AUDIOTAPED HYPNOSIS FOR CHRONIC BACK PAIN
A CASE STUDY

By

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Abstract

The purpose of this research was to investigate the effectiveness of audiotaped hypnosis as a treatment for chronic pain using physiological as well as psychological measurements. The research design is a modified single case study employing an A-B format; the A phase constituted the responses of the Control Group, which provided a stable baseline and the B phase constituted the responses of the Experimental Group which received the treatment. Both groups received 25 sessions of biofeedback. A randomized selection of a variety of audiotapes (hypnosis, guided imagery, relaxation) was given to the Control Group. The same audiotape of hypnosis was used as the independent variable over a period of 25 sessions for the Experimental Group. The modified form of Melzack & Torgerson's Present Pain Intensity Scale which evaluates pain on a scale of increasing intensity both verbally and numerically was used as a subjective self-report measure. Electromyographic (EMG) readings were taken as an objective physiological measurement. An interrupted time-series analysis called, The Box Jenkins Analysis provided statistical data. This data was corroborated by a Binomial Test. The eight subjects, six of whom were male were all chronic pain patients who were referred by the Workman's Compensation Board for work related injuries. The patients in this setting are resistant to change. The results showed a statistically significant result of the data in the Experimental Group which may be viewed as a trend towards improvement. However the results should be viewed with caution as external validity is weak. This study was meant as a pilot study and will need further research to corroborate the findings.
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CHAPTER 1

INTRODUCTION TO THE PROBLEM

Chronic Back Pain

The term chronic back pain (CBP) is commonly used to refer to back pain whose assumed origin is in the spine or the surrounding muscular, or inflammatory origin, and has lasted for more than six months (Fordyce, 1986; Sternbach, 1974, 1984). It is estimated that 70% of low back pain and most headaches have no known organic cause. Statistics vary from 10% to 80% of adult Canadians suffering from back pain to 33% suffering from chronic back pain (Fraser, 1991; Hall, 1986; Jenish & Deacon, 1991). All low back pain patients experience acute pain at first and 50% are successfully treated at this stage while 50% become chronic low back patients (LaFreniere, 1979).

In Canada it has been reported that three million Canadians suffer from chronic pain which results in $4 billion a year in lost income, medical expenses and disability payments. It has been estimated that in British Columbia 300,000 people live with chronic pain (Wigod, 1991). Jenish & Deacon (1991) reported that back pain "is the second most common cause of absenteeism in the workplace, behind the common cold" (p. 52). The Worker's Compensation Board of Ontario stated that back problems accounted for approximately one-quarter of all compensation claims in Canada; in Ontario alone, $399 million was awarded in 1984 for work-related back injuries (Hall, 1986) and "back problems resulted in more claims for lost wages than any other type of injury last year" (Jenish & Deacon, 1991, p. 54). In 1980 the total cost of chronic pain to the American

One researcher suggested that litigation-related chronic pain should be considered a diagnostic entity distinct from other types of chronic pain and that a "two-tiered" system of compensation should award more for pain of "organic" origin (Weber, 1989). Pain clinics reported that "30-40% of their clientele have back-related pain as their major presenting complaint (whatever the real cause)" (Clarke, 1987, p.1).

The Injured Worker

Chapman (1988) studied the injured worker and found that employed individuals spend about one-fourth to one-third of their waking time at work. Work serves as one of the most important factors in the formation of self-esteem and personal identity. It provides the individual with security and the "ability to make more choices in life, gives life a purpose, makes it more meaningful and serves as a social outlet. Loss of work is associated with "loss of work status" (p.103). Chapman found that:

Chronic pain is frequently associated with a loss of work status. For example, a random sample of a mixed group of chronic pain patients at the Emory Pain Control Center indicated that only 12% were working full-time at the time of admission into the program; 40% were on Workers’ Compensation and 23% had established Social Security disability. This loss of work status often is associated with very strong affect regarding returning to work, despair regarding physical limitations, and rage toward previous health care personnel who had stated or implied that they should be working when they were not. Several factors often contribute to this strong affect, including inconsistent messages regarding work ability from previous health care personnel, stigmas placed on individuals without obvious physical disability who are not working, financial stresses, frequent souring of relationships with insurance companies and with the last employer, and progressive loss of mental and physical
abilities and self-confidence with long-term physical disuse and drug dependency. In addition the adversarial nature of legal systems often puts the patient in the position of maximizing pain and disability in order to receive a more substantial settlement, while the insurance company may look for evidence to minimize the patient's claims and attribute them to a desire for secondary financial gains. (p. 105)

**Stages of Chronicity**

In another study Chapman, Brena and Bradford (1981) theorized a four stage-process by which industrial accidents can lead to a permanent disability status:

1. **Premorbid stage:** Characterized by increased stress at work or at home and by difficulty in performing work tasks adequately.

2. **Establishment of the sick role:** Involves repeated medical testing and interventions which fail to relieve pain. Many patients continue to remain inactive and take habit-forming pain medications during this stage, leading to increased depression and dependency. Many also have unsuccessful surgeries for back pain: two-thirds of patients referred to the Emory Pain Control Center with pending or current disability had previous pain-related surgery, with a mean of 2.8 surgeries per person. (Chapman, S.L.; Brena, S.F.; and Bradford, L.A. 1981; cited in Chapman et al. 1988 p.103)

3. **Stabilization of chronicity:** As time passes, the patient develops the identity of being disabled, which may help satisfy dependency needs and provide some level of financial security. Drug use and inactivity frequently have become habitual by this point, and continue to create additional physical and emotional deterioration which erodes the injured worker's ability to manage the pain problem or return to a normal lifestyle. Lawyers also often become involved and may reinforce the crystallization of disability through suits for large settlements contingent on the continuation of a disabled status. Many lawyers work on contingency and thus have a direct financial interest themselves in establishing a permanent disability status for the patient. Some are paid a percentage of the patient's Workers' Compensation benefits, which can reinforce them for delaying settlement through legal delays and encouragement of further testing and therapy before settlement. (p. 103)
4. **Learned helplessness**: At this stage, the patient is likely to have developed the 'Disease of the D’s' (Morse cited in Chapman, 1988) characterized by depression, dysfunction, disuse, drug use, dependency on doctors, dramatization of pain complaints, and disability income. As these roles persist (and sometimes are reinforced) over long periods of time, they become increasingly refractory to change. (p. 103)

The Chronic Pain Patient

Chapman (1988) cited a study by Yelin, Nevitt, and Esteom (1980) who surveyed 245 individuals with rheumatoid arthritis and looked at a host of demographic, medical, and social variables. They found that previous surgery and heavy reliance on medications such as steroids were associated with reduced likelihood of return to work, even when the stage of illness was held constant; however, control over the pace of work and self-employment were by far the most predictive variables (p.106).

In his review of chronic pain, Chapman (1986) described the chronic pain patient as one who suffers physical deterioration caused by sleep, lack of appetite, reduced physical activity and dependence on drugs. As well, there was enormous strain on family and social life.

**PURPOSE OF THE STUDY**

Hypnosis has been used by clinicians for hypnotherapy in the treatment of pain (Erickson, 1967b, 1983b, 1989; Hilgard, 1986) and as an effective adjunct when it is used on an individual basis as an adjunct to formal hypnosuggestive procedures (Ellis 1986; Tarnowski, 1986), or combined with other approaches. (Barber, 1986; Finer, 1982; Golden, 1986; Guck 1985; Melzack & Wall, 1965; Pinsky & Malyon's study, cited in Spino, 1984).
Research on hypnosis has been found to be useful in the reduction of experimentally induced pain (Barber, 1960, 1970, 1971; Crasilneck, 1979; Evans, 1970; Hilgard, 1975, 1980; Hilgard & Hilgard, 1986; McGlashan, 1969; Sternbach, 1984) and in single case studies of chronic pain (Erickson, 1983b). However, investigators reported that studies of clinical research on the use of hypnosis in the reduction of chronic pain are few and mainly consist of uncontrolled case studies (Hilgard, 1986; Sternbach, 1986a; Tan, 1982, Turner & Chapman, 1982). Some researchers found that clinical research in relieving chronic pain failed to demonstrate that hypnosis has more than a placebo effect (Turner & Romano, 1984) and others found that there was no reliable evidence that hypnosis is effective in the treatment of chronic pain (Hilgard & Hilgard, 1986). There are few documented clinical studies using audiotaped hypnosis as a treatment for chronic pain and no previous investigations directly comparing the effectiveness of listening to the same audiotape of hypnosis over time versus listening to a random selection of audiotapes which use soothing sounds, mood music, or hypnosis, as a treatment for chronic pain. The purpose of the study is to:

1. Explore the effectiveness of audiotaped hypnosis as a therapeutic treatment for the reduction of chronic pain, using relaxation, visualization, guided imagery, hypnotic ego-strengthening techniques at an unconscious level and positive posthypnotic suggestions;

2. To assess change over time using outcome measures to provide both subjective and objective evidence that during the period of treatment there was a significantly quantifiable trend towards the reduction of chronic low back muscle tension (which may reduce pain) as measured by lowered electromyographic (EMG) readings, lowered self-report pain
intensity scores and positive self-report on the effectiveness of using audiotaped hypnosis for reducing chronic pain.
HYPOTHESES

Stated in the null form, the hypotheses this single case experimental design investigated were:

**Hypothesis 1**

Listening to audiotaped hypnosis will have no statistically significant effect on chronic pain as measured by electromyographic (EMG) readings over time in the Control and Experimental Group.

**Hypothesis 2**

There will be no reduction in perceived pain after daily treatment in the Experimental group as measured by subjective self-reports of pain using words and numbers on a continuum of increasing value.

**Hypothesis 3**

Audiotaped hypnosis will have no effect on perceived pain after a period of twenty-five treatments over five weeks as measured by subjective self-report.

**Hypothesis 4**

A combination of electromyographic (EMG) biofeedback in combination with audiotaped hypnosis will not be effective in the reduction of chronic pain.
RATIONALE

Research on the effectiveness of hypnosis on pain has focused mainly on acute pain which is experimentally induced employing either the cold pressor test or muscle ischemia to find a pain threshold and/or tolerance, using subjective pain ratings as the main dependent variable (Hilgard & Hilgard, 1986; Tan, 1982). There are few documented clinical studies using audiotaped hypnosis as a treatment for chronic pain. Current theories of pain (Crue, 1976; Erickson, 1983b; Le Roy, 1976; Hilgard, 1975; Melzack & Wall, 1982) look at both the psychological and physiological components.

The definition of hypnosis is based on the theories of hypnosis as an altered state of consciousness (Erickson, 1983; Barber, 1976), a state of dissociation (Hilgard, 1973), and a state of modified attention (Wyke (1986). This is an exploratory study which evaluates the effectiveness of audiotaped hypnosis by studying both the psychological and physiological components of chronic pain through the use of subjective and objective variables measured over time. A modified single case experimental design was chosen to evaluate audiotaped hypnosis because of the practical limitations and difficulties of clinical research (Hersen & Barlow, 1982, Hilgard, 1986). The A-B design, which is the most suitable for a pilot study (Borg,1963b), was modified in order to establish stability of repeated measures (Hersen & Barlow, 1982).

Limitations of the Study

The cause-effect relationships are difficult to isolate in the A-B design but changes in the dependent variable may be "attributed to the effects of treatment" (Hersen & Barlow, 1982, p.169). Due to the
difficulties inherent in clinical research, obtaining a large sample size and random distribution was not possible. The findings are not readily generalizable because the group results were averaged and therefore the individual differences of the pain patients were not adequately sampled.
CHAPTER 2

REVIEW OF THE LITERATURE

The review of the literature will focus on four areas of interest: history of pain; theories of pain; treatments for chronic pain and chronic low back pain; research on experimental and clinical pain, with an emphasis on therapeutic methods of hypnosis for pain reduction.

History of Pain

From the time of Aristotle, who theorized that pain was the opposite to pleasure and therefore was an emotion, to the present day, controversy has continued over how to define and conceptualize pain (Meizack & Wall, 1988). Pain, and the infliction of pain has been viewed as a societal instrument of social control both within the family unit, in society at large, and as a sign of courage in initiation ceremonies in many countries throughout the world (Hilgard & Hilgard, 1986).

In 1664 Descartes proposed that pain was transmitted in a straight channel from the skin to the brain. This was not challenged until the nineteenth century when physiologists began to wonder if there were different qualities of sensations for the senses of seeing, hearing, taste, smell and touch. Johannes Muller, theorized that there was, "a straight-through system from the sensory organ to the brain centre responsible for the sensation." Max von Frey, a physician, published articles in 1894 and 1895 in which he postulated that nerve endings were pain receptors, corpuscles were touch receptors and that there were receptors for cold and warmth as well. This theory was extended over the next twenty-five years to include specificity theories which proposed that the different sensory
fibres of touch, smell, taste, hot, cold, etc. had specific (italics added) pathways to the brain centre. Finally, anatomical studies on humans and animals discovered that certain areas of the spinal cord were important for pain sensation and provided a “pain pathway” to the brain (Melzack & Wall, 1982, p. 151).

The thalamus is thought to be the ‘pain centre’ by some specificity theorists, and is debated by others (Melzack & Wall, 1982). Critics of the specificity theory of pain theorized that there is psychological evidence to refute that there is a one-to-one relationship between pain perception and intensity of the stimulus. Melzack & Wall (1982) cited Pavlov’s experiments with dogs who were given electric shocks, burns and cuts, followed by food and then when they were conditioned to respond to the stimuli as signals for food, failed to show ‘even the tiniest and most subtle’ signs of pain. Clinically, Melzack & Wall cited phantom limb pain, causalgia, and the neuralgias as evidence against the theory and other theories, under the heading of ‘pattern theory’ which dispute the specificity model of pain. (p.156)

Goldscheider (1894) was the first to propose that stimulus intensity and central summation (the accumulation of pain over long periods), produced a “patterning of the input” which is essential for any theory of pain. This theory takes into account chronic pain of intractable origin. Melzack & Wall (1982) posited that while the “development of sensory physiology and psychophysics during the twentieth century has given momentum to the concept of pain as a sensation and has overshadowed the role of affective and motivational processes....this sensory approach to pain, fails to provide a complete picture of pain processes.” The authors theorized that “sensory motivational and cognitive processes occur in
parallel, interacting systems at the same time” and distinguished between “physiological specialization and psychological specificity” and stated:

Neurons in the nervous system are specialized to conduct patterns of nerve impulses that can be recorded and displayed. But no neurons in the somatic projection system are indisputably linked to a single, specific psychological experience....If we can all agree that ‘specificity’ means physiological specialization, without implying that specialized neurons must give rise to the experience of pain and only to pain or that pain can never occur unless they are activated, then we will have eliminated a major source of unnecessary controversy. (p. 164)

The Gate Control Theory of pain proposed by Melzack & Wall in 1965, took into account both physiological and psychological processes by proposing that neural mechanisms in the spinal cord act like ‘gates’ which may be inhibited by descending messages from the brain. The authors stated that in order for, “ A new theory of pain to be useful,” it “must incorporate known facts about the nervous system, provide a plausible explanation for clinical pains, and stimulate experiments to test the theory, including procedures that are potential new therapies” (p. 165).

Historically, medical treatment for pain relied on surgery, drugs, and counterirritants. Many of the psychological methods of today can be traced back to treatments based on folk methods. Faith healing has existed as long as man and many religious groups have claimed to have the answer to curing pain (Hilgard, 1986). Ether and chloroform were discovered 150 years ago and used as anesthesia in surgery. Morphine and other narcotics derived from opium have been the most successful pain-killers for the relief of nonsurgical pain and pain that persists after surgery (Hilgard, 1986).
During the past two decades there has been a scientific revolution in the research of pain. Until the middle of this century pain was believed to be a symptom of disease or injury. Chronic pain is now seen as a problem in its own right which at times can be more debilitating than the disease process which caused it (Melzack, 1982).

Since the 1960s and the advent of space age technology, bioengineers and behaviorists have developed methods for the nonsurgical treatment of intractable and chronic pain through bioelectric stimulation, either through implants or by external electronic systems (Le Roy, 1976). Behavioral and cognitive-psychological methods have been combined in pain clinics for the treatment of chronic pain (Wall & Melzack, 1984). At the same time drug research has discovered new chemical pain inhibitors called “beta-endorphins” and natural pain inhibiting endorphins which are released when deep regions of the brain are stimulated (LeRoy, 1976).

Recently, there has been a shift away from the medical model where the patient has no input into the treatment received, to an emphasis on holistic medicine and personal self-regulation in therapy (Elton, 1980; Rossi, 1986). The study of neurophysiology has increased our knowledge of the mind/body connection. Pain is now viewed as a psychoph physiological process which has neurological, physiological, behavioral and affective dimensions (Sternbach, 1986; Wolf, 1982).

**Acute Versus Chronic Pain**

Pain is derived from the Latin word "poena," meaning a penalty (Spino, 1984). Descriptions of pain, reflect the particular theoretical background of researchers in neurology, physiology, psychology or the behavioural sciences (Sternbach, 1986; Fordyce, 1986). Sternbach
emphasized that pain was the common denominator but the processes were different.

The amount and quality of pain an individual experiences is determined by the individual's past experience of pain, their cultural values, their negative or positive perception of the event causing the injury and their anticipated projection into the future of the outcome of the trauma (Sternbach, 1986). Studies of cultural experiences of women in childbirth illustrated this theory (Melzack, 1961; Keefe, 1982). Studies by Beecher (Cited in Melzack 1961) of World War II soldiers injured during the war, and civilians who had undergone surgery after the war, demonstrated how a positive or negative perception of the event changed their perception of pain. The soldiers viewed their injuries as a means of escaping from the battlefield and needed a significantly lower dosage of morphine than the civilians who viewed the surgery as a "depressing, calamitous event" (p. 4).

During the 1960s the classical view of pain as a specific sensory experience, whose intensity is directly proportional to the intensity of the injury received, was challenged by researchers (Melzack, 1961; Sternbach, 1968). Early clinical studies on prefrontal lobotomies provided evidence of two distinct dimensions of pain; the sensory component and the suffering or affective component. Patients with intractable pain (pain resistant to treatment) stated that after surgery, the pain was still there but that it no longer bothered them. In other words, the sensory pain was still there but the suffering had been relieved (Barber, 1959; Melzack, 1961).

Hilgard & Hilgard (1975) categorized the experience of pain in two ways:
1. That pain is a sensory response to an injury and the reaction to it is the suffering part; or

2. That the two components happen simultaneously rather than successively, with two parts of the nervous system activated at the same time.

Sensory physiology and psychophysical analyses of sensory qualities have been examined in detail (Craig, 1984). Pain from a biomedical viewpoint was thought of as both a warning signal of impending injury or as a need-state for rest in order for the injury to heal (Sternbach, 1984). However, researchers found that the experience of pain does not always accompany injury signals (Mcglashan, 1969; Melzack, 1961; Wall, 1979). Intractable or prolonged pain such as phantom limb pain, arthritis, bone cancer or chronic low back pain do not provide these functions to the individual. It is only recently that researchers have studied the differences between acute and chronic pain (Sternbach, 1984).

Some researchers (Hilgard & Hilgard, 1975) classified the uncertainty of the source of pain into three descriptive categories:

*Referred* pains are those felt in one place although the source of irritation is somewhere else. *Psychosomatic* pains are complex and are intricately related to the emotional life of the individual, and their perception of the pain and the subtle purpose it may serve. *Phantom limb* pains are the perception of pain after a limb has been amputated. (pp. 31-32)

The authors noted that these pains take into consideration the psychological aspects of pain.

The main aspect of chronic pain which differentiates it from acute pain is the time element or duration of the pain (Fordyce, 1986; Melzack, 1983, 1989; Melzack & Wall, 1984; Sternbach, 1968). Chronic pain has
been defined as a pain that is benign in origin and that is present on a constant, daily basis for longer than six months by some researchers (Fordyce, 1986; Sternbach, 1974), or pain which persists beyond the required time for healing (Craig, 1984). Others think the “six month time frame...is arbitrary and often inappropriate...and the use of the term chronic should be restricted to those individuals who, in addition to complaints of pain, display evidence of affective distress and/or behavioral disruption” (Grzesiak & Ciccone, 1984, p. 165).

Melzack (1989) classified pain into three stages: 1. Acute pain which has two components: 2. The phasic component which has a rapid onset, and 3. a subsequent tonic component which persists for variable periods of time. He cited as examples of acute pain, “a burned finger or a ruptured appendix” (p. 6526). Chronic pain may pass through the two stages of acute pain, but “may persist long after the injury has healed...may spread to adjacent or more distant body areas...is resistant to surgical control, and its prolonged time-course is characteristically associated with high levels of anxiety and depression” (p. 6526). Examples of chronic pain are chronic low back pain, intractable myofascial pain, the neuralgias and phantom limb pain.

Physiologically, autonomic activity (involuntary activity such as heart rate, muscle tension etc.) is regarded as an indicator of activity of acute or chronic pain (Sternbach, 1984, 1986). Autonomic activity with acute pain is characterized by a “fight or flight” syndrome with changes in the autonomic activity roughly proportional to the intensity of the stimulus; chronic pain is characterized by a “habituation of the autonomic responses,” a “vegetative” state accompanied by “sleep disturbance, appetite changes, decreased libido, irritability, withdrawal of interests, weakening
of relationships, and increased somatic preoccupation" (Sternbach, 1986, p.223).

Some behaviorists described three stages of pain: acute, prechronic, and chronic (Fordyce, 1986). Each stage was explained in terms of a "conditioning process" in which patients learned behavior patterns that helped them to reduce pain or helped them maintain pain. At the "chronic stage-12-months or more" patients may become bedridden and drug dependent. Fordyce, described pain medication, financial compensation, avoidance of work responsibilities as "powerful positive consequences of these behaviors" (p. 326).

Nigl, (1984) in his review on chronic pain cited Crue (1976) who divided chronic pain into two subtypes; recurrent acute pain which can be mistaken for chronic pain (migraine headaches, osteoarthritis, and rheumatoid arthritis) and chronic pain which is constant pain with no organic basis. Crue (cited in Nigl, 1984) noted that recurrent acute disorders may become chronic disorders if they persist after the acute pain is treated with medication. Two classes of pain were distinguished; those with pain due to malignancy or cancer and those with chronic pain which is benign and intractable. Chronic benign pain disorders were listed as having the following characteristics:

Patients have pain all of the time; it is constant.

The pain is functional in nature; it is central pain not peripheral.

It is accompanied by reactive depression.

Patients fail to cope with their pain unlike other patients with chronic pain states who do not seek treatment.
There is an underlying, premorbid personality pattern that predisposes an individual to have chronic pain disorder, regardless of diagnosis or treatment. (p. 98)

Chronic Pain

There is considerable disagreement about which disorders can be properly labeled as chronic pain disorders, and some authors made a distinction between chronic pain and chronic pain syndrome (Nigl, 1984). Pinsky (cited in Nigl, 1984) developed the concept of chronic intractable benign pain syndrome (CIBPS) to differentiate between patients who had intractable pain and no psychological problems and those patient’s who, "present symptoms of constant pain that cannot be related to any active pathophysiologic or pathoanatomic disorder" (p. 98). Patients suffering from CIBPS were characterized by the following factors:

- Drug dependency or abuse, physical decline, generalized dysphoria, psychosocial withdrawal and interpersonal dysfunction, intensified feelings of hopelessness and helplessness, chronic conflicts with medical professionals accompanied by anger and hostility, and a general loss of self-worth and self-esteem. (p. 99)

Pinsky (cited in Nigl, 1984) theorized that chronic pain was a "psychologic disorder which represented an individual's attempt to cope with intrapsychic conflicts" and he stated that it "can be thought of as an adaptive attempt to counteract anxiety or resolve a particular conflict; however, in almost all cases, it is destined to fail. Signs of adaptive failure include unresolved grief response, depression, tension and anxiety, shame and guilt, feelings of rejection, isolation....symptoms of grief which normal individuals experience over a loss; namely somatic distress, preoccupation with premorbid self-image, anger and bitterness toward medical treatment
'failures' and significant behavioral changes (e.g., restlessness, insomnia)" (p. 101-102).

**Measurement of Pain**

Chapman, Casey, Dubner, Foley, Gracely, and Reading (1985) reviewed the advantages and limitations of physiological and behavioral methods of pain measurement in animal research, human subjects, and in laboratory and clinical studies. The authors noted that pain measurement is complex and could be quantified only indirectly. They quantified research in human laboratory studies into four types of procedures:

1. Psychophysical methods that attempt to define a threshold for pain;

2. Rating scale methods in which subjects rate pain experiences on structured scales with clearly defined limits;

3. Magnitude estimation procedures in which direct judgments of stimulus intensity or quality are made by number assignment or cross-modality matching techniques such as handgrip force;

4. The measurement of performance behavior on laboratory tasks, usually to obtain indices of discrimination ability or detection. (p. 7)

In addition to these methodologies, some investigators have assessed physiological or facial expression correlates of pain but these techniques have not been used alone as indicators of pain. Chapman et al.(1985) pointed out that:

Tolerance methods are limited by individual differences in pain tolerance, rating scales are difficult to assess because individual perception of categories is not equal, and statistical analysis can be misleading if the scores are used as interval or ratio scales. (p. 10)
However, they concluded that these scales are often used, "because they are simple, economical and easy for subjects to comprehend" (p. 10). They found that cross modality methods, while more complicated, have the advantage over other methods in that they scale pain on more than one dimension and can be used for both laboratory and clinical studies.

Other methods reviewed included laboratory research using performance measure (measures which do not directly measure pain); and Sensory Decision Theory (SDT), which is used for laboratory research on human pain and as an evaluative tool for chronic pain patients.

Chapman et al. (1985) noted that while there had been a need for objective evidence of pain experience, it was difficult to, "reduce human pain to measures of neuronal activity alone even though such signals are the basic building blocks of pain" (p. 14). They defined a physiological correlate of pain as serving three purposes:

1. It could help confirm the validity of the experiment in question by providing supporting evidence that the verbal pain reports of subjects are linked to the stimulus rather than to an extrinsic psychological state.

2. It could contribute to the statistical power of an experiment by providing additional information to be used in hypothesis testing.

3. In certain cases such a measure could help in quantifying aspects of the human pain experience such as anxiety that are presently ignored in most studies. (p.14)

Chapman et al. (1985) defined four human physiological correlates:

1. Direct recording from peripheral nerves;
2. Electromyographic (EMG) measures;
3. Autonomic indices and evoked potentials and
4. Electroencephalography (EEG) measures (p. 14).

Peripheral nerve studies have recorded frequencies which reflect the activity of peripheral nerves, which can then be compared to the volunteer subject's report of sensory changes and the area of involvement. Chapman et al. (1985) cited studies of recordings made from electrodes implanted in human teeth. They cautioned that this is not a perfect relationship of peripheral activity to pain because, "the modulation processes occurring at the dorsal horn and higher centers are not reflected in such signals" (p. 14).

Several studies (Budzynski, 1973; Haynes, 1975; Jessup, 1984; Keefe, 1982; Large, 1983; Nigl, 1984; Pearce, 1987; Schuman, 1982; Wickramasekera, 1972; Wolf, 1982) reported using electromyographic (EMG) measures to relate muscle tension in chronic pain patients with myofascial disorders, chronic back pain, tension headache, temporomandibular joint pain, and muscle tension pain in the neck and shoulders. Autonomic indices included pulse rate, skin conductance and resistance, skin temperature, and finger pulse volume. The Autonomic Perception Questionnaire (APQ) was devised by Mandler et al. (Cited in Chapman et al., 1985) and has been used by researchers to "study pain related arousal associated with ice water immersion of a limb." They found that "APQ data were not related to pain tolerance" (p. 15).

Evoked potentials (EPs) and electroencephalographic (EEG) are both central nervous system measures. Researchers cited in Chapman et al. (1985) studied the EPs of "short and long waves" and have concluded that, "waveform amplitude increases with the amount of stimulus energy
delivered” and when analgesics are given they decrease. Both of these measures correlated well with subjective pain reports. (p. 16)

EEG measures are used to “quantify or monitor non-specific arousal during pain studies in human subjects” and to “assess the effects of analgesic drugs” or “psychological interventions on arousal, a methodology termed pharmacoelectroencephalography.” Chapman et al. (1985) concluded that physiological measures are objective measures which may provide information about the “underlying pain or analgesic state” but may not be “less susceptible than subjective report to psychological variables such as expectancy or attention” (p. 16).

Jenish & Deacon (1991) reported that a "new approach" to the measurement of back pain was developed by a professor of engineering, Serge Gracovetsky, who developed a "spinoscope." It allows physicians “to measure with unprecedented accuracy the movement of spinal muscle, ligament and fibre, which are known as 'soft tissue,' as opposed to the hard tissue of the spinal cord itself" (p. 52).

Clinical Pain Assessment

Chapman et al. (1985) credit Beecher (1957, 1959) with influencing the “emotional dimension” of pain, the “importance of experimental design, including double blind procedures”. and “the scaling of pain as opposed to the measurement of pain relief.” The measurement of behavior as a basis for inference about clinical pain, and pencil and paper test instruments which quantify multiple dimensions of the pain experience from subjective report, have been developed to provide both quantitative and qualitative aspects of pain. (p. 17)
A review of behavioral methods for the assessment of chronic pain has been provided by Keefe (1982) and Nigl (1984c). Some of the variables reported were: 1. activity (e.g., moving in bed) and activity diaries; 2. measures of the amount of time spent standing, sitting or reclining (up-time vs. down-time); 3. sleep patterns; 4. sexual activity; 5. medication demand or intake; 6. food intake; 7. normal household activities such as meal preparation and gardening; and 8. engagement in recreational activity.

Chapman et al. (1985) reported that pain investigators had attempted to categorize chronic pain behavior for clinical observation; had devised a rating scale for scoring or quantifying pain behavior in chronic back patients; had developed a rating instrument “to assess behavior generally indicative of pain”, and had designed an “automated monitoring device worn by the patient” which quantified “up-time” and quantified facial behavior with a videotape. (p.18) Self-reported behaviors in the form of diaries or pencil and paper tests had been used by investigators to determine normal daily activity levels or pain medication but the authors noted that "patients are sometimes biased or incorrect in their reporting" (Chapman et al., 1985, p.18).

Subjective pain reports are used to scale both pain itself and pain relief following treatment. Pain category ratings and Visual Analog Scale (VAS) judgments are the simplest report scales. Category scales have been used to guage pain relief in cancer patients following morphine treatment and with children following surgery. With category scaling it is difficult to specify the size of each category or know if the categories are equally spaced. (Chapman et al., 1985)

The qualitatively different types of pain have been described as pricking or sharp, burning, and dull or aching. Pricking and burning pain
is easy to locate. Aching pain usually originates in deep tissues, including
the viscera, muscles, and bones, and is difficult to localize (Spino, 1984).

Syrjala (1984) in an overview of clinical pain measurement, cited
two scales which measure pain using word descriptors. Melzack &
Torgerson, cited in Syrjala (1984) developed a five point scale of word
descriptors of pain dimension which represented universal descriptions for
sensory, emotional or other aspects of pain. Melzack (1975) then developed
the McGill Pain Questionnaire (MPQ) which was based on this work. The
McGill Pain Questionnaire quantifies three dimensions of pain experience;
sensory, affective, and evaluative. Patterns for different clinical pain
syndromes have been obtained which include arthritis, labor and childbirth,
cancer pain, and low back pain.

The advantage of the MPQ is that it measures both quantitative and
qualitative aspects of pain and scales pain multidimensionally. Critics of the
scale pointed out that some patients had difficulty with the complexity of
the words; that sensory aspects of pain are weighted more than affective
aspects and that it was more time consuming to administer than the VAS
(Chapman et al., 1985). Others noted that a test should show reliably that a
given “clinical pain state changes after the patient is administered an
opiate," or after surgery and that the “placebo effect” should show a
different pattern of responses (Syrjala, 1984). The statistical manipulation
of MPQ scores has also been criticized for not being “standardized." It has
been suggested that “spatial distribution of chronic pain conditions” be
assessed as well because “behavioral variables change significantly as a
function of pain location and distribution” (Chapman et al., 1985, p. 22).
An eight point facial expression picture scale has been developed which has
been found to correlate well with visual analog and numeric rating scales (Syrjala, 1984).

Chapman et al., (1985) found four problem areas in their review of the literature on pain measurement. These included the following:

1. The literature lacks an integrated overview of pain assessment technology and a critical evaluation of the methods commonly employed.

2. There is a need for integration of work on pain measurement in animal, human laboratory, and clinical areas of investigation.

3. There is need for broader, more comprehensive operational definitions of pain.

4. The area of clinical pain in animals needs to be explored further in order to validate and extend the findings of laboratory research. (p. 24-25)

THEORIES OF PAIN

There are three main theories of pain: specificity theory, pattern theory and gate control theory.

Specificity Theory of Pain

The traditional specificity theory of pain, which is still taught in some medical schools, proposes that pain is a specific sensation and that the intensity of pain is proportional to the extent of tissue damage. The theory implies a fixed, straight-through transmission system from somatic pain receptors to a pain center in the brain. However, recent evidence shows that pain is not simply a function of the amount of bodily damage alone, but is influenced by attention, anxiety, suggestion, and other psychological
variables. Moreover, pain is not only a sensory experience but also has obvious emotional properties that demand immediate attention, disrupt ongoing behavior and thought, and drive the organism into activity aimed at stopping the pain. These data refute the concept of a straight-through sensory transmission system (Melzack, 1989, p. 652).

**Pattern Theory of Pain**

The pattern theory of pain, a rival theory to the 'specificity theory', was proposed by Goldscheider who believed that pain depended on the "summation of neural inputs that must reach a critical level for pain to be felt. Peripheral stimulation is not enough, because central systems are important in this summation" (Hilgard & Hilgard, 1975, p. 34). This theory does not support the concept of peripheral sites which transmit painful stimuli along a set of peripheral nerves.

Modern theories include both peripheral and central summation, and as did earlier theories, attempt to explain why pain may endure beyond the initial stimulation (Hilgard & Hilgard, 1986; LeRoy, 1976; Melzack & Wall, 1982).

**Gate Control Theory of Pain**

Melzack & Wall (1965) proposed that neural mechanisms in the dorsal horns of the spinal cord act like a gate which can increase or decrease the flow of nerve impulses from peripheral fibers to the spinal cord cells that project to the brain. Somatic input is therefore subjected to the modulating influence of the gate before it evokes pain perception and response. The theory suggests that large-fiber inputs tend to close the gate, while small fiber inputs generally open it, and that the gate is also
profoundly influenced by descending (italics added) activities from the brain. It further proposes that the sensory input is modulated at successive synapses throughout its projection from the spinal cord to the neural areas responsible for pain experience and response. Pain occurs when the number of nerve impulses arriving at these areas exceeds a critical level. The theory, therefore, proposed a mechanism to explain pain relief by a variety of different procedures which close the gate by selective activation of large fibers (i.e., physiotherapy) or by activation of descending inhibitory influences from the brain (i.e., distraction of attention).

Melzack (1989) theorized that there are “three major psychological dimensions of pain: sensory-discriminative, motivational-affective, and cognitive-evaluative....these are subserved by physiologically specialized systems in the brain, as follows:

1. The sensory-discriminative dimension of pain is influenced primarily by the rapidly conducting spinal systems.

2. The powerful motivational drive and unpleasant affect characteristic of pain are subserved by activities in reticular and limbic structures which are influenced primarily by the slowly conducting spinal systems.

3. Neocortical or higher central nervous system processes, such as evaluation of the input in terms of past experience, exert control over activity in both the discriminative and motivational systems. (p. 6525)

All three forms of activity can then influence motor mechanisms responsible for the complex pattern of overt responses that characterize pain. Acute and chronic pain are influenced by two different (italics added) ascending spinal cord pain-signalling pathways. One set of pathways, the ‘lateral pathways’ convey phasic information, while the other
set of pathways are slower and ‘are unlikely to signal the need for immediate action’ .... These ‘medial pathways’ carry ‘tonic’ information and “they continue to send information as long as the wound is susceptible to re-injury. These messages may prevent further damage, and foster rest, protection, and care of the injured areas, thereby promoting healing and recuperative processes’ (Melzack, 1989, p. 6525).

As well as the ascending pathways, Melzack (1989) theorized that there is in the brain a ‘powerful descending (italics added) system which is able to inhibit, or ‘close the gate’ to incoming pain signals (Melzack, 1961; 1989). Melzack theorized that memory may account for the persistence of certain kinds of pain. He cited experiments where a rat with an injured hindpaw showed a heightened sensitivity to pain not only in the injured paw but in the opposite paw and continued to have sensitivity to pain in the injured paw after the nerves from the injured paw were cut. Melzack (1989) concluded that, ‘These results show clearly that the hyperalgesia (heightened sensitivity to pain) is dependent on abnormal activity in the central nervous system, probably the spinal cord’ (p. 2530).

From studies of chronic phantom body pain in paraplegics who sustained total spinal cord lesions, Melzack and Loeser (1978) proposed that synaptic areas along the major sensory projection systems, from the spinal cord to somatosensory projection areas in the thalamus and cortex, may become pattern-generating mechanisms. Once the pattern-generating mechanisms become capable of producing pain signals, any input may act as a trigger.
TREATMENTS FOR THE MANAGEMENT OF PAIN

Cognitive-Behavioural Methods

During the last decade, cognitively based therapies have proliferated. Therapy methods are based on the assumption that emotional disturbance is the function of maladaptive thought patterns which must be restructured. The three most influential cognitive-behavioral therapies are Ellis' (1975) rational-emotive therapy; Beck's (1970) cognitive training therapy, and Meichenbaum's (1977) self-instructional training. All three therapies make use of imagination procedures such as imagining the desired behavioral and emotional responses while thinking rational thoughts discussed during therapy (Rachman & Wilson, cited in Spinhoven, 1987).

Sternbach (1986) noted that there are "philosophic and psychologic" differences in the assumptions "underlying cognitive and behavioral interventions. Cognitive theories assume that if one changes the ways of thinking, there will be changes in affect and behavior that will follow. Behavioral theories assume that if behavior changes, there will be consequent changes in affect and--especially--in cognition, as through the process of cognitive dissonance" (p. 235). Tan (1982) in a review article noted that evidence for the efficacy of cognitive-behavioral techniques were good for experimental pain but meager for clinical pain.

More than 30 different illnesses and anatomic dysfunctions have low back pain as a symptom (Grzesiak and Ciccone, 1986, p. 175). Chronic low back pain, migraine headaches and cancer pain are the most difficult pain syndromes to treat (Melzack & Wall, 1988). Flor & Turk (1984) categorized low back pain as inflammatory, degenerative, structural,
traumatic and muscular ligamentous processes but the specific (italics added) process which caused back pain were unclear.

The psychological treatment of patients with chronic low back pain is very difficult and has been avoided by psychiatrists and psychologists because they:

Deny psychologic distress, reject suggestions that their pain problems may have psychologic basis, have little or no insight, and are not introspective....this group of patients tends to be very resistant to exploring personal issues and frequently reacts negatively, often vituperatively, when referred for psychologic treatment. (Nigl, 1984, p. 127-128)

Behavioral methods of dealing with chronic pain, "derive chiefly from the classical conditioning of Pavlov, as represented by the desensitization therapy of Wolpe (1958) from the operant conditioning of Skinner (1969) and from the social learning theory of Bandura (1969)" (Hilgard, 1980, p. 261). Operant conditioning, as practiced in pain clinics which treat chronic pain, focus on the theory that pain responses have been learned and therefore can be unlearned. The patient is "rewarded" for "non-pain" responses and pain responses are "countered or extinguished" (Sternbach, 1974, 1978; Fordyce, 1978). Hilgard (1980) gave the following example:

A person with joint pains can walk only so far before the pain becomes so great as to require rest. Looking forward to that rest is like expecting a reward for experiencing pain. Hence, having found the distance that can be walked without excessive pain, the patient at first is requested to walk less than this distance, so that the pain is not reinforced following the walk. Each day the walk is lengthened a little, and, not surprisingly, the person walks beyond the original tolerance limit without experiencing the rest-demanding pain.
Corresponding methods are used to reduce dependence on pain-reducing drugs. A 'drug-cocktail' consisting of the usual dosage mixed with a taste-concealing fruit drink, is taken at regular intervals, so that it is no longer associated with the relief of pain that has mounted to some disturbing level. With the pain thus controlled, without being contingent on the timing of the drug intake, the amount of drug is gradually reduced until the patient remains comfortable with the 'cocktail' no longer containing any pain medication. (p. 261)

**Biofeedback**

Clinically, biofeedback therapy "is a blend of physiological and psychotherapeutic intervention" (Schuman, 1982, p.164). Biofeedback is a form of behaviour therapy but it differs from the more "strictly conditioning therapies" because there is an emphasis on "achieving voluntary control" through "amplification of the changes in electrophysiological or neuromuscular processes over which control is sought. Examples are learned control over muscular tension through observing the signals from selected muscle groups by way of the electromyogram, and control of blood flow through amplification of temperature changes in the figures" (Hilgard, 1980; p. 262).

Karoly and Jensen (1987) described electromyographic feedback (EMG) as the measurement of:

small amounts of electrical activity that are produced by muscles when they are active (that is, tense). . . . electromyography has the potential to be useful in the assessment of pain conditions that are or may be associated with abnormal muscle response. Pain disorders studied with EMG include back pain, headache, and the myofacial pain dysfunction (MPD) syndrome. (p. 76)
Two assumptions are made by the biofeedback clinician; one, that muscle tension and spasm have a causal relationship to pain and that the reduction of muscle tension thus reduces pain; and two, that a generalized state of relaxation should contribute to pain relief, either by diminishing affective concomitants related to the problem or through some central gating mechanism. Muscle pain is frequently associated with a pattern of chronic muscle tension (Grzesiak, 1984; Schuman, 1982).

Hilgard (1980) noted that the rationale between pain control through hypnosis and pain control through biofeedback differed; in hypnosis, pain is removed through a process of denial, whereas in biofeedback there is a "realistic sensitivity to bodily processes, such as relaxation," therefore individuals who are good at hypnosis might not be good at biofeedback (p. 262). Hilgard also pointed out that biofeedback could in itself be a form of distraction from pain. In a review of psychological approaches to the management of chronic pain, Schuman (1982) noted that some researchers theorized that:

Hypnosis and biofeedback involve different skills and mechanisms. Biofeedback involves a focus on an external stimulus, which may distract some subjects from the inwardly directed experience that characterizes deep relaxation or hypnosis. (p. 164)

Schuman (1982) defined biofeedback from two very different perspectives: the specificity model which theorized that the individual is "trained to vary a target function in a quite differentiated and specific manner" and the state model which theorized that the individual "shapes a more general change in behaviour along a continuum of arousal-relaxation" (p.153). As an example, if the individual wished to decrease heart rate through the use of biofeedback; with the specificity model, the
individual would learn "to become aware of cardiac activity and learn to decrease heart rate at will," whereas with the state model the individual would learn "to produce a state of deep bodily quiet that happens to be associated with a decrease in heart rate" (p. 153).

Schuman (1982) concluded that "biofeedback therapy for chronic pain has no specific psychophysiological basis: it becomes instead a psychotherapeutic (italics added) context for teaching relaxation or exploring the mind-body relationship." However, relaxation "which is a common clinical objective in biofeedback training" may sometimes reduce pain by interrupting the "pain-tension" cycle, or in some cases it "may worsen pain" (p. 165).

Nouwen and Solinger (1979) compared chronic low back patients who received low back EMG feedback with a control group over 20 sessions and reported that the treatment group had lowered EMG recordings and lowered pain self-report at the end of treatment but that both had returned to baseline levels at a one month follow-up. They concluded that the biofeedback training given to the treatment group produced a sense of control (italics added) which changed the patient's attitude towards pain and that this was more important than the physiological function of pain.

In another comprehensive review of the literature on low back pain and EMG biofeedback, Nouwen and Bush (1984) came to the conclusion that there was no consensus on the role of paraspinal muscle tension in the production of low back pain. However, they did note that pain avoidance may cause patterning of the muscles in the low back which are the result of posturing which in turn causes muscle spasm. The authors stated that these results were not "atypical" and cited other studies (Epstein et al., 1977;
Penzien et al., 1983) which showed similar findings with tension headaches and studies (Ciccone and Grzesiak 1984; Turner and Chapman, 1982) which concluded that the advantages of biofeedback have more to do with the psychological (italics added) rather than the biological aspects of pain treatment.

Fowler and Kraft's study (cited in Schuman, 1982) found that patients with muscle pain generally do sustain a level of tension as evidenced by electromyographic readings (EMG) which is significantly higher than normal. Schuman (1982) reported that some researchers reported EMG training was successful without resulting in pain relief and others reported that pain relief was maintained and even improved while EMG readings reverted to pretraining levels.

There is considerable controversy in the literature regarding the efficacy of using EMG readings as an indication of reduced pain. Syrjala (1984) reviewed the literature and came to the conclusion that researchers had found that patients suffering from identical diagnoses of low back pain did not have identical EMG readings; some were elevated and some were reduced. Schuman (1982) cited Phillip's study which found that if EMG readings decreased within a session, the readings tended to show a progressive decline over many sessions but noted that biofeedback training did not necessarily enable either a lasting reduction in EMG or one that generalized outside the office or laboratory. Another study by Phillip found that when pain patients tensed or activated painful muscles, there was a disproportionate amount of EMG activity from each side of the back as compared to normals.

In spite of these conflicting findings, Schuman (1982) concluded that EMG feedback is a useful clinical technique in treating muscle tension pain
because it can facilitate the learning of muscle relaxation skills; it can train
the patient to recognize the maladaptive muscular response and this in turn
can facilitate identification of situational factors that are related to this
response and even temporary reduction in muscle tension may interrupt the
pain-tension cycle. Because researchers have found that EMG readings are
significantly higher in chronic pain patients they are therefore one of the
most frequent applications of biofeedback for the reduction of muscle
tension in chronic pain patients.

Researchers differ on the effectiveness of frontalis EMG for the
reduction of muscle contraction headache. Grzesiak and Ciccone (1986)
cited studies (Gottlieb et al., 1977, 1982; Johnson et al., 1983) of muscle
tension and pain reduced by EMG frontalis feedback but disputed the
findings because the EMG component was not the only intervention used to
reduce pain. They disagreed with the theory that a state of relaxation in one
area of the body can "generalize" to another part of the body and stated
that, "The idea that frontalis tension can serve as an indication of general
muscle tension has not met with empirical support" (p.176). The authors
concluded that, "It is unlikely that there is such a phenomenon as general
muscle tension contraction" (p. 176).

Some researchers found EMG feedback to be effective on tension
headaches (Budzynski, 1973; Wickramasekera, 1972; Haynes, 1975; Jessup,
1984). Haynes (1975) found both EMG feedback and relaxation training
superior to a no-treatment group in the reduction of muscle contraction
headaches. Others, (Large, 1983) found EMG to be useful in muscle
relaxation but not in pain reduction. Chapman et al. (1985) cited one study
which compared pain perception of pain patients with normals and found
no correlation with EMG recordings.
Keefe, Block, Williams & Surwit (1981) cited a study by Keefe of 111 chronic low back pain patients who participated in a comprehensive behavioral treatment program emphasizing relaxation procedures. Over the course of treatment, significant reductions were obtained on measures of subjective tension, EMG activity, and pain. Fordyce et al. (cited in Keefe et al., 1981) demonstrated the utility of operant conditioning techniques in modifying well entrenched behavior patterns of chronic low back pain patients, such as narcotic dependence and inactivity. Keefe et al. (1981) stated "recent studies employing behavior therapy techniques such as assertive training, progressive relaxation and electromyographic frontalis biofeedback" showed "interesting results" but didn't state which studies they referred to. The authors noted that, "More clinical studies with large numbers of chronic low back pain patients are needed" (p. 222).

Other researchers found that combining therapies proved more effective in the treatment of pain. Melzack & Perry (1975) studied the effects of alpha biofeedback training and hypnosis by comparing them in a study on the treatment of chronic pain. Both treatments produced increased alpha activity but both were unsuccessful in the reduction of pain. However, when the authors "combined (italics added) the alpha biofeedback training with hypnosis, the patients reported significant pain suppression" (p. 820). The authors concluded:

The multidimensional nature of the relaxation response may explain its success in the alleviation of pain. Since the relaxation response combines increased alpha with attentional modification and suggestion, the synergistic effects may account for the successful use of the relaxation response in the treatment of pain. (p. 820)
Similarly, Melzack & Wall (1988) reported that "multiple convergent therapy using several psychological procedures is effective because each kind of therapy may have its predominant effect on a different mechanism" (p.261). The authors theorized that:

The data indicate that multiple convergent therapy using several psychological procedures is effective because each kind of therapy may have its predominant effect on a different mechanism. Relaxation, for example, may reduce muscle tension and generally reduce activity in the sympathetic nervous system. Hypnosis, however, may have its predominant effect by activating control processes that modulate the input as it is transmitted through the brain. Procedures which involve the diversion of attention (so that even spinal reflexes may fail to occur) may, conceivably, activate the descending systems of the brainstem so that inputs are modulated at spinal levels. (p. 261)
Medical Treatment for Pain

Medical treatments for pain focus on eliminating or altering the problem which produces the pain. Analgesics are commonly used for pain relief but many other techniques ranging from ancient methods of magnets, copper bracelets, acupuncture, etc., to more modern methods of physiotherapy, transcendental meditation, surgery, homeopathic medications and drug therapy are used (Spino, 1984).

Surgery is commonly used for chronic back pain (CBP). Flor and Turk (1984) reported that in 1982, surgeons in the United States, which has the highest number of back surgeries in the world, excised approximately "200,000 discs" (p.111). The authors concluded that the results of back surgery are disappointing and cited Finneson (1979) who suggested that, "80% of the surgical patients should never have entered surgery. Often, surgery increases the pain problem instead of attenuating it" (p.112).

Physical therapy is encouraged with chronic pain patients who often become inactive, lose muscle tone and become intolerant of physical exertion (Fordyce,1986; Guck, 1985). Physical therapists use exercise, heat, cold and massage to alleviate muscle spasm and restore spinal mobility and muscle strength. Very little research has been done on the effectiveness of these treatments (Flor & Turk, 1984).

Blumer (cited in Spino 1979) found that chronic pain patients have considerable emotional problems and recommended various types of psychotherapy for helping patients cope with their depression and focus on pain. He included, "dynamic therapy, hypnotherapy, behavioral therapy, and group therapy" as treatments which have "moderate success" with chronic pain (p. 38).
Transcutaneous electrical stimulation (TENS) is a current treatment for chronic pain, however there is controversy over its analgesic component. Some researchers believe any benefit is due to the placebo effect (Spino, 1984) while others believe that electrical stimulation is carried through large nerve fibers, or afferents, which close the 'gate' (Melzack & Wall, 1965) thus disrupting input along small diameter fibers (which transmit pain stimuli).

Some medical researchers advocated an eclectic approach to the treatment of chronic pain. Pinsky & Malyon (Cited in Spino, 1984) theorized that effective therapy for chronic pain patients in an "intensive seven-week program" should include, "psychodynamic psychotherapy, existential approaches, and cognitive-behavioral therapies" (p.111). The authors stated:

Neurosurgeons, psychiatrists, and psychologists all appear to agree that the most effective treatment methods are those that focus on the patient's general personality and emotional make-up. The primary goal is to re-educate the chronic pain patient in order to reduce his or her overpreoccupation with pain and pain behavior. Traditional pain relief methods, such as neurosurgery or medication, are de-emphasized and often discouraged. Chronic pain is conceptualized as primarily a psychological problem which does not fit a disease model for either diagnostic or treatment purposes. (p. 111)

Melzack (Melzack & Wall, 1965) stated that while it is possible to reduce many kinds of clinical pain by means of analgesic and antidepressant drugs, sensory modulation (e.g. nerve blocks or transcutaneous electrical nerve stimulation) as well as by different psychological therapies....they rarely abolish pain entirely and are not equally effective for everyone” (p. 261). He concluded:
We have learned, as a result of literally hundreds of experiments, that there is a limit to the effectiveness of any given therapy but, happily, the effects of two or more therapies given in combination are cumulative. Two therapies, each with slight effects that may not reach statistical significance compared to a placebo, may produce significant reductions in pain when given together. For this reason, *multiple convergent therapy* (italics added) is increasingly becoming the standard approach to pain problems. (p. 261)

Melzack & Perry (cited in Weisenberg, 1984) conducted a clinical study of alpha training alone, hypnosis alone, and a combination of the two suggested benefits with three groups of chronic low back patients. The authors concluded that:

The combination of hypnosis and alpha-training significantly relieved pain compared to the baseline measures; 58% of the patients reported a decrease of pain of 33% or greater. Hypnosis alone achieved a substantial but statistically insignificant change from baseline while alpha training alone was ineffective. The authors interpret the combined procedure as consisting of alpha training as a distractor of attention combined with relaxation, suggestion and a sense of control over pain. The increase in percentage alpha production alone, a measure often used to indicate relaxation, was not adequate. (p. 165)

**Pain Clinics**

In response to the challenge of treating chronic pain patients, Dr. John Bonica of the University of Washington Medical School decided to try a new approach and developed the concept of a pain clinic which would treat the patient with a variety of approaches using the talents of "surgeons, neurologists, psychiatrists, psychologists....who meet the patients both individually and as a group." (Melzack & Wall, 1988, p. 263). During the
last decade, this idea has spread so that there are pain clinics in most major cities throughout North America. Melzack & Wall (1988) stated that the advantages of having different specialists treat the same patient are threefold:

The professional can learn not only from a special group of patients but also from each other; by grouping many pain patients and many concerned professionals together, new therapies are developed; data can be accumulated on the relative effectiveness of different therapeutic procedures which are often lost when a patient visits each specialist in his own clinic. The pain clinic allows for the combination of pharmacological, sensory, and psychological methods of pain control, which may be used in different combinations depending on the type of pain and the needs of the individual pain patient. (p. 263)

Drugs

Pain medication is an important aspect in treating the chronic pain patient. Chronic pain patients often receive excessive doses of opiates (drugs derived from opium) which may cause drug dependency and abuse (Gorsky, cited in Nigl, 1984). Flor & Turk (1984) reviewed chronic pain and reported that medication was the "physician's treatment of choice" for chronic back pain (p.111). They questioned the value of both narcotic drugs (e.g., morphine and codeine), and the non-narcotic drugs (e.g., aspirin) as a treatment:

Although analgesics undoubtedly relieve pain for brief periods, tolerance, habit formation and side-effects pose various problems and make their prolonged use not advisable. Other medications, such as antidepressants, muscle relaxants and anti-inflammatory agents are increasingly used, but few controlled trials are available to assess their efficacy. ( p. 111)
The authors noted that the evidence is inconclusive because most studies are done on *acute* (italics added) back pain patients.

During the 1970s advances were made in the investigation of the physiological effects of pain (Nigl, 1984). Naturally occurring substances called endorphins and enkephalins which are morphine like pain inhibitors were isolated in the brain. Spino (1984) posited the theory that patients whom he calls 'placebo responders' (patients who respond well to a sugar pill in the belief that the pill is a drug), have the ability to release these natural analgesic substances from receptors in the central nervous system (CNS) in response to a placebo. He noted that "so-called 'real' as well as 'psychogenic' pain may be relieved by a placebo" (p. 39).

At the same time researchers found that pain impulses could be transmitted by both chemical and electrical systems. They discovered new pain inhibitors called 'beta-endorphins' which are 48 times as potent as morphine when injected into animals and they found that the brain (italics added) produced endorphins when deep regions were stimulated electrically (LeRoy, 1976). Although enkephalins and endorphins both have strong analgesic and other properties, their physiological role and their involvement in endogenous pain control is not yet fully known. Hilgard (1986) noted that some experiments eliminated endorphins as part of the opiate class because naloxone which is an "antagonist" to endorphins does not appear to reverse "hypnotic analgesia" (p. 209).

Hilgard (1986) cited a study by Barber & Mayer of a dental patient who used hypnosis as the sole anesthetic for the removal of four impacted molars. Her EEG activity was monitored and it was concluded that "hypnotic responses may be a right hemisphere function, in part as a result of direct EEG studies, in part because of the relationship of hypnosis to
imagery and fantasy, also predominantly right hemisphere function" (1986, p.210). Hilgard noted that further interviews of the patient "showed that the pain control had been achieved largely through enriched fantasies with hypnosis, a form of dissociative distraction that reduces felt pain, regardless of the physiological stresses that the surgical insults may have produced" (p.210).
Hypnosis

History of Hypnosis

Both waking and hypnotic suggestion have been practiced since ancient times. Witch doctors, magicians, medicine men and shamans in primitive cultures have used monotonous drumbeats, chanting and dancing as a form of trance induction. The healing powers of trance induction have been referred to in the early civilizations of Syria, Egypt, and Greece where patients went to "sleep temples" and were hypnotized or talked to during their sleep and given suggestions for relief of their symptoms. Persian magi and Hindu fakirs used eye fixation techniques to intensify cataleptic states. Techniques of waking suggestion have been used by the church in the form of faith healing, however the western Christian world throughout the middle ages regarded the use of hypnosis for healing as sacrilegious and the work of the devil (Pulos, 1980).

Hypnosis as a therapy has gone through cyclical stages since its inception in the 1700s; at times popular and supported by those in the academic psychological community and at other times unsupported and in disrepute (Hilgard, 1969). Most researchers (Ambrose, 1980; Gorsky, 1981; Miller, 1979; Mutter, 1988; Pulos, 1980; Rosen, 1960) refer to Dr. Anton Mesmer (1734-1815) as the father of medical hypnosis. He was influenced by Grassner, a German priest who performed "miraculous healings" and by English physicians who believed in the curative powers of magnets. He termed this power "animal magnetism," a redistribution of a fluid circulating in the body, to distinguish it from "mineral magnetism." He theorized that the individual had a "electrochemical relationship" with
the planets through this fluid. And disease was caused by a "disequilibrium in this system."

Mesmer believed that he had magnetic rays which flowed from his fingers to cure his patients. He developed a bath-like structure, or "bacquet," lined with iron filings and magnets in which a patient was immersed for a cure. His success was due largely to the power of suggestion and the patient's expectation of a cure and not the iron filings which his patients held. He became famous after he cured a child of hysterical blindness. She was a pianist; a child prodigy who was a favourite of Empress Maria Theresa. Unfortunately, the child again developed blindness and this put Mesmer in disfavour with the Empress. A French Royal Commission was set up at the insistence of the medical establishment of the time and they discredited his theories. Mesmer was denounced as a fraud, lost his license to practice and was forced to retire (Hershman & Secter, 1961; Pulos, 1980). Seventy years later Elliotson and Braid, British doctors, explored Mesmer's methods. Braid coined the word "hypnotism" and was the first to substitute visual optic fixation for hypnotic passes to induce trance (Chertok, 1967).

Hypnosis has been used for the management of pain since the early 19th century when it was used to provide analgesia for surgery (Crasilneck and Hall, 1985b; Hilgard, 1986; Sternbach, 1984). In the 1800's James Esdaile, a Scottish physician, was the first to use hypnosis as a means of anesthesia and was reported to have performed over three hundred major and several thousand minor operations quite painlessly on patients. Shortly afterward in France, Dr. Ambroise August Liebeault of the Nancy School discovered that by combining verbal sleep suggestion and Braid's method of fixed gazing he was more effective in hypnotizing patients. He wrote a
book about his methods but sold only one copy due to criticism from the Salpetriere School of medicine which opposed the psychological orientation of hypnosis as a treatment (Chertok, 1967).

Bernheim, a famous neurologist, initially opposed Liebeault but after trying out his methods on patients recognized the significance of the verbal suggestion used by Liebeault. He was the first to demonstrate that the phenomenon of suggestion was the real underlying factor of hypnosis and that hypnosis was due exclusively to psychological rather then physical causes, thus disproving the original conclusions of Mesmer, Braid, Charcot and others (Cheek & LeCron, 1968; Miller, 1979).

The French neurologist, Charcot, in 1878 revived Mesmer's theory of animal magnetism and was opposed by the Nancy School headed by Bernheim. Miller (1979) related an incident which was pivotal in changing Charcot's mind:

> It appears...that Charcot did not realize that the hypnotic influence was exercised by means of suggestion; rather he believed that physical phenomena were involved. For instance, on one occasion, Charcot presented a man whom he believed was quite deaf, in the hypnotic state. He then announced that a magnet would produce a certain effect. Bernheim than demonstrated that the effect was due purely to the suggestion and not magnetic force; that the subject could hear perfectly well and that a wooden imitation "magnet" produced the same remarkable effect. (p. 22-23)

During the last three decades hypnosis has increased in popularity. Single case studies have been reported on integrating hypnosis with Gestalt therapy (Barber, 1986), Rational Emotive Therapy (Ellis, 1986), and Ericksonian and cognitive-behavioral therapy (Golden, 1986). Although hypnosis was not fully accepted by the medical establishment, after World
War II, it was given official sanction by the British medical association in 1955 and American medical association in 1958 (Hilgard, 1986). Crasilneck & Hall (1985) cited a survey by Sachs (1982) which reported that:

A 1978 survey revealed that one third of American medical and dental schools were offering courses in hypnosis, twice as many as a similar survey in 1974. It is estimated that more than 10,000 physicians, psychologists, and dentists in North America are trained in the use of hypnotherapy as an adjunct to traditional forms of medical and dental treatment. (p. 3)

Theories of Hypnosis

Chertok (1967) posited three approaches to hypnosis: physiological, experimental psychological, and psychoanalytical. Physiological theories use Pavlovian concepts and regard hypnosis as an incomplete sleep which allows a communication between the hypnotist and the subject due to "waking points" in the brain. Pavlovians use animal experiments to confirm their theory. For example, a dog conditioned to the sound of a trumpet awakens only to this sound and remains insensitive to other sounds even if they are more intense. (Birman, cited in Chertok, 1967) Chertok noted that experiments on animals cannot be compared to man; that language cannot be compared to a "physical stimulus" and that even Pavlov admitted that the similarity between hypnosis and sleep has "received no electroencephalographic confirmation whatsoever" (p. 4).

Experimental psychology is based on the concepts of Bernheim (1884) and in the United States was developed by Hull in the thirties. Hull theorized that "suggestibility" was the basis of hypnosis and that hypnosis was "a kind of learning" (Chertok, 1967, p. 5). Chertok cited
Weitzenhoffer, Hilgard and Orne as researchers who attempted to quantify hypnosis. Hilgard (cited in Chertok, 1969) studied the psychological characteristics of hypnosis and classified seven:

1. Subsidence of the planning function;
2. Redistribution of attention;
3. Availability of visual memories from the past, and heightened ability for fantasy-production;
4. Reduction in reality testing, and a tolerance for persistent reality distortion;
5. Heightened suggestibility;
6. Aptitude for role behaviour;
7. Amnesia for what transpired with the hypnotic state (Chertok, 1969, p. 5).

Hilgard (1986) concentrated on the problem of hypnotizability from the point of view of quantification but found that this approach did not answer the question of why one individual is easier to hypnotize than another.

The psychoanalytic theory of hypnosis was originally interpreted as "a gratification of the subject's instinctual wishes. It was seen as a masochistic type of relationship and a form of transference (Ferenczi, 1909; cited in Chertok, 1967).

During World War I, hypnoanalysis, the merging of hypnotic techniques with psychoanalytic techniques, was developed by Ernst Simmel, a German psychoanalyst. At the same time other psychoanalysts used "barbituates to induce a state of drug hypnosis (narcosynthesis) in order to bring traumatic experiences to the surface." These techniques were used
during World War II to treat "combat fatigue and other neuroses" (Hershman & Secter, cited in Hilgard, 1986, p. 9).

Pierre Janet (1859-1947) was one of the first to attempt to explain hypnosis. Janet was a philosopher and physician at the Saltpétrière School in Paris and was the first to use the expression "subconscious" (Haule, 1986). He posited the theory of progressive dissociation which occurred during hypnotic induction. He believed that the subconscious mind took over during deep hypnosis particularly if the conscious mind was suppressed and inhibited. Joseph Breuer, a physician who with Freud had used hypnosis on mental patients, discovered at the same time as Janet, the importance of uncovering traumatic experiences through the use of hypnosis. Later, these methods were used successfully to treat soldiers during World War II (Miller, 1979).

Freud became interested in hypnosis after witnessing Dr. Breuer cure a case of hysteria. He studied hypnosis under Charcot, Bernheim and Liebeault but became discouraged when he found that he could not hypnotize all his patients. However, Freud was very analytical and gained new insights into the dynamics of the unconscious mind during hypnosis. He observed that repressed memories and experiences could be recaptured by means of association while a patient was in a hypermnestic (unusual ability to remember) state. From this he developed the technique of "free association" which was the beginning of the development of psychoanalysis (Sternbach, 1984). He observed "the intense affective reactions of the unconscious in the phenomena of abreaction and catharsis" (Miller, 1979, p. 24). Jung also used hypnosis from which he evolved the technique of "active imagination" (Barber, cited in Araoz, 1985, p. X).
Rossi (cited in Araoz, 1985) suggested that, "Milton H. Erickson (1902-1980) would have called free association and active imagination indirect forms of hypnosis" (p. X). Erickson was a psychiatrist whose indirect methods of hypnosis are well documented (Erickson, 1967, 1983). Erickson (1989) developed concepts and techniques which differed from the traditional authoritarian direct approach to hypnosis which gave the hypnotist magical powers over the subject, like the stereotypical stage hypnotist. He viewed therapy as an "interactional process" between the therapist and client in which the relationship between the hypnotist and therapist was one of "cooperation based upon mutually acceptable and reasonable considerations" the subject therefore "cannot be forced, as a function of hypnosis itself, to do things against his will, as is sometimes claimed. He can be aided in achieving possible desired goals, but frequent failures in hypnotherapy attest to the limitations of hypnosis in accomplishing even wanted purposes, and extensive and reliably controlled studies discredit the possibilities of antisocial use of hypnosis" (Araoz, 1985, p. 1).

Erickson stressed the individuality of each person and tailored therapy to the uniqueness of each individual (Yapko, 1984). Haley (cited in Yapko, 1984) explained Erickson's approach as that of "teacher and student" in the sense of developing a situation in which the patient or client is forced to view it from a different perspective. Rossi (1986) reported that Erickson's approach emphasized the use of the patient's conscious and unconscious resources. Erickson theorized that we communicate with both a "conscious language" and an "unconscious language" and that this "communication" was "in the form of body movement, vocal intonation, and the metaphors and analogies implicit in our verbal speech" (p. 545).
Rossi (1986) referred to Rank's theory that the source of "complexes and neuroses" stem from "the original trauma of birth" and he posited the theory that, "the entire edifice of psychoanalysis could be said to rest upon this effort to explain how trauma gave rise to emotional complexes by initiating dissociation repressions, and amnesia." He cited Erickson as demonstrating, "how amnesias caused by psychological shocks and traumatic events are psycho-neuro-physiological dissociations that can be resolved by 'inner resynthesis' in hypnotherapy" (p. 39).

Rossi (1986) posited the theory of "state dependent learning" which he explained as follows:

We would submit that hypnotic trance itself can be most usefully conceptualized as but one vivid example of the fundamental nature of all phenomenological experience as "state-bound". The apparent continuity of consciousness that exists in everyday normal awareness is in fact a precarious illusion that is only made possible by the associative connections that exist between related bits of conversation, task orientation, etc. We have all experienced the instant amnesias that occur when we go too far on some tangent so we "lose the thread of thought" or "forget just what we were going to do," etc. Without the bridging associative connections, consciousness would break down into a series of discrete states with as little contiguity as is apparent in our dream life". (p. 41)

Kebrdle and Roeder (1986) cited other theories of hypnosis which included definitions of hypnosis as:

An altered state of consciousness (Barber, 1976), heightened expectancy (Barber, 1976), increased compliance and belief in the hypnotic state (Wagstaff, 1981), increased suggestibility (Von Dendenroth, 1968), a unique cognitive state (Hilgard, 1977), role-taking (Sarbin & Slagle, 1979), regression (Gill & Brenman, 1961), dissociation (Hilgard, 1977; Nogrady, McConkey, Laurence &
Perry, 1983), and heightened imagery. (Barber, Spanos & Chaves, 1974, p. 22)

In the 1970s Hilgard (1973) posited a "neodissociation" theory of hypnosis based on Janet's (1889) theory of progressive dissociation. Hilgard (1973) referred to Freud's theory of repressed thoughts and wishes in the unconscious as a 'closed' form of the theory and posited that in the 'open' form of the theory, "the subconscious layer is not only more extensive than the conscious layer, but it has access to some broader sets of experience that may never have been in the waking consciousness" (p. 405). Hilgard cited Jung's collective unconscious, universal archetypes and mandala symbols in dreams as a more recent example of the theory.

Hilgard explained his theory as follows:

Many of the arguments over classical dissociation theory and the efforts to provide experimental tests have assumed that if systems are dissociated there should be no interaction between them or at the very least that the interaction should be reduced by hypnotic dissociation. I propose, instead that the problem of separation, both in awareness and in behavior, is an empirical one and may be a matter of both dimensionality and degree. That is, cognitive and behavioral systems that are separated in one dimension may be interacting in another, and the separation or interaction need not be sharp in order for some dissociative process to be demonstrated. Hence there may be partial dissociations, according to various criteria, and these may tell us about important aspects of cognitive functioning. For example, in experiments on dichotic listening to conversations, in which one message comes to one ear and a separate message to the other ear, the listener readily processes one message and ignores the other. Here one cognitive control system is dominant over another, and the two systems can be thought of as dissociated, because messages are surely reaching both ears. It is known however, that while fully processing only one message, a subject may still report whether the other message is being delivered by a male
or female voice, and, if interrupted, he can often tell you something of what was said to the nonattending ear. In other words, the dissociation is incomplete. Similar evidence can be found for the incompleteness of the dissociations in hypnotic experiments. (pp. 404-405)

Hilgard (1973) cited an experiment on task interference to show that there is a 'cognitive cost' in maintaining hypnotic dissociation. A subject who in the waking state was given the task of alternatively pressing two keys with the index and middle fingers of the right hand, did so with few errors. Under hypnosis, with posthypnotic suggestion with the task out of awareness, the subject made approximately 20% errors. He stated:

Keeping the task out of awareness apparently uses some of his attentive ability and interferes with the performance. If there is added a simultaneous task, such as naming colors aloud from a panel of colors before him, with full awareness of what he is doing, this will, of course interfere with conscious key pressing. If the key pressing is performed out of awareness, the errors again rise, so that the performance with the two tasks dissociated is less efficient than when both tasks are conscious. This task interference, exaggerated when one of the tasks is performed automatically through hypnotic suggestion, is compatible with neodissociation....The basic assumption of neodissociation theory proposes that the unity which exists in personal cognitive functioning is somewhat precarious and unstable. An executive ego provides a basis for self-perception and for conceiving the self as an agent (Hilgard, 1949). Its integrity is provided largely through the continuity of the personal memories, not through any unusual self-consistency either in awareness or behavior. This executive ego has many constraints upon it, both through internal conflict and insufficiencies, and through environmental pressures, physical and social, including hypnotic interactions. There are many subordinate control systems that represent fractions of total cognitive functioning. It is proposed that these substructures have at any one time a hierarchical arrangement,
but their hierarchical positions can shift. For example, in sleep, the cognitive control system that produces dreams is more prominent than it is in waking, though it is doubtless present at a lower level in waking also, as in daydreams and fantasy production generally. Once a system is activated, it may exert its controls autonomously, even though it is a subordinate system. When, for whatever reason, you start humming a haunting tune while working at something else higher in your hierarchy, the humming may have started spontaneously and continue unchecked. Daily life is full of many small dissociations, if we look for them. Where hypnosis will enter into this framework is in shifting the hierarchies of control, so that what is normally voluntary may become involuntary, what is normally remembered may be forgotten, and (under some circumstances) what is normally unavailable to recall may be recalled. Furthermore, the dominance of the normal executive ego is reduced, though not obliterated. For example, if the hypnotic subject is given a suggestion that violates his self-conception, he is likely to be aroused from hypnosis, and the executive ego may be responsible for this arousal. (p. 405-406)

In the 1980's Rossi (1986) linked "the psychobiological characteristics of ultradian rhythms" (a multioscillatory system of psychophysiological processes involving many parasympathetic and right-hemispheric functions which have a 90-minute periodicity throughout the 24-hour day) and the "common everyday trance" that Erickson utilized for hypnotherapeutic healing to formulate the ultradian theory of hypnotherapeutic healing, in which he proposed:

1. The source of psychosomatic reactions is in stress-induced distortions of the normal periodicity of ultradian cycles;

2. The naturalistic approach to hypnotherapy facilitates healing by permitting a normalization of these ultradian processes. (p. 43)
More recently, Barber referred to the "New Hypnosis" which focuses on techniques developed over the last thirty years. These techniques "are 'client-centered hypnosuggestive approaches," of the 1980s as opposed to, 'hypnotist-centered approaches,' focusing on ritualistic hypnotic induction procedures and direct suggestions which were still dominant in the 1950s" (Barber, cited in Araoz, 1985, p. Xiii).

Hypnosis in the Treatment of Pain

Hypnosis has been used for the management of pain since the early 19th century when it was used to provide analgesia for surgery (Crasilneck & Hall, 1985b; Hilgard, 1986; Sternbach, 1984). There is unequivocal evidence that psychological factors play a part in pain perception and response (Barber, 1982; Hilgard & Hilgard, 1986; Melzack, 1988; McGlashan, 1969) but there is much controversy over how hypnosis works. Some researchers theorized that hypnosis produced physiological changes which mediate symptom relief (Finer, 1982; Hilgard, 1969). Mutter, (1986) reviewed the current uses of hypnosis in medical, dental and psychological practice:

Hypnotic suggestions for pain control and time distortion can be given to increase comfort, save time and enhance healing potential. Similar suggestions can be given to patients undergoing surgery to reduce swelling and blood loss, increase healing and resistance to infection, and speed postoperative recovery. Quite often, patients can be discharged earlier and return to normal functioning more quickly". (p. 271)

Hypnosis has been successfully used for pain reduction in the treatment of burns, obstetrics, migraine headaches, low back pain; habit
disorders such as smoking, nail biting; eating disorders and more recently with cancer patients not only to alleviate pain but as a direct intervention to combat it (Hilgard, 1967; Mutter, 1986). Hypnosis is also used as an "adjunct to psychiatry and psychology particularly in the treatment of "depression, psychoneuroneses, psychosis in remission, personality and character disorders and sexual disorders" and is "the treatment of choice" for post traumatic stress disorder because of its effectiveness as a "direct route to the unconscious mind" and the ability to "uncover repressed traumatic material within a very short period of time, in contrast with other forms of psychotherapy; which could take months or years of intensive treatment before meaningful material is uncovered" (Mutter, 1986, p. 272). Mutter stated:

Because hypnosis has a direct connection to the autonomic nervous system psychosomatic disorders such as...migraine headaches, ulcers, colitis, hypertension, certain skin disorders...respond to...hypnotherapeutic intervention....Many behavior modification techniques used with hypnosis are highly effective in symptom control....Hypnosis is also used effectively with chronic pain patients who suffer from a....loss of control...anxiety and depression. Pain clinics use hypnosis to help patients break...the pain/depression cycle. simultaneously....As well, it reduces the patient's dependency on narcotics and therefore the risk of addiction. (p. 272)

Crasilneck (1979) posited the theory that "the hypnotized patient blocks the perception of pain in the same manner that psychosurgery obliterates intractable pain. It is akin to the 'gate control theory of pain' (Melzack, 1973) with a cortical hypnotic change service as the 'gate closing stimulus.' He cited as an example a female physician in labour who was hypnoanesthetized and "described herself as having a 'psychological prefrontal lobotomy'" (p. 76).
Wyke (1986) posited the theory of hypnosis as "applied neurology," or "a state of modified attention, created by modification brought about in the central nervous system, by external or internal stimuli." He stated that the opposite of attention was "habituation" which refers to "a diminution in the intensity of a particular perceptual experience in circumstances of its monotonous presentation: monotonously repetitive presentation" (p. 2). He theorized that:

On the one hand we have the phenomenon of attention, which is the process by which a particular perceptual experience is intensified, and on the other hand, we have the process of habituation in which a particular sensory experience is diminished or in certain instances is totally abolished...Hypnosis is a state of modified attention, created by modification brought about in the central nervous system, by external or internal stimuli of one kind or another....gateway synaptic neurons are activated by the incoming input, then that activity is further transferred up the neural axis into the brain stem...and it is in these synaptic systems of these limbic sectors of cortex that all emotion experiences are generated. When one is happy, one is happy there; when one is depressed, one is depressed there; and since pain is an emotional state and not a sensation (italics added) that is where things hurt as well, not in any kind of sensory cortex. (p. 5)

Wyke (1986) stated that contrary to what he learned in medical school, "There is no necessary correlation between the intensity of a perceptual experience and its emotional concomitants and the intensity of the evocative stimulus at all!" (p. 5). Like Melzack & Wall (1982) Wyke theorized that with pain there were "facilitating and inhibitory modulating systems" which can be modulated at the gateway synapses at the base of the spinal cord by "peripheral or central sources." The peripheral sources release "inhibitory endorphins" which block the pain messages at the"
"gateway synapses." Wyke believed that this is a system which is "peculiar to pain" and gave the following example to explain "how a change in the environmental situation" could bring about a "perceptual switch" or a "change in the direction of attention from one input system to another" (p. 7).

It all started with this famous experiment.....This experiment involves a cat....This cat is sitting in a cage here, unanesthetized and quite happy, with a micro electrode in its left cochlear nucleus. Remember, the cochlear nucleus consists of the gateway neurones of the acoustic system. It is the first group of neurones, the gate neurones, on the acoustic pathway into the brain....Now, this cat sitting quietly in its cage, is being presented with a series of clicks, and these are single sweep oscilloscope recordings of the synaptic potentials evoked in this cochlea nucleus by each click. Each potential that you see there, indicates that the incoming impulses from the cochlea have crossed the cochlea synaptic system, the gateway synapse in the cochlea nucleus, have activated the post synaptic cell and the activity has gone up to the animal’s acoustic cortex and the animal hears each click. In the second picture, a beaker containing a mouse is being introduced into the animal’s cage, and I assure you that from a cat’s point of view, a mouse is a much more interesting object than a click. As a result, the animal’s attention is switched from its acoustic input to its visual input and it is looking as you see, very intently at the mouse. Its attention is canalized on its visual input. But look what has happened to its acoustic input, because the clicks are continuing unabated. There is practically no trans-synaptic discharge in the cochlea nucleus and the animal is not hearing the clicks any more because the activity is not passing beyond the gateway synapse, and not reaching its acoustic cortex. As far as that cat is concerned, the clicks have gone and boy, look at that mouse. When you take the mouse away, and the clicks are still continuing, the evoked trans-synaptic potentials return once more and now the cat is again paying attention to the clicks. (p. 8)
Wyke theorized that through monotonously repetitive stimulation the animal became bored and that boredom is the "neurological mechanism of habituation--inhibitory inhibition of gateway synaptic transmissions as a result of enhanced activity of the inhibitory modulating systems which is a phenomena of the exposure of individuals to monotonously repetitive environmental changes" (p. 8). He argued that in humans the brain is a "one channel system" and that, "The more intensely information is driven in through one system, the less possible does it become to drive in information through other systems. The more intensely somebody concentrates on something, the less they are aware of other things going on around them" (p. 12). He noted that contrary to what was once believed, "The administration of barbituates to patients," instead of facilitating the induction of hypnosis, "militates against" it. He concluded that, "It has become apparent that the neurons of certain parts of the brain stem reticular system are very much involved in the processes of attention modulation which underlie,...the processes of the induction and the maintenance of hypnosis" (p. 8).

On the question of pain and hypnosis Erickson (1989) theorized that we can have "pain" habits in much the same way as we have "speech," "eating," "olfactory and gustatory habits." He believed that, "You can take various stimuli and habitually translate them into pain responses. (And you can also learn to do the reverse.)" and he cited as an example tasting very hot Mexican food for the first time and then learning to "translate the stimulation of the pepper into a pleasant sensation." He used this example to talk about the tongue developing, "callous formation" in order to make Mexican food pleasant and compared this analogy to a woman with chronic pain in her hip who was encouraged to form "nerve callouses down her
hip." Evidently his suggestions worked because the woman "Arrived home...free of pain and very proud of the fact that somehow she was managing to translate the experience of pain into a feeling of comfort." Erickson explained that he would have failed with this patient if he had attempted to "diminish her pain by directly inducing an anesthesia or an analgesia," because the concept of pain was part of her reality and he helped her "use that reality in a manner that allowed her to experience comfort as well" (p. 113).

Barber (1982) suggested four basic hypnotic methods for pain control:

1. Analgesia or anesthesia can be created in the hypnotized individual by simply suggesting that the perception of pain is changing, is diminishing, or that the area is becoming numb, so that the pain is gradually disappearing. It may be easier for a patient to notice growing comfort rather than diminishing pain; thus a specific feeling of comfort such as that associated with anesthesia can be suggested specifically.

2. Substitution of a painful sensation by a different, less painful sensation can frequently enable a patient to tolerate some persistent feeling in the area but not to suffer from it. A sensation of stabbing pain may be substituted with a sensation of vibration.

3. Displacement of the locus of the pain to another area of the body, or sometimes, to an area outside the body, can again provide an opportunity for the patient to continue experiencing the sensations, but in a less vulnerable, less painful area. The choice of the area is usually based on its lesser psychological vulnerability, and suggestions can leave the choice to the patient.

4. Dissociation of awareness can be created when the patient does not need to be very functional (e.g., during a medical or dental procedure) or when some condition renders the patient virtually
immobile (e.g., during the last stages of a terminal illness). The patient can be taught simply to begin to psychologically experience himself or herself as in another time, place, or state, as in a vivid daydream. (p. 46)

Barber (1982) emphasized that the effectiveness of pain control depends on the patient's imagination and the ability of the clinician to "evoke or capitalize on that imagination" (p. 47). He theorized that while pain may be completely removed, more often pain control means "modifying the particular experience of a quality of the pain, either sensory or affective, in a way that alleviates suffering" (p. 47). He believed that the "psychological management of the pain patient" included:

Issues such as secondary gain, reinforcement of disability, family dynamics, self-esteem and using pain as a focus to deflect attention away from other important problems may need to be dealt with before pain can be successfully managed. Awareness of such issues does not itself guarantee reduction in pain, however. (p. 49)

Barber suggested that the need for pain was necessary as a "warning function" but that patients had many reasons for not wanting their pain to completely disappear. He thought that hypnotic suggestions for some patients "may require the framing of suggestions that explicitly allow the retention of some aspect of the pain at certain times. He gave the following example:

A 55-year-old woman with a 30-year history of low back pain following laminectomy was able, within a few minutes of the first treatment by hypnosis, to completely eliminate her pain. Her relief was dramatic and very pleasant to her. Within a few days, however, the recognition that she had relieved her pain through her own psychological power - and that she would need to learn to continue to
take care of her pain - illuminated for her an important characterological issue: her need for dependence on others for help. She quickly discovered that she resented having to take care of herself, and she became aware of a tendency to disown her own healing ability in favor of seeking cures from the outside - notably, she was interested in seeking further surgery. Such awareness did not make possible the resolution of this characteristic, since it was very central to her personality and she did not want to change it, but the awareness did make it possible for her to disengage from this need in this one context. She was able to understand why she was having difficulty maintaining her motivation for using self-hypnosis, and this understanding protected her from seeking further needless surgery. She learned that she could continue to enjoy her independence in this one area of taking care of her pain. (p. 50)

Barber cautioned clinicians to "be more sensitive to psychological issues" and not assume that because "a psychological characteristic inhibits therapeutic success," the patient either has no pain or "doesn't want to let go of the symptom" (p. 21).

Similarly, Erickson (1989) believed in utilizing the imagination for the reduction of pain. He stated: "When you want to use hypnosis in dentistry, medicine, or psychological experimentation, you need to be aware of what it is your patient should include in the situation" (p. 101). He suggested removing the patient's imagination from the body which is left behind in the office and gave the example of a patient in a dentist's office who under hypnosis imagines going to the beach. Thus, "everything that happens in the office is in relationship to the body being left behind. You have restricted and limited the patient's body orientation to the work that you are going to do" (p. 102). Erickson theorized that:

In a trance state or at an unconscious level we are not too concerned too much with concrete reality....For example at a concrete level we
expect to actually see a glass of water in the waking or conscious state but in the unconscious or trance state you substitute a visual memory or a concept of what a glass of water is....As soon as you recognize the tendency of the unconscious to rely upon memories, ideas, and concepts in place of concrete reality then it is much easier for you to ask your hypnotic subject to hallucinate....You’re asking your patient to substitute for that state of pain the memory of a very pleasant feeling because in the unconscious there is a memory of a very pleasant feeling....All you want to do is take your patient’s attention away from the concrete reality of the state of pain and direct it to that very real and very genuine concept or learning or memory or experience of comfort that exists within the unconscious mind. (p. 104)

Erickson used the metaphor of a runner in a race to explain the hypnotic process:

At the races the starter fires the pistol, but it is the runner who wins the race....The firing of the pistol only announces the beginning of the race; it doesn’t enter into the process of running the race....So it is with hypnosis....What the hypnotist says is like the firing of the pistol....The patient then has to do all of the 'running' himself, and he can only do that in accordance with his own understandings....As soon as you introduce the memories of comfort and ease into a pain situation the pain begins to diminish because you have only so much attention to give....You can give all of your attention to the pain, or you can give most of it to the pain and a little of it to the memories of comfort and ease....Then you can give progressively more and more attention to the ease and comfort, and less and less attention to the pain. (p. 104)

Erickson (1983b) emphasized avoiding words such as pain which reminded the patient of their problem. He summarized his views on hypnosis and pain as follows:

You approach pain as a subjective experience. You try to dissect it, to analyze it; you try to get the patient to recognize the various
attributes of the various psychologically subjective ways he deals with it; and then you use direct hypnotic suggestion, when possible, or permissive, indirect hypnotic suggestion, for its total abolition. You can use any or all of the following: amnesia, hypnotic analgesia, hypnotic anesthesia, hypnotic replacement or substitution, hypnotic dissociation, time distortion, body disorientation, the reinterpretation of pain, the relocation of pain, and the diminution of pain. You never know which measure will be useful, nor do you know to what degree any one of them is going to be helpful. But you ought to have them all on hand, so to speak, so that you can shift from one to another with ease. You might use disorientation to reduce a burning pain, while a cutting pain seems to call for referral or dissociation. You can never know ahead of time how you are going to handle the individual aspects of the pain. (p. 237)

Audiotaped Hypnotherapy as a Treatment for Pain

In 1900, a Parisian physician, Hippolyte Baraduc presented a report to the Second International Congress of Experimental and Therapeutic Hypnosis in Paris on phonographically induced hypnosis as a treatment, which may be the first time a phonograph was used to produce hypnosis (Gravitz, 1983). Baraduc claimed to have 'effective' results in ten patients and stated that, 'One obtains nothing without expectant attention, or if the recording on the cylinder is contrary to the individual's philosophical or religious ideas.' He prepared individual cylinders for each patient but "used the same recorded set of instructions for several patients who presented similar problems" (p. 281). Liebeault, 1885 (cited in Barber, 1979) concluded that pain reduction with subjects who were in a hypnotic trance was due to "mediating processes" which focused "attention on thoughts or ideas other than those concerning pain" (p. 237). Similarly, Barber & Calverly, (cited in Barber, 1979) reported that 'waking control' subjects
and 'hypnotic trance' subjects who were asked to remember details of an interesting story presented on a tape recording were both distracted and reported equal pain reduction after receiving a "pain-producing stimulation" (p. 237).

Controversy exists over the need for one-on-one therapist/client situation for successful hypnotherapy. Erickson (cited in Beahrs, 1971) believed that it was important for the therapist to be flexible in his approach to the patient, "always adapting techniques to the presenting intellectual and emotional needs of the patient" (p. 90). Several researchers questioned the role of the therapist in hypnotherapy. Levitan (1988) posited the view that the hypnotherapist only "speaks words" to the patient and that it is "the patient who causes trance to occur" (p. 71). Edelstein (1986) recommended that patients use a tape prepared by the therapist at home in order to increase the effectiveness of suggestion by repetition.

Hilgard (1967) found in laboratory studies that hypnotic susceptibility under ordinary laboratory conditions is a fairly consistent characteristic of the individual, as shown by reinductions on other occasions with different hypnotists. He found that hypnotist skill is relatively unimportant and success appears to be, "about as great with beginners as with experienced hypnotists.....Susceptible subjects respond very well to inductions delivered by an unfamiliar voice on electromagnetic tape, with what is said having nothing to do with capitalizing on their responses" (p. 126). He cautioned that transference effects may be more important in a clinical setting and noted that in the laboratory there are certain "expectations" which do not exist in a clinical setting. However, he pointed out that there is little evidence to back this up
as there does not seem to be a uniform definition of what constitutes hypnosis.

Levitan (1988) reported that patients who had difficulty with self-hypnosis were helped by taping the session for use at home. He cited a controlled study by Hammond, Bartsch, Grant, & McGhee (1988) in which a group using self-hypnosis was compared to a group using tape-assisted hypnosis. The results "found that subjects who were newly trained in self-hypnosis consistently reported a higher quality experience when using tapes compared with doing self-hypnosis unaided" (p. 71).

He stated:

It is necessary at the beginning to dispel the misconception held by many patients that a hypnotic state can only be achieved through the suggestions of their therapist....It is useful for patients to understand that all hypnosis is self hypnosis and that each of us does self-hypnosis frequently throughout the day....We have learned to turn off awareness of a variety of sensations, such as the feel of the clothing on our bodies or the shoes on our feet....Once patients appreciate that they are already accomplished in this kind of informal self-hypnosis, they are often more receptive to learning a different variety or applications. (p. 71)

Audiotaped hypnosis was found to be a useful adjunct to self-hypnosis in an investigation by Hammond (1988) who studied the relationship between heterohypnosis and either self-directed self-hypnosis or tape-assisted hypnosis:

Forty-eight inexperienced volunteers were hypnotized and taught self-hypnosis by posthypnotic suggestion and immediate practice in the office. They were randomly assigned to one of two experimental orders to practice self-directed and tape-assisted self-hypnosis. No differences were found between heterohypnosis or either type of self-hypnosis in response to behavioral suggestions. Experiential
rating, however, consistently favored heterohypnosis over either type of self-hypnosis. Tape assisted self-hypnosis was consistently evaluated as superior to self-directed practice by newly trained subjects. (p. 128)

Although the subjects rated heterohypnosis as superior to either type of self-hypnosis, the researchers noted that when the subjects were using tape-assisted practice they were "more focused and absorbed experience of greater depth and richness." The subjects also were more convinced that "they had been in an altered state of consciousness" and by using a tape there was a more powerful effect than if they hadn't used a tape (p. 133).

Paul and Trimble (1970) studied the effectiveness of recorded versus 'live' relaxation training and hypnotic suggestion to stressful imagery with three groups of female college students who received two sessions, one week apart. Their results showed that recorded relaxation was inferior to 'live' procedure on all the physiological measures taken (heart rate, respiratory rate, tonic muscle tension, skin conductance) except for self-report.

Clinical Studies

Clinical studies on the effectiveness of audiotaped hypnosis as a treatment for pain are scarce. Hilgard (1986) cited a study by Bennett, Davis and Giannini (1985) in which 33 patients who underwent various surgical procedures under a general anaesthetic, wore earphones and listened to either a prerecorded tape of music and "suggestions of postoperative healing" or a "tape of natural operative sounds ended with a three minute personal message not included in the control tape. The message was given about five minutes before the anesthesia was reversed."
It was suggested that the patient should "pull on his or her ear to assure the interviewer that the message on the tape had been heard" (p. 202).

The results showed that a "substantially higher proportion of the patients who had received the personal message pulled their ears during the interview than those in the control condition who did not have the message" (p. 203). Hilgard concluded that:

The result bears more on dissociation than on the recovery of memories by hypnosis, for in fact none of the subjects recalled having received the ear pulling suggestion, either before or after hypnosis in the interview session. The bearing on dissociation is that a comprehended verbal message may have behavioral consequences even though the memory is not available for verbal report. (p. 203)

Budzynski (1977) discussed the need for developing "a physiological pattern that is incompatible with the 'flight or fight' or defense-alarm pattern" which causes muscle tension and anxiety and stress related problems. Budzynski theorized that the use of "several kinds of feedback sequentially and simultaneously....trained a generalized 'cultivated' relaxation in the individual. He advocated using "EMG feedback in combination with a cassette tape home practice course as an excellent starting point for the training of cultivated relaxation" (p. 445).

Experimental Studies on Hypnosis and Pain

Most of the studies on pain are experimental and some researchers question whether or not these studies are relevant to clinical pain problems because of the difference between clinical and experimental pain. (Fordyce, 1976, cited in Nigl, 1984b) lists the following differences between experimental and clinical pain:
1. Experimental pain is produced by a known stimulus; clinical pain often occurs in the absence of an identifiable stimulus.

2. Experimental pain tolerance is time-limited; the subject knows it will end within a particular time frame. Clinical pain patients do not know how long their pain will last; chronic pain patients often have constant pain.

3. Because experimental pain is short-lived, it is not under the influence of learning effects. Clinical pain, especially chronic pain, can be influenced by conditioning factors which can prolong pain and reduce tolerance.

4. Experimentally induced pain usually does not affect other aspects of the subject's existence; however, clinical pain can reduce the quality of life for the patient who cannot work, interact with friends, or engage in any meaningful activity. (p. 95)

Hilgard (1986) stated that laboratory experiments have advantages over clinical experiments because the setting in a laboratory is more easily controlled and motivation of pain patients in a clinical setting varies according to the degree of illness and the duration of the pain being treated which makes "appropriate controls with well-matched untreated patients or double-blind procedures...difficult to arrange...and in some circumstances unethical" (p.203). He noted that the "major disadvantage of laboratory studies is that "the motivational condition of a suffering patient cannot be duplicated, and the typical doctor-patient relationship cannot be capitalized upon....placebo effects appear to be more prevalent in real-life settings than in the artificial laboratory" (p. 204).

Hilgard (1969) reviewed the literature on experimental psychology and hypnosis and stated that he included methods that were physiological,
psychophysical and that sometimes involved "verbal interactions." He reported that in clinical research, patients go to the investigator for help, but in experimental research the subjects are there by invitation. However, he noted that there was some overlap in that subjects could also be patients; for example, those suffering from painful burns. He referred to five topics "as illustrative of efforts to make objective various scientific approaches to problems that have long been in the folklore of hypnosis" (p. 125). These five are:

1. The nature of susceptibility;
2. The effects of induction upon suggestibility and depth of trance;
3. Amnesia;
4. Analgesia;
5. Hallucinations;

Hilgard concluded that the issue of susceptibility is still unresolved but noted that subjects who are resistant to hypnosis can be "improved" and that susceptibility is a very important issue particularly in the area of pain (p. 125).

Kebrdle & Roeder (1986) noted that susceptibility is an important feature of positive treatment outcome for some disorders and cited a number of standardized measures for assessing Low, Medium and High susceptibility in individuals and groups (i.e. The Harvard Group Scale of Hypnotic Susceptibility, Form A (HGS HS:S); Forms A, B, and C of the Stanford Scale of Hypnotic Susceptibility (SHSS:AB; SHSS:C), and the Barber Suggestibility Scale (BSS),(p.24). The authors noted that some research indicated that conditions which had "non-volitional nature" such as clinical pain, asthma, or warts, were "more related to susceptibility levels,"
than those of a "volitional nature" such as weight loss or cigarette smoking" (p. 25).

Barber (cited by Hilgard, 1973) does not believe in the effectiveness of induction and has taken the position that "the behaviour in induction is itself a response to suggestions given in the normal state (eye closure, relaxation, appearing to be in a sleep-like condition), and that it does not necessarily follow that this state is an essential preliminary to other phenomena of hypnosis, such as amnesia, or responsiveness to posthypnotic commands" (p. 128).

Hilgard and Tart (cited in Hilgard, 1973) in a series of experiments, attempted to show that Barber's results were misleading. The experiments were concerned with responsiveness to waking and imagination instruction, compared to responsiveness to the same items following hypnotic induction. They concluded that the effects of induction were not as great as they expected but noted that the hypnotizability of the subjects and the size of the sample were very important criteria for designing the experiment.

Amnesia of events within the trance state is one of the marks of the highly hypnotizable subject but Hilgard (Hilgard & Cooper, cited in Hilgard, 1973) stated that this may be due to the "subject's expectations that this is what is called for, possibly by the manner in which the interrogation is done, possibly for the inference that hypnosis is like sleep, and you do not remember what happens when you are asleep" (p.129). Hilgard's experiments showed very little spontaneous amnesia but found that amnesia existed when it was suggested. Evans and Thorn (cited in Hilgard, 1973) defined two kinds of amnesia: content amnesia and source amnesia. When subjects remembered something learned under hypnosis, but forgot that they had learned it there, it was defined as source amnesia.
Analgesia in hypnosis has been disputed by experimenters (Sutcliffe, Barber, cited in Hilgard, 1967) who theorized that subjects are either "heroic" and do not admit that they have pain or that they can not be believed unless there is a physiological measurement of the pain.

Laboratory pain can be produced in a variety of ways but two stressors are most commonly used: ischemic pain, in which pain is caused by cutting off the circulation of blood in an arm which is being exercised and cold-pressor pain, in which a hand and forearm are placed in circulating ice water for a standard period of time not exceeding 60 seconds (Hilgard, 1986). Hilgard (1973) reviewed the experiments with hypnosis and stated:

When unselected subjects, with a minimum of prior exposure to hypnotic procedures, are studied under laboratory conditions, the suggestion of hypnotic anesthesia or analgesia results in a marked reduction in felt pain, honestly reported, and the amount by which quantitatively estimated pain is reduced is positively correlated with hypnotic susceptibility as measured on standardized scales. (p. 396)

Hilgard (1986) cited studies by Stern, Brown, Ulett and Sletten (1977) which "compared various psychologic methods of pain reduction, such as hypnosis, acupuncture, biofeedback, and chemical agents such as tranquilizers, aspirin, and morphine. Hypnosis provided the greatest pain relief for both cold-pressor and tourniquet pain, morphine was second, and acupuncture was third, whereas for these pains, aspirin, diazepam (Valium) and placebos proved ineffective" (p. 203).

Hilgard (1973, 1986) found a curious paradox during laboratory experiments on cold-pressor pain in which there is a discrepancy between physiological indicators of stress and felt pain. He stated:
It has been shown that some part of the person's cognitive system may be registering and processing pain while that person is hypnotically analgesic, so that the pain is not being cognitively processed at a conscious level. The concealed or covert cognitive apparatus has been described as a 'hidden observer' that knows things that the overt cognitive apparatus in hypnotic analgesia is not aware of" (p.211). Hilgard (1986) explained how the hidden experience is explored:

The hypnotized person, after the test of analgesia has been completed, can be told that the hypnotic consciousness may know only a limited part of the total information being processed, some of which is processed subconsciously. This is plausible because the hypnotized part commonly fails to attend to voices other than the hypnotist's or comes out of hypnosis with amnesias for memories that are obviously stored in some manner because they can be recovered when the amnesia is reversed. The covert cognitive system of the subject is able to recall the highest pain report given in waking and in hypnosis and can add a supplementary report on what the pain was like to the concealed part while the subject was analgesic. Commonly covert pain is reported as near to but below the normal waking pain and above the hypnotically reported overt pain. If questioned about the distress felt at the concealed level, the distress is often reported as less than was felt at the same level of sensory pain when not hypnotized or when not hypnotically analgesic. (p. 212)

Another method for exploring the hidden observer is automatic writing. The subject is asked to report verbally any pain felt by the hand in ice water according to a numerical scale. The other hand is in a box which has numerical keys, "appropriate to reporting numerical pain magnitude estimates. The subject will then be giving two reports simultaneously, one overt by word of mouth, the other covert via key-pressing by a hand of which she or he is not conscious" (p. 212). Hilgard (1973, 1986) cited cold-
pressor experiments with hypnotically suggested analgesia in which the subject's results were averaged. The experimenters found that the covert reports of pain went higher than the overt (verbal) reports as the pain increased in the subjects. They also found that the covert report was lower than the normal pain report. Hilgard concluded that the hidden observer provided "at least a partial resolution of the paradox of the persistence of some physiological signs of stress even when the subject feels no pain" (p. 213).

Clinical Studies on Hypnosis and Pain

As compared with the sophisticated clinical outcome studies done in the medical disciplines, there have been few and relatively unsophisticated clinical research studies of the psychologic therapies in chronic pain (Stembach, 1984; Tan, 1982). In his review of 21 studies on hypnotherapy and behavior therapy, Spinhoven (1987) assessed 7 of the studies for the relationship between the level of hypnotizability and the outcome of hypnotherapy studies. He reported that 3 of the 4 studies (Land, 1969; Schubot, 1967; Sullivan et al., 1974), in which a significant positive correlation was found, were related to the treatment of anxiety disorders. In 3 studies (Devine & Bornstein, 1980; Perry, Gelfand, & Marcovitch, 1979; Wadden & Flaxman, 1981) on the treatment of obesity and smoking, no relationship was demonstrated. Only Deyoub and Wilkie (1980) reported a significant positive correlation between hypnotizability and weight reduction in hypnotherapy.

Sphnhoven (1987) posited that these findings further validate the hypothesis that in hypnotherapy, hypnotizability is especially relevant in the
treatment of psychosomatic and anxiety disorders as opposed to habit disorders which have a more voluntary component.

In none of the six behavior therapy studies in which the relationship between hypnotizability and outcome was measured did significant correlations emerge. The fact that in behavior therapy irrespective of the nature of the disorder no relationship between hypnotic capacity and outcome was found, sheds a critical light on the position of Murray & Litvak (cited in Spinhoven, 1987), who hold that imagination procedures used in behavior therapy inadvertently induce a hypnotic state. In 5 of these 6 studies, an imagination procedure was investigated and, in contrast to, the hypnotic condition, hypnotizability was not therapeutically relevant. Spinhoven (1987) concluded that:

The finding that behavior therapy procedures with a high ingredient of relaxation and imagination do not tap the hypnotic capacities of patients possibly can be explained by the issue of control. Behavior therapists typically emphasize a rational and explicit use of scientifically based procedures. This emphasis on voluntary control may prevent the occurrence of more involuntary and dissociative experiences characteristic of hypnosis per se. (p. 22)

Elton, Burrows & Stanley (cited in Hilgard, 1980) studied clinical pain in patients complaining of migraine, tension headaches, lower back pain, generalized arthritis, and miscellaneous other symptoms. All had been resistant to other forms of treatment. Five groups were compared: control (waiting list, untreated), placebo, social interaction only, hypnosis, and biofeedback. All treatment methods were beneficial beyond no-treatment and placebo. Biofeedback and hypnosis were both highly successful over 12 months post-treatment. The effectiveness of hypnosis was dramatically
demonstrated in those of the placebo group who were later transferred to hypnosis (p. 264-265).

In another study Elton et al. (cited in Hilgard, 1980) compared two chronic pain groups of 10 pain-prone patients and 10 organic-pain patients at a ‘Pain Clinic’ with two normal pain-free groups of 10 pain-free students and 10 pain-free patients. "The treatment procedure involved hypnosis, biofeedback, placebo and interaction....Such psychological techniques were assumed to alter the subject's self-concept" (p. 275). The authors concluded:

The results of this study indicated a relationship between low self-esteem and 'persistent' pain. Patients in the pain-prone group showed significantly lower self-esteem ratings than the control groups. There was no significant difference in self-esteem between the two control groups, which suggests that this concept may not be strongly related to age, or socio-economic class. There was no significant difference in self-esteem between the organic pain patients and the two control groups. This indicates that, in the groups studied, self-esteem was not affected significantly by chronic illness, of known pathology, which responded to treatment. (p. 276-277)

The study of self-esteem of the 'pain prone' patients demonstrated the importance of psychological approaches to chronic pain. In another study Elton et al. (cited in Hilgard, 1980) compared three groups of chronic pain patients who were randomly selected for each group and contracted to attend the groups once a week for 14 weeks. The groups were divided into a psychotherapy group, a placebo group, and a hypnosis group. The authors found the following:

The results showed that the placebo group did not improve significantly on any of the pain parameters....Both interaction and hypnosis groups reported significant inter-and intrapersonal gains,
and felt much better about themselves and their coping abilities....Most of the patients in the hypnosis group showed significant improvements....A 3-year follow-up showed that the results appeared lasting for most of the patients. (p. 283)

Elton et al. (cited in Hilgard, 1980) concluded that, "Hypnosis has been shown to be more effective than behavioural psychotherapy....Its use can be recommended as a method of choice in the treatment of chronic pain" (p. 283).

In a clinical study of pain patients suffering from headaches, arthritis, dental, abdominal, and other pains, Elton et al. (Cited in Hilgard, 1986) compared a control (nontreatment) group, a placebo, biofeedback, hypnosis, and social-interaction therapy, with the result that hypnosis and biofeedback were similar in their rates of effectiveness. Hilgard concluded:

The hypnosis method...appeared to be the method of choice, partly on the basis of convenience, because less equipment was needed, and also because less pain was reported between treatments than for the biofeedback group. (p. 203)

McCaeley, Thelen, Frank, Willard & Callen (1983) compared self-hypnosis to relaxation in chronic low back patients attending an outpatient clinic. The results suggested that both treatments were effective in the reduction of pain and the authors concluded that, "Hypnosis and relaxation are both manifestations of the relaxation response," a theory posited by Edmondston and Benson (cited in McCauley et al., 1983, p. 551). However, they noted that more patients dropped out of the relaxation group, which they attributed to the fact that "relaxation training is more mechanical and has less intrinsic appeal than self-hypnosis" (p.551). Benson, Pomeranz and Kutz (1984) cited studies (Benson et al., 1974, Benson, 1975) which
supported the hypothesis that "a physiological response, termed the relaxation response, underlies an altered state of consciousness" (p. 817).

Crasilneck (1979) used hypnotherapy as a treatment for 24 patients with chronic low back pain. Twenty patients responded positively; four patients failed to respond to the hypnotic induction techniques and were considered failures. Sixteen reported an average of 80% relief during the first four sessions, and all 20 patients reported an average of 70% relief (based on verbal estimates by patients) by the sixth session. Fifteen voluntarily discontinued medication by the third week of therapy, and the rest were withdrawn by their physicians during the ensuing four weeks. Most patients were seen daily the first week, three times the second week, twice the third week, and thereafter as necessary. The mean number of outpatient sessions was 31 over an average of nine months. All patients were taught self-hypnosis. None of the individuals retained their addiction, and only occasionally did they require analgesics. Patients were seen by their referring physicians as needed during the course of hypnotherapy, and frequent consultations between the therapists created a combination of treatments best suited for each patient. Crasilneck concluded that:

Hypnotherapy appears to be the major factor in controlling most problems of back pain which has been resistant to recovery prior to treatment. It is my contention that every referring physician had previously used all the psychotherapeutic wisdom at his disposal in the treatment of each referred patient. The back pain finally came under control only after the use of hypnosis. (p. 71)
CHAPTER 3

METHODOLOGY

Single-Case Experimental Design

Campbell and Stanley (1963) coined the term *quasi-experiment* to describe "experiments that have treatments, outcome measures, and experimental units, but do not use random assignment to create the comparisons from which treatment-caused change is inferred" (p. 6).

Gottman (1976) in his book on time-series analysis, pointed out that:

In planned experiments, randomization of the experimental design is introduced to validate analysis conducted as if the observations were independent. However, a great deal of data in business, economics, engineering and the natural sciences occur in the form of time series where observations are dependent and where the nature of the dependence is of interest in itself. The body of techniques available for the analysis of such series of dependent observations is called time series analysis. (p.IX)

This design goes beyond observations within treatment to include observations from repeated measures in a period preceding and following a given intervention (Hersen & Barlow, 1982). The authors theorized that this is basically an A-B design and that, "while there is a baseline," this design is, "basically correlational in nature and is unable to isolate effects of therapeutic mechanisms or establish cause-effect relationships" (p. 27). However, they noted, "with some major reservations, changes in the dependent variable are attributed to the effects of treatment" (p. 169).

Borg (1963) in describing single-subject designs noted that, "If two or more subjects are treated as one group, this also is considered
a single-subject experiment” (p. 706). The A-B design is the simplest of the single-subject designs and should only be used when no suitable alternative is available or when the researcher intends it as a pilot study to be followed by more rigorous designs. The A phase of a study which is defined as the baseline involves the repeated measurement of “the natural frequency of occurrence of the target behaviors under study” (Hersen & Barlow, 1976, p. 176). The baseline establishes a standard, “by which the subsequent efficacy of an experimental intervention may be evaluated.” Statistically, the baseline period, “functions as a predictor for the level of the target behavior in the future” Riley & Wolf, (cited in Hersen & Barlow, 1982, p. 169).

The question of how long a baseline should be in order to establish stability is one which Hersen & Barlow (1982) explored. They pointed out that researchers concur that “repeated measurement be applied until a stable pattern emerges," but that practical limitations make this difficult when the experimenter is working in an institution where, “the subject under study will have to be discharged within a designated period of time, whether upon self-demand, familial pressure, or exhaustion of insurance company compensation” (p. 74). Borg (1963) noted that, "As a general rule, there should be approximately the same length of time and number of measurements in each phase of a single-subject design. Otherwise the imbalance complicates the statistical analysis of interpretation of treatment effects" (p. 711).

Due to the practical limitations of the experimenter in a clinical setting, and in order to establish a stable baseline, it was
decided to use a modified A-B time series design in which the A phase constitutes the responses of the Control Group and the B phase constitutes the responses of the Experimental Group. Electromyographic (EMG) readings were used as a continuing baseline measurement for both phases, with the intervention of a hypnosis audiotape as the independent variable. The Control Group of four chronic back patients was compared to the Experimental Group of four chronic back patients. The mean of electromyographic (EMG) readings was calculated for the Control Group before treatment and after treatment for each day and the difference of the means produced a mean calculation of EMG readings for each day for 25 days. The same calculations were made for the Experimental Group. As the electrodes were individually placed on different parts of the body for each patient each day, (some parts, such as the shoulders have two readings) and temperature readings were not included; by taking the mean for the four patients each day, this averaged out body effect and allowed for the confounding variable of EMG readings for different parts of the body. This also took into account days when patients were away. A lower mean EMG reading for the Experimental Group than the Control Group over 25 sessions was an indication that the treatment was effective. This study is exploratory in nature and is meant to be used as a beginning for future research where there is the opportunity to develop experiments and theoretical assumptions in a more controlled setting.

This research on audiotaped hypnosis in the treatment of chronic back pain focused exclusively on chronic back patients who had been
referred to a pain clinic for a six-week in-patient program. The purpose of this study was to investigate the effectiveness of audiotaped hypnosis as a therapeutic method in the reduction of chronic pain. The psychological and physiological components of pain were also examined.

As well, the study explored the theoretical view that a combination of cognitive and behavioural therapies or multiple convergent therapies were more effective than any one therapy in the treatment of chronic pain. Knowledge of the mind/body connection and the effectiveness of audiotapes as an adjunct to other therapies could facilitate one-on-one client-centered therapy or any therapy which involves cognitive processes either singly or in combination with behavioural therapies. Audiotapes could also provide a safe, economical method of enhancing and providing a faster resolution to traditional psychological therapies or hypnotherapy.

In this chapter, a description of the sample selection, procedures, treatment and dependent measures are presented.

Sample Selection

The sample employed in the study was selected from a six-week in-patient program at a pain clinic. The subjects were patients who were referred from the Workman's Compensation Board of British Columbia and all were diagnosed as having chronic pain from work-related injuries. The clinic had a 40% success rate in returning patients to work but if patients were found not fit to work at their prior jobs, they were retrained or received pensions if they could no longer work. The patients (Appendix A) in both groups fitted the profile of the chronic back patient as described by Gentry, Shows, and Thomas (cited in LaFreniere, 1979). (Appendix B)
The Control Group was drawn from a prior group of chronic back pain patients who had previously attended a six-week in-patient program, and were matched as closely as possible to the Experimental Group. The Experimental Group was selected at the convenience of the therapists at the pain clinic who agreed to allow the experimenter to conduct research at a specified time.

**Description of the Sample**

**Control Group**

Patients in the sample ranged in age from 40 to 48 years old. The mean age of the control group was 45.1 years. All suffered from chronic back pain. There were three males and one female in the group. The males were unemployed or in blue collar manual jobs; the female was employed in a blue collar manual job. The mean number of surgeries was 2.2; the least number for one patient was two surgeries, the most for one patient was three surgeries.

**Experimental Group**

Patients in the sample ranged in age from 30 to 50. The mean age of the treatment group was 39.5 years. All suffered from chronic back pain. There were three males and one female in the group. The female was employed in a white collar clerical-type job; the males were all employed as blue collar manual workers. The mean number of surgeries was 1.7; the least number for one patient was one surgery; the most for one patient was two surgeries. Two male patients were not included in the sample; one because he was dropped from the program; the other because he was going
to have more surgery and was absent at various times during the treatment period.

Procedure

Three days before treatment began, the experimenter met with the Experimental Group to explain and discuss the procedure. The experimenter explained some of the myths about hypnosis; namely that it was not a form of sleep; that the subjects would not lose control and could not be forced to reveal secrets or do things against their will. Hypnosis was defined as an altered state of consciousness which allowed the individual to focus attention and was a state which often occurred to varying degrees in everyday life. The experimenter gave as examples: thinking about an event and missing a familiar exit from a highway while driving; and a person who has a sore tooth, goes to a movie and forgets the tooth while watching the movie but is in pain as soon as the movie ends. The experimenter encouraged the subjects to ask questions about hypnosis. One subject was concerned about subliminal messages and was assured that there were none. The subjects were told that they would receive a copy of the hypnosis audiotape at the end of the experiment.

Each subject in the Experimental Group signed a written consent form (Appendix C) which explained that during their biofeedback sessions which recorded their electromyographic (EMG) readings, they would also receive 25 treatments of listening to a 25 minute audiotape of hypnosis over a five week period. The subjects would also be required to fill out a pain questionnaire (Appendix D) before and after treatments on each Monday and Friday of the week and a questionnaire (Appendix E) on the effectiveness of the audiotape, at the end of the treatment period. The
subjects were told that their involvement was voluntary and that their confidentiality would be respected. They were given the right to refuse to participate in the study without it affecting their treatment.

The Setting

Researchers have noted that "hypnotic response is facilitated by making the subject comfortable and eliminating all distracting influences; a soundproof room free from interruptions helps to promote relaxation" (Kroger, 1960, p. 667). The experiment was conducted in a sound-attenuated room which contained cubicles in which there were comfortable padded reclining armchairs. Each chair was hooked up to a biofeedback machine (EMG Biofeedback System: Boulder Colorado) which recorded the subject's individual EMG readings as measured in microvolts. Subjects listened to audiotaped hypnosis from a speaker which was situated at the back of the room. During the session the lights were dimmed.

Treatment

Subjects received both Electromyographic feedback (EMG) and audiotaped hypnosis at the same time.

Electromyographic Feedback (EMG)

EMG biofeedback has been discussed in a previous chapter. Schuman, (1982) stated that EMG biofeedback relies on the following premises: 1. Painful muscles are characterized by elevated EMG; 2. EMG biofeedback training enables a reduction in muscle tension; and 3. a reduction in muscle tension produces a reduction in pain (p. 154). It is used "to help patients become more aware of excessive muscular activities in specific muscle groups, to help them concentrate on relaxing these muscle
groups and to increase motivation to practice general relaxation procedures" (Keefe, Block, Redford, Williams, Surwit, 1981, p.223). With sufficient repetition the feedback sensitizes the individual to subtle, or at least previously unrecognized, proprioceptive cues associated with muscle tension, which may lead to a reduction of a pattern of chronic muscle pain (Grzesiak, 1984; Schuman, 1982). Once the person has learned how a relaxed muscle feels, they can practice relaxing the muscle voluntarily (Schuman, 1982). However, as previously pointed out biofeedback may facilitate relaxation and pain reduction either through diminishing affective components or through some central 'gating' process as theorized by Melzack & Wall (1965, 1984).

**Audiotaped Hypnosis**

**Control Group**

Subjects listened to a 25 minute tape every week day for five weeks. The tapes were chosen at random from a selection of tapes which included:

1. Healing Image:-direct suggestion, music in the background, imagery;
2. subliminal messages, ocean sounds, bird sounds;
3. subliminal messages, heartbeat, music;
4. double induction using music, waves and heartbeat in the background;
5. double induction using heartbeat and waves in the background;
6. relaxation from head to toe;
7. A Trip To The Beach; imagery, relaxation, waves, deepening techniques;
8. hypnotic induction, mood music in the background.
Experimental Group

Subjects listened to the same audiotape (Appendix F) during the week days for five weeks. Subjects received a five minute hypnotic induction beginning with progressive relaxation adapted from Crasilneck's (1988) deepening technique and indirection suggestions (Erickson, 1983d) to combat resistance. This was followed by visual imagery of a pleasant scene (Margolis, 1983) which may facilitate the reduction of pain (Barber & Mayer, cited in Hilgard, 1986; and Pelletier, 1979); soothing sounds of music to enhance relaxation and the use of guided imagery of a "healing light" which penetrated to the center of the brain to facilitate the release of healing chemicals or endorphins (Bloom et al., cited in Benson et al., 1984) and absorb discomfort. Suggestions which evoked past memories of a time when the subject felt in control were used for ego-strengthening (Levitan, 1988) and to promote self-esteem (Elton et al., 1980). Physiological and psychological messages were linked to produce a mind/body connection (Rossi, 1986). This was followed by deepening techniques to allow the suggestions to reach the unconscious (Erickson, 1983d). Before the trance was terminated positive cognitive (Ellis, 1977) post hypnotic suggestions were used to reinforce mental and physical health. Termination of the trance followed by adapting Golan's (1988) technique for "re-alerting" so that after the procedure each subject would feel "exhilarated" and full of energy (p. 53).

Dependent Measures

1. Electromyographic (EMG) Readings

EMG readings are in microvolts. of electricity Loeb & Gans (1986) stated that "An EMG at best represents the major changes in currents and
voltages that occur whenever muscle fibers are being activated by their motor neurons " (p. 3). The authors found that EMG feedback "by itself has limited ability". (p. 4)

For the treatment of pain, electrodes may be applied to any area of muscle spasm or to specific trigger points. In clinical practice certain areas are commonly targeted. "Frontalis, or forehead placement, which measures muscle activity not only in the forehead but over the entire head, including eyes, jaw, face, and neck" has been used "despite the fact that correlations between EMG and other muscles tend to be rather low. For generalized relaxation training, wrist-to-wrist and ankle-to-ankle placements are useful for measuring upper body and lower body tension respectively. Trapezius, neck, upper back, and masseter placements are also useful, since most people have tension in one or more of these muscle groups" (Schuman, 1982 p. 151).

Subjects were connected to individual biofeedback machines by electrodes placed on different parts of their body; (deltoids, forearm, forehead, shoulders, temperomandibular joint, intrascapula, low back, posterior back, and quads). Each subject had an individual program which was designed by a trained physiotherapist who placed electrodes on the subject's body each day starting from the least painful areas to the most painful areas during the course of the treatment. Prior to the audiotaped hypnosis treatment the subjects had received several sessions in learning how to operate the biofeedback machines. Normal EMG readings range from 3 to 5 microvolts for frontalis (forehead) and low back. The EMG readings ranged from 0 to 10 (microvolts x 100). Trained physiotherapists took readings before treatment began and 15 minutes after the treatment had started.
2. Verbal Self-Report

Self-report scales which use either words or numbers presented on a scale of increasing value are commonly used among pain specialists to provide a quick and understandable measure of pain intensity (Melzack & Torgerson, 1971).

Hersen's study (cited in Hersen & Barlow, 1982) on the self-assessment of fear argued that, "Verbalizations of discomfort from distressed patients cannot be discounted either for clinical, ethical, or moral reasons". The authors cautioned researchers to consider the following "biasing factors" in experimental single case investigation: "self-monitoring effects, demand characteristics, impression management, faking, and other more subtle forms of response bias" (p.132).

Subjects in the Experimental Group were asked to fill out a pain questionnaire based on Melzack & Torgerson's (1971) five point Present Pain Intensity (PPI) scale (Appendix D) which rated pain from the least painful (1) mild; to the most painful, (5) excruciating. The subjects were asked to fill out the pain intensity scale on Mondays and Fridays only so that they would not get sensitized to the scale. The total number of measurements taken for each patient was ten.

At the end of the treatment period of five weeks, the subjects were asked to fill out a simple questionnaire created by the experimenter (Appendix E) which consisted of one question which scaled how helpful the audiotape was in reducing pain from a score of least helpful=0, to most helpful=10; seven questions on the content of the tape; one question on the effect between sessions and one question on the words used in the Pain Intensity Scale. A final space was left for additional comments.
Statistical Analysis of the Data

Box Jenkins Analysis

In this study a deviation from common practice in analyzing time-series data was used. In particular the method described by Cook & Campbell (1979) called The Statistical Analysis of Simple Interrupted Time-Series was applied. This is a particularly powerful technique often called the Box Jenkins Time-Series Analysis. It is used for modeling the intervention as well as testing for statistical significance for the treatment effect. The computer program BMD P:2T was used for this analysis. The model showed that there was an abrupt drop after the intervention and it remained at the same level throughout the experimental phase.

Binomial Test

The Binomial Test is used to "describe the process of change in an individual's behavior rather than as a tool to assess statistical significance....If the null hypothesis upon which the test is made is that there is no change in performance across A and B phases....then the celeration line of the baseline phase should be a valid estimate of the celeration line of the intervention phase. Assuming the intervention had no effect, the split middle slope of baseline should be the split middle slope of the intervention phase, as well. Thus, 50 percent of the data in the intervention or B phase should fall on or above and 50 percent of the data should fall on or below the slope of baseline when that slope is projected into the intervention phase. To complete the statistical test, the slope of the baseline is extended through the B phase" (Hersen & Barlow, 1982, p. 307).
Another simple comparison of the percentage of times the EMG readings were lowered was calculated to find out if the groups differed in the number of positive or lower EMG readings.
CHAPTER 4

RESULTS

Statistical Analysis of the Data

Hypothesis 1

Box Jenkins Time-Series Analysis (Figure 1)

The first hypothesis stated that listening to audiotaped hypnosis will have no statistically significant effect on chronic pain as measured by electromyographic (EMG) readings over time in the Control Group and Experimental Group.

The Null Hypothesis upon which the test is made is that there is no change in performance across A (Control Group) and B (Experimental Group) phases. As there was a statistically significant difference in the Experimental Group in a positive direction, the Null Hypothesis was rejected.

Binomial Test (Figure 2)

The probability of x points lying above the baseline by sheer chance, in the case of a significant intervention should be small— it is, in fact; (with p=0.5 for each data point). In the Control Group the probability is p=.06 that 16 points would fall by chance above the line. In the Experimental Group the probability is p=.000009 that 23 points would fall by chance above the line. Results showed that there was a change of 2.06 μv (microvolts) in average EMG readings in the direction of improvement in the B phase. (Appendix G)

A comparison of the Control Group and the Experimental Group showed that the probability of 23 cases lying above the baseline by chance
FIGURE 1.

PLOT OF AUTOCORRELATIONS

ST. E. ERROR OF THE MEAN

ACF♥VAR IS PAIN./

VARIABLE IS PAIN

FIRST CASE NUMBER TO BE USED
LAST CASE NUMBER TO BE USED
NO. OF OBS. AFTER DIFFERENCING
MEAN OF THE (DIFFERENCED) SERIES
STANDARD ERROR OF THE MEAN
T-VALUE OF MEAN (AGAINST ZERO)

AUTOCORRELATIONS

LAG CORR.
Mean E.M.G. differences for Control Group and Experimental Group.

B

INOMIAL TEST

Time (day of treatment)

-ve Difference of E.M.G. Readings indicates improvement

+ve Difference of E.M.G. Readings indicates no improvement

FIGURE 2.
alone was very small. From this we inferred a significant interaction effect and these results led to a rejection of the hypothesis as stated in the Null form.

To corroborate these results a comparison of the percentage of treatments which were an improvement was tabulated for the Control Group and the Treatment Group. For the Control Group, 51% showed improved (lowered) electromyographic (EMG) readings. For the Experimental Group, 67% showed improved (lowered) EMG readings. As the Control Group results were statistically shown to be sheer chance, 51% improvement for the Control Group would confirm these results.

Hypothesis 2

The second hypothesis stated that there will be no reduction in perceived pain after daily treatment in the Experimental Group as measured by subjective self-reports of pain using words and numbers on a continuum of increasing value.

A modified version of Melzack & Torgerson's (1971) Present Pain Intensity Scale (Appendix D) which describes pain intensity through words and a numerical scale of increasing value was used as a subjective measurement of pain intensity. The reports were taken before and after treatment and the results and the numerical change in pain intensity were tabulated (Table 1) for ten sessions for each individual of the Experimental Group. The results of the 40 reports taken found that 12 reports were positive; 10 were negative and 18 showed no change. Therefore out of 40 reports, 28 reported no change or negative change in pain and 12 reported a reduction in pain, thus, the Null Hypothesis must be accepted.
Table 1

Summary of Change Scores in Present Pain Perception Scale

<table>
<thead>
<tr>
<th>Change</th>
<th>A</th>
<th>G</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>+3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+2</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>+1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>0</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>-1</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>-2</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>-3</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

Total 10 10 10 10

Number of Reports = 40

Note
+= positive change; decrease in pain = 12
-= negative change; increase in pain = 10
0= no change in pain = 18

Hypothesis 3

The third hypothesis stated that audiotaped hypnosis will have no effect on perceived pain on the Experimental Group after twenty-five treatments over five weeks as measured by subjective self-report.

A questionnaire (Appendix E) of nine questions was devised to assess the subjective reports of the subjects after the five week period. One question rated the effectiveness on pain reduction using a rating scale of 0
to 10; 0 = least helpful; 10 = most helpful. The other eight questions focused on the most and least helpful aspects of the tape; how the subjects would improve the tape; the words used on the Present Pain Intensity Scale; the ability of the subjects to go deeper into hypnosis, and whether or not the subjects would use tapes in the future for the control of pain. Evidence was obtained for a positive perception of the effectiveness of audiotaped hypnosis (Table 2) but the question pertaining to pain perception was negative, thus, the third hypothesis was accepted as stated in the Null form.
Table 2

Summary of Scores from Tape Effectiveness Questionnaire

Experimental Group

<table>
<thead>
<tr>
<th>Comments</th>
<th>Positive</th>
<th>Negative</th>
<th>No Comment</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>1)</td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2)</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3)</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>4)</td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5)</td>
<td></td>
<td>1</td>
<td></td>
<td>3</td>
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<tr>
<td>6)</td>
<td>3</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>7)</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>8)</td>
<td>2</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>9)</td>
<td>1</td>
<td></td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>16</td>
<td>10</td>
<td>2</td>
<td>8</td>
</tr>
</tbody>
</table>

Note. Nine Questions-Four Subjects=36 answers

Note. N/A refers to answers which had to do with the quality of the tape recording (i.e., volume, tape static) or the quality of the furniture (chairs), and not the effectiveness of the tape.

Results: 16 comments were positive; 12 were negative or no comment.
**Hypothesis 4**

The fourth hypothesis stated that a combination of electromyographic (EMG) biofeedback in combination with taped hypnotherapy will not be effective in the reduction of chronic pain.

If the objective physiological EMG readings are used as a measure, then the Null Hypothesis is rejected. However, if the subjective self-report statements are used as a measure then the Null Hypothesis must be accepted for the self-report of Present Pain Intensity.
CHAPTER 5

DISCUSSION

INTRODUCTION

The general purpose of this case study was to provide evidence for the efficacy of audiotaped hypnosis as a therapeutic intervention for chronic back pain. Hypotheses, written in the Null form, made statements of no change in the reduction of chronic back pain. Continuous monitoring of electromyographic (EMG) readings over time, before and during treatment as well as self-report assessment before and after daily treatment and at the end of the final time period, provided the criteria for change. Both statistical and verbal report analyses were used to assess impact; one hypothesis was rejected; two were accepted, and one was equivocal in its findings.

THE MAIN HYPOTHESIS

The rationale for Hypothesis One stems from theories of pain as posited by Sternbach (1968) as having both sensory and affective components (Barber, 1959; Erickson, 1967; Melzack & Wall, 1982; Pinsky, cited in Nigl, 1984; Hilgard & Hilgard, 1975) the dynamics of pain as proposed by the 'gate control' theory of Melzack & Wall (1982) and hypnosis as a treatment for pain as posited by Crasilneck (1979) who agreed with the gate theory. Hilgard's (1973) neodissociation theory of hypnosis illuminated the processes of the conscious and unconscious in the perception of pain and provided an insight into the difference between the conscious and the unconscious in acute and chronic pain. Wyke's (1986) neurological theory of hypnosis as a form of 'habituation' (a process of

Audiotaped hypnosis appears to be effective in reducing chronic back pain over a five week period of time. Success of treatment can be evaluated by the statistically significant lowered mean score of electromyographic (EMG) readings over time in the Experimental Group (B phase) as compared to the Control Group (A phase).

Hersen & Barlow (1982) cited studies which indicated that autonomic variables (in the area of biofeedback), "are subject to modification via instructional feedback, and reinforcement procedures." However, they noted that "considerable training is required before changes approach clinical significance" and that "the results of training...are rather ephemeral, as indicated by long-term follow-ups." They concluded that, "physiological responses seem to be less subject to conscious distortion on the part of the patient or client when used as dependent variables in experimental single case research. Only a highly sophisticated and equally highly trained subject (in terms of biofeedback for the particular response modality under consideration) would have the capacity to willfully control his physiological responses" (p. 138).
Hersen & Barlow (1976) cautioned that with "physiological measurement" and "repeated presentation of stimuli" there is "decreasing responsivity" (p. 139). This theory is consistent with Wyke's (1986) theory of neurological habituation and corroborates Melzack & Wall's (1965) gate theory of pain and Crasilneck's (1979) theory that the hypnotized patient blocks the perception of pain in the cortex.

**Box Jenkins Time-Series Analysis** (Figure 1.)

The data which has been analyzed fits the model of the Box Jenkins Interrupted Times-Series Analysis (Cook & Campbell, 1979) which is a sophisticated statistical technique which takes all the information into account. For the Experimental Group it not only modeled an abrupt change after the intervention but showed a statistically significant change of 2.06 microvolts in lowered electromyographic (EMG) readings, which indicated a significant reduction in muscle tension which remained steady for the rest of the treatment period.

The time-series was stationary for the Control Group and followed stochastic (probabilistic) processes. This is a typical pattern in the Control Group and the chart shows that all the data lie within the 95% confidence interval. If one looks at the chart, it shows that by daily use of the audiotape the pattern of change which is measured by lowered electromyographic (EMG) readings remains at a lowered level for the Experimental Group. If the data lie outside the confidence interval, then the data is said to be deterministic. This tells us that on the average, everything is correlated with everything else so that the occasional spikes in
the chart could be attributed to chance deviation and should not be interpreted as deterministic.

In so far as could be ascertained, the Experimental Group and the Control Group were very much alike. Nonetheless, there may have been some bias which was overlooked. Therefore, the reader is cautioned to accept the results accordingly.

The Binomial Test (Appendix G) (Hersen & Barlow, 1982), which Cook & Campbell (1979) refer to as "eyeball tests" (p.233) was used as a simple corroboration of the statistical results. As well, a simple comparison of positive change in EMG readings in the Control and Experimental Groups showed that the Control Group had a 51% improvement and the Experimental Group had a 67% improvement. This provided a further corroboration. It was clear from these results that the intervention was effective.

**Hypothesis 2**

There will be no reduction in perceived pain after daily treatment in the Experimental Group as measured by subjective self-reports of pain using words and numbers on a continuum of increasing value. The Null Hypothesis was accepted as there were fewer reports of pain reduction than reports of no change or an increase in pain.

The results of the self-report in this study are contrary to other clinical studies (Crasilneck, 1985b; Elton, Burrows & Stanley, cited in Hilgard, 1980) on hypnosis and experimental studies (Hilgard, 1973) in which subjective self-reports by subjects under hypnosis reported less pain.

There are several theories which may provide plausible explanations for this conclusion. Experimental studies (Hilgard, 1986) of acute pain and
hypnosis found that through the "hidden observer" and the process of "automatic writing," subjects reported that at an **unconscious** level, the subjects felt pain but at a **conscious** level the pain is not processed. The physiological mechanism (Hilgard & Hilgard, 1975) of acute pain ("fight or flight") is different from the mechanism of chronic pain ("habituation pattern"). It could be postulated that the chronic pain patient has over time accumulated pain memories so that under hypnosis the processes are reversed and at the **conscious** level the individual perceives pain but under hypnosis, at an **unconscious** level this perception is blocked or inhibited and pain is not felt.

Another explanation may lie in the subjects pain perception at a conscious level. Herson & Barlow (1982) stated that "Of the three response systems (motoric, self-report, physiological) that can be monitored in single case strategies, the self-report system is the one that is most subject to conscious distortion on the part of the patient or client (p. 131). The biasing factors include: self-monitoring effects, demand characteristics, impression management, faking, and other more subtle forms of response bias" (p. 132). The authors discussed the relationship among motoric, self-report, and physiological measures and stated that, "In addition to motoric and physiological target measure, the clinical researcher is most concerned with his patient's *perception* (italics added) of improvement....in short, there would be no reason to assume a high degree of correlation among the three response systems" (p.144). Lang (1968) corroborated the use of physiological and psychological measurements by suggesting that "specific techniques" should be applied to the "different behavioral systems that we are trying to change-verbal, overt-motor, and somatic, and that therapy should be a self-conscious, multidimensional process" (p. 92).
Another explanation for this discrepancy of the conscious responses versus the unconscious responses under hypnosis may lie with the profile of the chronic pain patient (Chapman et al., 1981) which corroborates the theory that patients who stand to gain something from their pain (secondary gain) will not acknowledge a reduction in pain or wish to give up their perception of pain.

Hilgard (1969) cited studies by Lewin, which found that, "The amount of pain felt in laboratory experiments has been shown to be related to how much pay is offered the subjects: the higher the reward the greater the pain, even though the amount of reward is determined by lot" (p. 139). Barber (1970) cautioned that accepting the hypnotic patient's verbal report in experimentally induced pain may not be valid indices of suffering as patients in a hypnotic situation may be motivated to "inhibit overt signs of pain and to deny pain experience" (p. 214).

Hersen & Barlow (1982) cited studies by Braginsky & Braginsky; Braginsky, Grosse, & Ring, in which both acute and chronic psychiatric patients presented themselves "as either 'healthy' or 'sick' in structured interviews and on standardized self-report inventories" (p. 136). The authors also reported that with respect to "demand characteristics," self-report is the "most vulnerable to bias" and that "biases in verbal reporting" include "lying and faking" (p. 136). Barber (1982) stressed that "secondary gain, reinforcement of disability, family dynamics, self-esteem and using pain as a focus to deflect attention away from other important problems" (p. 49) were issues which had to be considered.
Hypothesis 3

Audiotaped hypnosis will have no effect after twenty-five treatments over five weeks on perceived pain as measured by subjective self-report. The Null Hypothesis was accepted as there were 16 positive responses and 12 negative responses out of 28 possible responses which related to the effectiveness of the audiotape. However on question #1 which was the only question which rated pain reduction on a scale of 0=least helpful to 10=most helpful, there was only one response which was above a 4, and this response was from the subject who was most cooperative towards the researcher. Hersen & Barlow (1982) cited studies (Orne, 1962, 1969, 1970; Orne & Evans, 1965; Orne & Holland, 1968) in which "It has been shown that experimental subjects frequently respond in accordance with the experimenter's hypotheses and expectations as soon as they become aware of their existence" (p. 134). The subjects in this study may have been influenced by wanting to please the experimenter with positive self-reports on the efficacy of the effectiveness of the tape while at the same time excluding any positive ratings or descriptions of a reduction in pain for fear of losing any of the benefits from secondary gain as well as the realistic gains of a pension if they were not fit to work. Chapman, Brenna & Bradford (1981) studied pain patients in a chronic pain rehabilitation program and stated:

In addition the adversarial nature of legal systems often puts the patient in the position of maximizing pain and disability in order to receive a more substantial settlement, while the insurance company may look for evidence to minimize the patient's claims and attribute them to a desire for secondary financial gains. (p. 105)
However, the possibility exists that the patients really did find the tapes to be helpful but did not experience a reduction in pain.

Hypothesis 4

A combination of electromyographic (EMG) biofeedback in combination with audiotaped hypnosis will not be effective in the reduction of chronic pain. The Null Hypothesis was rejected by the measurement of EMG readings and accepted by self-report measurements. However, as physiological responses are less likely to be affected by demand characteristics (Barlow, Agras, Leitenberg, Callahan and Moore, cited in Hersen & Barlow, 1982, p. 135) and physiological responses are less subject to distortion, (Hersen & Barlow, 1982) than self-report, there is more statistically significant evidence for a rejection of the Null Hypothesis which is corroborated by theories which propose that the combination of two or more therapies (Melzack & Perry, cited in Weisenberg, 1984: Pinsky & Malyon, cited in Spino, 1984) or multiple convergent therapy, (Melzack & Wall, 1965) is more effective than any given therapy.

Threats to Causal Inference

Random assignment is the main criteria for causal inference (Cooke & Campbell, 1979) but the authors noted that this is difficult to implement in a "field" or clinical setting. (p. 4) Kebrdle & Roeder (1986) agreed that random assignment "allows for greater generalization and extrapolation of the findings but pointed out that "several factors mitigate against its use in the research of hypnosis" (p. 22). The authors cited studies by Hilgard & Tart (1966) which reported that "only 30 percent of the population is highly susceptible to hypnosis and 42 to 45 percent are minimally
susceptible" (p. 22). Hilgard argued that because many subjects are not susceptible to hypnosis, any positive effects by those subjects who are susceptible to hypnosis would be obscured. Kebrdle & Roeder (1986) suggested using subjects of varying levels of susceptibility "in sufficient numbers to allow for comparisons of meaningful susceptibility categories" (p. 23). Hilgard (1980) theorized that if careful measurements were used, there was less need for large numbers because they "may conceal as much as they reveal" (p. 249). He argued that statistical significance alone was not a guarantee of practical significance. As this case study involved a small group of subjects, hypnotic susceptibility was not measured and random assignment was not possible but by taking the mean EMG readings for the four patients each day, this averaged out the effect of the treatment and allowed for the confounding variable of susceptibility.

**Threats to Valid Inference**

In both the Control Group and the Experimental Group the dependent variable was the same. In order to rule out threats to valid inference (Cooke & Campbell, 1979) one has to look at the "three senses of control" (p. 6). These include: the research environment; control over the independent variable; awareness of single threats. The authors noted that "The amount of control is at issue and not whether there is control or not" as "no environment offers total control" (p. 5). The research environment was in a controlled setting for both groups. The independent variable differed in content for each group but the equipment (an audiotape) was the same. As well, the individuals who recorded the electromyographic measurements were trained physiotherapists who had no "experimenter expectancies" for the results of the measurements (Cook & Campbell,
In a clinical setting the experimenter has less control over extraneous outside variables and as Cook & Campbell (1979) pointed out causal inference is therefore more problematic to infer than in a laboratory experiment and that "experiments probe but do not prove causal hypotheses" (p. 18).

**Internal Validity**

The internal validity of an experiment implies "that the relationship between two variables is causal or that the absence of a relationship implies the absence of cause" Campbell & Stanley (cited in Cook & Campbell, 1979, p. 37). The independent variable (audiotaped hypnosis) was present in both the control and experimental groups but in the Control Group the audiotapes were not all the same. Some were relaxation, some mood music, some hypnosis and they were chosen at random, whereas in the Experimental Group the audiotape was the same over the period of treatment. The treatment for the Experimental Group was repetitive over time.

When physiological measurements are monitored in single case research there are certain difficulties which may cause problems. These include: "Mechanical problems, adaptation phases, stimuli, experimenter and contextual variables, and the question of stimulus-response specificity in the absence of confirmatory verbal reports. (Hersen & Barlow, 1982, p.139). The researcher found that mechanical problems were a very important variable because the tape recorder did not function well on the first day and had to be replaced. However, measurements were still recorded and averaged for the day. Checking out equipment beforehand is suggested for future studies.
Hersen & Barlow (1982) suggested allowing "sufficient time for adaptation during each trial" (p. 140). EMG readings were taken 15 minutes after each session started which allowed for adaptation time to occur. Galvanic skin response (GSR) has been shown "to diminish in size with repetition of the stimulus" by some researchers (Solyom & Beck, cited in Hersen & Barlow, 1982, p.141) and to be "quite reliable by others" (Barlow, Leitenberg, & Agras, 1969, cited in Hersen & Barlow, p.141). The authors noted that "all physiological response systems do not show equal decrements in the face of repeated presentations" (p.141).

**External Validity**

These results rely on the assumption that the Control Group and the Experimental Group have equivalent characteristics but as random selection was not possible external validity is somewhat weak. The criteria for selection was that all the subjects were in the in-patient program at the pain clinic and all were being treated for chronic back pain. In order to strengthen external validity to allow for generalizing the findings to subjects, settings and occasions, future research would need to replicate this experiment in a different setting, at a different time of day and on different occasions in order to substantiate that the intervention effect which was observed was in fact steady and didn't vary with these other factors. If there was a difference in any of the factors, then the experimenter would have another variable to worry about. However, as this is an exploratory study, at this moment in time, one can generalize to these subjects, this particular setting and this particular occasion.
CONCLUSIONS

If acute pain is a warning (Hilgard & Hilgard, 1975) then the message to the brain is a fight or flight signal and is short in duration. Melzack & Wall's (1982) gate theory of pain postulated that when pain occurs it sends information to higher centers in the brain stem and ultimately to the cerebral cortex. As well, "The higher cerebral and brain stem centers can influence the volume (italics added) of pain information allowed to reach conscious levels by opening or closing the gate at the spinal cord level." As there is an affective component to pain (Barber, 1959; Hilgard & Hilgard, 1975; Melzack & Wall, 1982a, 1982b; Sternbach, 1968) and a mind/body connection (Rossi, 1986) then perception of pain is a key issue in the treatment of chronic pain. If pain is perceived as positive as in the example of World War II soldiers who when wounded required little or no pain medication because they were relieved to be taken out of battle, then the "higher cerebral centers clearly not only influenced but turned off the volleys of pain information reaching their spinal cords" (Paul, 1937, p.37). Melzack & Wall (1988) posited the belief that the predominant effect of hypnosis may be in activating control processes which modulate input as it is transmitted to the brain. Experimental studies (i.e. studies on the "hidden observer" and "automatic writing," Hilgard, 1975, 1986) on hypnosis and acute pain, have shown that under hypnosis this 'gating' process occurs so that at a conscious level there is no perception of pain even though pain is felt at an unconscious level. This may be the reverse for chronic pain. As well, through hypnosis, powerful natural inhibiting chemicals called endorphins may be released from the brain (LeRoy, 1976).
Chronic pain builds over time (Fordyce, 1986; Melzack, 1983, 1989; Melzack & Loeser, 1978; 1965; Sternbach, 1984) and a pattern of pain is learned (Erickson, cited in Lankton, 1989; Fordyce, 1986). Messages to the brain are patterned so that a stimulus not associated with pain (anxiety, cognitive self-defeating messages) cause muscle tension which in turn may lead to pain, thus building a pain-cycle and a chronic pain personality (Chapman, 1986, 1988; Mutter 1986; Pinsky, cited in Nigl, 1984) or "sick role" personality (Pilowsky, cited in Sternbach, 1984) which is similar to Glasser's (1965) "failure identity" in which the individual has no control over their life and becomes a "negatively addicted person" who escapes emotional pain by giving up and developing psychosomatic diseases. Studies (Elton, Burrows & Stanley, cited in Hilgard, 1980) have shown that there is a relationship between low self-esteem and persistent pain.

If chronic pain takes time to establish a pattern in the brain and if hypnosis depends on repetition of a monotonous stimuli (Wyke, 1986) which reduces the perception of acute pain, then it could be postulated that hypnosis for chronic pain would require repetition over an extended period of time. This could be accomplished by the repeated use of audiotaped hypnosis.

Hypnosis has been shown to be a powerful tool for the therapist, alone (Erickson, 1983) or in combination with other therapies (Ellis, 1986; Erickson, 1986; Golden, 1986; Melzack & Wall, 1982). Individuals function at all times with many levels of consciousness; some voluntary, some involuntary (Fromm, 1979; Hilgard, 1973). Audiotaped hypnosis over time which includes deepening techniques, indirect suggestions to the unconscious (Erickson, 1983d), relaxation which produces a physiological pattern to combat the 'fight or flight' defense pattern of pain messages,
(Budzynski, 1977) visual imagery which may reduce pain, (Barber, 1982; Erickson, 1989) guided imagery to facilitate the release of inhibiting endorphins from the brain, (Blum et al., cited in Benson et al., 1984; Nigl, 1984) and ego-strengthening suggestions (Levitan, 1988) which promote a sense of control and self-esteem (Ellis, 1977; Elton et al., 1980) may be effective in producing cumulative positive processes which will break the 'pain cycle,' (Grzesiak, 1984; Keefe et al.; Schuman, 1982) change pain memories (Melzack & Loeser, 1978) and prevent the chronic pain personality, (Chapman et al., 1981) from developing further.

This study has shown that audiotaped hypnosis in combination with biofeedback may prove to be a more effective treatment for chronic pain when the same audiotape is used over time. Both physiological and psychological evidence of the effectiveness of audiotaped hypnosis was reported. However, the reader should be cautioned that while the physiological data is statistically significant, because the electromyographic readings were taken from different sites of the body and the differences in EMG readings were averaged each day, the clinical significance of the analysis of the data should be viewed not as a numerical value of change but as a tendency to deviate in a positive direction of change.

The use of hypnosis audiotapes provides a safe, economical, method of treating patients with chronic pain in either a pain clinic in combination with behavioral and other treatment methods or as an adjunct to individual therapy. As well, audiotaped hypnosis may prove to be a valuable adjunct to the therapist who wishes to speed up therapy with patients or clients who have differing personality disorders but are unable to pay for lengthy periods of individual therapy.
Implications for Future Research

Biofeedback has been reported as a successful treatment of chronic back pain (Nouwen & Solinger, 1979; Schuman, 1982). Hypnosis has been reported to be successful in inducing an altered state of consciousness (Erickson, 1983d, Hammond, 1988; Hilgard, 1975) and has been successful in reducing chronic back pain (Crasilneck, 1979; Elton, Burrows & Stanley, 1980; Elton et al., cited in Hilgard, 1980). Audiotaped hypnosis has been shown to be effective in educating clients with self-hypnosis (Levitan, 1988) and in cultivating relaxation (Budzynski, 1977) which promotes a reduction in anxiety and muscle tension, which may reduce pain.

The role of the "hidden observer" (Hilgard, 1973) has been explored in laboratory studies of hypnosis and acute pain. Further studies on chronic pain with patients in a clinical setting may provide more information on conscious versus unconscious processes with chronic pain patients.

Studies have shown that a combination of therapies is more effective than one therapy (Melzack & Perry, 1975; Melzack & Wall, 1988). However, further studies with more rigid controls are necessary to confirm the results of this study which combined audiotaped hypnosis and biofeedback.
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APPENDIX A

PAIN PATIENTS
The following information was taken from any available material to which the experimenter was given access and a daily log which the experimenter kept on the pain subjects.

Pain Patients

Subject A

A. was a forty-two year old man who was injured when the logging truck he was in rolled over. He has not worked since 1987. He has a younger sister and brother. His father died at 54. His childhood was very disruptive as he moved many times. He is an alcoholic who stopped drinking five years ago and does ACOA work. He was separated from his second wife who is living with their two sons (he has two other children from his first wife) and her boyfriend in their home. He still cares for his wife. A. described himself as a "cowboy". He liked country and western music, horseback riding, fishing, camping, running and other outdoor sports.

A. worried about money and his future and was often depressed and sometimes suicidal. His test results on the MMPI showed that he was severely depressed, had low self-esteem, autistic daydreaming and depressive ideation. He had high levels of anxiety, tension and insecurity. The psychologist reported that, "It is probable that his somatic complaints are used for dependency gratification, particularly in interpersonal relationships." The Beck Inventory indicated a moderate to severe level of depression. The Life Impact Assessment Questionnaire revealed that his activity was restricted and he had no real satisfaction in life. He had no social contacts and acknowledged low self-esteem and low sexual desire.
The Pain Disability Index showed that he was only minimally effected in life support activities and self-care. The McGill Pain Questionnaire showed that he had low back pain and leg pains. He had been on pain medication and was in a rehabilitation program at the Workman's Compensation Board for three weeks.

During the course of treatment A. reported having "out of body" experiences. He was concerned about subliminal messages in the tape. He talked about his wife and children and feeling "like a nine year old" when, due to miscommunication, his family didn't show up at the hotel. Over the period of the treatment his moods fluctuated depending on the moods of the therapists and the other patients reactions to him. He complained about the quality of the tape, especially one word which "popped" and he told the experimenter that he knew a good recording studio. A. said that when he was on the bus and "having problems" he would remember "three deep breaths" from the tape, which helped him. The psychologist at the clinic said that A's past history as a child of alcoholics and his lifestyle of drugs and alcohol precluded his making any long lasting changes.

Subject G

Subject G. was a 50 year old man who was injured moving a 45 gallon drum at a brewery. He was the youngest of three children and grew up in the prairies. His father was an alcoholic who died at the age of 76. G. married recently and had three children from two previous marriages. He had no contact with two of his children. He has a grade nine education and spent three years in the army and worked for five years in a grain elevator
and six years at a gas station prior to his job at the brewery. He had been on compensation before but had been cut off two or three times.

G. had undergone two back surgeries and several mild seizures and one grand mal seizure. He had tried to go back to work but found it too difficult. He was angry at the WCB for the delays for his claims. He was suspicious of questionnaires. He questioned the value of being retrained for work.

G. had a supportive wife but the marriage was stressed because of his pain and sexual dysfunction. The psychologists report stated that he "appeared tense, frustrated, irritated, and angry" and that he was searching for a medical resolution to his pain problems. He denied any problems with depression. The doctor at the clinic stated that he "needs to learn to manage pain" and that he has been "leading an inactive, sedentary lifestyle with gradually increasing protective accident behaviors."

During the course of treatment, G. had several seizures. He complained of the noise at the hotel, the uncomfortable chairs during the audiotaped hypnosis, other patients' comments and the physiotherapists comments about his posture. He got upset when he thought that his progress was being unfairly compared to another patient. G. was angry with the WCB because he thought that if he was off medication, they would think he was fit to work.

G. said that he would use the audiotape at home and thought he would loan it to his mother-in-law, who had problems but didn't like "being told what to do." He thought the "non-directional suggestions" were better than "being told what to do."
Subject C.

C was a single 30 year old female who had chronic low back pain due to an injury when she twisted her back while filing. She had a therapeutic abortion on her doctor's advice that it would be too difficult to carry the baby to term. She was depressed afterwards. The report on the Beck Inventory showed that she had significant depression and was despondent about her interpersonal relationships. Sexually she had less desire.

C. participated in a rehabilitation program prior to this in 1987. She walked and swam twice a week and her general attitude improved as she was more active. Her family was supportive; her father has heart disease and chronic bronchitis; her mother is healthy.

During the course of treatment, C was good-natured but complained of nightmares and not sleeping well. She found the chairs uncomfortable at the clinic. C flirted with one of the other patients and sometimes laughed at jokes during the sessions. The physiotherapist thought that her smile masked a passively aggressive person and queried possible sexual abuse.

C. expressed impatience with WCB and said that she would like to work part time in an office and part time at home on a computer. She said that she would use the audiotape at home but didn't think that it helped her with pain during the sessions.

Subject D

D was a 36 year old man from the prairies who was separated from his wife. He had six children. His prior jobs included working as a B.C. lineman and a roustabout in the oil fields. He hadn't worked since 1983. He injured his back in 1974 and had been to the WCB rehabilitation program.
He tried to return to work twice but had to stop. He enrolled in a Fine Arts course and enjoyed it.

D. has had a lot of physiotherapy without much success. He used to be active in horseback riding for up to two hours a day and canoed, hunted, walked, did woodworking and worked with leather. He had a home exercise program he did for 20-30 minutes a day. His social activity was severely limited due to his pain. However, he expressed a desire to return to work.

During the course of treatment he complained that the placements of the electrodes were painful. After eight treatments with audiotaped hypnosis, he said that he could "relax better now but that it had nothing to do with the biofeedback." After the tenth treatment he said that he noticed that there were two places in the tape where he relaxed more but he couldn't remember where they were. He said that every time he listened to the tapes he heard "something new" and wondered if the experimenter had made a new tape.

Towards the end of the sessions there were several conflicts with the staff and the patients and the patients amongst themselves. The group divided into two parts. There were many upheavals at the hotel due to renovations. Usually the patients went home at the weekends and their mood on Monday reflected whether or not the weekend was good for them.

All the male patients in the Experimental Group came from dysfunctional families and there was a history of alcohol and drug abuse in their families of origin and with themselves. All the patients had suffered severe loss in their lives and had also experienced a loss of physical and mental control due to their pain. The experimenter did not have access to the personal files of the Control Group.
APPENDIX B

CHRONIC PAIN PATIENT PROFILE
Chronic Pain Patient Profile

From intensive investigation of chronic low-back patients, the emergence of the following profiles are presented. They broadly characterize the patient who suffers with severe, intractable, disabling back pain for which no specific abnormality is found, and are presented only to alert the therapist to additional descriptive "signs" of patients who have the propensity to chronicity.

Biological Profile (Gentry et al., 1972; Cairns et al., 1976)

The potential chronic low-back patient:

- has an initial onset of symptoms at a relatively young age; 30.6 for females, 35.7 for males, 33.5 average;

- attributes his or her symptoms to a wide variety of minor causes, usually sprains, strains, or other minor trauma;

- tends to have less formal education: 11.7 years formal education for females, 10 years formal education for males, 10.8 average;

- begins work at an early age; 20 years old for females, 14.5 years old for males, 16 average;

- tends to be later-born child with many siblings;

- places an emphasis on family togetherness and interaction;

- may have had model figures who experienced chronic low-back pain that was unresponsive to conventional treatment (23% do).
Socioeconomic Profile (Gentry *et al.*, 1972; Cairns *et al.*, 1976)

The chronic low-back patient:

- most were married at the onset of pain (98%);
- most had some form of compensation available at the time of initial onset;
- most had a stable work history: Average length of time at job at onset of initial symptoms was 7.2 years, and on the average patients held only two previous jobs;
- tended to be employed in jobs that required physically strenuous or overly routinized responsibilities;
- tended to work at blue collar manual or white collar clerical-type jobs (64%), to be housewives (18%), or to be professionals (11%);
- 59% tended to have a life experience including familial models for pain and/or major disability;
- often experienced little satisfaction from their jobs;
- often were a drug and/or alcohol abuser.

Preexisting Personality Profile

At the time a patient experiences an "acute" episode of low-back pain, any of the following psychic states or conflicts may already be present or emerge under the added stress:

Anxiety

Depression
Conversion hysteria
Masochism
Pain and loss
Strong dependency needs
The "need" for pain
APPENDIX C

SUBJECT CONSENT FORM
Subject Consent Form

Title of Project: An Investigation into the Use of Audiotaped Hypnosis for Chronic Back Pain
Principal Investigator: Susan Taylor

I am doing a Master's thesis to investigate the effectiveness of listening to hypnotic suggestions on an audiotape in order to reduce chronic pain. I will be asking you to fill out a questionnaire before and after the sessions on each Monday and Friday and listen to an audiotape for one twenty-five minute session per day for five weeks. Each session will be tracked by EMG readings as well. The information given will be strictly confidential. Confidentiality will be maintained by deleting any personal references and only the first initial of your first name will be used.

Your participation is voluntary. You have the right to refuse to participate in the study without having your decision affect your treatment.

In light of these facts, I consent to be a subject in this study.

Subject:__________________________

Researcher:__________________________

Date:___________, 1989
APPENDIX D

PRESENT PAIN INTENSITY SCALE (PPI)
Present Pain Intensity Scale (PPI)

Please check the appropriate number which describes your pain at this moment.

___ -1 - mild
___ -2 - discomforting
___ -3 - distressing
___ -4 - horrible
___ -5 - excruciating
APPENDIX E

VERBAL SELF-REPORT TAPE EFFECTIVENESS QUESTIONNAIRE
Tape Effectiveness Questionnaire

First name: ___________________ Date: ___________________

Please circle the number which corresponds to how effective the tape was for you in reducing pain during the sessions.

0 1 2 3 4 5 6 7 8 9 10

least helpful most helpful

What did you find most helpful about the tape?

What did you find least helpful about the tape?

At what point or points in the tape did you drift off?

If you wanted to make improvements in the tape what would you change?

Did you find that there were any lasting effects of the tape between sessions? If so, what?

Do you think you will use tapes in the future to help you manage your pain?
APPENDIX F

TRANSCRIPT OF THE HYPNOSIS AUDIOTAPE
Appendix C

Hypnosis Tape Transcript

Just make yourself comfortable. Put your hands on your sides, uncross your legs and close your eyes and become aware of any sensations around your eyes, your eyelids and your eyebrows. Allow those muscles there to become more and more relaxed, more and more relaxed—so relaxed and so calm and allow the relaxation to drift down and down to your chin, down and down to your neck—and let it drift and drift and drift—all the way down to your feet—and while you’re relaxing the different parts, imagine that you are more and more relaxed—and as you hear the music in the distance,—allow yourself to drift and drift and relax—and now be aware of your breathing—take in the oxygen to your lungs and as you breath out, relax the muscles in your chest a little bit more—feel the comfort—feel the relaxation—every time you breath in, in a normal, regular manner—and while you’re listening to me and the music in the background—just allow yourself and your body to become a little bit more relaxed—and allow your mind to drift and drift and drift—Everything I’m going to talk about will be taken up by your unconscious mind and you will use it to help yourself in every way, every day, the unconscious will understand and utilize everything I’m going to tell you,

Trance Induction

Progressive relaxation induction (Crasilneck, 1985)

Relaxation (Hammond 1988)

Deepening technique

Deepening technique

Posthypnotic suggestions (Hammond, 1988)
without your even being aware of it in the
daytime consciously, or at night——for your unconscious will always help you
improve——physically, men-
tally,——and emotionally——and while I'm talking to
you——just allow yourself to become
more and more relaxed——And
just allow the music, or any surrounding noise
to become part of your comfort, part of your
relaxation——just allow your-
self to drift and drift and drift——
drift, deeper and deeper and deeper——
so relaxed, so calm and while you're relaxing
yourself or imagining you're relaxing, I'll count
from 5 backwards to guide you——
———and every time I count from 5 to 1
allow the body to become even more relaxed——
———more calm———more
comfortable———You see, you
don't need to move———You don't
even need to think———You don't
need to do anything——and you
don't even need to listen———Just
drift and drift———5———4
———deeper and deeper——and as
you hear the music and my voice, 3———
———so relaxed, becoming more and more
comfortable———relaxing,———calm,—
———2———very relaxed, very
calm———1———relaxed, calm——
———
———As you breath in, allow the oxygen to enter your
lungs———and then as you breath out,
allow yourself to become more and more re-
laxed each time———and now,
just relax———Your breathing rate now

Contingent suggestion is
useful for utilizing exter-
nal environmental noises
(Hammond, 1988, p. 63)

Deepening technique-
breathing and counting
(Hartland, 1971; cited in
Hammond, 1988, p. 65).

Hypnotic suggestion: not
knowing, not doing:
these suggestions facili-
tate unconscious respon-
siveness rather than
conscious effort (Ham-
mond, 1988, p. 84).
-Counting down; deepen-
ing technique, (Ham-
is changing, down and down—and down,
to a normal, regular, restful, rate—

—Your breathing heart rate is going down and down,
and down to a normal, regular, beat—

—Your metabolism now is drifting
down and down
brainwaves are shifting—
—Everything in your body is changing to a
much, slower, relaxing rate—CALM,
RELAXED, and while I'm talking and as you
hear my voice and the music in the background,
consciously you don't need to pay attention to
me at all—

and now just picture yourself in my office lying
back in a comfortable reclining chair, looking
out the window imagining, enjoying the ocean
and the fresh air—

—You might just enjoy the sounds of the ocean tum-
bling onto the sand, or the music in the back-
ground—

—Picture a beautiful healing light all around
you or you might just sense it, as though you
are in an energy field surrounding you—

Just feel the comfort—allow the energy
causing you discomfort, to evaporate, and at the
same time, allow the light to absorb the discom-
fort or an sensations you don't need—

—imagine one beam brighter than all the
others which will shine right in the middle of
your forehead—and will

—go right inside to the centre of your brain—

You may feel the sensation there or you might
relax and go into the music—and allow the part of you unconscious mind to
release healing chemicals or endorphins which

Conscious-unconscious double bind (Erickson
and Rossi, 1976).

Visual imagery develops
an internal absorption of
attention (Hammond, 1988, p.65)

Hypnotic suggestion of a
truism; a statement of
fact which person has
experienced and can't
deny (Hammond, 1988,
p. 84).

Visual imagery
will reduce any discomfort or tightness in your body—

Allow the chemicals to release and to flow throughout your whole body. With every breath that you take in, the oxygen will increase the energy, increase the healing—which will flow throughout your system—and now imagine that you see a large T.V. screen in front of you. Consciously you don’t need to listen—your unconscious mind will listen for you—Picture yourself when you were healthy and happy—and enjoy that feeling of comfort and oneness with your body—

A sense of harmony,—feeling a sense of inner control, of warmth,—of health—Let those feelings be imprinted on your mind.—

—Now allow yourself to enlarge that picture and see them in technicolour—sense them and enjoy them—

—Allow these feelings to be imprinted on your mind and know that any time you wish to use them these feelings will help you in the future and any time you need them you will take three deep breathes and know that your unconscious mind will bring forth these feelings and healing chemicals from the centre of your brain, without your being aware of this consciously—

—And every night when you fall asleep—your unconscious mind will resolve the problems that you encounter every day and will get rid of any negative self-defeating thoughts, without your being aware of it.
consciously, because your unconscious mind
will do it for you
—and know that all the different functions of
your muscles and nerves within your body will
help you feel a sense of inner harmony and
calm
and we know that every moment of the day, that
every moment, there are thousands of cells
being replaced—so that in any one day there
are billions of new cells which are healthy and
strong—as if they have give you a new
beginning, a new start
—Now, allow yourself to relax, enjoy the mu-
sic, allow the light to surround you, like a vi-
brant, healing energy field
and the next time when you hear this quiet
music and my voice, allow yourself to drift
even deeper than before—and allow
yourself to become more and more relaxed,
more and more peaceful
—Now, I will count from 1
to 5. Allow yourself to awaken feeling re-
freshed, revitalized, calm
—2—3, beginning to awake feeling re-
freshed and calm, mentally and physically, 4—
—just about awake—feeling calm,
refreshed—5—wide awake, wide awake.
Binomial Test

The probability of an observation point being either below the baseline is .5. For n points, the probability of 50% lying above the baseline and 50% below, is .5.

If there is a significant intervention effect, x-points could lie above the baseline and n-x could lie below the baseline, +x should be significantly larger than n-x.

Lowered mean EMG readings are an indication that audiotaped hypnosis is effective. In this study, for the control group (A phase), 16 points are above the baseline and 9 points are below the baseline. In the experimental group (B phase), 23 points are above the baseline and 2 points are below the baseline.

The probability of x points lying above the baseline by sheer chance, in the case of a significant intervention should be small— it is, in fact; p=0.5. In the Control Group, p=.06. In the Experimental Group p=.000009.

Results showed that there was a change of 2.06 µv (microvolts) in average EMG readings in the direction of improvement in the B phase (Figure 1).

A comparison of the Control Group and the Experimental Group showed that the probability of 23 cases lying above the baseline by chance alone was very small. From this we inferred a significant interaction effect and these results led to a rejection of the hypothesis as stated in the Null form.