Satinsky and Frerotte	1981	14	EMG

Table 1--Continued

AUTHORS	YEAR	PATIENTS	FEEDBACK TECHNIQUE
Cott et al.	1981	8	EMG
Blanchard et al.	1982	33	EMG
Biofeedback Treatmewnt of Migraine Summary of Research 1973 - 1981			
Wickramasekera	1973	2	Skin Temperature
Sargent, Green and Wolter	1973	74	Finger, Forehead Temp.
Andreychuk and Skriver	1975	33	Finger Temperature
Johnson and Turin	1975	1	Finger Temperature
Fuerstein and Adams	1976	1	Vasomotor
Friar and Beatty	1976	16	Temporal Temperature
Median and Franklin	1976	24	EMG, Skin Temperature
Turin and Johnson	1976	7	Finger Temperature
Reading and Mohr	1976	6	Finger Temperature
Feuerstein and Adams	1977	2	EMG, Temperature Blood
Fried and Sneed	1977		Finger Temperature
Blanchard et al.	1978	25	Skin Temperature
Silver, Blanchard, Williamson, Theobaid & Brown	1979	25	Skin Temperature

Table 1--Continued

AUTHORS	YEAR	PATIENTS	FEEDBACK TECHNIQUE
Gainer	1978	1	Skin Temperature
Diamond et al.	1979	123	EMG, Skin Temperature
Drury and Liberman	1979	4	Finger Temperature
Boller and Flom	1979	3	Finger Temperature
Attfield and Peck	1979	5	Finger Temperature
Lake and Papsdorf	1979	18	Finger Temperature
Bilf and Adams	1980	21	Blood Flow
Kewman and Roberts	1980	11	Skin Temperature
Elmore and Tursky	1980	23	Temperature Pulse
Largen, Mathew, Dobbins & Claghorn	1981	6	Skin Temperature
Claghorn, Mathew, Largen & Meyer	1981	6	Skin Temperature
Sovak, Kunzel, Sternback, Dalessio	1981	29	Skin Temperature, EMG
Mathew	1981	68	Skin Temperature

Source: From Nigl, A.J. (1984). Biofeedback and behavioral strategies in pain treatment (pp. 184-185, 224-225). Jamaica, NY: Spectrum.

Published reports evaluated the efficacy of cognitive coping strategies; a summary of these studies had been provided by Turner and Chapman, 1982a (see Table 2).

Classification of Headaches

Headache or head pain is a common symptom experienced by headache sufferers. From a neurologic perspective, headache may be caused by different sources such as muscles of head and neck, and/or dilation of cerebral arteries. Wolff (1948) indicated that, uncommonly, vascular headaches may be caused from intracranial causes (e.g., traction, inflammation of pain sensitive structures), and commonly, headache is caused from extracranial sources.

Muscle contraction headache is associated with stiffness or aching of the muscles of the neck and shoulders. The main cause of pain is muscle spasm and a reduction in circulation (vasoconstriction) in muscles themselves.

Symptoms of Muscle Contraction Headache

The outstanding features of the muscle contraction (tension) headache collected from the literature are:

1. Pain is steady and soreness exists.
2. Headache is bilateral.

Table 2

Relaxation Training: Summary of Research

AUTHORS	POPULATION	NUMBER	INTERVENTION
Gassel & Alderman	Myofascial Pain	11	Relaxation
Hay & Madders	Migraine	98	Relaxation
Lutker	Migraine	1	Relaxation
Fitchtler & Zimmerman	Tension Headache	10	Relaxation
Tasto & Hinkle	Tension Headache	6	Relaxation
Andreychuk & Skriver	Migraine	33	Finger Temp. Autogenic EEG & Relax
Cox et al.	Tension Headache	27	EMG, Relax.
Haynes et al.	Tension Headache	21	Relax. EMG
Warner & Lance	Migraine	25	Relaxation
Chesney & Shelton	Migraine, Mix	30	Skin Temp. & Relaxation

Source: Turner, J., & Chapman, C. (1982a). Psychological interventions for chronic pain: Relaxation training and biofeedback [Critical Review, I]. Pain, 12, 6-7.

3. Pain is associated with stiffness of head and neck muscles.

4. Long continued pain in the head accompanied by muscle contraction.

5. Headache is localized in one region.

6. Pain is not vascular in origin.

7. Duration of attacks may change from hours to weeks.

8. Vasodilation occurs in skeletal muscles and in the cranium arteries.

9. Pain is elevated by exposure to cold.

10. Pain is usually addressed as individual reactions to the life stressors (Friedman, 1979).

Symptoms of Migraine Headache

The outstanding features of migraine symptoms collected from the literature are:

1. Unilateral in onset.

2. Headache is associated with nausea, vomiting, constipation and diarrhea.

3. Headache is limited to the head.

4. Cranial artery dilation occurs during the attacks.

5. Excessive sweating and chilliness.

6. Thickness of the skin.

7. Disturbance in water metabolism.

8. Sensation disturbances may be experienced before migraine attacks.

9. Migraine attacks end during pregnancy period.

10. Duration of attacks ranges from minute to hours (Dalessio, 1979).

Wolff (1948), provided different descriptions for different kinds of headaches (in addition to the muscle contraction and migraine headaches symptoms just described) as follows:

1. Five different classifications of migraine headache: (a) Classic migraine. It is a vascular headache which is associated with sensory and motor prodromes; (b) Common migraine. This kind of vascular headache is related to the environmental factors more than any other kind of migraine headache and it is identified as a week-end or summer headache; (c) Cluster headache. It is brief in duration and varied in intensity, associated with sweating and flushing; (d) Hemiplegic migraine. It is described by motor and sensory features; and (e) Lower-half headache. It is centered primarily on the facial nerves located in the lower part of the face.

2. Combined headache. The pain is caused by the combination of vascular headache and muscle contraction headache.

3. Nasal headache. It is usually associated with the patient's reaction to environmental stressors and is characterized by burning and tightness.

4. Headache of delusional state. This headache is featured by delusional and conversion attacks, and is associated with the psychogenic pain.

5. Non-migrainous. It is associated with systematic infections and illness, and is not related to the vascular headache symptoms.

6. Traction headache. It is associated with traction of intracranial structures (e.g., tumor headache).

7. Inflammation headache. It is due to the inflammation of cranial structures (intra and extracranial).

8. Cranial neuritis. The headache is associated to the inflammation of cranial structures. Symptoms result from neuritis and trauma.

9. Cranial neuralgia. It is brief in attack and results from stimulated and affected nerves. This kind of headache must be distinguished from cluster headache.

Mechanisms of Headache

Physical Mechanism

Feedback training techniques and self-control procedures may assist in controlling the physiological dysfunction of headache disorders. As was mentioned before, the major aim of behavioral treatment of headache is to help the patient learn how to control the physiological processes that make up the problematic component (Kimmel, 1967).

Dalessio (1979) concluded that migraine headache involves two basic stages of vascular process, vasoconstriction and vasodilation, while Edmeads, Burrows and Stanley (1979) assumed that real headache is associated with the dilation of the extracranial and intracranial arteries.

Wolff (1948) concluded that headache results from the narrowing of intracranial arteries caused by chemical and mechanical factors, and the releasing of serotonin, histamine, and proteolytic enzymes by blood platelets. Serotonin and histamine start to operate after they are released by increasing the activation of the vessels and venules throughout the vascular system, thus urging the passage of plasmakinin into the vascular wall; if both the plasmakinin and the serotonin work separately, the pain will increase, but if they work together the pain activity will decrease (Scherer, 1985).

Regarding muscle contraction headache, Friedman and Merritt (1959) suggested that the sustained contraction of the muscles of head, neck and shoulders are the main causes of head pain.

Psychological Mechanisms

Skin temperature is affected directly by the stress and relaxation activities. Emotional stress results in decreasing the skin temperature. Tension headache has both physiological and psychological components, so treatment involves both pharmacological and psychological therapy.

Friedman (1979) stated that: "Psychotherapy helps patients identify and cope more effectively with the environmental and emotional situations producing the stress and tension underlying their headaches, while pharmacotherapy relieves the immediate headache attack." (p. 456). According to Friedman, the problem of headache can be solved if the emotional conflicts are resolved.

Touraine and Draper (1934) and Wolff (1937) assumed that migraine headache patients have specific personality characteristics such as anger and emotions which are integrated with other psychological aspects and characterize the personality of migraine patients. Some researchers reject the idea of a specific migraine personality. For example, Harrison (1980) concluded that research does not support the notion that psychological deficits are greater among migraine patients.

Psychophysiological Mechanisms

The relation between psychological and physiological mechanisms is so close that physical disorders almost always accompany certain emotional states. Regarding the psychophysiological dysfunction of headache disorders, studies assumed that, the psychophysiological disorders fall into four categories. Fotopoulos and Sunderland (1978) stated that the categories are: "(1) Psychophysiologic musculoskeletal disorders (excluding muscle tension headache), (2) psychophysiologic genitourinary disorders, (3) psychophysiologic skin disorders, and (4) psychophysiologic endocrine or metabolic disorders" (p. 331). Studies indicated that changes in skeletal muscle activity are due to psychological changes. Friedman (1979) for example, concluded that emotional conflicts are usually behind the main factors which precipitated head pain in almost all cases of tension headache, but not always with migraine sufferers. Phillips (1978) concluded that tension headache patients show a higher EMG level than non-headache subjects, and that there is no relationship between EMG level and pain intensity.

Pre-Headache Mechanisms

Wolff (1948) indicated that the mechanism of pre-headache is different from that of the headache itself. Pre-headache phenomena of migraine are not always followed by headache. Symptoms that are associated with that phenomenon are hallucinations of light and color, and defects of motility. Intracranial blood volume changes from one phase of headache attack to the next, and cerebral vasoconstriction usually terminates before extracranial vasodilation has begun; if the vasodilation phase follows, it will play a minor part in the headache. Migraine sufferers exhibit such cranial vasomotor changes during 12 to 72 hours prior to the headache.

Harrigan et al. (1984) stated that: "Migrainers frequently comment on mood disturbances prior to and following an attack" (p. 386). The same authors concluded that mood changes may be considered as a predictor of an oncoming migraine headache.

Friedman (1979) estimated that out of a 1,420 patients surveyed, 77% reported having headaches which were precipitated by emotional factors. In addition, the author indicated different patterns of behavior that may be identified among tension headache patients such as: aggressiveness, hostility, self-identity, dependency and seeking secondary gain of attention.

CHAPTER III

METHOD

Subjects

Twenty-four Jordanian headache patients (13 women, 11 men; ages 21-41 years) were recruited by consulting neurologists to serve as subjects through a referral system at the Royal Medical Services of Jordan. Subjects were requested to contact the Department of Clinical Psychology at Farah Rehabilitation Hospital in Amman City, if they were interested in treatment using behavioral techniques. Six behavioral therapists working in a clinical psychology department supervised by the author were responsible for conducting this study. Only subjects who reported a regular occurrence of 4 or more headaches per month with at least 2 of the following symptoms associated with their headaches were considered to be migraine sufferers: nausea, vomiting, and/or pulsatile head pain in the frontalis area. Subjects were considered to be tension headache sufferers if they reported four or more headaches and two or more of the following symptoms: Soreness, stiffness of head and neck muscles, head pain accompanied by muscle contractions, and headache's localized in one region.

All participants were diagnosed previously as having migraine or muscle contraction headache (tension headache) by their physicians or by the neurologists. Participants did not receive other supervised psychological or pharmacological treatment during the treatment phase of the study, except for the control subjects who stayed on their pharmacological treatment program.

Participants were selected on the basis of a clinical interview (Appendix A) and symptomatology as reported by the headache questionnaire (Appendix B). They all volunteered and signed informed consent forms, perhaps indicating that they were motivated by the wish to find a treatment other than medication.

Apparatus

1. A Galvanic Skin Response (GSR) temperature machine (Autogen 1000 Thermal FB) was used to monitor finger temperature. GSR instruments are used with migraine patients as a kind of biofeedback treatment which can help patients to increase their skin temperature and to decrease resistance to blood flow through the arterial system.

2. An EMG machine (BIO-Feedback System, Inc., Model B-1) was used in monitoring the frontalis EMG level. Three electrodes were used, two electrodes placed over each eye and the ground electrode placed on the middle of

the forehead (10 mm Beckman electrodes) (Thompson & Adams, 1984). Although this placement combines EMG monitoring from two separate frontalis muscles, the instrument provides an average reading for overall frontal EMG activity.

Assessment Procedures

As part of the initial assessment, all of the participants were required to meet specific criteria associated with each headache, including the taking of a detailed medical history, and completing several assessment procedures; these processes are presented in the following section.

Criterion for Muscle Contraction Headache Group (MCH)

1. Medical diagnosis of MCH by physician; currently not receiving biofeedback or other behavioral treatment for head pain.
2. Headache elicited in stressful situation.
3. Self report of at least 6 to 8 headaches per month.
4. Absence of migraine symptomatology (e.g., nausea, vomiting, prodrome).
5. Dull aching pain in frontalis or neck regions.

Criterion for Migraine (Mg) Group

1. Medical diagnosis of migraine by physician; not currently receiving biofeedback or other behavioral treatment for headache pain.

2. Presence of nausea and vomiting during migraine.

3. Unilateral onset and/or pain greater on one side of the head than the other.

4. Ability to differentiate between migraine and MCH headache.

5. In addition to their migraine symptoms, patients must also report no more than one MCH symptom per week.

Selection and Assigning Procedures

All subjects were interviewed according to an interview question form (translated in Appendix D) completed an informed consent (translated in Appendix C) and filled out the headache questionnaire (Appendix B). During the first interview, all subjects received all forms which were to be completed during the first week.

All of the medical information relating to the patient's headache and pain history was gathered during the selection phase.

It is hard to measure directly the antecedents for pain responses, so in most studies antecedent to pain response is measured indirectly by using one or more varieties of verbal report (e.g., headache questionnaire). In contrast, a number of slightly more direct methods have been used to measure pain. These methods usually involve visual scales or magnitude estimation.

Table 3 shows the pain intensity rating card. The patient was asked to circle his level of pain each hour he was awake, and to mark times he took pain medication. The pain intensity rating card was divided into 4 parts, a.m. (morning), p.m. (afternoon), evening and night, starting from 6:00 a.m. and showing 24 hours. Level of pain shown on the card was scaled from 0 to 10, as follows: 0 to 1, no pain; 2 to 3, low level; 4 to 5, pain can be ignored; 6 to 7, painful; 8 to 9, horrible pain; 10 to over, excruciating.

Following the initial assessment, all participants kept the "patient daily diary/medication consumption" (see Table 4) for one week before the study started, during the study, and during the follow-up phase. The medication consumption was checked, however, by data from another scale (UAB Pain Behavior Scale, Richards, Nepomuceno, Riles, & Suer, 1982) which depends on the health care professional's rating, to credit the patient daily diary/medication consumption (see Table 5). Richards et al. (1982) described the UAB scale as follows:

Table 3

Pain Intensity Rating Card (0 - 10)*

Name ____________________

Date ____________________

	Time																							
	A.M.							P.M.												A.M.					
	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6
	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Level	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
of	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Pain	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

- Circle your level of pain each hour you are awake.
- Put an X through the times you take pain medication.

Key	
0-1 = None, no pain.	6-7 = Distressing; painful but able to continue job.
2-3 = Mild, low level.	8-9 = Horrible; pain severe, concentration difficult.
4-5 = Discomforting; pain can be ignored.	10 = Excruciating, intense, severe, incapacitation.

Source: Turk, D., Merchenbaum D., & Genest, M. (1983). Pain and behavioral perspective (p. 214). New York: Guilford.

Table 4

Patient Daily Diary/Medication Consumption

Time Midnight	Duration of Bout	Time	Number of Bouts	Time	Intensity of Pain	Time	Medicine Consumption Erogtamine/ mg Analgesics/ Tablets	Time
12-1								
1-2								
2-3								
3-4								
4-5								
A.M. 5-6								
6-7								
7-8								
8-9								
9-10								
10-11								
11-12								
Noon 12-1								
1-2								
2-3								
3-4								
4-5								
P.M. 5-6								
6-7								
7-8								
8-9-								
9-10								
10-11								
11-12								
Total								

Name ____________________

Day of Week ______________

Date ____________________

Table 5

UAB Pain Behavior Scale (0-10)*

Used By Health Care Profession

Patient________________________

Room #______

Rater__________________________

Item	DATE	S	M	T	W	T	F	S
1. Vocal Complaints: Verbal	None	0	0	0	0	0	0	0
	Occasional	½	½	½	½	½	½	½
	Frequent	1	1	1	1	1	1	1
2. Vocal Complaints: Non-Verbal (moans, groans, gasps, etc.)	None	0	0	0	0	0	0	0
	Occasional	½	½	½	½	½	½	½
	Frequent	1	1	1	1	1	1	1
3. Down Time: (Time spent lying down per day because of pain: 8 a.m.-8 p.m.)	None	0	0	0	0	0	0	0
	0-60 min	½	½	½	½	½	½	½
	60 min	1	1	1	1	1	1	1
4. Facial Grimaces:	None	0	0	0	0	0	0	0
	Mild and/or infrequent	½	½	½	½	½	½	½
	Severe and/or frequent	1	1	1	1	1	1	1
5. Standing Posture:	Normal	0	0	0	0	0	0	0
	Mildly impaired	½	½	½	½	½	½	½
	Distorted	1	1	1	1	1	1	1
6. Mobility:	No visible impairment	0	0	0	0	0	0	0
	Mild limp and/or mildly impaired walking	½	½	½	½	½	½	½
	Marked limp and/or labored walking	1	1	1	1	1	1	1
7. Body Language: (clutching, rubbing site of pain)	None	0	0	0	0	0	0	0
	Occasional	½	½	½	½	½	½	½
	Frequent	1	1	1	1	1	1	1
8. Use of visible supportive equipment: (braces, crutches, cane, leaning on furniture, TENS, etc.) Do not score if equipment prescribed.	None	0	0	0	0	0	0	0
	Occasional	½	½	½	½	½	½	½
	Constant use	1	1	1	1	1	1	1
9. Stationary movement:	Sits or stands still	0	0	0	0	0	0	0
	Occasional shifts of position	½	½	½	½	½	½	½
	Constant movement, position shifts	1	1	1	1	1	1	1
10. Medication:	None	0	0	0	0	0	0	0
	Non-narcotic analgesic and/or psychogenic medications as prescribed.	½	½	½	½	½	½	½
	Demands for increased dosage or frequency, and/or narcotics, and/or medication abuse.	1	1	1	1	1	1	1
	TOTAL							

Source: Richards, J., Nepomuceno, C., Riles, M., & Suer, Z. (1982). Assessing pain behavior: The UAB pain behavior scale. Pain, 14, 395.

The UAB scale consists of 10 target behaviors, each of which contributes equally to the total score, hence a range of possible scores from 0 to 10 target pain behaviors has been culled from a larger list.

Verbal and non-verbal vocal complaints are treated as separate behaviors, the latter consisting of moans, groans, gasps and/or similar vocal but non-verbal pain complaints.

Ratings are based on frequency estimates for both of these variables: none (0), occasional (1/2) and frequent (1).

Downtime is defined as amount of time per day spent reclining or lying down because of pain between the hours of 8 a.m. and 8 p.m.

The fourth category, facial grimaces, is judged on frequency. Standing posture and mobility, the fifth and sixth categories, are judged on the basis of distorted posture and limping and/or labored walking. Body language, the seventh category, refers specifically to how often the patient clutches or rubs the site of his/her pain.

The eighth category reflects the use of visible supportive equipment. The ninth category, stationary movement, measures how often a patient shifts position while sitting or standing.

The tenth category reflects pain medication behavior. One-half point is given if the patient is taking non-narcotic analgesics and/or psychogenic medications. Demands for increased or more frequent dosages, medication abuse (e.g., suspected supplementing with alcohol and/or patient's own medication source) and/or the use of narcotics (even if prescribed) earn a full point. (p. 394)

Medication Consumption

Medication consumption was recorded on the diary forms. Each instance of taking medication, regardless of the amount taken, was recorded as a single instance. Medication is the most widely used strategy in headache treatment. Because drug usage in such treatment does not totally eliminate head pain, it is more precise to refer to that strategy as a management technique than as a treatment agent (Doleys, et al., 1982). Medications were grouped into two categories:

1. Ergotamine

2. Mild analgesics, sedatives or tranquilizers.

In the present study, the amounts taken in each of these categories were recorded by time of day.

These two categories are considered very important. Almost all headache patients consume these drugs at high rates which may result in drug abuse or habituation of drugs taken (Turner & Stone, 1979).

Ergotamine

Ergotamine is used with migraine patients to prevent or reduce the pain activity; while ergotamine enhances the vasodilation of cranial arteries, caffeine is added to enhance the vasoconstriction phase and to make the vasodilation for arteries occur gradually and not suddenly. In addition to that, components are added to ergotamine tartrate such as belladonna, and alkaloids to prevent or reduce the excessive nausea and vomiting during attacks. Possible side effects may occur by habitual use of this drug, especially with large doses. The following side effects may show: nausea, vomiting, weakness in legs, diarrhea, muscle pains, uselessness, and localized itching. In large doses, ergotamine increases blood pressure causes arterial insufficiency, slows heart rate pressure, and increases the arterial vasoconstriction.

Analgesics (Tranquilizers)

Regarding treatment of muscle contraction headache Friedman (1979) concluded that, analgesic sedative combinations are usually the most prescribed medicines for relieving head pain.

Doleys et al. (1982) stated, "Fiorinal is perhaps the widest used combination drug for tension headache. It contains aspirin, caffeine, phenacetin, and butalbital, a short-acting barbiturate" (p. 221).

These drugs have few severe side effects when used as prescribed. The following side effects may be seen: anemia, neutropenia, fever, skin eruptions, CNS stimulation, drowsiness, and glossitis. In large doses analgesics may cause chills, fever, excitement, CNS stimulation, and vascular collapse followed by depression (Scherer, 1985).

Assigning

According to the results of the selection phase (i.e., MCH and Mg) the subjects were randomly assigned into eight equal subgroups: G1, G2, G3, G4, G5, G6, G7 and G8.

The assigned groups were treated by assigned treatment strategies as described in the following treatment procedures.

The groups received treatment as follows:

G1 and G2. These groups were treated by using an EMG biofeedback machine. The EMG tension level was reported for these groups at the end of each session.

G3 and G4. These groups were treated by using a GSR machine to modify hand warming; the body temperature was reported for them at the end of each session.

G5 and G6. These groups were trained in relaxation techniques. They completed the self-reports of pain using the pain rating card. They were given a relaxation instruction sheet at the first interview.

G7 and G8. These groups served as the control group and received no treatment; their headache pain level and the headache's intensity were self-reported weekly.

The frontalis EMG level was recorded for all subjects twice; once at the first interview, and the second time at the end of the treatment session. In addition, the skin temperature was recorded for all subjects during each period, and the average was recorded.

Treatment Procedures

It was explained to the patients that the treatment procedures in their particular cases were entirely experimental since there existed virtually no literature as to whether the treatment procedures would be of benefit or not with this Jordanian population. Informed consent was obtained prior to initial assessment and, again, prior to each treatment stage.

The initial stage of treatment was a 21-session training/treatment program (relaxation & biofeedback), following a 1 week baseline phase, and followed by an 8 week session as a follow-up phase for all participants.

In this study, 4 treatments and 1 follow-up phase were presented. For all of the treatments, an ABA design was used. Basic to the design is the establishment of a stable baseline level of the target behavior, (A) representing the baseline recording period; (B) representing the introduction of an experimental manipulation, and the removal of the experimental manipulation and return to baseline conditions represented by (A).

The experimental variables were assigned to the treatment and control groups as follows:

First treatment: EMG biofeedback training was introduced for the G1 and G2 groups.

Second treatment: GSR biofeedback hand warming procedure was introduced for the G3 and G4 groups.

Third treatment: Relaxation training procedures were introduced for the G5 and G6 groups.

Fourth treatment: No treatment was introduced for the G7 and G8 groups (these two groups served as control groups).

Participants were assigned to MCH or Migraine groups then randomly assigned to treatments. A clinical interview had been conducted with all subjects in which the therapist introduced a summary of techniques and procedures that had been used for headache treatment. Those subjects not wishing to participate were not referred to take part in the experiment. All groups answered the headache questionnaires as a diagnostic method to qualify the subjects for the groups. In addition, all subjects had to fill out all needed forms before being assigned to a group.

Treatment 1

An EMG biofeedback treatment strategy was used in this treatment.

The 6 subjects ranged in age from 22 to 41 years and were assigned to 2 groups (G1 and G2). G1 subjects were diagnosed as suffering muscle contraction headache episodes. G2 subjects were diagnosed as suffering migraine episodes.

Pretreatment frequency of headache attacks ranged from 4 to 6 per week. All subjects had taken medication for acute headache pain attacks during their previous medical treatment.

Baseline

The subjects began keeping daily records of headache activity as a headache index (number of bouts per week and duration of bout--hours/week) for one week prior to the beginning of treatment; the EMG frontalis level and skin temperature were recorded for all subjects.

All subjects in this experiment were introduced to the rationale and techniques involved in the biofeedback treatment they were to receive initially.

Intervention Phase

At the initiation of EMG bio-feedback training for each subject, contraction of the forehead, neck muscles and migraine headache pain was discussed as a contributing factor to the pain sustained during headaches. The therapists suggested that learning to relax these muscles would help patients control their headaches. An overview of the theory and practice of clinical biofeedback, particularly as it related to treatment of tension headaches, was presented to each subject.

Treatment involved providing a feedback tone proportional in frequency to the level of frontalis EMG activity. The subject was instructed to create a "RELAXATION" response in which the feedback tone was kept as low as possible by relaxing. As each subject began to relax, amplifier gain was progressively increased so that a deeper state of relaxation was required to keep the tone low.

At each session the frontalis EMG activity was recorded while the subjects reclined on a therapy couch. Electrodes (three silver-silver chloride electrodes) were attached to the forehead per instructions to monitor frontalis muscle activity. A 100-200 Hz band pass was utilized. An average EMG in microvolts (rms) was recorded for 20 one-minute blocks utilizing an autogen 5100 digital integrator.

Self-recording of headache duration was collected on diary sheets that divided the day into 24 one-hour periods. Other activity levels were assessed by magnitude measures in which the activity level was defined by patient self-report on diary forms (see Table 6) which indicated when and for how long the person was sitting,

Table 6

Headache Duration Form

Day of Week ______________

Date ____________________

	Sitting		Walking		Reclining	
Midnight	Major Activity	Time	Major Activity	Time	Major Activity	Time
12-1						
1-2						
2-3						
3-4						
4-5						
A.M. 5-6						
6-7						
7-8						
8-9						
9-10						
10-11						
11-12						
Noon 12-1						
1-2						
2-3						
3-4						
4-5						
P.M. 5-6						
6-7						
7-8						
8-9						
9-10						
10-11						
11-12						
Total						

Source: Fordyce, W. E. (1976). Behavioral methods for chronic pain and illness (p. 226). C.V. Mosby Company.

walking and reclining; an activity checklist was also used.

Headache intensity was rated on a 10-point scale, with 0 indicating no pain and 10 indicating a incapacitating headache. When relevant, on the same sheet, each subject recorded the time when home practice sessions were conducted during specified stressful situations.

Treatment 2

The 6 subjects ranged in age from 21 to 41 years and were assigned to 2 groups (G3 and G4). G3 had been diagnosed as suffering muscle contraction headache episodes. G4 had been diagnosed as suffering migraine episodes. Pretreatment frequency of headache attacks ranged from 2 to 4 per week. All subjects had been taking medication for acute headache pain attack during previous medical treatment.

Baseline

The 2 assigned groups in this treatment began keeping daily records of headache activity as a headache index (number of bouts per week and duration of bout--hours/week, skin temperature, EMG level, and pain intensity) for 1 week prior to the beginning of treatment; the 5 headache index measures were recorded for all subjects. All subjects in this treatment were introduced to the rationale and techniques involved in the GSR biofeedback treatment.

Intervention Phase

At the initiation of this training for each subject, contraction of the forehead, neck muscles and migraine headache symptoms were discussed as a contributing factor to the pain sustained during headaches. The therapist suggested that learning to relax these muscles would increase the blood flow and the skin temperature; accordingly, their headaches would be controlled. Each subject was connected to the GSR biofeedback equipment with auditory feedback, and the subject was asked to imagine a stressful situation while trying to relax the tense muscles. Each subject was trained to increase his/her skin temperature 1 degree C or 2 degrees F, by hand warming techniques. Feedback was decreased in the audio feedback sound intensity.

Treatment 3

The 6 subjects ranged in age from 22 to 40 years and were assigned to 2 groups (G5 and G6). G5 had been diagnosed as suffering muscle contraction headache episodes, and G6 had been diagnosed as suffering migraine episodes.

Pretreatment frequency of headache attack ranged from 3 to 5 per week. All subjects had been taking medication for acute headache pain attack during previous medical treatment.

Baseline

The 2 assigned groups in this experiment began keeping daily records of headache activity as a headache index (number of bouts per week and duration of bout), for one week prior to the beginning of treatment. The 5 headache index measures had been recorded for all subjects.

All subjects in this experiment were introduced to the rationale and techniques involved in the relaxation training procedures.

Intervention Phase

The initial stage of treatment was a training program consisting of twenty-one, 30-minute sessions (spread over 7 weeks) in progressive relaxation procedures. This program was based in large part on the procedures outlined in the relaxation summary sheet (Appendix E). Each patient was given the relaxation sheet summary to practice relaxation techniques as a home assignment for two 15-minute sessions each day. The goal was to enable the patient to obtain a relatively deep sense of relaxation in a relatively brief period of time, using so-called cue-controlled relaxation.

The initial session lasted approximately 1 hour, later sessions took 30 minutes for each session.

Patients were strongly urged to practice the relaxation procedures on a regular basis at home (Hiebert, et al., 1983).

Treatment 4

The six subjects ranged in age from 22 to 40 years and were assigned to two groups (G7 and G8). G7 had been diagnosed as suffering muscle contraction headache episodes and G8 had been diagnosed as suffering migraine episodes. Pretreatment frequency of headache attack ranged from 3 to 4 per week. All subjects had been taking medication for acute headache pain attack during previous medical treatment.

Baseline

The two assigned groups in this experiment began keeping daily records of headache activity as a headache index (number of bouts per week and duration of bouts--hours/week), for one week prior to the beginning of treatment. The five headache index measures were recorded for all subjects. The subjects in this treatment were not given any rationale for any kind of treatment, but they were urged to keep going on the medical treatment strategy that had been assigned to them by their medical doctors.

Intervention Phase

These two groups served as a control group for the study; no new treatment was introduced to them. They attended sessions for the purpose of recording the five headache measures. These groups continued using the same kind of drugs they used before the study was introduced.

Summary of the 4 Treatments

Previous discussion may be summarized as follows (see Table 7).

1. Patients were divided into two major groups according to their headaches (muscle contraction, migraine).

2. Muscle contraction headache patients were assigned to 4 subgroups (G1, G3, G5, and G7 group).

3. Migraine headache patients were assigned to 4 subgroups (G2, G4, G6, and G8 group).

4. Treatment strategies were divided into 4 strategies (biofeedback EMG, biofeedback GSR, relaxation, and no treatment strategy).

5. Each two sub-groups were treated by one strategy as follows:

G1 and G2 were treated by biofeedback EMG.

G3 and G4 were treated by biofeedback GSR.

G5 and G6 were treated by relaxation.

G7 and G8 served as a control group, no treatment was introduced to these subgroups.

Table 7

Summary of the 4 Treatments

	Headache Patients	
Strategies	MCH Patients	Mg Patients
EMG	A, B, C (Group 1)	D, E, F, (Group 2)
GSR	G, H, I (Group 3)	J, K, L (Group 4)
Relaxation	M, N, O (Group 5)	P, Q, R (Group 6)
None	S, T, U (Group 7)	V, W, X (Group 8)

Follow-up

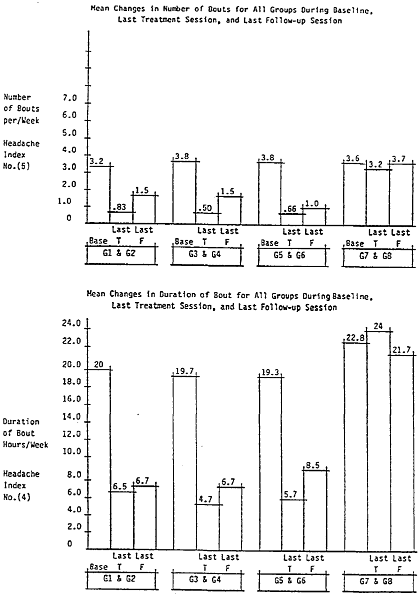
This phase was started after the end of the last session of the treatment and continued for eight weeks. In this phase, all of the subjects reported the five headache index measures (pain intensity, EMG level, skin temperature, duration of bout, and number of bouts per week) when attending specific sessions. Once a week, to credit the patient's medication consumption, the physician who referred the patient was requested to check the level of his patient's pain, and the kind and amount of drugs that had been taken by the patient.

CHAPTER IV

RESULTS AND DISCUSSION

The main effects of the research study are shown in Figure 1 which describes the baseline, end of treatment, and end of follow-up levels for each of the five headache indices. Data are shown for the EMG treatment groups, the GSR treatment groups, the Relaxation treatment groups, and the no treatment control groups. Each headache index shows substantial treatment effects which were partially maintained during the eight week follow-up period. Similar changes are not present in the data from the no treatment control subjects. Table 8 includes the data shown in Figure 1 and also shows the percentage changes from baseline to end of training and from baseline to end of follow-up.

It can be seen that essentially the same patterns of changes are seen in the headache indices for each treatment. As might be hoped, data from all three treatments show decreases in the number of bouts per week, the duration of bouts, and pain intensity levels. On the other hand, changes in EMG level were similar regardless of whether the treatment was EMG biofeedback, GSR biofeedback (directed at changing skin temperature), or

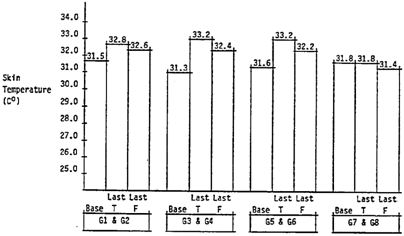


Note. Last T = Last Treatment Session.
Last F = Last Follow-up Session.

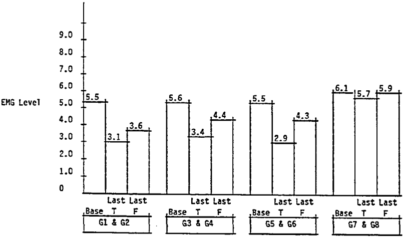
Figure 1. Mean Changes in Headache Index Measures for All Groups During Baseline, Last Treatment Session and Last Follow-up Session.

Figure 1--Continued

Mean Changes in Skin Temperature for All Groups During Baseline, Last Treatment Session, and Last Follow-up Session



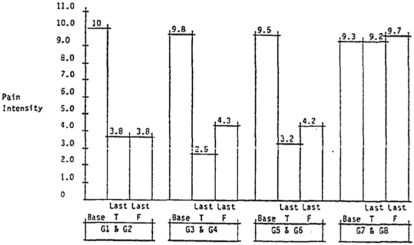
Mean Changes in EMG Level for All Groups During Baseline, Last Treatment Session, and Last Follow-up Session



Note. Last T = Last Treatment Session.
Last F = Last Follow-up Session.

Figure 1--Continued

Mean Changes in Headache Index Measures for All Groups During Baseline, Last Treatment Session, and Last Follow-up Session



Note. Last T = Last Treatment Session.
Last F = Last Follow-up Session.

Table 8

Mean Changes and Improvement in Headache Index Measures for All Groups, in Base, End of Treatment, and Follow-up

		Biofeedback EMG	Biofeedback GSR	Relaxation	No Treatment
Pain Intensity	Base	10	9.8	9.5	9.3
	End T.	3.8	2.5	3.2	9.2
	Follow-up	3.8	4.3	4.2	9.7
	B-E	6.2	7.3	6.3	.4
	%	62%	70%	64%	4%
	B-F	6.2	5.5	5.3	-.4
	%	62%	53%	53%	4%
EMG Level	Base	5.5	5.6	5.5	6.1
	End T.	3.1	3.4	2.9	5.7
	Follow-up	3.6	4.4	4.3	5.9
	B-E	2.4	2.2	2.6	.4
	%	41%	37%	45%	6%
	B-F	1.9	1.2	1.2	.2
	%	33%	20%	20%	03%
Skin Temp (C^o)	Base	31.5	31.3	31.6	31.8
	End T.	32.8	33.2	33.2	31.8
	Follow-up	32.6	32.4	32.2	31.4
	B-E	-1.3	-1.9	-1.6	0
	%	4%	6%	5%	0
	B-F	-1.1	-1.1	-.6	+.4
	%	3%	3%	2%	1%
Duration of Bout	Base	20	19.6	19.3	22.8
	End T.	6.5	4.7	5.7	24
	Follow-up	6.7	6.7	8.5	21.7
	B-E	13.5	14.9	13.6	-1.2
	%	67%	74%	70%	5%
	B-F	13.3	12.9	10.8	1.1
	%	66%	64%	55%	4%
No. of Bouts per Week	Base	3.2	3.8	3.8	3.6
	End T.	.83	.50	.66	3.2
	Follow-up	1.5	1.5	1	3.7
	B-E	2.37	3.3	3.14	.4
	%	71%	76%	72%	10%
	B-F	1.7	2.3	2.8	-.1
	%	51%	53%	65%	3%

Note. End T. = End of treatment.
B-E = Base - End of treatment.
B-F = Base - Follow-up.

relaxation training. Similarly, changes in skin temperature showed the same patterns regardless of whether the treatment was directed at skin temperature changes, frontalis activity, or general relaxation.

These data showing averages during baseline, at the end of treatment, and at the end of follow-up provide a global summary of the results. They show the magnitude of the changes but do not show the time course of the changes. They also do not show whether, for example, the EMG treatment was more effective for muscle contraction patients than for migraine patients.

Table 9 shows the time course for the treatments by presenting the weekly averages for each headache index for each treatment. The data for week seven, comprised of averages over three sessions, are quite similar to the data from the last treatment session as shown in Figure 1. However, the important thing to note in Table 9 is the orderly improvement from week to week shown by the treatment groups and the lack of such changes shown by the no treatment controls. These orderly changes will be examined in more detail as data are presented in conjunction with a treatment by treatment description of the results.

Table 9

Weekly Data: Mean of Headache Measures
for All Groups Through Treatment

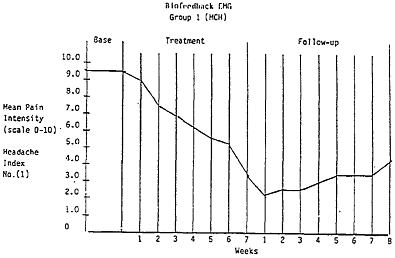
	Weeks	Biofeedback EMG x Per Week	Biofeedback GSR x Per Week	Relaxation x Per Week	No Treatment x Per Week
Pain Intensity	1	9.4	9.3	8.9	9.3
	2	8.3	8.4	8.4	7.7
	3	7.8	7	7.7	8.3
	4	6.9	5.7	6.8	9
	5	6.3	4.8	5.7	7.7
	6	5.2	3.6	4.6	8.5
	7	3	2.5	3.2	8.3
EMG Level	1	5.3	5.5	5.5	5.9
	2	4.9	4.9	5.1	5.8
	3	4.5	4.7	4.7	4.7
	4	4	4.3	4.1	6
	5	4	3.9	3.6	5.7
	6	3.5	3.7	3.2	5.7
	7	3.1	3.4	3	5.8
Skin Temp (C°)	1	31.5	31.4	31.4	31.6
	2	31.8	31.7	31.7	31.2
	3	32	31.9	32	31.3
	4	32.2	32.2	32.4	31.8
	5	32.4	32.5	32.6	31.7
	6	32.6	32.9	33	31.4
	7	33.2	33.1	33.2	31.71
Duration of Bout Hours/Week	1	18.7	14.8	17.1	21.8
	2	15.3	11.9	15.9	19.3
	3	14.5	10	14.3	19
	4	13.2	9	11.1	19.2
	5	11.3	8.2	8	17.8
	6	9.5	6.1	6.6	19.5
	7	5.3	4.8	5.8	20.2
No. of Bouts per Week	1	3	4.1	3.2	3.7
	2	2.4	2.5	2.5	3
	3	2.2	2.3	2.1	3.7
	4	2	1.9	1.6	3.3
	5	1.7	1.5	1.3	3.7
	6	1.4	1.1	.80	3
	7	.83	.70	.60	3.3

Treatment 1: EMG Feedback

Groups G1 and G2 who used the EMG biofeedback technique showed a diminished headache activity after baseline. In the intervention phase frontalis muscle activity was lowered while headache activity continued to progressively decline, as shown in Figure 2.

The removal of biofeedback training from the treatment was followed by a gradual worsening in the headache indices. It appears that EMG feedback training procedures were primarily responsible for the therapeutic gains because the removal of biofeedback training was followed by an increase in headache activity. EMG biofeedback influenced frontalis muscle activity and this seemed to be associated with the reduction in headache activity. The results for EMG usage help to clarify the effectiveness of biofeedback treatment when EMG feedback procedures were utilized alone. In the second phase with the MCH group the frontalis EMG levels were diminished although reported bouts per week continued at rather high levels. A slight increase in headache activity was recorded during the last phase.

The results of this treatment with both groups suggest that EMG biofeedback training may have been the most active component of the treatment procedure for the MCH group, perhaps more so than for the MG group.



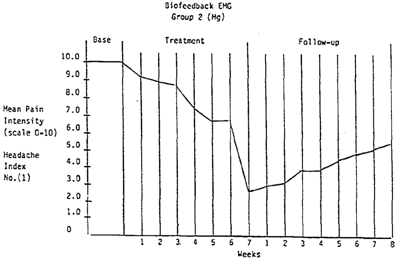
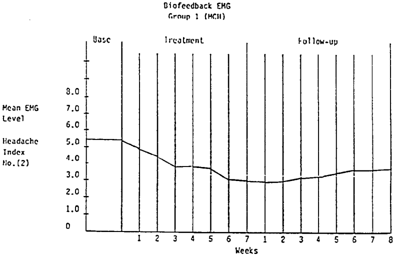
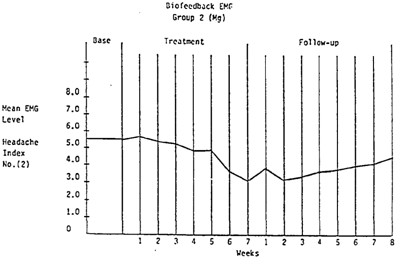


Figure 2. Mean Changes in Headache Index Measures for (G1 & G2) During Base, Treatment, Follow-up.

Figure 2--Continued





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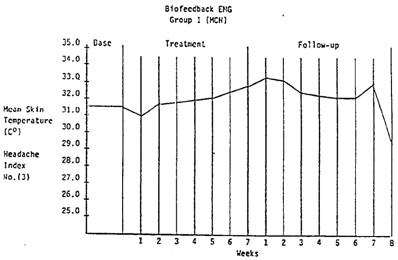

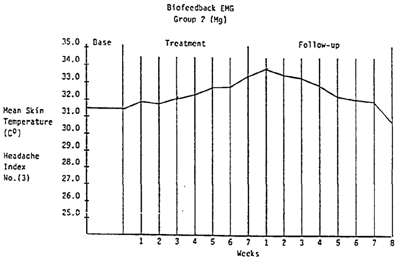

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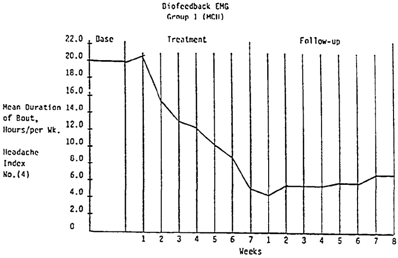


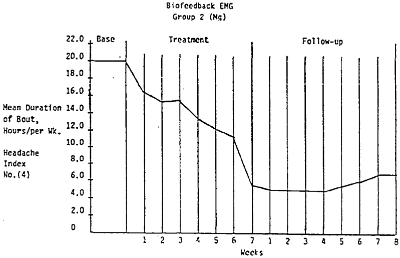
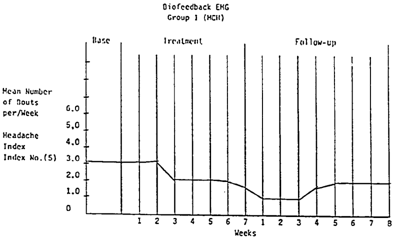
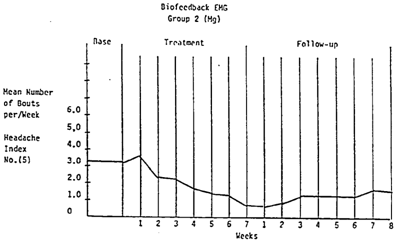


Figure 2--Continued





Accordingly, these results suggest that a more efficient EMG treatment approach for tension headaches would place increasing emphasis on the modification of the maladaptive frontalis muscle activity.

When the groups treated by EMG biofeedback were compared with the control groups, (Table 8) the findings indicated that the biofeedback group showed a reduction in EMG activity, while the control group showed no fundamental improvement in recorded headache activity.

The results of this experiment have indicated that biofeedback (EMG) is effective in the treatment of both migraine and muscle contraction headache (Figure 2). EMG biofeedback technology is a clinical tool that is used to investigate the internal physiological and psychological responses for chronic pain by providing subjects with immediate feedback (visual or auditory). An important deficiency of this treatment design is the degree of generalization from one setting to another. The results indicate that all patients improved with respect to their headaches, although the results provide no clear evidence that EMG biofeedback is more effective with MCH patients than with MG patients.

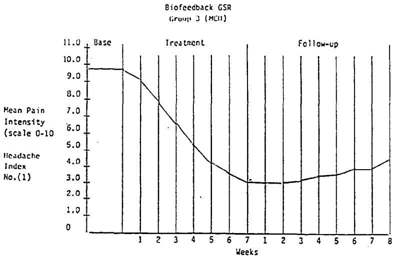
Treatment 2: Skin Temperature

Because migraine is thought to be associated with an impairment of functioning of the cranial arteries, and because head pain onset is associated with the dilation of the extracranial arteries (Sargent et al., 1973a), the behavioral treatment strategies were directed toward preventing the vasodilation phase of the disturbances which accompany pain.

It appears that a hand-warming strategy is effective in reducing vasoconstriction of the cerebral arteries. In this experiment a hand-warming strategy treatment was used which instructed the migraine group (G3) to raise their skin temperature, while the other MCH group (G4) was also trained to increase their finger temperature. The results, shown in Figure 3, indicate that groups showed significant improvement in the intensity of headache onsets, pain duration, and the number of symptoms experienced during a headache episode.

The results of this experiment appear to support the specific effectiveness of hand-warming biofeedback strategy (raising the skin temperature by GSR) for the treatment of chronic migraine headache.

The MCH group decreased their headache pain. All treatment groups showed a decrease in the frequency of headache attacks per week.



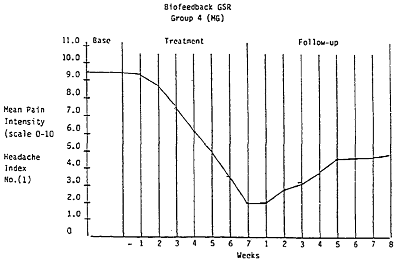
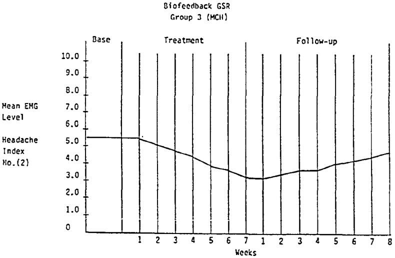


Figure 3. Mean Change in Headache Index Measures for (G3 & G4) During Base, Treatment, Follow-up.

Figure 3--Continued



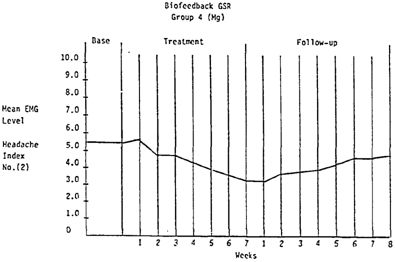
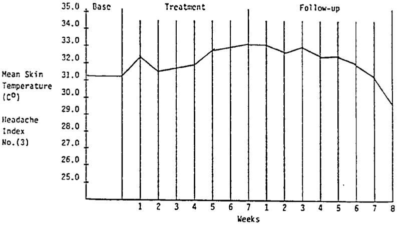


Figure 3--Continued

Biofeedback GSR
Group 3 (MCH)



Biofeedback GSR
Group 4 (Mg)

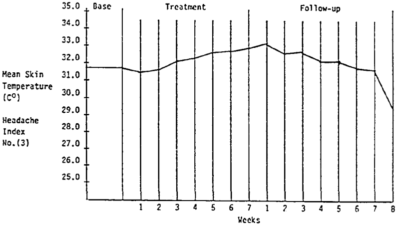
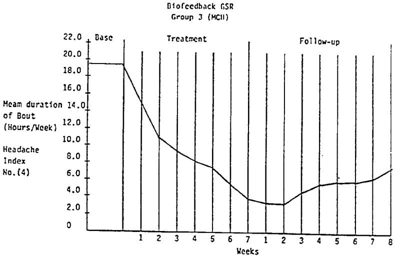


Figure 3--Continued



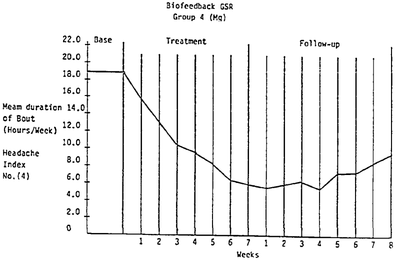
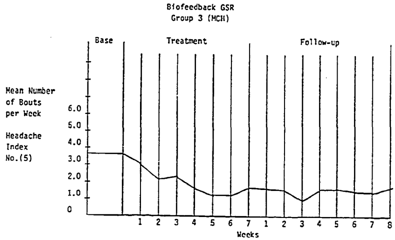
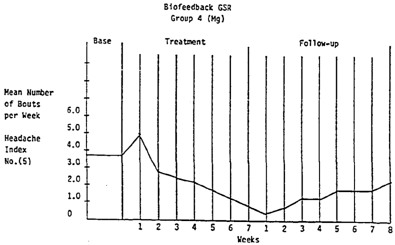


Figure 3--Continued





Treatment 3: Relaxation

Two groups in this experiment, G5 and G6, diagnosed as MCH and as having migraine symptoms were used. The major strategy used was progressive muscle relaxation. All patients in both groups (G5, G6) were taught to recognize muscle tension and then trained to progressively relax muscle groups through a successive relaxation procedure.

For each patient a score was obtained on each of five headache dependent measures reported in this study: (a) average headache pain intensity for each session, (b) EMG level, (c) skin temperature, (d) duration of bout, and (e) number of bouts per week.

It should be noted that relaxation training procedures were applied successfully with both groups as a primary therapeutic technique.

Inspection of differences between the two groups (Figure 4) shows no substantial differences over the five headache index measures between the two groups. The patterns seen are similar to the patterns shown by the biofeedback groups. This indicates that relaxation training is an effective strategy in the treatment of headache pain.

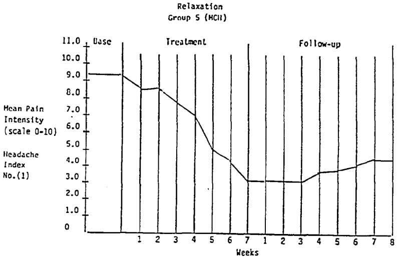
The results indicate that the therapeutic gains achieved by members of both treatment groups at the end of treatment were maintained for a seven week period, and all subjects had improved in terms of decreased frequency and intensity of headache.

Treatment 4: No Treatment Controls

Two groups in this experiment, G7 and G8, diagnosed as MCH and as having migraine symptoms were used as control groups in the study. No improvement was seen in this treatment, for either group (Figure 5). The MCH subjects decreased their EMG level at the beginning of the study while other subjects did not show significant improvement at any time. However, the differences between the groups was not large.

Follow-up Phase

The follow-up phase continued for eight weeks, all groups attending a weekly session. The effects shown in treatment had generalized to other settings, as shown by the reduction in bouts per week, duration, and intensity. However, this improvement decreased progressively during the follow-up period. Examination of the data in Figures 1 through 5 shows that the headache indices had not yet reached baseline levels but were steadily progressing in that direction.



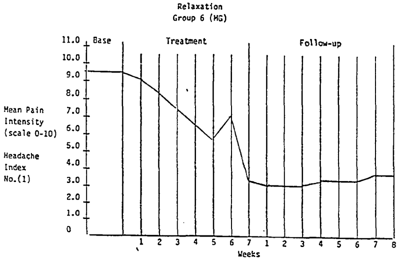


Figure 4. Mean Changes in Headache Index Measures for (G5 & G6) During Base, Treatment, and Follow-up.

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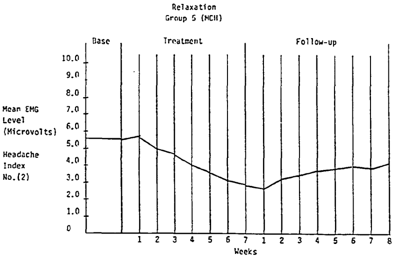


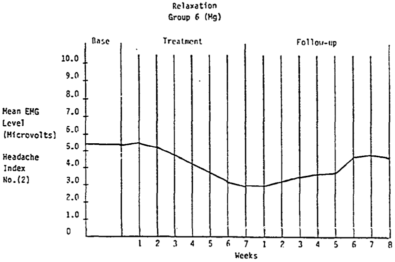
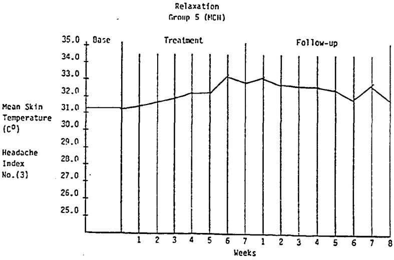
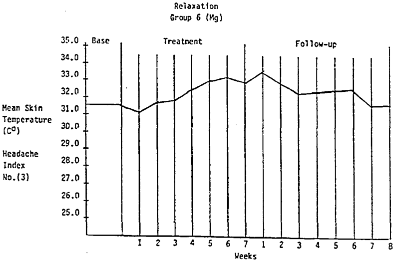


Figure 4--Continued





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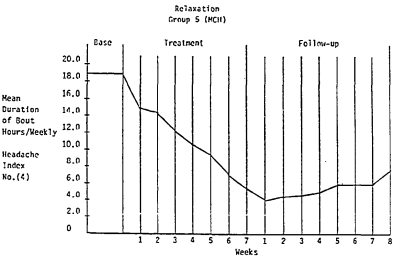


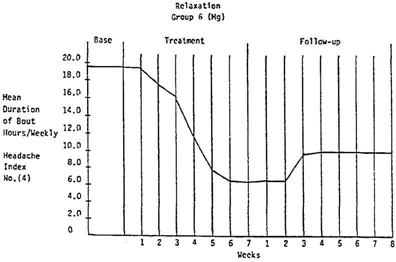
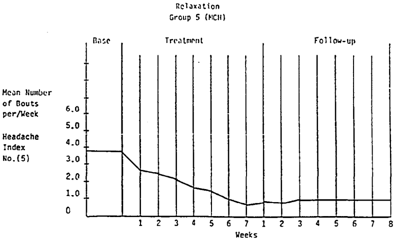
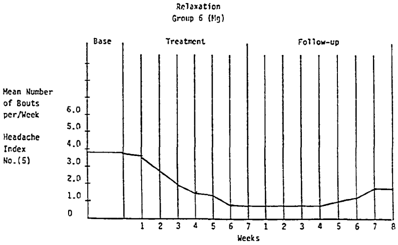
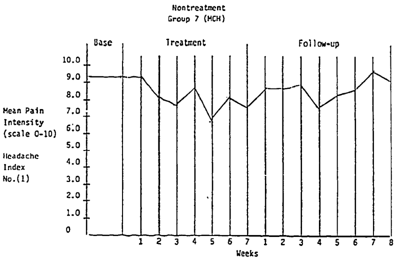


Figure 4--Continued







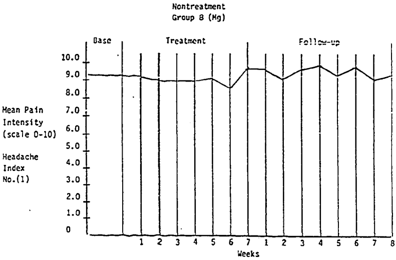
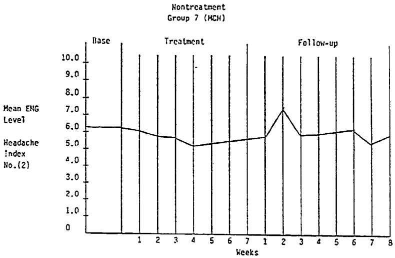
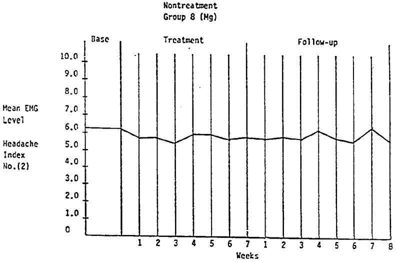


Figure 5. Mean Changes in Headache Index Measures for (G7 & G8) During Base, Treatment, and Follow-up.

Figure 5--Continued





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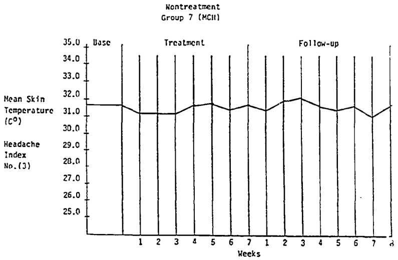

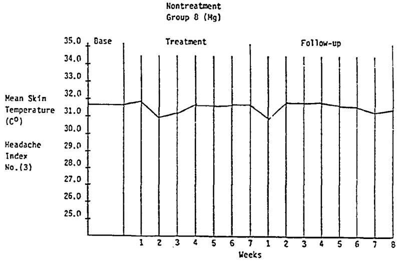

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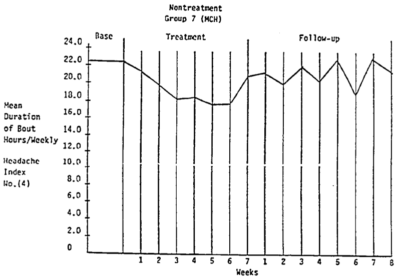

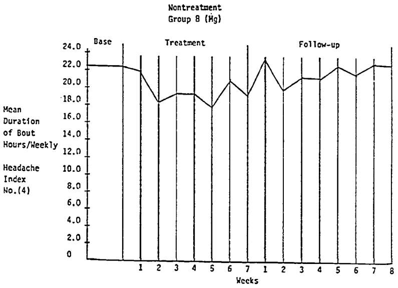

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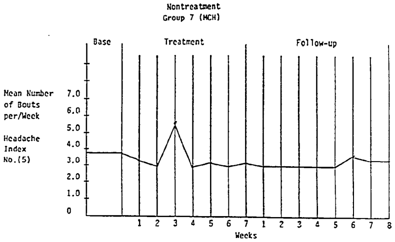

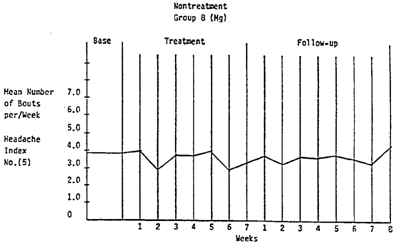

Data on medication consumption were not collected in such a way that trends could be analyzed; however, it is interesting to note that treatment subjects reported that their medication consumption decreased (Figure 6). Most patients had reported taking 90-110 milligrams of Ergotamine per week and 9-10 analgesic tablets per day prior to treatment. During treatment and follow-up there is a shift in the reported distributions of Ergotamine and analgesic tablet consumption showing a reduced consumption of medicine. Thus the treatment effects appear to have occurred in spite of a reduction in medication; alternatively, we might say that another index of the effectiveness of the treatment was the reduction in medication taken by the patients.

The referring physicians who rediagnosed the patients at the end of the follow-up period indicated that some improvement had occurred in their patients as a result of the treatment strategies.

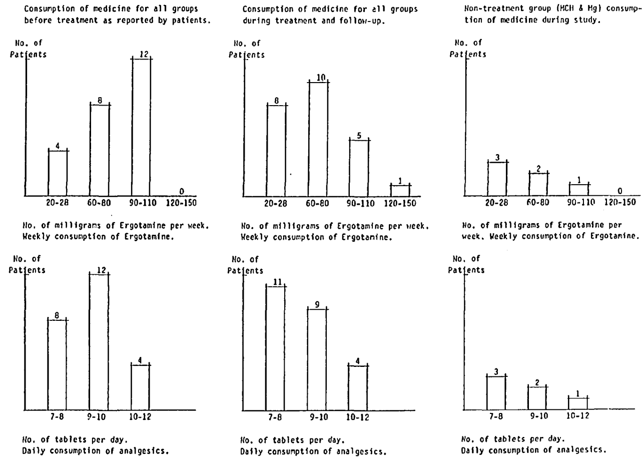

Figure 6. Consumption of Medicine.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

The research findings clearly justify six conclusions. First, biofeedback treatments and relaxation treatments are effective in reducing headaches for this Jordanian population, just as they have been for other populations. The subjects in all three treatment conditions showed a significant reduction in headache activity. The reductions were sustained as long as the treatments were in effect, with a gradual worsening over an eight week follow-up period.

Second, the patterns of improvement for all three treatment groups were similar in the five headache indices covaried. Finger temperature feedback was accompanied by changes in frontalis muscle activity and frontalis activity feedback was accompanied by changes in finger temperature; moreover, general relaxation training produced effects similar to the biofeedback training.

Third, the three forms of treatment were accompanied by voluntary reductions in medication intake. It seems unlikely that the treatments made the medication more effective so we can conclude for the moment that the treatments make medication less needed.

Fourth, the therapeutic improvement in symptoms of migraine headache with finger temperature feedback is probably due in part to reducing vasoconstriction of cranial arteries that precede the vasodilation. According to headache mechanism theories, the termination of migraine action during the symptoms of the disease stage is created when the vasodilation of cranial arteries is generalized and prevents the increasing of sympathetic outflow. However, the effective process in treating the migraine patients was not the localized blood volume changes associated with finger warming but the most general effects of relaxation training. The biofeedback equipment used, while clearly adequate for a clinical effect, was not precise or elaborate enough to differentiate among the possible mechanisms of improvement.

Fifth, the effectiveness of the treatments was probably not due to a placebo-like effect of the general attention of the therapists. While given an overall rationale for the procedures the patients were not told specifically to expect results since the treatments were experimental with the population being studied. The attention and regular visits to the hospital were provided to the no treatment control subjects who did not show improvement. In addition, the improvements were incompletely sustained during the follow-up period when measurements occurred and treatments had been terminated.

Sixth, researchers in the field would be well advised to use multiple indices as was done in this study. Had there not been multiple indices, it would not have been possible to observe the covariation. Not having observed the covariation, we would not have known that the three treatments were probably producing general rather than specific effects.

The findings clearly indicate that treatment gains maintain for several weeks for members of both relaxation and biofeedback training groups. These results further support earlier findings of relative efficacy of biofeedback in the treatment of headache pain. However, there is no firm basis on which to use one treatment over the other. The similarity of the results for most of the dependent variables suggests that both biofeedback and relaxation treatments may be reflecting a subjective component that patients learn to relax in response to stress in order to reduce the overall level of sympathetic arousal.

The results also suggest that the main therapeutic benefits for migraine patients treated by hand-warming techniques resulted from overall decreased sympathetic out-flow. It should be noted that various relaxation procedures have been applied successfully in the treatment of tension headaches and migraine headaches. However, it still remains to be discovered whether relaxation methods are more or less effective than biofeedback procedures, whether a combined relaxation-biofeedback strategy facilitates treatment, and whether the effectiveness of any strategy is associated with a particular disorder.

In this study, although the biofeedback groups did not receive any specific form of relaxation training, they were supposed to use relaxation techniques by themselves during treatment processes, and to practice at home the relaxed feelings they learned. On the other hand, a hand-warming strategy was used for treating the migraine patients. Inasmuch as migraine occurs as a function of increasing sympathetic activity and as a facilitator to vasoconstriction of intracranial arteries, the success in using a hand-warming biofeedback strategy with migraine patients relies upon the notion that patients used some kind of relaxation procedures during the treatment.

This study indicates that the biofeedback treatment is effective as is relaxation training in reducing headache activity (see Figure 1). The combination of the two strategies (relaxation and biofeedback) might provide the desirable treatment. With respect to drug therapy, the superiority of treatment strategy (relaxation, biofeedback, or combination of both strategies) has not been determined.

What remains to be investigated is if and how one strategy facilitates or is associated with the other. The argument raised here provides necessary and appropriate direction for future research, in order that the treatment can be matched with both the disorder in general and the individual patient in particular. For example, it might be interesting to do a study in which patients were initially taught general relaxation techniques. Frontalis activity and finger temperature could be monitored, along with other indices, and individuals given specific biofeedback training tailored to progress or lack of it shown by individual indices for individual patients. It might be that the major differences between chronic headache patients are not best summarized by labeling them MG patients or MCH patients. It might be that, consistent with clinical lore, there are characteristic habit patterns that individuals have acquired which result in each person "putting his (or her) tension" in a characteristic place. Relaxation training plus biofeedback tailored to the patient might be highly affective treatment.

APPENDICES

Appendix A

Clinical Interview

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These consist of pages:

121-123

125-131

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Appendix B

A Migraine Personality Quiz

Muscle Contraction (Tension) Headache Quiz

Appendix C

Informed Consent

INFORMED CONSENT

Patient"s Name ______________________________

Therapist's Name .... Jordanien Royal Medical Services

Date

1. The goal of this project was to use non-drug therapy in treating the headache patients.
2. Patients were referred by the neurologists.
3. Patients made a choice whether to participate.
4. Risks and benefits of the treatment strategies were described by the therapists.
5. The director of the Royal Medical Services agreed on the goal of this project.
6. Participants paid nothing as a cost for the treatment.
7. No risks were expected by using any of the treatment strategies.
8. Explanations were be given about the entire strategies by the therapists during the pre-selection phase.
9. Written instructions and any expectations were given to the participants.
10. Time needed for participants was 8 weeks for the treatment phase, and another 8 weeks for the follow-up phase.

11. Participants quit consumption of any medication during the study (except the control group).
12. The referral medical doctors participated in this project as observers.
13. Participants were encouraged not to drop out after they signed this contract.
14. Therapists responsibilities were:
    a. they provided no drug treatment
    b. they used one or more of three strategies:

Biofeedback EMG, Biofeedback GSR, and/or Relaxation strategy.

    c. data collection
    d. evaluation and follow-up
    e. arrangement for treatment settings

15. Patients were able to ask the therapists any questions at any time.
16. Patients were informed about the results according to their requests.
17. Only participants who sign this contract, were subjects for this project.
18. All of the information was treated as confidential.
19. Participants were instructed to do all the home work that will be assigned by the therapists.
20. Participants were to meet three times each week in the Royal Medical Services.

21. The subjects were allowed to take medication if they requested it.

Signature ______________________________

Note:

None of the subjects who signed the consent form asked later, to withdraw from the experiment. This informed consent procedure was implemented in 1985 and is not in compliance with the Western Michigan University policy on use of human subjects as it has been clarified and implemented since that time. The procedures met the requirements of the Jordanian Royal Medical Services and general standards for protection of human subjects but was not pre-approved by the Human Subjects Institutional Board of Western Michigan University.

Appendix D

Interview Questions

INTERVIEW QUESTIONS

1. When did the headache begin?
2. Does the headache occur on one side or part of the head, or does it affect the whole head?
3. Does the headache recur in the same place each time?
4. At what time of the day does the headache occur?
5. What are the intervals between head pains?
6. What is the nature of the head pain?
7. Do other symptoms (prodromal symptoms) occur before the headache starts?
8. Are there concurrent symptoms?
9. What precipitates the headaches?
10. Is there a family history of headaches?
11. What helps relieve the headache (including any medications)?
12. What makes the headaches worse?

Source: Olton, D. S., & Noonberg, A. R. (1980). Biofeedback clinical application in behavioral medicine (pp. 153-154). Englewood Cliffs, NJ: Prentice-Hall.

Appendix E

Relaxation Summary Sheet

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139-141

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