CHRONIC PAIN: REDUCTION THROUGH HYPNOSIS AND TENS

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CHAPTER I

INTRODUCTION

According to the National Center for Health Statistics, approximately 8 to 10% of the population in most western countries have some form of migraine headache; and in America, low-back pain has disabled an estimated 7,000,000 people. In terms of dollars, chronic pain costs the American economy an estimated fifty billion dollars annually (Bresler, 1979). The average chronic pain patient's medical and surgical expenses range from fifty to one hundred thousand dollars (Shealy, 1976). Many of these patients have not been relieved of their pain through conventional therapies. In some cases, surgical intervention which was intended to eliminate the pain resulted in a more severe form of pain.

When faced with ceaseless pain, the patient becomes withdrawn, irritable and depressed. In many cases life goals and responsibilities are replaced by a constant focus on the pain. This focus creates tension within the individual. This tension is reflected in certain muscle groups. The sustained muscle tension leads to muscle pain which further compounds the original pain.

This study was conducted to demonstrate that nursing interventions which incorporate the simultaneous use of hypnosis and transcutaneous electrical stimulation (TENS) could reduce pain. The patient, through hypnosis, refocuses his attention from the experience of pain to performing the various instructions and scenes contained in the hypnosis tape. As attention was focused on the hypnotic instructions, the major muscle groups became relaxed. With muscle relaxation the pain associated with muscle tension was reduced. At the same time, the TENS unit was stimulating large nerve fibers at the original source of pain and inhibiting pain signals traveling up the spinal cord. In reducing both types of pain the total pain perceived by patients was reduced.

Problem of Study

The problem of the study was to determine if the effects of hypnosis and TENS given simultaneously would show a reduction in reported pain by subjects with chronic back pain and headaches when compared to the use of either therapy given unimodally.

Justification of the Problem

In a 1979 report of the Department of Health, Education, and Welfare the epidemic dimensions and overbearing

cost of chronic pain were acknowledged and the recommendation for research and training in this field was presented (Interagency Committee on New Therapies for Pain and Discomfort, 24-41).

The nurse, due to greater amounts of time and interaction spent with the patient in pain, is an important member of the health team. In pain clinics, it is the nurse who usually teaches the patient about the methods utilized for pain control and encourages the patient to follow through with the recommended prescribed regime. In these settings the nurse is in a position to make a significant contribution to the total management of the patient in pain. In attempts to understand, evaluate, and reduce pain, it is important to investigate combinations of treatments which may prove more effective in a total reduction of pain than if those treatments are utilized singularly.

Nurse researchers who have focused their studies on pain include: J. Johnson (1972, 1973), Johnson and Rice (1974), and Susie Kim (1978) who looked at accurate information, expectancy, anxiety, and pain reduction both in the laboratory and clinical setting; A. Jacox and M. Stewart (1973) who did a descriptive study on the psychosocial contingencies of pain; Healy (1968); and McBride (1967) who studied the quality of nursing care and the frequency and

severity of pain. The results of these studies have made a significant contribution to nursing knowledge in terms of identifying psychosocial factors which may influence a patient's responses to pain and in identifying nursing interventions which effectively contribute to the reduction of pain and promote patient comfort.

Theoretical Framework

The Gate Control Theory of Pain was formulated in 1965 by Melzack and Wall in an attempt to integrate the facts of three competing theories: specialization, central summation, and the pattern pain theory along with experimental findings on spinal mechanisms. Basically, the theory proposes that the small, densely packed cells of the substantia gelatinosa in the dorsal horn modulate the incoming signals from the periphery before they influence the central transmission (T) cells; and the afferent patterns in the dorsal column act as the central control trigger which activates selective brain processes (central control system) which influence, via descending fibers, the modulating mechanisms of the gate control system; and activation of the neural mechanisms (action system) responsible for perception and response is accomplished by T cells. The interaction of these systems determines the

pain phenomena. The theory recognizes the physiological and psychological dimensions of the mechanism.

In the Gate Control System it is proposed that the primary function of the substantia gelatinosa (SG) is to inhibit (-) the flow of nerve impulses. The inhibitory effect of the SG is increased by activity in the large fibers and decreased by activity in the small fibers. Large fibers inhibit the flow of impulses by activating (+) the inhibitory function of the SG or "closing the gate", while small fibers inhibit (-) "the inhibitory" function of the SG or "open the gate". Therefore, the relative activity between these two fibers from the peripheral area and descending influences from the Central Control System determine the degree to which the gate opens and closes, increasing or decreasing sensory input to the T cells. When output of the T cells exceeds a critical level, it activates the action system (Melzack, 1972).

Melzack and Wall (1965) proposed that the central control trigger activates two subsystems in the brain: the brain reticular formation and the cortex. The reticular formation exerts an inhibitory control over the information projected by the gate control system. This reticular control includes somatic, visual and auditory inputs. At the same time the gate control system is also influenced by

the cortex which subserves cognitive processes such as past experiences and attention. The central control system acts rapidly in identifying, evaluating and selectively modifying the sensory inputs and closely interacts with the action system (Melzack, 1973).

The action system is activated only when the output of the T cells exceeds a critical level and is controlled by the central control system. When the output of the T cells reaches a critical level and the brainstem reticular formation and the cortex are activated. Activation of the reticular structure underlies the motivational drive and unpleasant affect that triggers the individual into action toward flight or fight. The cortex evaluates the sensory input as to location, magnitude, and spatio-temporal characteristics of the noxious stimulus and provides the sensory-discriminative information for the action system.

The theory assumes that the activities in the action system plus the cognitive information processed at the central control system interact with one another to influence the motor mechanisms responsible for the pattern of overt behavior in response to noxious stimuli (Melzack, 1973).

The Gate Control Theory of Pain addresses the physiological and psychological dimensions in the pain mechanism. Many aspects of the physiological dimensions have been

validated by research (Wall, 1976). However, the psychological dimension is rudimentary in describing and explaining how psychological and socio-cultural elements play their roles in facilitating or inhibiting the pain process. The theory suggests that psychological inputs such as emotion, past experience, attention, and other stimuli which modulate cognition, influence pain perception and response.

Both the physiological and psychological dimensions of the theory are in need of further validation through research. The theory suggests that by simultaneously stimulating the large nerve fibers near the original source of pain, which block pain messages from ascending the spinal cord, and adding psychological input such as distraction, cognition is modulated and thus will influence pain perception and response.

Assumptions

1. The existence of the gate control system of pain transmission.
2. That the phenomena of pain is measurable.

Hypothesis

There is no significant difference in the reported pain of the group of subjects who receive the combination

of TENS and hypnosis given simultaneously and those subjects who receive either method administered unimodally.

Based on this major hypothesis several specific explications were formulated. The following are the empirically testable hypotheses of the study:

1. There is no significant difference of reported pain of subject groups receiving hypnosis only and those receiving TENS only as a chronic pain intervention; as measured by the McGill Pain Questionnaire:

   a. Pain Rating Index (PRI-S)
   b. Pain Rating Index (PRI-R)
   c. The Number of Words Chosen (NWC)
   d. Pain Intensity (PI) Scale

2. There is no significant difference of reported pain of subject groups receiving hypnosis only and those receiving hypnosis and TENS simultaneously as a chronic pain intervention; as measured by the McGill Pain Questionnaire:

   a. Pain Rating Index (PRI-S)
   b. Pain Rating Index (PRI-R)
   c. The Number of Words Chosen (NWC)
   d. Pain Intensity (PI) Scale

3. There is no significant difference of reported pain of subject groups receiving TENS only and those

receiving TENS and hypnosis simultaneously as a chronic pain intervention; as measured by the McGill Pain Questionnaire:

a. Pain Rating Index (PRI-S)
b. Pain Rating Index (PRI-R)
c. The Number of Words Chosen (NWC)
d. Pain Intensity (PI) Scale

Definition of Terms

Pain: The pain phenomenon is composed of two components: sensory and affective. The sensory component is characterized by the type and intensity of sensation experienced. Words such as "burning", "sharp", "ache", and "dull", describe the type of sensation. Magnitudinal terms describe intensity. The affective component has emotional properties and is characterized by words such as "exhausting", "fearful", "vicious", and "gruelling". It too varies in intensity, as defined by the McGill Pain Questionnaire (Melzack, 1975).

Transcutaneous Electrical Stimulation: The stimulation of peripheral nerves with a variety of electrical impulses via electrodes attached to the skin and connected to a portable electrical stimulator.

Hypnosis: A set of instructional-situational manipulations which allow the subject to undergo an altered

state of consciousness characterized by: an exaggerated state of awareness; selective attention to words articulated by someone else with selective inattention to distracting noise; attainment of deep relaxation; and an increased capacity to accept suggestions.

Chronic Pain Patient: An adult patient who has experienced headaches or back pain of at least a 3-month duration.

Limitations

Limitations of the measuring instrument may include:

1. A lack of discrimination of individual subtle differences which may exist in the pain experience.

2. The lack of discrimination of subtle differences of the pain experience which may exist as a result of the experimental treatments.

Summary

Chronic pain in the United States is costly both in terms of dollars and personal suffering when conventional therapies fail to relieve or cure the victim of its relentless agony. The nurse is the member of the health care team who spends most time in interacting with the patients. In this position the nurse has a unique opportunity to contribute to the total management of the patient in pain.

In the management of pain, it is important to determine which treatment or combination of treatments afford more pain relief. The Gate Control Theory of Pain addresses both the physiological and psychological aspects of the pain phenomenon. It is proposed that in simultaneously treating the pain patient with hypnosis (which affects the psychological aspect) and transcutaneous electrical stimulation (which affects the physiological aspect) the patient will report a significant reduction in the pain experienced.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

This chapter addresses the major physiological and psychosocial theories of pain. Included in the discussion are: definitions of pain, the historical development of physiological pain theories, major psychosocial theories related to pain, and pertinent research studies which support or fail to support the theory.

The Importance of Pain as a Warning System

A few people who never feel pain are afflicted by a rare genetic disorder. These people usually die young since pain is nature's warning which alerts us that something has gone wrong in our bodies. A completely painless existence, for most of us, would seem to be an ideal situation. The fear of pain for many is more than the fear of death. Pain is accepted by many if it is understood as a warning system; but once the warning is heeded and acted upon, the pain has served its purpose and is unnecessary. Most of us at that time demand that the pain be eliminated as well as the condition which created it (Singer & Switzer, 1980).

Knowledge about pain exists on as many levels as there are disciplines which deal with pain. There exist no neat and tidy solutions to the problem of pain relief. There is no adequate definition of pain. The basic definitions and views of pain used today are derived from the work of several researchers. Melzack (1973) views pain as a complex phenomenon: "physiological components plus cognitive evaluation of pain sensations takes place in the terms of past experience, psychological state, and attitudes toward pain. . ." (pp. 45-46). In their theory of the gate control of pain, they link the physiological and psychosocial factors that operate in the pain experience. Sternbach (1968) defines pain as "an abstract concept which refers to a personal, private sensation of hurt; a harmful stimulus which signals current or impending tissue damage; and a pattern of responses which operate to protect the organism from harm" (p. 12). Merskey (1968) states that it is "an unpleasant experience which we primarily associate with tissue damage or describe in terms of such damage, or both" (p. 298). McCaffery (1977) states that "pain is whatever the experiencing person says it is, existing whenever he says it does" (p. 11).

Historical Development of Pain Research

The historical development of pain study occurred in neurophysiological, psychological, social, and cultural components, which explains the slow development of theories that integrate various pain concepts.

Three historical theories of pain have been incorporated into the contemporary gate control theory. Affect theory considers pain to be an emotion rather than a sensation. It dates back to Aristotle (Marshall, 1894). The theory fails to provide an explanation of why pain is an emotion, but it influenced early pain theorists to propose that pain is composed of two dimensions (Melzack, 1973).

Specificity theory is derived from Decartes' "straight-thought" concept of 1644 (Melzack, 1973); the theory was modified by Muller in 1840 (theory of specific nerve-energies), Erb in 1874 (intensive theory of pain), and Frey in 1895 (theory of cutaneous sense of pain). The main idea in specificity theory is that of physiological specialization. Specific pain receptors in body tissue project impulses via pain fibers (A delta and C fibers) in peripheral nerves and by the Lateral Spinothalamic Tract in the spinal cord to the pain center in the thalamus. To say that a certain receptor responds to intense noxious

stimulation of the skin is a physiological statement of fact. Impulses are then sent to the cerebral cortex where they are perceived as pain. The theory contributed to finding the physiological mechanism which includes receptors and fibers of the skin sensory system exhibiting a high degree of specialized function. However, evidence suggests that there are only a small number of fibers which can be classified as "pain fibers". The theory fails to provide an explanation of the psychological process response.

The third theory, Pattern theory, is the general heading for a group of theories which were formulated late in the 19th century in reaction against the Specificity theory (Melzack, 1973). In 1894, Goldscheider proposed that stimulus intensity and central summation are the important determinants of pain. According to this theory, large cutaneous fibers comprise a specific touch system, while smaller fibers converge on dorsal horn cells which summate their input and transmit the pattern to the brain where it is perceived as pain. In 1943, Livingston proposed a Central Summation Theory suggesting that specific central neural mechanisms account for the summation phenomena in the pain syndrome. In 1955, Weddell and Sinclair proposed the Peripheral Pattern Theory suggesting

that excessive peripheral stimulation produces a pattern of nerve impulses thought of as pain. In 1955, Noordenbos suggested that pathological pain states were the result of the destruction of a specialized input-controlling system normally preventing summation from occurring. This theory suggests the existence of a protopathic (slow) conduction system that carries the pain signal in which the synaptic transmission can be inhibited by a relatively more rapid conducting fiber system referred to as epicritic (fast) (Melzack & Wall, 1970). The Central Summation Theory explains many clinical phenomena of pain, i.e. phantom limb pain (Melzack & Wall, 1977), but it does not account for the fact that surgical lesions of the spinal cord often do not abolish pain (Melzack, 1973). The Peripheral Pattern Theory does not account for physiological specialization, nor provide an adequate account of the psychological dimensions of pain.

The Gate Control Theory of Pain was formulated in 1965 by Melzack and Wall in an attempt to integrate the facts of specialization, central summation, and patterning theories along with experimental findings on spinal mechanisms. Basically, the theory proposes that the small, densely packed cells of the substantia gelatinosa in the dorsal horn modulate the incoming signals from the

periphery before they influence the central transmission (T) cells; and the afferent patterns in the dorsal column act as the central control trigger which activates selective brain processes (central control system) which influences, via decending fibers, the modulating mechanisms of the gate control system; and activation of the neural mechanisms (action system) responsible for perception and response is accomplished by T cells. The interaction of these systems determines the pain phenomena. The theory recognizes the physiological and psychological dimensions in the pain mechanism. Although all of the physiological facts to support the theory are lacking, the Gate Control Theory of Pain has been the impetus for the development of Dorsal Column Stimulators and Transcutaneous Electrical Stimulation for the control of pain (Shealy, 1976) and the recent emphasis on behavioral control for pain (Fordyce, 1977).

Dyke, Lambert, and O'Brien (1976) present some evidence being used against the Gate Control Theory. The theory proposes that small fibers open the gate and thereby increase pain stimulus transmission while large fibers close the gate and thereby decrease pain stimulus transmission. In some pathological conditions (Fabry's disease) it has been demonstrated that where there is selective

loss of large fibers patients have pain, but in other pathological conditions (Friedreich's Ataxia) there is selective loss of large fibers and patients do not have pain.

As more empirical data is added to the knowledge of the neurophysiological events in the pain phenomena, the Gate Control Theory will undergo modification. The theory was never intended to be complete by itself. The theory has both proponents and opponents who seem to be viewing much of the same evidence as either supporting or opposing gate control. The important aspect of the Gate Control Theory is that it has been a stimulus for increased pain research and changes in clinical treatment strategies (Weisenberg & Tursky, 1976).

Psychosocial Theories Related to Pain

Research on the psychosocial components of pain has demonstrated the importance of cognitive and affective aspects of pain. The term "pain experience" was suggested by Hardy, Wolff, and Goodell (1953) as a way to avoid the confusion in measuring, defining, and investigating pain. The term "pain experience" refers to the individual's integrating of all effects of noxious stimuli: reactions to threat of pain; reactions to noxious stimuli locally at the site of stimulation; sensations of pain itself, with

accompanying sensations; and reactions to the pain sensation. In 1957, Beecher described two components of the "pain experience". The primary component was the pain sensation and the secondary component involved the suffering, reactive aspects, and emotional aspects. In 1971, Murray discussed the psychological factors which contribute to the individual's response to pain. He specifically addressed: the meaning ascribed to the sensations; past experience; anxiety; age of the individual; and ethnic background (Murray, 1971).

In examining the cognitive aspects of pain, Murray stated that the basic ingredients of the reaction component are anticipation of pain and resulting anxiety. It has been demonstrated that an individual's previous experience influences the pain experience (Hall & Stride, 1954). In examining the affective aspects of pain, it seems that the amount of pain experienced need not be related to the amount of injury (Murray, 1971).

The type of pain or the origin of the pain is an important factor that influences how a person experiences pain. For example, the pain of a coronary infarction has a profoundly different meaning for both the present and the future of a person than say the labor pain experienced by a woman eagerly anticipating the arrival of her baby

(Jacox, 1973). In 1946, Beecher noted that 68% of the men who sustained serious battle injuries denied pain or had such mild pain that medication was unnecessary. However, these same men complained about pain associated with inept venipuncture, indicating that they were able to perceive pain. In 1957, Beecher studied a large group of civilian hospitalized males undergoing surgical procedures that involved equally severe wounds and found that only 17% of his population did not request narcotics for their pain. He interpreted these findings in the following way: for the men in battle, the wound meant their release from a life threatening situation. Their response was one of relief at having escaped alive. In terms of the Gate Control Theory of Pain, brain activity was exerting a major influence at the presynaptic level for the men wounded in battle. For the civilians, pain was associated with a depressing, threatening event which disrupted their lives. Such studies point out the importance of the meaning of the pain and the situation in which it is experienced.

Jacox (1973) studied patients who were experiencing pain associated with three different pathological conditions, each with different temporal expectations. The three types of pain were: short term, as associated with

elective surgery which signified the end to an annoying problem (a cholecystectomy); long term, or pain experienced by patients with a chronic illness (rheumatoid arthritis) where the patient must learn to live with the pain for many years; and progressive pain, which symbolizes a process in which death is a highly probable outcome (metastatic cancer). The results demonstrated that within the various pain groups, women tended to indicate greater pain in the short term and long term groups, and men reported greater pain in the progressive group. Overall the proportion of patients who stated that they were in pain was significantly greater in the long term and progressive groups reported higher pain intensities. This study suggested that patient assessment of pain varies with sex, age, and the nature of the illness.

To some degree, depression and anger often accompany pain. The patient may be depressed and angry because he is ill and is in pain. He may be angry with himself for doing something which led to the pain or angry at the physician for not curing the illness or eliminating the pain. Depression and anger consume physical and mental energy. McCaffery (1979) states that relief from this anger and sadness will enable the patient to experience less pain, free energy to handle pain better, and increase pain

tolerance. Depression and anger may become serious problems when the pain becomes prolonged or chronic. Anxiety, which is the most obvious emotion associated with acute pain, becomes less prominent and is replaced by a reactive depression (Sternbach, 1974). Sleep and appetite disturbances, decreased physical and social activity, forgetfulness, mental dullness, irritability, and suicidal thoughts are characteristic of this depression. Restricted environments of depressed persons foster focusing on the pain, which makes the pain more intense and less bearable (McCaffery, 1979).

Eysenck and Eysenck's Theory of Personality

Eysenck and Eysenck (1968) view personality as being comprised of two pervasive, independent dimensions: extraversion-introversion and neuroticism-stability. They assume that personality characteristics are determined by both biological and psychological influences and state that introversion-extraversion is a function of cortical arousal, mediated by the reticular formation. The function of extraversion-introversion is related to the degree of excitation and inhibition in the central nervous system. Introverts have lower sensory thresholds and greater reactions to sensory stimulation because they are continually in a state of greater cortical arousal. Typical introverts

are quiet, retiring, introspective, plan ahead, dislike excitement, are somewhat pessimistic, and keep their feelings under close control. Extraverts are outgoing, impulsive, have many social contacts, are carefree, easy going, optimistic, and do not keep their feelings under tight control. There are two aspects to extraversion: sociability and impulsiveness.

According to Eysenck's theory, introverts have a lower sensory threshold and a greater reaction to sensory stimulation; extraverts have a higher sensory threshold and can tolerate pain better. Pain threshold refers to the intensity of the noxious stimulation necessary for the person to perceive pain; tolerance refers to the duration of time of the intensity at which the person accepts a stimulus above the pain threshold before making a verbal or overt pain response (Sternbach, 1968). Although the findings of some studies are somewhat contradictory, the studies relating extraversion to the pain experience have generally shown that patients with chronic painful conditions tend to be more introverted than normal controls (Bond, 1971). Eysenck has suggested that extraverts tend to exaggerate the painfulness of an event, even though they have a higher tolerance for pain (Jacox, 1973).

Neuroticism is seen as an emotional lability, an overresponsiveness and tendency to develop neurotic disorders under stress. Neuroticism is linked to lability of the autonomic system, particularly the sympathetic branch (Eysenck & Eysenck, 1969). People high on neuroticism have frequent minor somatic complaints such as headaches, digestive upsets, and report many worries and anxieties. Anxiety is a major component of neuroticism. Anxiety is commonly defined as an affective response to a real or imagined threat to the self. Sternbach (1965) states that anxiety is in a class of physiological reponses known as "activation". These physiological responses, which primarily consist of increased autonomic nervous system activity, prepare the individual for "fight or flight" and are seen in conditions of pain, anger, fear, and anxiety. Therefore, it is difficult for both patient and observer to know whether the patient is experiencing pain, anxiety, or both (Jacox, 1973).

Anxiety is a common accompaniment of pain (McCaffery, 1972; Sternbach, 1968). The many factors associated in the pain experience can be perceived by the patient as threatening. Some of these factors are the experience of the noxious stimuli caused by the disease or injury, treatments, and uncertainty about what the illness means in terms of

the patient's future. Whatever the cause of the accompanying anxiety, there is clear empirical support for the proposition that increased anxiety is associated with increased pain. Research demonstrates that anxiety decreases the pain threshold (Schalling & Levander, 1964), decreases the pain tolerance (Lynn & Eysenck, 1961), or both (Merskey, 1965).

Several studies looking at neuroticism in relation to illness have found that patients have increased neuroticism scores (with some exceptions) (Woodfords & Merskey, 1972; Bond & Pearson, 1969). Studies relating neuroticism with aspects of the pain experience present contradictory evidence. High neuroticism scores are commonly found in patient groups, but the relationship between neuroticism and pain threshold and tolerance is not clear (Jacox, 1973). The question here is did neuroticism precede the illness or did illness induce neuroticism?

Learned Pain

Pain may become for many patients a way of life. Shealy (1976) states that a common statement is heard from his patients when they speak of their pain: "You have to learn to live with it!" (p. 3). Shealy believes that such statements are an indication that the patients' pain has become a habit. They have built their lifestyle around

their pain, "enjoying" poor health. Pain behavior is like a bad habit that can be broken. The patterns of pain behavior are very self-destructive. Regardless of the origin of the pain, the patient may discover that there are secondary rewards for suffering, or that the pain provides a handle with which the patient may manipulate others. The rewards may be strong enough to keep the patient from recovering. Some patients have found that the pain habits elicit sympathy, feelings of concern, or approval; these are rewards he is willing to purchase at the expense of being in pain. The pain may also offer an easy way out of unpleasant situations: a job, reduced demands from family, or social and marital relationships which the patient would just as soon avoid (Shealy, 1976).

In some cases patients receive financial aid for disability. The term "secondary gain" is becoming increasingly used and generally refers to the financial rewards associated with disability. In many cases, patients who receive secondary gains in terms of financial benefits are off work an average of 10 days or longer than patients with the same condition who do not receive financial assistance. It is felt that a number of patients undergo a conditioned response related to the secondary gain which prolongs the symptoms (Finneson, 1976).

Pain of Psychological Etiology

Merskey discusses three principal mechanisms which are recognized in the psychological etiology of pain: pain as a hallucination, pain due to muscle tension, pain as a conversion hysteria. The occurrence of pain as a hallucination is relatively rare and is linked to either schizophrenia or endogenous depression. The pain in schizophrenia is usually associated with a number of other delusional experiences, i.e. body changing in size or radar or electricity being directed at the patient. In endogenous depression, hallucinatory pain is usually part of a well defined syndrome.

Psychogenic pain represented by pain due to muscle tension resulting from psychological causes has been supported by many investigators (Malmo & Shagass, 1949; Malmo, Shagass & Davis, 1951). These investigators state that anxiety gives rise to local muscle contractions which, if persistent, causes pain. A variation along the same theme is the pain of vascular distention (migraine) where the process can be initiated by psychological factors. This concept has not been seriously challenged even though the possible chemical mediator is still in doubt.

The third psychological mechanism of coversion hysteria originated with Brodie in 1837. He stated that

in upper-class women, four-fifths of joint pains were hysterical, and claimed that fear, suggestion, and unconscious stimulation were the primary factors. In Freud's first essays on hysteria, pain was a prominent symptom. The actual frequency of hysteria as a cause of pain is difficult to assess. There is some evidence that hysterical mechanisms are important in the development at least of persistent pain in psychiatric patients. What is of importance is the idea that pain may arise by an intelligible chain of psychological events.

In looking at personality characteristics and pain, the attitudes of hostility, resentment, and guilt (frequently unconscious) have been attributed to patients with pain of psychological origin. In 1935, Knopf was the first to suggest that these traits occurred in subjects who were liable to have migraine headaches precipitated by psychological factors. These attitudes have been attributed to patients with asthma, eczema, dysmenorrhea, ulcerative colitis, and other "psychosomatic" illnesses. In 1957, Szasz suggested a psychological pain theory which stated that pain arises as a consequence of a threat to the integrity of the body. In this theory the body is regarded as an object of concern to the self. An outside observer may not see the threat and the pain is then classified as

"psychogenic". Szasz uses the Freudian concepts of Ego, Id, and Super-Ego. The Ego is the part of the mind which relates the other two systems to external reality. Szasz suggests that the Ego perceives the body as an object and postulates that pain arises when a threat to the body is perceived, either for objective or emotional reasons. Depending on the observer's assessment of the reality of the threat to the body, the symptom is considered organic or functional. Then the meaning of the symptom can be considered and interpreted at three levels of symbolization. At the first level, the patient's communications are facts having to do with his experience of the bodily symptom. At the second level, pain is used as a communication which requests help. The third level of symbolization shows that communication is more complex, and pain can persist as a symbol of rejection, the repetition of the complaint may be considered as a form of aggression, and guilt may be expiated by the continued experience of pain. The most important aspect of Szanz's theory is that it emphasizes the communicative significance of pain (Merskey, 1968).

Social and Psychological Correlates of Pain Perception

In looking at the social and psychological correlates of pain perception, researchers have attempted to identify the characteristics of people who respond more strongly and less strongly than others to pain stimuli, In the four main areas studied--age, sex, race, and culture--researchers have found difficulty in drawing definite conclusions from their available data (Weisenberg, 1976). The literature shows no agreement about sex differences in relation to sensitivity to pain. Some studies state that women are more sensitive to pain than men and other studies did not find any evidence of variation in pain reactions between the two sexes (Notermans & Tophoff, 1967). However, in a study which had 41,119 subjects tested for pain tolerance differences according to age, sex, and race, it was concluded that on the average, pain tolerance decreased with age, women tolerated pain less than men, and Whites tolerated more pain than Orientals with Blacks occupying an intermediate position (Woodrow, Friedman, Siegelaub, & Collen, 1972).

Several cultural and ethnic groups have been studied under a variety of conditions both in clinical and laboratory settings to determine differences in their reaction

to pain. Among the groups studied are Puerto Ricans, Eskimos, Indians, Blacks, Italians, Irish, Jews, and Yankees. The major differences found between the groups seem to be related to the reactive component of pain rather than to the discrimination of the pain sensation. Underlying attitudes and anxiety reactions seem to be the major sources of the cultural differences in pain tolerance. Festinger's theory of social comparisons helps explain why the differences in social-cultural reactions to pain are not at all unexpected. In summary, the theory states that there exists a drive to test the validity of a person's opinions and judgements of the world environment. When outside means for evaluation are reduced, the individual turns toward his social environment for validation of his judgements. Since pain is a private, ambiguous situation, comparison with others helps to determine what reactions are appropriate. For instance, is crying permissible? does one grin and bear it? when may one ask for help? when are analgesics permissible? (Weisenberg, 1976; Wolfe, & Langley, 1975).

In the treatment of pain, an easily used independent measure of pain sensation is needed. To date, most research has been devoted to measure discriminate degrees of pain. However, pain reaction is composed of both

perception of pain sensation and the motivational affective-cognitive component. In looking at the individualization of treatment, it might be possible to discover and use measures of attitudes and anxiety which would be most appropriate for a given treatment and a valuable tool for use in clinical decision making. The future of dolorology will include the integration of the pertinent aspects of the various theories to develop a variety of methods that can be used in dealing with, understanding and controlling pain (Weisenberg, 1975).

Summary

The slow development of theories that integrate various pain concepts is explained by the many disciplines which have studied pain. The Gate Control Theory integrates the three historical pain theories and provides a useful framework for studying pain from a physiological and psychological perspective.

The physiological aspects of the Gate Control Theory explain many of the neurophysiological events which occur from noxious stimulation of the peripheral nervous system. The theory also accounts for the effects of psychosocial variables which influence perception and response by modulating the process in the central control system.

The psychosocial theories reviewed were: Eysenck's extraversion-introversion and neuroticism-stability theory; Szasz's theory that pain is a form of communication; pain of psychological etiology; the cultural aspects of pain; and the role of emotions in the pain response. The future in pain control will include the integration of the pertinent aspects of the various theories with new data derived from clinical research in the development of individualized treatment plans for patients in chronic pain.

CHAPTER III

PROCEDURE FOR THE COLLECTION AND TREATMENT OF DATA

This chapter presents the experimental design of the study. The variables of the study are defined operationally. In addition, the sampling techniques and research techniques utilized in this study are discussed.

The research design of this study was a multigroup pretest-posttest design (Huck, Cormier, & Bounds, 1974). This design includes a random assignment of subjects to one of three treatment groups: hypnosis only, TENS only, and hypnosis and TENS given simultaneously. Each subject was given the McGill Pain Questionnaire as a pretest. The sub-groups were then exposed to one of the experimental treatments for 5 consecutive days. At the conclusion of the final treatment on the fifth day, each subject was administered the McGill Pain Questionnaire as a posttest.

The advantage of utilizing the multi-group pretest-posttest design is that a control group was not necessary. Since the study was carried out to determine the effectiveness of hypnosis and TENS administered simultaneously on the reduction of chronic pain, the design offered the most

effective method of data collection. Previous research studies and numerous clinical reports have demonstrated and substantiated that hypnosis and TENS administered alone are effective in reducing pain (Barber & Hahn, 1962; Hilgard, 1971; Orne, 1976; Loeser, Black, & Christman, 1975; Long, 1974; Winter, Winter, & Laing, 1974). The major disadvantage of the multi-group pretest-posttest design was that the effects, if any, of pretesting on the experimental treatments could not be evaluated.

Setting

The setting for this study was a treatment room in a physician's office; the research clinic at Texas Woman's University; and a designated room, providing a comparable atmosphere, at a local nursing home. The room was kept at a comfortable temperature and provided a quiet atmosphere for the subject receiving the designated pain intervention. A recliner chair and a padded examining table were available for the administration of the experimental treatment.

Population and Sample

This study used a convenience population which was obtained by contacting patients of selected physicians in the Dallas, Denton, Fort Worth metropolitan area who had experienced chronic pain of headache or back variety. The

physicians were contacted for names of patients who fit the criteria of this study and permission was obtained to use the TENS unit on the patient (Appendix A).

A total of 20 patients were contacted via letter by their physician. The letter explained the study and gave the name of the person to contact if they desired to participate. All patients who contacted the researcher and agreed to participate in the study were administered the Minnesota Multiphasic Personality Inventory (MMPI). The sample included 17 patients who scored at least one standard deviation or more above the mean of the depression scale of the MMPI. Those subjects were then randomly assigned by use of a random table of numbers to one of three experimental treatment groups. The remaining subjects were placed in an alternate study.

Protection of Human Subjects

A description of this study was included in a specific application which was submitted to the Human Subjects Review Committee of Texas Woman's University. The committee determined that the rights of the subjects involved in this study were adequately protected and that risks to the individual were outweighed by the potential benefits and knowledge to be gained (Appendix B).

Informed consent was obtained by presenting to each subject a written description of the study and a consent form which had been approved by the Human Subjects' Review Committee of Texas Woman's University. The data of these subjects were handled in a confidential manner. After all treatments and data collection, the data were coded to insure anonymity (Appendix C).

Instruments

McGill Pain Questionnaire

The McGill Pain Questionnaire included a demographic data sheet along with the pain scales (Appendix D). Descriptive words are the most commonly used measures of pain in the clinical setting. In 1971 Melzack and Torgerson conducted a study from which the McGill Pain Questionnaire (MPQ) was empirically derived. The MPQ primarily consisted of three major classes of word descriptors used by patients to specify their subjective pain experience. The three classes were: words that described the sensory qualities of the pain experience in terms of temporal, spatial, pressure, and thermal; words that described affective qualities, in terms of tension, fear, and autonomic properties of the pain experience; and evaluative words that described the subjective overall intensity of the total pain

experience. Each subclass was given a descriptive label and contained a group of words which were considered by most subjects to be qualitatively similar.

In an attempt to determine the pain intensities implied by the words within each subclass, groups of physicians, patients, and students were asked to assign an intensity value to each word, using a numerical scale ranging from least pain to worst pain.

Their findings demonstrated that although the intensity-scale values differed for the three groups, all agreed on the position of the words relative to each other. A high degree of agreement on the intensity relationships among pain descriptors was obtained from subjects of varying cultural, socioeconomic, and educational backgrounds.

The questionnaire also included drawings of the body to indicate the spatial distribution of the pain, words that describe the time course of pain, and the overall Present Pain Intensity. The terms constant, rhythmic, and transient were utilized as the descriptor labels of the time course of pain. A number from 1 to 5 was utilized to record the Present Pain Intensity. The following words were associated with each number: mild, 1; discomforting, 2; distressing, 3; horrible, 4; and excruciating, 5. These words, which were chosen from the evaluative category,

had a mean scale value which was approximately equally far apart and thus represented equal scale intervals and so provided anchors for the specification of overall pain intensity (Melzack & Torgerson, 1971).

In 1975, Melzack reported standardization procedures on a sample of 297 medical patients. He described the administration and scoring techniques and made the scope of the instrument more comprehensive. To date, the MPQ utilizes 78 verbal descriptors which provide quantitative data on the sensory, affective, and evaluative qualities of pain, as well as additional indices which include: intensity, pattern, location and psychophysiological aspects of the pain experience (Melzack, 1975).

In a study by Graham, Bond, Gerkovich and Cook (1980) the reliability and validity of the MPQ was reconfirmed. Their sample was similar to one of the patient groups for which Melzack presented data (Dubuisson & Melzack, 1976). The purpose of the study was to compare and contrast the findings here with those reported by Melzack. The results demonstrated that the MPQ indices obtained in Phase I (N=18) when compared with similar data in Phase II (N=18) were highly replicable with no significant differences found between the two phases. Next the data from these two samples were combined and compared with the patient

sample reported by Melzack. In terms of the "total pain rating index", the "number of words chosen", and in the "sensory" and "affective" scores, no differences were found.

Melzack (1975), in reporting the statistical relationship between internal MPQ measures, found significant correlation between Present Pain Intensity and all components of the Pain Rating Index. In the combined sample (Graham, et al, 1980), only the affective and evaluative components of the index significantly correlated with intensity ratings ($r = 0.40$ and 0.36, respectively). However, the intensity ratings were both lower and less variable in the combined sample. Replicating that reported by Melzack the combined sample had a significant correlation ($p<0.01$) between "Total Pain Rating Index" values and "the number of words chosen".

The consistency with which subjects responded to the MPQ was evaluated in terms of the effects of repeated administration of the MPQ, and the relationship between summary MPQ measures and daily pain intensity ratings obtained from the home record data. In examining the effects of repeated administrations on MPQ response, consistency results obtained supported the reliability of the questionnaire. The Mean consistency with which subjects selected a particular descriptor subclass to describe

their pain over four administrations ranged from 66% to 80.4%. The values obtained in this study compared well to Melzack's (1975) report of 70.3% consistency obtained over three administrations.

The Minnesota Multiphasic Personality Inventory (MMPI)

The MMPI is a lengthy questionnaire which has 14 scales of measurement providing a wide profile of personality attributes. There are 550 statements on the instrument which cover a wide range of subject matter. The subject can respond to the statements in one of three ways: true, false, or cannot say. The time to answer questions is on the average of 1 hour. Minimal supervision and instructions are required for the administration of the questionnaire.

Hathaway and McKinley have discussed in detail the construction of the MMPI in a series of papers (Hathaway & McKinley, 1940, 1942, 1943, 1944, 1952). As experience with the MMPI accumulated Dahlstrom, Welsch and Dahlstrom (1972, 1975) discussed the meaning of the scales in their book, The MMPI Handbook.

The reliability of the MMPI was reported by Hathaway and McKinley (1942, 1944). They used the card form of the MMPI with unselected normals, and reported test-retest coefficients for six of the clinical variables. Test-retest

coefficients were also reported by Cottle in 1950. In these two studies test-retest time varied from 3 days to more than 1 year. Again in 1949, Holzburg and Alessi reported test-retest coefficients on a psychiatric population for a 3 day retest. The reported coefficients for the Depression Scale (D) gained from the three studies were: Hathaway and McKinley, normals with an N=47, 0.77; Cottle, normals with an N=100, 0.66; and Holzberg and Alessi, psychiatric population with an N=30, 0.80.

Validity for the MMPI has been reported by McKinley and Hathaway (1943). A high score on a scale of the MMPI has been found to predict positively the corresponding final clinical diagnosis or estimate in more than 60% of new psychiatric admissions. The percentage was derived from differentiation among various kinds of clinical cases (McKinley & Hathaway, 1943).

Transcutaneous Electrical Stimulator (TENS)

The TENS unit utilized in this study was a Neuromod, comfort burst dual channel system, Model 7718-120, manufactured by the Medtronic Company.

The TENS (neuromod unit) is usually adjusted for comfort and pain relief levels as indicated by each individual patient. The Pulse Width of the unit is fixed at 80 ms

measured at one-half of the maximum peak amplitude (500 ohm load). The Pulse Amplitude is adjustable (0-75mA positive peak per channel - 100-1000 ohm load). Most patients prefer it in the 7-10 range on the neuromod scale. The Pulse Rate is adjustable for two levels: high is a continuous 85 pulse per second stimulation; low waveform is cyclical stimulation consisting of bursts containing seven pulses per burst, the primary pulse rate within the burst being 85 pulses per second. Bursts repeat three times per second. The pulse rate, either high or low, was determined by the patients comfort report level. The Waveform is a biphasic, exponentially decaying spike with a zero net dc. component.

The placebo effect of any analgesic agent must be evaluated. A 1977 study by Thorsteinsson, Stannigton, Stillwell and Elveback studied the placebo effect of the TENS unit. In 93 patients involved in a double-blind, cross-over trial study using a genuine stimulator and a placebo machine demonstrated that in 32% of trials placebo analgesic effects occurred as compared with 48% effectiveness of actual stimulation as a pain reliever. This study revealed that the placebo effect of TENS treatment is similar to the placebo behavior of medication in the apparent effect of the machine and to the time-effect

relationship. Previous research has demonstrated that using Transcutaneous Electrical Stimulation alone was effective in relieving pain (Loeser, et al, 1975; Long, 1974; Winter, et al, 1974).

Hypnosis

Hypnosis has been used for pain reduction since the early 19th century and more recently it has been utilized in obstetrics, in the relief of painful burns, in dental extractions, in terminal cancer, and in some surgical procedures (Kroger, 1963).

Clinical experiences with hypnosis have been duplicated in the laboratory. The multitude of experiments with hypnosis and laboratory induced pain can be summarized as follows: When selected subjects, with a minimum exposure to the hypnotic procedure, were studied under laboratory conditions, the results of hypnotically induced anesthesia or analgesia demonstrated a marked reduction of perceived pain (Hilgard, 1973). McCaffery (1979) in her extensive review of pain interventions concluded that utilizing hypnosis and imagery can benefit in the relief of pain. Exactly how it happens, she points out, is still somewhat a mystery, but increasing evidence makes it usefulness a reality.

Pilot Study

In order to ensure that the four tapes of hypnosis utilized in this study were of acceptable technical quality and were valid promotors of a sufficient depth of relaxation, a panel of 17 judges were requested to evaluate them. The panel of judges consisted of nine professionals who had not been exposed to hypnosis or relaxation therapy and eight professionals who had used hypnosis and/or relaxation therapy.

The judges who had utilized hypnosis/relaxation therapy ranged in age from 28 to 46 years and in length of professional practice from 4 to 24 years. The professions included were: physician, psychologist, teacher, staff nurse and nurse educator. The judges who had not been exposed to hypnosis/relaxation therapy ranged in ages from 29 to 60 years and in length of professional practice from 6 to 36 years. The professions represented in this group were: staff nurse, secretary, health educator, engineer, teacher, nurse educator, and administrator.

Instructions were given for the judges to assume a comfortable position and follow the instructions on the tape. After listening to each tape they were then to fill out the questionnaire for the specific tape. Each tape consisted of a standard muscle relaxation induction which

was followed by a specific imagery scene with appropriate sound effects in the background matching the manuscript (i.e. water in boat scene, wind in snow storm) (Appendix E). The judges rating validations are summarized in Table 1. The written comments identified distracting noise as motor noise from the tape machine and a difference in voice volume between the induction procedure and the imagery scene. These distractions were eliminated by redoing the tapes on sophisticated equipment. Based on the data received from the panel of judges it was concluded that the hypnosis tapes were of acceptable quality to induce a state of profound relaxation necessary for this study.

TABLE 1

EFFECTIVENESS RATINGS OF HYPNOSIS TAPES

BY A PANEL OF SEVENTEEN JUDGES

	Imagery							
	Beach		Mountain Cabin		Thunder-Storm		Boat	
Evaluation	Yes	No	Yes	No	Yes	No	Yes	No
Voice Soothing	16	1	17	0	17	0	16	1
Pauses of Comfortable Length	17	0	17	0	17	0	16	1
Sufficient Number of Pauses	17	0	17	0	16	1	14	3
Voice Clear	17	0	16	1	17	0	16	1
Words Understandable	17	0	17	0	16	1	17	0
Instructions Clear	17	0	17	0	16	1	16	1
Sufficient Length to Achieve Relaxation	17	0	17	0	15	2	17	0
Distracting Noises	3	14	4	13	14	3	3	14

Data Collection

On the first day, and prior to treatment, the subjects were given the McGill Pain Questionnaire. Again, a brief explanation of the specific treatment procedure for the subject was explained.

Hypnosis Only Group

The subjects receiving hypnosis only as a pain intervention were asked to assume a position of comfort (lying down or sitting). They were asked to follow the instructions on the tape which they heard through headphones connected to a stereophonic tape player.

The treatment time was approximately one half hour in length. The tape series of general muscle relaxation with Beach, Thunderstorm, Boat, and Mountain Cabin imagery was utilized in that order with the Mountain Cabin imagery repeated on the last day of treatment. After completion of the final treatment, on the last day, the MPQ was re-administered.

TENS Only Group

Subjects receiving TENS only as a pain intervention had their skin prepared and the TENS gel was applied to the entire surface of the electrodes. The electrodes were then positioned either around the area of reported pain (greatest tenderness) or at superficial points along the peripheral nerves in that area (Appendix F). Each subject was asked to assume a position of comfort (lying down or sitting).

The electrode placement and neuromod control setting was recorded. The treatment time was approximately

30 minutes in length. On the last day, after completion of the final treatment, the MPQ was readministered.

TENS Plus Hypnosis Group

Subjects in the group receiving the simultaneous combination TENS and hypnosis for pain intervention were asked to assume a comfortable position after the electrodes were applied using the same procedure as the TENS only subject group. The comfort level of the neuromod unit was adjusted. Earphones connected to a stereophonic tape player were then placed in position. The subjects were asked to follow the instructions on the tape while they were receiving the TENS treatment. The indentical sequence of scene imagery was followed as with the hypnosis only group. The length of the treatment session was approximately 30 minutes. On the last day, at the completion of treatment, the MPQ was readministered.

Treatment of Data

Experienced pain was measured by the McGill Pain Questionnaire which was made available to this investigator by Professor Ronald Melzack of McGill University, Montreal, Canada. The questionnaire yields four types of data:

1. Pain Rating Index (PRI - S) (Melzack, 1975): This scale is based on the patients' mean scale values

obtained by Melzack and Torgerson (1971). The subject was given the PRI Scale (Appendix D) before treatment and asked to circle only those words that best described the pain he was experiencing at that moment (present pain). The subject was instructed to use only one word in each appropriate group and to leave out any word-group that was not suitable. Then each word was assigned a Mean Scale Value as published by Melzack and Torgerson (1971). The sum of the values of all the words chosen was the Pain Rating Index - Spatial. After treatment on the fifth day, the subject again received the questionnaire.

2. Pain Rating Index (PRI - R) (Melzack, 1975): The PRI scale also yields the PRI-R index. This index was based on the rank vales of the words. The word in each subclass implying the least pain was assigned a value of 1, the next word was assigned a value of 2, and so forth. The values of the words chosen by the subject were added to obtain a score for each category, and a total score for all categories. The total score indicated the Pain Rating Index - Rank (PRI - R).

3. The Number of Words Chosen (NWC) (Melzack, 1975): The PRI scale also yields the number of words chosen score. The sum of the number of words chosen by the subject became the NWC score.

4. Pain Intensity (PI) scale (Melzack, 1975): The PI was scored from 1 (mild) to 5 (excruciating). The scale values from 1 to 5 were approximately equally far apart (Melzack & Torgerson, 1971), so that they represented equal scale intervals. The number-word combination chosen by the subject indicated the overall pain intensity at the time of administration of the questionnaire.

An analysis of covariance with the pretreatment scores used as the covarient was used to determine if there was a significant reduction in pain after treatment. An analysis of covariance was performed on the scores obtained from the Pain Rating Index (PRI-S), the Pain Rating Index (PRI-R), the Pain Intensity (PI) scale, and the Number of Words Chosen (NWC).

CHAPTER IV

ANALYSIS OF DATA

The general purpose of this study was to investigate an intervention designed to reduce the reported pain of subjects with headache or back pain of at least a 3 month duration. The data provided by this study could be used by nurses and other professionals in the future development of therapies for the reduction of chronic pain.

The results of the data analysis will be reported in this chapter. The findings will be presented in the following order: (1) description of the sample, (2) findings, and (3) summary of findings.

Description of Sample

Twenty subjects who were contacted by the researcher agreed to be in this study. All 20 subjects were administered the Minnesota Multiphasic Personality Inventory (MMPI). Seventeen of the subjects scored one or more standard deviations above the mean on the depression scale of the MMPI and were included in this study. The remaining three subjects were placed in an alternate pain study being conducted by another researcher. The subjects were

randomly assigned to one of three treatment groups: Transcutaneous Electrical Nerve Stimulations (TENS) only, hypnosis only, and the combination of TENS/hypnosis. Permission for the subject to receive TENS was obtained by the researcher from each subject's personal physician. As a result of the random assignment, six subjects were assigned to the TENS and hypnosis group, six to the hypnosis only group, and five to the TENS only treament group.

The TENS/hypnosis group was composed of five females and one male; ages ranged from 26 to 41 years with a mean age of 34.83. Three subjects in this group complained of headaches from which they had suffered for a length of 3 to 11 years, with a mean of 5.83 years. Three subjects stated they had back pain for a length of 8 to 16 years, with a mean of 13.33 years in back pain (Tables 2 and 3).

The hypnosis only group was composed of six female subjects ranging in age from 20 to 56, with a mean age of 29.33 years. One subject had chronic headaches for over a one year duration, and the remaining five reported that they suffered from back pain. The duration of the back pain ranged from 1 to 12 years with a mean of 5.20 years (Tables 2 and 3).

The TENS only treatment group was composed of five female subjects ranging in age from 31 to 41 years, with a

mean age of 34.60 years. One subject stated she had headaches from which she had suffered for over 18 years. Four subjects reported they had back pain which ranged in length from 2 to 23 years, with a mean of 11.5 years (Tables 2 and 3).

TABLE 2

SUBJECTS WITH BACK PAIN AND HEADACHE

	TENS/Hypnosis	Hypnosis	TENS
Headache	3	1	1
Back Pain	3	5	4
TOTAL	6	6	5

TABLE 3

MEAN YEARS OF CHRONIC PAIN

	TENS/Hypnosis	Hypnosis	TENS
Headache	5.83	1	18
Back Pain	13.33	5.20	11.5
TOTAL $\bar{X}$	9.58	4.5	12.80

All 17 subjects of this study were taking aspirin, Tylenol and/or muscle relaxants to control their pain

before this study began. The four subjects who had been taking muscle relaxants reported that during the 5 days of their treatment no muscle relaxants were necessary and that their analgesic intake had been reduced from ten grains, 2 or 3 times a day, to ten grains once a day for the first 2 days of the treatment. Thirteen subjects of this study were utilizing aspirin or Tylenol only to control their pain prior to the beginning of this study. Three of these subjects reported that they reduced their intake of analgesics from ten grains, twice to 3 times a day, to ten grains once a day for the first 2 days of this study. Ten subjects reported that they took no analgesics during the 5 days of treatment in this study. On the fifth day of treatment all 17 subjects reported that they had taken no analgesics or muscle relaxants prior to their final treatment.

Findings

Hypothesis

The null hypothesis of this study was stated as follows: There is no significant difference in the reported pain of those groups of subjects who received the combination of TENS and hypnosis given simultaneously and those subjects who received either method administered unimodally.

Based on this major hypothesis several specific explications were formulated. The following were the empirically testable hypotheses of the study:

1. There is no significant difference of reported pain of subject groups who received hypnosis only and those who received TENS only as a chronic pain intervention, as measured by the McGill Pain Questionnaire:

   a. Pain Rating Index (PRI-S)

   b. Pain Rating Index (PRI-R)

   c. Pain Intensity (PI) Scale

   d. The Number of Words Chosen (NWC)

2. There is no significant difference of reported pain of subjects who received hypnosis only and those who received hypnosis and TENS simultaneously as a chronic pain intervention, as measured by the McGill Pain Questionnaire:

   a. Pain Rating Index (PRI-S)

   b. Pain Rating Index (PRI-R)

   c. Pain Intensity (PI) Scale

   d. The Number of Words Chosen (NWC)

3. There is no significant difference of reported pain of subject groups who received TENS only and those who received TENS and hypnosis simultaneously, as measured by the McGill Pain Questionnaire:

a. Pain Rating Index (PRI-S)

b. Pain Rating Index (PRI-R)

c. Pain Intensity (PI) Scale

d. The Number of Words Chosen (NWC)

Treatment of the Data

An Analysis of Covariance, utilizing the pretreatment scores as the covariate, was applied to the data to statistically control for any differences in the sample which might have been present and have confounded differences between the treatment groups. The presence of unequal subjects in the treatment groups and the possibility of non-homogeneity of cell variances, necessitated a test of this factor. This was carried out utilizing Levene's technique (Huck, 1974). Results demonstrated that the group of subjects did, in fact, share homogeneity of variance (PRI-S, $F = .2514$, d.f. 2/14, $p < .05$, PRI-R, $F = .4893$, d.f. 2/14, $p < .05$; PPI, $F = .8242$, d.f. 2/14, $p < .05$; NWC, $F = .0771$, d.f. 2/14, $p < .05$).

The four posttest variables of all three treatment groups were then analyzed utilizing a one way analysis of covariance design with the appropriate pretest as a covariate in each analysis. The PRI-S (F 2, 13 = 1.0899), PRI-R (F 2, 13 = 1.729), PPI (F 2, 13 = 2.0823), and

NWC (F 2, 13 = 2.87) were all found to be nonsignificant, and therefore the null hypothesis failed to be rejected (Table 4).

TABLE 4

ANCOVA SUMMARY FOR THE FOUR VARIABLES OF THE MPQ

Variable	Source	d.f.	S.S,(adj.)	Mean Sq.	F
PRI - S	Treat	2	171.909	85.954	1.0899
	Error	13	1025.26	78.866	
	Total	15	1197.173		
PRI - R	Treat	2	128.38	64.19	1.729
	Error	13	482.59	37.123	
	Total	15	610.979		
PPI	Treat	2	1.62	0.8105	2.0823
	Error	13	5.06	0.38923	
	Total	15	3.437		
NWC	Treat	2	55.73	27.865	2.87
	Error	13	126.14	126.14	
	Total	15	181.87		

Tabled $F_{.95,2,13} = 3.80$

In examining the Mean of the pretest and post-test scores on the MPQ it was noted that the post-test mean scores appeared to have been reduced to a point which could not be ignored without further statistical investigation. The pre-treatment test and post-treatment test MPQ scores of all 17 subjects, treated as one group, were subjected to the t-test for paired comparisons. This statistical test was carried out to determine if a significant reduction of reported pain was present (Table 5). The grouping of all 17 subjects demonstrated that the group as a whole reported a reduction of pain on all four variables of the MPQ at the 0.001 level of significance. The pre-treatment and post-treatment MPQ scores within each group were then subjected to the t-test of pairwise comparisons to determine if a statistically significant reduction of reported pain was present within each of the treatment groups (Table 6).

The TENS and hypnosis group demonstrated a reduction of reported pain at the $p = .001$ level of significance for the PRI-S, PRI-R, and NWC variables and a $p = .01$ level of significance for the PPI variable. The hypnosis only treatment group demonstrated a reduction of reported pain at the $p = .001$ level for the PPI variable, $p = .02$ level for the PRI-S variable, and $p = .03$ level of significance

TABLE 5

T-TEST RESULTS FOR THE SEVENTEEN SUBJECTS ON THE

PRE-TREATMENT AND POST-TREATMENT MPQ SCORES

Variable	Means	Standard Deviation	Standard Error	Mean	Standard Deviation	Standard Error	T Value
Pre PRI-S	27.509	12.813	3.108	21.318	13.599	3.298	6.46*
Post PRI-S	6.191	8.406	3.039				
Pre PRI-R	23.765	10.900	2.644	19.529	11.479	2.784	7.01*
Post PRI-R	4.235	6.300	1.528				
Pre PPI	1.941	0.748	0.181	1.471	0.943	0.229	6.43*
Post PPI	0.471	0.624	0.151				
Pre NWC	10.294	4.120	0.999	7.529	4.823	1.170	6.44*
Post NWC	2.765	3.437	0.834				

*p .001
d.f. = 16

TABLE 6

REPORTED PAIN REDUCTION OF THREE TREATMENT GROUPS

ON THE FOUR VARIABLES OF THE MPQ

Variable	No. of Cases	Mean	Standard Deviation	Standard Error	Means	Difference Std. Dev.	Standard Error	T Value	d.f.	2 tail probability
GROUP: TENS/Hypnosis										
Pre PRI-S	6	31.298	13.709	5.597	23.080	14.775	6.032	4.66	5	0.001
Post PRI-S		3.218	6.840	2.793						
Pre PRI-R	6	27.500	9.772	3.990	25.500	9.203	3.757	6.79	5	0.001
Post PRI-R		2.000	4.427	1.807						
Pre PPI	6	2.000	0.894	0.365	1.833	1.169	0.477	3.84	5	0.01
Post PPI		0.167	0.408	0.167						
Pre NWC	6	11.167	4.622	1.887	9.667	5.428	2.216	4.36	5	0.001
Post NWC		1.500	3.209	1.310						
GROUP: Hypnosis Only										
Pre PRI-S	6	21.728	9.929	4.053	12.687	9.964	4.068	3.12	5	0.02
Post PRI-S		9.042	12.289	5.017						
Pre PRI-R	6	18.000	9.317	3.804	11.167	9.432	3.851	2.90	5	0.03
Post PRI-R		6.8333	9.496	3.877						
Pre PPI	6	2.000	0.632	0.258	1.500	0.837	0.342	4.39	5	0.001
Post PPI		0.500	0.837	0.342						
Pre NWC	6	8.667	3.502	1.430	5.000	4.336	1.770	2.82	5	0.03
Post NWC		3.667	4.803	1.961						
GROUP: TENS Only										
Pre PRI-S	5	29.898	14.825	6.630	23.560	2.497	5.589	4.22	4	0.01
Post PRI-S		6.338	3.150	1.409						
Pre PRI-R	5	26.200	13.008	5.817	22.400	1.887	5.316	4.21	4	0.01
Post PRI-R		3.800	1.924	0.860						
Pre PPI	5	1.800	0.837	0.374	1.000	0.707	0.316	3.16	4	0.03
Post PPI		0.800	0.447	0.200						
Pre NWC	5	11.200	4.438	1.985	8.000	4.000	1.789	4.47	4	0.01
Post NWC		3.200	1.304	0.583						

for the PRI-R and NWC variables. The TENS only treatment group demonstrated a reduction of pain at the p = .01 level for the PRI-S, PRI-R and NWC variables, and a p = .03 level of significance for the PPI variable.

Finally, the difference of the pretest and post-test scores of the MPQ were subjected to the t-test for comparisons between treatment groups. The only statistically significant difference of reduction of reported pain occurred between the TENS/hypnosis group and the hypnosis only group on the variable PRI-R (Table 7).

TABLE 7

COMPARISON OF THE THREE TREATMENT GROUPS' REPORTED PAIN REDUCTION ON THE FOUR VARIABLES OF THE MPQ

Groups		PRI-S	PRI-R	PPI	NWC
TENS/Hypnosis vs Hypnosis	t value	2.1149	2.6348	.5680	1.6246
	d.f.	10	10	10	10
	probability	.0584	*.0239	.5878	.1327
TENS/Hypnosis vs TENS	t value	.5406	.4884	1.3891	.5680
	d.f.	9	9	9	9
	probability	.60	.64	.19	.58
Hypnosis vs TENS	t value	1.5913	1.7174	1.0563	1.1584
	d.f.	9	9	9	9
	probability	.1436	.1175	.3194	.2763

Summary

The analysis of the data by using an ANCOVA indicated that there was no significant difference in pain reduction between the three treatment groups of this study and the null hypothesis failed to be rejected. To determine if a statistically significant reduction of reported pain had occurred, the t-test for pairwise comparisons was utilized. Results demonstrated that a reduction of reported pain had occurred on all four variables of the MPQ at the .001 level of significance.

The pre-treatment and post-treatment scores of the MPQ within each treatment group were then subjected to the t-test for pair wise comparisons to determine if a statistically significant reduction of reported pain had occurred. Results demonstrated that the TENS/hypnosis group reported a reduction of pain for the PRI-S, PRI-R, and NWC variables at the .001 significance level and a .01 significance level for the PPI variable.

The hypnosis only group demonstrated a reduction of reported pain for the PPI variable at a .001 significance level and a .02 significance level for the PRI-S variable. A .03 level of significance was shown for the PIR-R and NWC variables.

The TENS only treatment group demonstrated a reduction in reported pain at the .01 level of significance for the PRI-S, PRI-R, and NWC variables of the MPQ. A .03 significance level was shown for the PPI variable.

The difference of the pre-treatment and post-treatment scores of the MPQ were subjected to the t-test to determine if a statistically significant reduction of reported pain had occurred between the three treatment groups of this study. The results demonstrated that a reduction of reported pain had occurred on the PRI-R variable ($p = .0239$) between the TENS/hypnosis and hypnosis only groups.

CHAPTER V

SUMMARY OF THE STUDY

This chapter will include a summary of the method of the study relative to the problem and hypotheses. A discussion of the findings, limitations, implications for nursing, and recommendations for future research are also included.

Summary

The problem of this study was to determine if the effects of TENS and hypnosis administered simultaneously would reveal a greater reduction in reported pain by subjects with chronic headache or back pain when compared to subjects receiving either intervention administered unimodally. The theoretical framework of this study, the Gate Control Theory of Pain, proposes that the small densely packed cells of the substantia gelatinosa in the dorsal horn modulates the incoming signals from the periphery before they influence the central transmission cells (T). The afferent patterns in the dorsal column act as the central control trigger which activates selective brain processes (central control system). These processes influence, via

descending fibers, the modulating mechanisms of the gate control system and the neural mechanisms (action system) responsible for perception and response. Perception and response is accomplished by the T cells of the system. The interaction of these systems determines the pain phenomena. The theory recognizes the physiological as well as the psychological dimensions of the pain mechanism (Melzak, 1973).

The population of this study was obtained from selected physicians in the Dallas, Denton, Fort Worth Metropolitan area. Physician referred patients suffering from head or back pain for at least a 3 month duration were contacted and those consenting to be in the study were administered the MMPI. A sample of 17 subjects who scored at one or more standard deviations above the mean on the depression scale of the MMPI was obtained. The subjects were then randomly assigned to one of the three treatment groups of this study. Subjects not fitting the criteria were placed in an alternate study for pain control.

The treatment setting was the Nursing Research Clinic at Texas Woman's University and a local physician's office. A comfortable and quiet atmosphere was maintained for the subjects receiving the designated pain interventions. A reclining chair was utilized for the administration of the treatments.

The McGill Pain Questionnaire was administered prior to the first treatment and following the fifth and final treatment. Standardized instructions were given to each subject. Subjects who received TENS as a treatment had their skin prepared, electrodes positioned and the TENS unit adjusted to a level of comfort. Those subjects receiving hypnosis, after assuming a position of comfort, had lightweight headphones positioned and adjusted for comfortable listening of the hypnosis tapes.

Discussion of Findings

The results of the Analysis of Covariance did not support the greater effectiveness in pain reduction of the TENS/hypnosis treatment administered simultaneously over either treatment utilized unimodally. Therefore, the major null hypothesis failed to be rejected.

One explanation for this occurrence is that hypnosis and TENS have been shown through prior research to be effective treatments for chronic pain reduction (Lesser, et al, 1975; Long, 1974; Winter, et al, 1974; Hilgard, 1973; & Kroger, 1973). All subject groups demonstrated a reduction in their reported pain as measured by the MPQ. Also, one must conjecture as to the possible discriminating power a larger sample would offer. The sample of this study,

although acceptable for the design, was small and may have masked the significance of treatment effectiveness between groups.

Another consideration must be the highly motivated individuals who composed this study sample. The 17 subjects were productive workers and/or college students. Verbally they expressed a desire to reduce their pain and also their medication intake. Subjects usually came to the Nursing Research Clinic before and after work hours or during their lunch break. In effect, they were taking a "relaxation" break from varied stressful situations. In allowing their muscles to relax, they in effect reduced the amount of pain which normally could be accounted for and attributed to muscle tension pain.

For the subjects receiving TENS as a treatment, belief in the magic of the "black box" may have contributed to a reported reduction in pain. Many subjects stated that "the little black box really works". Yet another possible explanation that must be entertained is the presence of the Hawthorne effect. Each subject received individual, although structured time and interaction with the researcher. It is possible that the attention they received by being subjects in this study and wanting to please the investigator may have accounted for some of the reported pain reduction.

With further analysis of the data (t-tests), although evidencing that all treatments were effective in relieving chronic pain ($p = .001$), the types of experimental treatments begin to be discriminated as to their level of significance of effectiveness.

The first variable of the MPQ, Pain Rating Index-Scale (PRI-S) consists of the individuals' sum total of the scale values of all the words chosen, in all categories, to describe their pain. These descriptive words included the sensory, affective and evaluative aspects of the pain experience. The most significant group change ($p = .001$) on this variable was observed in the TENS/hypnosis group, with the TENS only group ($p = .01$) second and the hypnosis only group ($p = .03$) ranked last. The combination treatment revealed a trend to have more significantly intervened in the pain experience at both the emotional and physiological levels. Although the alternate unimodal treatments were also found effective in the reduction of pain, the combination of perhaps a belief in the "black box" (TENS unit), relaxation and the physiological blocking of pain impulses had a synergistic interactive effect on the subject in the TENS/hypnosis group.

The Pain Rating Index-Rank (PRI-R) related to the rank values of the descriptor words chosen by the individual.

The descriptor words included the sensory, affective and evaluative dimensions of the pain experience. Again, the combination treatment, TENS/hypnosis, was found to be highest in significance in the relief of pain ($p = .001$), TENS only at the $p = .01$ level of significance followed by hypnosis at the .03 significance level. Again, one must recognize the effectiveness of all three methods of intervention of pain but focus on the combination TENS/hypnosis treatment as a special intervention. The combined treatments appear again to relate to both the physiological and psychological aspects of pain and hence tend toward being a more reliable and comprehensive pain intervention.

The Present Pain Intensity (PPI) variable relates to the number word combination chosen by the individual as his/her overall present pain intensity. Interesting, although puzzling, was the occurrence of the highest significance of pain reduction as measured by the PPI variable; $p = .001$ in the hypnosis only group. The combined TENS/hypnosis group reported pain decreased at the .01 level of significance and the TENS only group ranking last with a .03 significance level of change. This enigma may be partially explained by the fact that the PPI scale "fluctuates as a function of psychological factors of the moment: mood, anxiety level, attention. . ." (Melzak, 1973). Subjects

in the hypnosis only group may have been affected by any of the above mentioned variables which appear to have a direct relationship to the emotional aspects of the individual. A possible explanation may be that hypnosis affects the variables of anxiety, attention and mood to the point that it is reflected in the PPI scale of pain measurement. The second highest ranking significance was found in the combined TENS/hypnosis treatment group with the lowest of the significances ($p = .03$) in the TENS only group. One must note that the lowest ranking group in significance level was the only group who were not exposed to hypnosis at all.

The last variable of the MPQ, the Number of Words Chosen, was found to be at the highest significance level of reported pain reduction ($p = .001$) in the combined TENS/hypnosis treatment group, followed by the TENS group ($p = .01$) and lastly the hypnosis group at a .03 level of significance. This finding, again, reinforces the physiological/emotional explanation of pain (Gate Control Theory) and the intervention most highly effective being the combined TENS/hypnosis treatment.

The trends observed in the data of this study also appear to indicate that if the sample size had been larger the combination TENS/hypnosis treatment group would have been shown to be statistically significant as the most

effective pain intervention as compared to either treatment utilized unimodally. The results of this study support prior research (Lesser, et al, 1975; Long, 1974; Winter, et al, 1974; Hilgard, 1973; and Kroger, 1973), indicating that TENS and hypnosis are significant therapeutic interventions for chronic pain.

Conclusion and Implications

The major conclusion that can be drawn from this study is that all three treatments are effective in reducing chronic pain. These are treatment modalities that nurses and other health professionals will be utilizing as an alternative to narcotic analgesics. In view of the high cost of the TENS units, an economic alternative for chronic pain patients may well be hypnosis tapes which combine relaxation, imagery, and sound effects specifically designed for pain control.

The conclusions must also take into account the study's limitations. One major limitation of this study was that measurement of the dependent variable was done solely by self-report. The major difficulty of self-report measures is that the subject may answer the questions so as to please the investigator. A more accurate measurement of post-treatment pain would have to include a physiological measure such as blood endorphin levels. Such

a combination of pre-treatment and post-treatment measurement would provide a more precise measurement of treatment effects.

This study was limited to one population of 17 subjects who volunteered to be participants and who met the criterion. Generalizations to other populations cannot be made from this study.

Implications for Nursing Practice

It is recognized that nursing plays a major role in the care of individuals with chronic pain. Increasingly, nurses provide more of the treatment measures and interventions utilized to reduce pain. Hypnosis and TENS are two approaches which are alternatives to narcotic analgesics and as such will be utilized more frequently in the future. Nursing will become increasingly involved in the application of these measures. Nurses need to gain the ability to implement these therapies that have been supported by empirical evidence. Although further study is needed, the results of this study indicate that the combination of TENS/Hypnosis is effective in chronic pain reduction. The MPQ is an effective and easily administered instrument which nurses can readily utilize in clinical practice. The MPQ may be used to determine the effectiveness of most treatments utilized to reduce pain in many clinical settings.

Nurses must be aware that not all patients are willing to "give up" their pain for various reasons. However, many patients who wish to remain active and in the mainstream of life are highly motivated to use alternative treatments to analgesics to reduce their pain. Nurses have the expertise needed to teach those individuals who are so motivated.

Recommendations for Further Study

Based on the findings of this study, further research is recommended in these areas:

1. Replication of this study with a larger sample and with different populations needs to be carried out in order to broaden the scope of the generalizations.

2. Replication of this study utilizing a repeated measures design and administering the MPQ after each treatment.

3. Replication of this study increasing the sample size so that the number of treatments may be varied in order to determine the most appropriate number of treatments to achieve significant pain control.

4. Replication of this study adding a physiological measure of blood endorphin levels to determine a level of physiological pain reduction as well as the self-report measure of MPQ.

5. A follow-up study at a 6-month and a 1-year interval to determine the length of effect of the treatments on chronic pain reduction.

6. A follow-up study on personality variable changes, i.e. depression, that may have come about in conjunction with pain reduction.

7. Replication of this study utilizing business executives with chronic pain to determine if a relationship exists between treatment modalities and executive functioning.

APPENDIX A

LETTER TO PHYSICIANS

AND PATIENTS

Letter to Patients

Dear

A study will be conducted at the Texas Woman's University research clinic to determine the effectiveness of several treatments designed to reduce chronic pain. To participate, you would come to one research session which will last about two hours. At this session you would be asked to sign a form indicating that you are willing to participate in the study. Also, you would be asked to complete a questionnaire which is commonly used by psychologists, the Minnesota Multiphasic Personality Inventory. The questionnaire will be marked by numbers and only the researcher will know what names the numbers are associated with.

At the second session you will be given a form which was designed to measure pain and which has questions concerning demographic data about yourself and your pain history. After filling out this form, the McGill Pain Questionnaire, you will receive your first of five treatments. Treatments will last approximately 30 to 45 minutes for five successive days. At the end of the fifth treatment, you will again fill out the pain questionnaire. There is no charge to you for this service.

If you wish to participate in the study or desire additional information, please contact Carolyn Danner who is a doctoral student in nursing at Texas Woman's University. Phone: 382-4967 or 383-1641, extension 24 or 45.

Thank you.

Dr.

I am a doctoral student in Nursing at Texas Woman's University. I will be conducting a research project with patients who have had headaches or back pain of at least a three month duration. The patients who wish to participate in the study will be given the Minnesota Multiphasic Personality Inventory and then be randomly assigned to one of the following treatments: hypnosis for pain control, transcutaneous electrical nerve stimulation (TENS) therapy, the combination of hypnosis and TENS, or acupressure only, or the combination of acupressure and hypnosis.

The patient's pain level will be measured by the McGill Pain Questionnaire before the initial treatment and after the last treatment. Treatments will be given once a day for five consecutive days.

If you wish any of your patients to know about the study and also give permission for them to have TENS therapy upon assignment to that group, please send a list of names and addresses. I will send them a copy of the enclosed letter. The letter will be addressed to them from you explaining the study and whom to contact if they wish to participate.

Since this study is being conducted to fulfill academic requirements there is no charge to the patients. Thank you for your time and cooperation.

Dr. Patricia N. Mahon
Licenced psychologist
Alternate research study director

Carolyn Danner, RN, BSN, MSN
P.O. Box 24115, TWU Station
Denton, Texas 76204
Phone: (817) 382-4967

APPENDIX B

HUMAN SUBJECTS REVIEW COMMITTEE

TEXAS WOMAN'S UNIVERSITY
Box 23717 TWU Station
Denton, Texas 76204

HUMAN SUBJECTS REVIEW COMMITTEE

Name of Investigator: Carolyn A. Danner Center: Denton

Address: College of Nursing, ASB 118 Date: April 29, 1981

Denton, TX 76204

Dear Ms. Danner,

Your study entitled Chronic Pain: Reduction Through Hypnosis and TENS

has been reviewed by a committee of the Human Subjects Review Committee and it appears to meet our requirements in regard to protection of the individual's rights.

Please be reminded that both the University and the Department of Health, Education, and Welfare regulations typically require that signatures indicating informed consent be obtained from all human subjects in your studies. These are to be filed with the Human Subjects Review Committee. Any exception to this requirement is noted below. Furthermore, according to DHEW regulations, another review by the Committee is required if your project changes.

Any special provisions pertaining to your study are noted below:

_____ Add to informed consent form: No medical service or compensation is provided to subjects by the University as a result of injury from participation in research.

_____ Add to informed consent form: I UNDERSTAND THAT THE RETURN OF MY QUESTIONNAIRE CONSTITUTES MY INFORMED CONSENT TO ACT AS A SUBJECT IN THIS RESEARCH.

_____ The filing of signatures of subjects with the Human Subjects Review Committee is not required.

_____ Other:

__x__ No special provisions apply.

cc: Graduate School
Project Director
Director of School or
Chairman of Department

Sincerely,

Marilyn Hinson

Chairman, Human Subjects
Review Committee

at Denton

APPENDIX C

CONSENT FORMS

Consent Form
TEXAS WOMAN'S UNIVERSITY
HUMAN RESEARCH REVIEW COMMITTEE

(Form A -- Written presentation to subject)

Consent to Act as a Subject for Research and Investigation:

The following information is to be read to or read by the subject. One copy of this form, signed and witnessed, must be given to each subject. A second copy must be retained by the investigator for filing with the Chairman of the Human Subjects Review Committee. A third copy may be made for the investigator's files.

1. I hereby authorize Carolyn A. Danner
(Name of person (s) who will perform procedure (s) or investigation (s)

to perform the following procedure (s) or investigation (s):
(Describe in detail)
This study is being conducted to determine which of several treatments reduce pain. First the Minnesota Multiphasic Personality Inventory will be administered. Second, based on the results on the MMPI the subject will be assigned to one of the following treatments: Hypnosis, TENS, the combination of both or to a study which will use hypnosis and acupressure. Third, the McGill Pain Questionnaire will be administered before the first treatment and at the end of the last treatment

2. The procedure or investigation listed in Paragraph 1 has been explained to me by Carolyn A. Danner.
(Name)

3. (a) I understand that the procedures or investigations described in Paragraph 1 involve the following possible risks or discomforts:
(Describe in detail)
Risks involved include: (a) possibility of public embarrassment by improper release of data will be controlled by coding all subjects to insure ananymity; (b) minor skin irritations from the TENS electrodes will be controlled by proper skin preparation and use of non-allergenic electrodes; (c) possible anxiety about the treatment will be controlled by proper explanation of all procedures. The subject may withdraw from the study during any phase if he/she so desires.

(Form A - Continuation)

3. (b) I understand that the procedures and investigations described in Paragraph 1 have the following potential benefits to myself and/or others:

A reduction of chronic pain

3. (c) I understand that - No medical service or compensation is provided to subjects by the university as a result of injury from participation in research.

4. An offer to answer all of my questions regarding the study has been made. If alternative procedures are more advantageous to me, they have been explained. I understand that I may terminate my participation in the study at any time.

_____ _____

Subject's Signature Date

(If the subject is a minor, or otherwise unable to sign, complete the following):

Subject is a minor (age ____), or is unable to sign because:

Signatures (one required)

_____ _____

Father Date

_____ _____

Mother Date

_____ _____

Guardian Date

_____ _____

Witness (one required) Date

Consent Form
TEXAS WOMAN'S UNIVERSITY
HUMAN SUBJECTS REVIEW COMMITTEE

(Form B)

Title of Project: Chronic Pain: Reduction Through Hypnosis and TENS

Consent to Act as A Subject for Research and Investigation:

I have received an oral description of this study, including a fair explanation of the procedures and their purpose, any associated discomforts or risks, and a description of the possible benefits. An offer has been made to me to answer all questions about the study. I understand that my name will not be used in any release of the data and that I am free to withdraw at any time. I further understand that no medical service or compensation is provided to subjects by the university as a result of injury from participation in research.

_____ _____
Signature Date

_____ _____
Witness Date

Certification by Person Explaining the Study:

This is to certify that I have fully informed and explained to the above named person a description of the listed elements of informed consent.

_____ _____
Signature Date

_____
Position

_____ _____
Witness Date

One copy of this form, signed and witnessed, must be given to each subject. A second copy must be retained by the investigator for filing with the Chariman of the Human Subjects Review Committee. A third copy may be made for the investigator's files.

APPENDIX D

McGILL PAIN QUESTIONNAIRE

McGILL PAIN ASSESSMENT QUESTIONAIRE

Date _____ Administrative _____

Patient's Name: _____ ID: _____ Age: ____

Address: _____ Phone: _____

Referring Doctor: _____ Yrs. in Pain: _____

Diagnosis:

	Arthritis		Migraine
	Cancer		Musculoskeletal
	Central N. S.		Peripheral N. S.
	Cervical Back Pain		Phantom Limb
	Iatrogenic		Sciatica
	Low Back Pain		Other
Comments:			

Present Drug Intake:

Medication	Dose	Frequency	Duration of relief	Amount of relief	Date Started
Comments, Side Effects:					

Medical History:

A) Year Pain Began: _____

B) Circumstances of Onset:

	Accident at Home		Following Illness
	Accidental Work		Following Surgery
	Other Accident		Pain "Just Began"
Comments:			

Pain Description:

A) Choose on word group

	Continuous, Steady, Constant
	Rhythmic, Periodic, Intermittant
	Brief, Momentary, Transient

The following words represent pain of increasing intensity:

1	2	3	4	5
Mild	Discomforting	Distressing	Horrible	Excruciating

B) Choose the number of the word which best describes:

	Your pain right now
	Your pain at its worst
	Your pain at its least
	The worst toothache you ever had
	The worst headache you ever had
	The worst stomach-ache you ever had

What Does Your Pain Feel Like?

Some of the words I will read to you describe your present pain. Tell me which words best describe it. Leave out any word-group that is not suitable. Use only a single word in each appropiate group—the one that applies best.

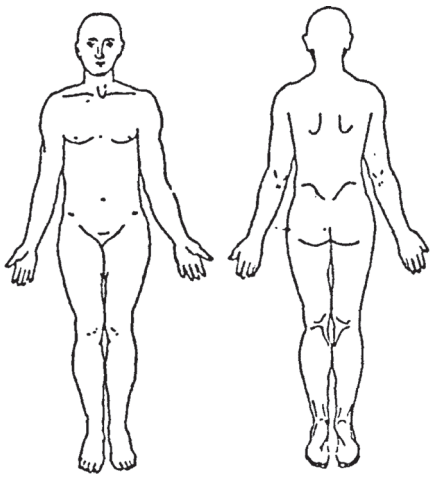
1	2	3	4	5	6	7
1 Flickering	1 Jumping	1 Pricking	1 Sharp	1 Pinching	1 Tuggiing	1 Hot
2 Quivering	2 Flashing	2 Boring	2 Cuting	2 Pressing	2 Pulling	2 Burning
3 Pulsing	3 Shooting	3 Drilling	3 Lacerating	3 Gnawing	3 Wrenching	3 Scalding
4 Throbbing		4 Stabbing		4 Cramping		4 Searing
5 Beating		5 Lancinating		5 Crushing		
6 Pounding						

8	9	10	11	12	13	14
1 Tingling	1 Dull	1 Tender	1 Tiring	1 Sickening	1 Fearful	1 Punishing
2 Itchy	2 Sore	2 Taut	2 Exhausting	2 Suffocating	2 Frightful	2 Gruelling
3 Smarting	3 Hurting	3 Rasping			3 Terrifying	3 Cruel
4 Stinging	4 Aching	4 Splitting				4 Vicious
	5 Heavy					5 Killing

15	16	17	18	19	20
1 Wretched	1 Annoying	1 Spreading	1 Tight	1 Cool	1 Nagging
2 Blinding	2 Troublesome	2 Radiating	2 Numb	2 Cold	2 Nauseating
	3 Miserable	3 Penetrating	3 Drawing	3 Freezing	3 Agonizing
	4 Intense	4 Piercing	4 Squeezing		4 Dreadful
	5 Unbearable		5 Tearing		5 Torturing

Where is your Pain?

Please mark, on the drawings below, the areas where you feel pain. Put E if external, or I if internal, near the areas which you mark. Put EI if both external and internal.
ALSO: if you have one or more areas which can trigger your pain when pressure is applied to them, mark each with an X.



Comments:

APPENDIX E

TRANSCRIPTS OF HYPNOSIS TAPES

INDUCTION TECHNIQUE

Sit in a chair, or lie down. Close your eyes, loosen any tight clothing or jewerly or shoes that might distract you. Now close your eyes, take a few slow, deep abdominal breaths. Inhale . . . exhale . . . inhale . . . exhale. Focus your attention on your breathing throughout this exercise and recognize how easily slow, deep breathing alone can help to produce a nice state of deep, gentle relaxation. Let your body breath itself according to its' own natural rhythm. Slowly, easily, and deeply. Now lets' begin the exercise with the signal breath. A specific message that tells the body that you are ready to enter a state of deep relaxation. Exhale . . . breath in deeply through your nose and blow out through your mouth slowly. Once again, exhale, breath in deeply through your nose and blow out through your mouth slowly. You may notice a kind of tingling sensation as you take the signal breath. Whatever is your body's way of acknowledging the experience of relaxation, comfort, and peace of mind. Remeber your breathing! . . . Slowly and deeply. As you concentrate your attention on your breathing, give your body a few moments to relax deeply and fully. Feel all the tension, tightness, pain or discomfort draining away; down your spine, down

your legs and out into the room. With each breath, you may be surprised to feel yourself becoming more and more deeply and fully relaxed, comfortable, and at ease. Enjoy this nice state of relaxation. Remember your breathing . . . slowly . . . and deeply from the abdomen. Now take a brief inventory of your body. Starting at the top of your head and working down to the tips of your toes . . . is every part of your body totally relaxed and comfortable? . . . if so, wonderful, enjoy how good it feels. However, if there is still any part of your body that is not yet fully relaxed and comfortable, simply inhale a deep breath and send it into that region, bringing soothing, relaxing, nourshing, healing oxygen into every cell of that area. Comforting it and relaxing it. As you exhale, imagine blowing out, exhaling right out through your skin any tension, tightness, pain, or discomfort from that area. Again, as you inhale bring relaxing, healing oxygen into every cell of that region and as you exhale . . . blow away, breath out, right through the skin, out into the air, any tension or discomfort that remains in that area. In this way you can dispatch your breath to relax any part of your body which is not yet as fully relaxed and as comfortable as it can be. Breath slowly and deeply, and with each breath you may be surprised to find that you have become

twice as relaxed as you were before and that you are able to breath away twice as much tension and discomfort as you did with the previous breath. Inhale . . . exhale . . . twice as relaxed. Inhale . . . exhale . . . twice as comfortable.

BEACH SCENE

In this state of relaxation, I want you to picture yourself walking along the beach; it is mid-July. It is very, very warm. (Sound effects of the ocean.) It is late in the afternoon. The sun has not yet begun to set but it is getting low on the horizon (sound effects of the sea birds). The sun is a golden blazing yellow, the sky a brilliant blue, the sand a dazzling glistening white in the sunlight. Feel the cold, wet, firm, hard-packed sand beneath your feet . . . taste and smell the salt in the air. There is a residue of salt deposited on your lips from the ocean spray. You can taste it if you lick your lips. Hear the beating of the waves, the rhythmic lapping to and fro. back and forth of the water against the shore. Hear the far-off cry of a distant gull as you continue to walk . . . .

Suddenly you come to a sand dune, a mound of pure white sand. Covering the mound are bright yellow buttercups, deep pink moss roses. You sit down on its crest and look out to sea. The sea is like a mirror of silver reflecting the sun's rays, a mass of pure white light, and you are gazing intently into this light. As you continue to stare into the

sun's reflection off the water, you begin to see flecks of violet, darting spots of purple intermingled with the silver. Everywhere there is silver and violet. There is a violet line along the horizon . . . a violet halo around the flowers. Now the sun is beginning to set. With each movement, with each motion of the sun into the sea you become deeper and deeper relaxed. With each breath you take you become deeper and deeper relaxed . . . deeper and still deeper. The sky is turning crimson, scarlet, pink, amber, gold, orange, as the sun sets . . . you are engulfed in a deep purple twilight, a velvety blue haze . . . you look up to the night sky. It is a brilliant starry night. The beating of the waves, the smell and taste of the salt, the sea, the sky . . . and you feel yourself carried upward and outward into space, one with the universe, comfortable, totally relaxed, no physical discomfort at all. Safe, secure . . . I am going to count to three and at the count of three you will open your eyes, you will feel completely refreshed, totally relaxed, no physical discomfort at all. Totally relaxed, totally in control of your body and your mind. A wonderful sense of comfort and relaxation. Counting now, one . . . two . . . three . . . eyes open, refreshed, relaxed, no physical discomfort at all, totally relaxed, feeling so good (sound effects of the ocean and birds).

THUNDERSTORM SCENE

In this state of relaxation, now picture yourself . . . sitting on a patio (sound effects of birds singing). Surrounded by a while fence and flowers. It is mid-June. It is one o'clock in the afternoon. It is 80 degrees and you feel so pleasant . . . so comfortable. You are looking at the flowers. There are bells of Ireland, sweet peas, zinnias, Canterbury bells, sweet William, roses, and irises. Past the fence are two box elder trees with a clothesline running between them. There is a long lawn of green grass, a large garden surrounded by poplar trees with silver leaves rustling in the wind, and past that a railroad track and a lake. White sheets are billowing on the clothesline. You get up. You gather the sheets in your arms. They are light and fluffy and dry. They smell sweet and fresh and clean. You carry them over to a table on the patio. Running the lenggh of the lawn is a hose with small holes in it out of which a fine mist of water is being forced. There is a rainbow in the mist. You strip to your underwear and run the length of the hose feeling the light, wet mist against your skin. You sit back down in a chair on the patio in the sun to dry.

Off to the west it is beginning to get dark. Large thick clouds are building up. It is getting colder. Storm clouds are rolling in. It is three o-clock in the afternoon but it is dark. It is very still. Now a wind begins (sound effects of wind in the background begin). It picks up, and soon branches are being torn from the trees as the wind increases in velocity, and it gets still colder; you walk back to the house, walk in through the door and close the door behind you and find a sweater and put on a heavy wool sweater. You come back outside and sit back on the patio. A bolt of lightning streaks across the sky. You hear deafening clashes of thunder (sound effects of thunder). The sky is black and gray with yellow steaks of lightning electricity. It begins to pour rain (sound effects of rain). Your sweater is soaked. You are cold and shivering . . . everything is deep and green. The sweater is heavy and wet against your skin.

You go back into the house, You walk down a long corridor and up a winding flight of stairs to the master bedroom. The room is large with a massive oak wide-beamed ceiling. There is a blazing fire in the fireplace. You crawl into an old Victorian bed with a high needle-point headboard. Feel the pressure of the dry, heavy quilts over your body. Smell the smoke from the burning

logs, hear the patter of the rain against the window pane . . . the sweet sound of the rain, the warmth of the fire. You are completely calm, totally secure, and totally comfortable. No physical discomfort at all, just a state of deep relaxation (rain sounds continue).

BOAT SCENE

In front of you is a very ancient-looking stone staircase, winding down and around, and in the dim light you begin going down the staircase, not afraid at all, but eager to go down into more relaxation. Deeper and deeper as you go down a step at a time, until finally reaching the bottom of the stairway to stand at the edge of what you recognize to be dark water, as black as ink or cypress-swamp water, making a lapping sound, where a small boat is waiting.

And now resting on blankets in the bottom of the boat, the boat adrift and floating in the blackness, dark all around, but rocking gently from the motion of the water, back and forth and rising and falling, rocked gently as the boat just drifts on and on, and as the boat drifts down and down, as you feel only that gently rocking, listening to the lapping of the water, smelling a pleasant smell of the dampness, and then becoming aware that the boat is moving toward a light in the distance, then passing out of a cavernous opening and into a warm sunlight.

Still floating downstream, feeling the warm sunlight, and a soft breeze that passes caressingly over you, as you

drift down and down, and along the bank the birds are singing, insects are chirping and humming, and the fish are jumping in the water to the left of you, and then to the rear. There comes to your awareness the smells of the flowers, and of the freshly cut grass in the fields, where the mowers are still working. And you draw from these things feelings of great contentment, serenity as you keep drifting on down, down further, down into more relaxation, more comfort. You might want to let your arm trail from the boat, so that you feel the cold water on your fingers, and it is very, very clear, clean water, so that you can just bring your fingers up to your lips and have a little taste of that good water, how good and refreshing that water is, as you keep drifting deeper and deeper, very comfortable. Continue to drift down and down, further and further, and going deeper and deeper . . . until just very easily the boat washes up against the shore. And remaining very, very relaxed, get out of the boat, and climb up the bank. You find yourself in a meadow where the tall grass is growing, and you can listen to that grass as it brushes your legs, as you move very slowly along in that warm sunlight. It is so pleasurable to feel, but it does make you feel very relaxed. The water in the background, relaxed and comfortable.

And seeing now in front of you, as you look, a beautiful big shade tree, a strong, vigorous, but very old tree. Some of its' roots are above the ground, and you will notice that there is moss, soft and heavy moss growing on some of thse roots. And lying down now and resting your head on one of the moss-covered roots in the shade, the grass and the ground feeling good to your body, and you find that it is an extremely comfortable and pleasurable place to be.

And lying there, aware of everything around you, of the movements of the rabbits out there in the tall grasses, of the squirrels looking down from the branches of the tree, of the wind in the grasses, of the rustling of the leaves, aware of that whole environment and finding it restful, and peaceful, and good.

You feel yourself to be entirely a part of it. Aware of yourself as very much belonging there, you belong in that whole beautiful, peaceful, and harmonious scene. You feel yourself so much a part of that scene, of that peace, that your body experiences no discomfort at all. It is totally relaxed. That comfort, that relaxation, no physical discomfort at all. This oneness with the peace and comfort being experienced so intensely, yet quietly. The peace (sound effects of water and birds).

I am going to count now, from one to ten and as each number gets larger you will get more and more awake, keeping relaxation and physical comfort, all pain and discomfort is gone. You are refreshed, at peace, feeling very, very good. At the number ten your eyes will open and you will have no physical discomfort at all. Counting now, one . . . two . . . three . . . four . . . coming up, more awake . . . five . . . six . . . seven . . . eight . . . nine . . . ten, eyes open, refreshed, relaxed, no physical discomfort at all, feeling very, very good.

MOUNTAIN CABIN SCENE

(Sound effects of wind.) In this state of relaxation, picture yourself in a cabin in the mountains. It is midnight and outside the wind is howling. Inside, you are sitting in front of a fire, a beautiful, blazing fireplace. You are starring into the embers, gazing fixedly into the coals. Feel the warmth from the flames against your skin. Feel the heat on the front of your body, it is so intense. See the flickering shadows on the wall. Hear the crackling of the pine logs as the sap hits the fire. Smell the smoke from the burning pine logs. The only source of light comes from the fire, the rest of the cabin is in darkness.

Now you get up. You are going outside. You bundle up. You put on a coat, gloves, cap, boots. You go to the door. Feel the door give way to the pressure of your hand. You are outside in the cold winter air. Take a deep breath of cool, fresh, pure mountain air. Smell the pine. It feels so good to breathe. Your entire rib cage collapses in total utter relaxation. The door closes behind you. The moon is full behind the clouds that are moving by. It is 20 degrees below zero, butter cold. You can see your breath in white puffs. You begin walking down a path on

either side of which are tall deep green pine trees laden with snow. The snow is knee deep. Everything has a bluish tinge to it; even the snow looks blue. Ten minutes pass, twenty minutes, pass, thirty minutes. You stop, take your glove off your right hand and thrust your warm hand into the snow making a fist compressing the snow into an ice ball in the palm of your hand . . . you feel a numb, wooden, leathery-like sensation beginning in your right palm, spreading throughout your hand. In a moment at the count of three, I will ask you to remove your hand from the snow and gently place it directly on the part of your body that hurts, that has pain. This will permit you to transfer the feelings of numbness from the hand into the area of your discomfort, and in exchange any tension, tightness, pain or discomfort will flow from this area back into your hand. You can then dip your hand into the snow once again to repeat the exercise. Okay, counting now, one . . . two . . . three . . . now remove your hand from the snow and place it directly on the part of your body that hurts, that has pain. Imagine all the deep feelings of numbness from your hand streaming into your body and at the same time, picture your hand beginning to absorb your body's discomfort. Gradually, the same numbness that quickly developed in your hand is now permeating the

affected part of your body, you can sense the skin constricting and the muscles losing all feeling as the numbness penetrates even deeper. You can experience your hand becoming filled with the sensations you once experienced only in those affected areas. Slowly rub your hand around the once painful area until you feel you have absorbed as much of the discomfort as you can. Allow yourself to be surprised to notice what an immediate difference this has made.

Now dip your hand once again into the snow to repeat the exercise. Move your hand around in the snow, and allow the transfered feelings of discomfort to move out through your finger tips and flow gently down to the bottom of the snow bank. At the same time, feel your hand once again react to the anesthetic, to the numbness. It will probably take much less time to achieve this state than it did the last time, but continue to move your hand around for as long as it takes, whether it takes a few seconds or even longer. Soak up as much numbness as your hand possibly can. When you are ready, put your hand back on the area of discomfort, on the area of pain. Once again, transfer the numb, relaxed feeling deeply into the area and if there is any remaining discomfort, take away as much of it as you

can. Gently rub your hand over the area until you are ready to dip it back in the snow.

Repeat this transfer process as many times as you wish, at any time of the day, and as many times a day as you wish, for each time you repeat it, you will be able to experience an even greater amount of comfort and relief in the affected area. And each time you repeat it, it will become easier and easier.

Good! Now place the glove back on your right hand. You turn around and begin tracing your footsteps back to the cabin. Ten minutes pass, twenty minutes, thirty minutes. You are back to the cabin. You go inside. You take off your outer wraps and walk over to the fire. Hold your hands over the fire. Feel the warmth spreading throughout your body. Your hands return to normal. You lie down beside the fire on a bearskin rug. The warmth of the fire, the smell of the pine smoke, the crackling of the logs, the howling of the wind, all these sights, smells, and sounds seem very, very far away as you drift further and further into relaxation and comfort.

In a short while I will count from one to three and at the count of three you will open your eyes, feel totally relaxed, totally free of any discomfort at all,

totally refreshed, totally comfortable. Okay, counting now . . . one . . . two . . . three . . . eyes open, refreshed, totally comfortable, no physical discomfort at all, feeling very, very good.

APPENDIX F

TENS PLACEMENT AND SETTINGS

TENS PLACEMENT AND SETTINGS

Type of Stimulator: Neuromod Comfort Burst by Medtronic, Model 7728. All subjects received the "LO" comfort burst wave form.

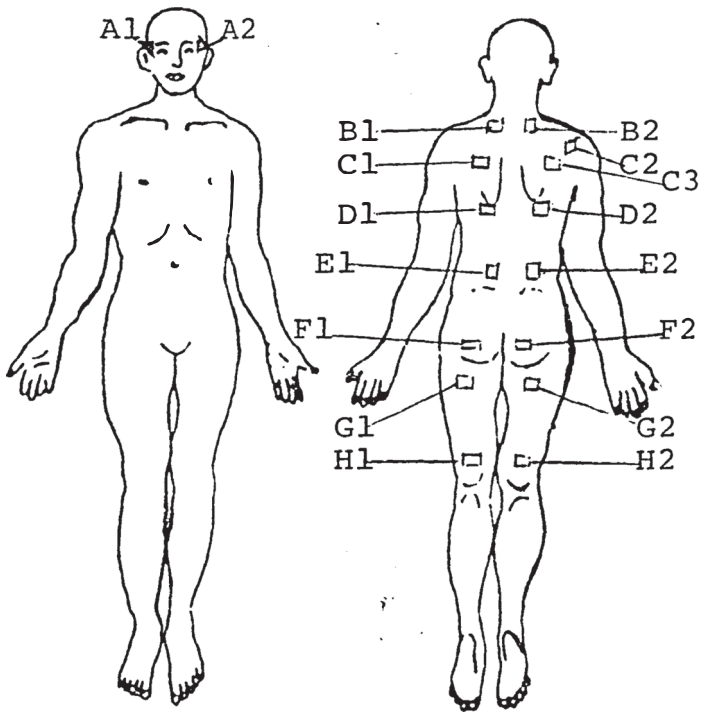
Electrode Material and Size: The Medtronic Model 3795 electrodes (approximately 1-1/2" x 2") were used on all patients.

Skin Preparation: The skin areas where the electrodes were applied were cleansed with a 70% Isopropyl Alcohol solution. A liberal amount of hypo-allergenic conductive gel was applied to the electrodes. The electrodes were taped in place by hypo-allergenic paper tape. Treatment time for all subjects was 30 minutes.

Subject	Pain Area	Electrode Placement*	Setting
#1	Low Back	F_1, F_2, G_1, G_2	2
#3	Upper Back	C_2, C_3	2.5
#4	Upper Back	B_2, C_1	2.5
#5	Headache	A_1, A_2, B_1, B_2	2
#6	Low Back	E_1, E_2, G_2, H_2	3.5
#7	Middle Low Back	D_1, D_2, E_1, E_2	3
#9	Headache	A_1, A_2, B_1, B_2	2
#12	Headache	A_1, A_2, B_1, B_2	2
#13	Low Back	F_1, F_2, G_2, H_2	3.5
#14	Upper Back	B_1, B_2, C_1, C_2	2
#17	Headache	A_1, A_2, B_1, B_2	2

*See Body Chart

BODY CHART OF TENS ELECTRODE PLACEMENT



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