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Does locus-of-control influence efficacy of nonpharmacologic approaches to pain control

Lange, Mary Patricia, Ph.D.

Wayne State University, 1990

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1990

DOES LOCUS OF CONTROL INFLUENCE EFFICACY OF
NONPHARMACOLOGIC APPROACHES TO PAIN CONTROL

by

MARY PATRICIA LANGE

DISSERTATION

Submitted to the Graduate School
of Wayne State University,
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DEDICATION

To my Parents who have always believed in me

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A project such as this can never be accomplished alone and it is very difficult to thank everyone who contributed. First, I would like to thank my family - my children, Scott and Matthew who were so understanding when my schedule was erratic and sometime took precedent over their needs; my husband, Ralph, who has supported and encouraged me all the way, often providing the additional help when I thought I could not make it and who was willing to put up with all the demands I have placed on him during this project. To my committee, I also owe a debt of gratitude - Dr. Carolyn Lindgren, Dr. Arthur Brown, Dr. Donald Marcotte, my advisor and especially Dr. Martin Hogan, who continued to believe in me more than I believed in myself. To my colleagues in the Surgical Intensive Care Unit, VA Medical Center, I express my thanks. They have put up with my demands, schedules and have never failed to be there with their interest, support and encouragement. Last, but by no means least, to Dr. Michael Dahn, my friend, without whom I never would have started this endeavor and who has always been there with technical advice, practical advice, encouragement and support for every aspect of this project, I offer my thanks. To all these and more, I owe a deep dept of gratitude. Thank you very much.

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CHAPTER I

BACKGROUND

Pain has been described as a multidimensional concept including physiological, psychological, sociocultural and behavioral considerations. Johnson & Rice (1974) and Melzack & Wall (1965, 1975) further describe pain as an experience which consists of three components: the stimulus, transmitting neural impulses to the higher brain centers, the interpretation of these transmissions and the behavioral responses to these transmissions. Richard Sternbach (1968), psychologist, encompasses both the sensory stimulus and behavioral response in his definition. He describes pain as an "abstract concept which refers to (1) a personal, private sensation of hurt; (2) a harmful stimulus which signals current or impending tissue damage; (3) a pattern of responses which operates to protect the organism from harm". McCaffery (1979) states that pain is "whatever the experiencing person says it is, existing whenever he says it does." From these definitions, the health care delivery team must derive methods to treat this worldwide health problem whose magnitude is enormous. Bonica (1980) estimated that 50 million Americans are disabled yearly, from a few days to several months, by some type of pain. This can be translated to millions of dollars lost in time and work productivity.

Although the concept of pain is abstract and multifaceted, there appears to be agreement on the two

distinct types of pain: acute and chronic pain. Acute pain typically functions to inform of a noxious stimulus and to warn of already present or impending danger. It may be caused by external (surgery/trauma) or internal (disease) agents and the behavioral responses usually are geared toward the maintenance of stability or prevention of further pain. Examples of these behavioral responses include splinting or shallow breathing to avoid pain following surgery; avoidance of a particular food which is known to have precipitated an episode of cholecystitis in the past. The key element of acute pain is the knowledge that the pain is limited to a certain period of time (e.g. limited to the time required for recovery from a surgical procedure) (Johnson, 1977).

Chronic pain may begin as acute pain or may have a more insidious onset. Characteristics of chronic pain may be similar to acute pain in terms of intensity; however, the characteristic of chronic pain which differentiates it fully from acute pain is the absence of a known time limit. Chronic pain becomes a state of existence for the sufferer (Johnson, 1977).

Understanding what is currently known about the concept of pain requires a chronological look at the evolution of pain theories as they exist today. Currently several theories are present which attempt to integrate many theoretical mechanisms and explain the multidimensionality of pain.

One of the earliest theories is known as the affect theory which takes into account the psychological and

emotional aspects of pain. Perception of pain is influenced by anxiety, suggestion, past experience, cultural norms and the meaning of pain to the individual (Kim, 1980). Levanthal and Everhart (1979) describe an attitude model which can be considered part of the affect theory. They propose that there is a direct link between overt expression and inner distress and that guilt, depression, shame and anger may have a significant impact on the intensity of pain.

Pain research of the early 1900's focused on identification of specific nerve fibers with special attention geared to explaining what parts of the nervous system were involved with pain. The specific and pattern theories were the products of this investigation. The specific theory proposed that a single nerve fiber transmitted a painful impulse directly to the brain. Discovery of the A-beta, A-delta and C-fibers supported this theory. (Fields, 1987). The specificity theory proposed that the nerve endings were pain receptors and the impulses were carried by these fibers by the lateral spinothalamic tract in the spinal cord to the pain center, located in the thalamus (Melzack & Wall, 1965). This theory implies that there is a direct communication from the skin to the brain but fails to explain the phenomena of phantom limb pain or other peripheral neuralgias.

In an effort to explain the presence of pain in the absence of peripheral nerve endings, the pattern theory was developed. This theory proposed that excessive stimulation of nerve endings resulted in stimulation of all nerve

endings which resulted in the interpretation of pain by the brain cortex (Gedaly-Duff, 1988). This theory is also known as the summation theory - that is, the stimulus intensity and central summation are critical determinants of pain and the central summation of the impulses is in the dorsal horn of the spinal cord (Melzack, 1973).

In 1965, Melzack and Wall proposed the gate control theory which is widely accepted today and endeavors to incorporate aspects of the previous theories into this contemporary theory. The gate control theory proposes that stimulation of peripheral nerves evokes the transmission of impulses to three areas or systems of the spinal cord: (1) cells of the substantia gelatinosa in the dorsal horn, (2) dorsal column fibers projecting toward the brain and (3) cells in the dorsal horn. Cells of the substantia gelatinosa (extending the entire length of the spinal cord) serve as the gate, modulating transmission of the nerve impulses from the periphery to central centers. Impulses transmitted via the A-fibers activate a negative feedback or inhibition while impulses traveling along the C-fibers activate a positive feedback mechanism. In addition, the afferent pathways in the dorsal horn activate selective brain processes which, in turn, activate descending efferent nervous fibers which also have an effect on the gating mechanism. This is the mechanism which is thought to allow previous experiences, memories, emotions, attention, and other sensory input control over gating (Melzack & Wall, 1965).

Melzack & Wall (1965) propose that the gate theory has

therapeutic implications and that control of pain may be modulated by (1) selectively stimulating the A fibers; (2) selectively decreasing C-fiber input and closing the gate; (3) pharmacologically selectively inhibiting the substantia gelatinosa; (4) counter-irritation with electric current, heat, cold, massage or other stimulation which creates a tolerance for noxious stimulus.

Another recent pain theory is that of endogenous opiate neuropeptides which are thought to modulate the perception of pain. Endorphins and enkephalins are neurotransmitters-neuromodulators which act at the synapse level of the neuron by binding to the opiate receptor (Sweet, 1979). Enkephalins are part of the endorphin molecule and are thought to inhibit transmission of the pain impulses in the spinal cord, as well as to intercept afferent pain impulses in the brainstem. Altered physical and emotional states can produce varying amounts of these neuropeptides. It is known that endorphins are increased with exercise and noxious states (Dolphin, 1983).

From the above-presented theories, one can form a framework involving a psychosomatic view of the pain process and derive that pain arises from (1) damaged or potentially damaged tissues; (2) memories of imprinted pain from the spinal column; (3) cognition; and (4) emotional response (Wallace, 1982).

From a practical standpoint, most people, when experiencing acute pain recognize it as short-lasting or easily reversible. In these instances the pain is believed to be a response to tissue damage or impending tissue

damage. Sternbach (1974) describes this as when people cognitively try to explain or find meaning in this experience. When the initial discomfort passes the threshold and becomes mild pain, one's anxiety increases as attention is focused upon the pain to understand it. When some cognitive structure is given to this experience, anxiety decreases again. If the pain persists and/or increases, this is accompanied by greater anxiety. Anxiety arises from two sources: 1) the cause of the pain may be mistaken and it may represent something more serious than expected and 2) the pain may increase in severity and be beyond control. This experience tends to be generalized to chronic pain; however, conditions are quite dissimilar.

In chronic pain cognitive meaning cannot be assigned when underlying cause may be obscure or even absent and effective management of the discomfort may not be available. In addition, the patient in chronic pain quickly becomes disillusioned at the apparent endlessness to the pain in his future. Due to the chronicity of this problem, medications alone seldom are the answer. The sequence of events frequently includes placing the patient on the smallest amount of medication possible for the discomfort with instructions to return at frequent intervals for follow-up. Since the medication at best does not eliminate chronic pain or even control it, the medication dose is gradually increased until there is an addiction problem, health care personnel are alarmed and the patient is admitted for withdrawal and the sequence is begun anew.

Pharmacologic management of pain has historically been the treatment of choice for management of acute pain and is often prescribed for chronic pain sufferers to relieve suffering. This includes both narcotic and non-narcotic prescription. Fordyce (1976) reports an estimated 50% habituation or addiction rate to pain relievers for chronic pain patients. The cycle described previously of prescribing small amounts and gradually increasing the dosage due to unrelieved pain is common practice. In addition, health care delivery personnel are aware that chronic pain often begins with acute pain. Because of these often unavoidable circumstances, a great deal has been written regarding undertreatment of acute pain (Angell, 1982; Marks, 1973).

Another reason for unrelieved pain is that being "stoic" in our community is expected and acceptable. Those who do not evidence this trait are looked upon in an unsympathetic manner. The medical and nursing personnel may be unresponsive to unrelieved pain and/or the patient may be reluctant to ask for additional medication. Torda (1983) also sites another reason for reduction of analgesia which includes current trends in medical and nursing training which emphasize the adverse affects of narcotic analgesia especially dependence, respiratory depression and reduced gastrointestinal function. The result is that the physician, for any of the aforementioned reasons, initially underprescribes narcotic pain relievers and the nurse, in an apparent effort to reduce chances of addiction or other adverse effects, further reduces the amount of analgesia

given which results in gross undertreatment of pain.

A second approach to pain management today is cognitive behavioral therapies utilized primarily for chronic pain sufferers. Several psychological-behavioral approaches are available to change learned attitudes and behaviors which include relaxation training, biofeedback, operant conditioning, hypnosis (Kutz, Caudill & Benson, 1983) and other cognitive behavioral therapies which include suggestions while under general anesthesia.

Kutz, Caudill and Benson (1983) describe "relaxation" as a means to loosen and divert one's attention which may be accomplished by such things as progressive muscle relaxation, guided imagery, autogenic training, biofeedback, self-hypnosis, as well as, distraction techniques and cognitive restructuring. Bonke, Schmitz, Verhage, et al (1986) reported that exposure to positive suggestion while under general anesthesia resulted in shorter hospital stay and improved postoperative course in patients who were older than 55 years of age. The purpose of all these techniques is to result in what Benson (1975) calls the relaxation response. This response is thought to be in opposition to Selye's (1976) stress response. The relaxation response results in electroencephalographic changes, reduced oxygen consumption, reduced heart rate, respiration, blood pressure and alterations in blood flow.

A third approach to pain relief is categorized as somatopsiologic therapy which includes acupuncture, transcutaneous electrical nerve stimulation (TENS), massage, ice and heat (Shealy, 1981). The use of these

methods fit well to Melzack's gate theory. Peripheral sensory stimulation has been long used to decrease or diminish pain for varying lengths of time. Large fiber stimulation by vibration, heat, cold, massage, electricity, etc. presumably inhibit the cephalad transmission of peripheral pain impulses with inhibition occurring at the level of the spinal cord (Sternbach, 1974).

To understand the complexity of attempts to manage pain, an attempt at understanding some of the underlying personality traits is in order. The psychological aspects of pain are complex and depend upon interaction between the patient's neurophysiological responses to organic injury and his individual psychological makeup, as well as, his unique social environment.

Studies have revealed that the influence of personality variables have substantial effect on recovery of patients following surgery as well as their ability to manage pain. There is evidence that high levels of neuroticism or anxiety are associated with slower recovery and more pain postoperatively. Locus of control has been positively correlated with anxiety levels. Anxiety and neuroticism levels have positively correlated with levels of pain (Mathews & Ridgeway, 1981). Logically one would expect locus of control to be related to pain coping strategies.

Rutrick's (1983) description of the typical chronic pain patient is one who is preoccupied with his pain, self-absorbed, isolated, lonely, passive, dependent, self-sacrificing and one who is unable to deal with his own

anger and hostility. In addition, he lacks empathy and insight to his pain problem.

Pain patients are often ungratified in life and may feel unloved. They tend to hide from, rather than master their feelings. Because their self-esteem may be damaged, fear, panic or conversion phenomena may ensue. There may also be obesity, substance abuse and/or anorexia present.

Secondary gains of the pain prone patient may be financial and personal. Litigation, whether real or anticipated, may be incentive enough to continue the pain prone behavior. Pain behavior includes frequent use of health care facilities, low activity levels, poor communication, helplessness and lack of interest in matters other than pain (Rutrick, 1983). In addition anxiety has been documented to increase as pain increases (Reuler, Girard & Nardone, 1980).

It should be noted that many, if not all the behaviors described may be the result of pain experienced rather than caused by the pain. Without a healthy inner self, solutions to pain relief are difficult. Because patients arrive at a health care facility with their pain plus differing methods of how they have managed to deal with the pain in the past, empirical study of pain is, at best, difficult which may help to explain conflicting results in pain studies.

For the purpose of simplicity, this study will focus entirely on acute pain in the postoperative time period. Efforts will be made to determine if the patient's pain perception can be modulated by determining his locus of

control and applying certain pain relief modalities accordingly and if the patient's personality characteristic of internal or external will have any effect on his postoperative complication rate or amount of analgesia utilized. In addition, these dependent variables will be studied in relation to the type of pain relief modality utilized..

Multiple psychological means of attenuating pain perception and increasing pain threshold have been tried with varying responses. These include placebo (Evans, 1974); cognitive coping (Hilgard & Hilgard, 1975); relaxation (Flaherty & Fitzpatrick, 1978; Horowitz, Fitzpatrick & Flaherty, 1984) and procedural teaching (Egbert, Battit, Welch and Bartlett, 1964). Efficacy of these techniques and the mechanism by which they are effective remains elusive. Some studies report significant findings while others fail to establish any change of perception, based on the experimental variable. The question remaining is: "What variables can be used to modulate or attenuate the patient's perception of pain?" It is thought that the patient's perceived coping efficacy will contribute to the attenuation of his pain. That is, patients who believe that they can alleviate their suffering are likely to mobilize all their efforts and persist until a change is noted in pain while, on the other hand, those who have no faith in their self coping efficacy are likely to give up with their own efforts (Bandura, O'leary, Taylor, Gauthier & Gossard, 1987). Coping efficacy, in turn, may be based on locus of control.

Locus of control is a major component of the Social Learning Theory developed by Rotter (1954). This theory attempts to integrate two trends in American psychology -stimulus-response and cognitive-theories. The locus of control theory is said to be the extent to which one perceives reinforcing events related to their own efforts. An external locus of control would be defined as one who believes that reinforcing events are the result of chance, powerful others or fate. On the other hand, internal locus of control is based on the belief that reinforcing events are functions of one's own actions (Hudzinski & Levenson, 1985). Several authors have suggested that there may be times when persons do not want control (Krantz, Baum & Wideman, 1980; Smith, Wallston, Wallston, Forsbery & King, 1984; Wallston et al, 1983). In addition to locus of control, anxiety may have an important role both in pain perception and locus of control.

According to Benson (1975) and Jacobson (1938), anxiety is a motivational-effective variable which elicits the stress response. Selye (1976) defines stress as a physiologic response in an effort to maintain homeostasis which involves the autonomic and endocrine systems. Studies showing a decrease in pain perception which correlates with a decrease in anxiety allude to yet another dimension to this complex phenomenon.

An area of importance for modulation of pain perception is in the immediate postoperative period. Postoperative complications are thought to be in direct proportion to the ability of the patient to obtain relief

from his pain in order to participate in self-care activities necessary for his recovery. Those activities include pulmonary hygiene directed toward maintaining vital capacity of the lungs in an effort to prevent atelectasis and ensuing pneumonia, as well as early mobilization (ambulation and moving about in bed freely) in an effort to prevent the circulatory complications of thrombophlebitis and pulmonary embolus. In addition, reduction of stress (anxiety) has been shown to enhance the immunologic system which, in theory, should aid in proper healing and infection-prevention.

One of the most widely accepted nursing theories is that described by Dorothea Orem, the self-care theory. This theoretical concept could easily be applied to the aforementioned personality traits pertaining to locus of control. Orem's self care model adapts especially well to the patient with internal locus of control who needs to maintain control of his environment in order to effect his health. The external locus of control patient, on the other hand, could respond well to the self care model due to extensive education required by health care clinicians in order for the external patient to maintain appropriate health care behaviors. If this theory is applied to the postoperative patient, enhanced coping skills should result which, in turn, results in improvement in postoperative care. In Orem's theory, she views people as having universal, developmental and health deviation self-care requisites. Universal requisites are common to all human beings and include sufficient intake of air, water, food

and elimination; balance between activity and rest; between solitude and social interaction. Developmental self-care requisites vary with age or with conditions such as pregnancy and these, like the universal requisites are met either through one's own ability or by another (as in the care of dependent children). The third area of Orem's self-care theory deals specifically with the ill patient population, that of health deviation self-care requisite which she places in the following categories: (1) support of life processes and promotion of normal function; (2) maintenance of normal growth, development, maturation; (3) prevention, control, cure of disease processes and injuries; (4) prevention of or compensation of a disability (Orem, 1985). Attempting to increase the patient's health deviation self-care requisite by active participation in the prevention and treatment of his disease offers tangible efforts to be contributed by the patient toward his recovery. If the efforts contributed by the patient can be more effective in attenuation or modulation of discomfort, then post-operative perception of pain should be reduced and a reduction in postoperative complications should result.

STATEMENT OF THE PROBLEM

What is the effect of locus of control on the three approaches (pharmacologic, cognitive-behavioral and somatophysiological) of pain relief modalities, separately and in combination, utilized in the postoperative patient as measured by pain perception, postoperative complication

rate and amount of analgesia utilized?.

MAJOR RESEARCH QUESTIONS

1. Is locus of control related to perception of pain, postoperative complication rate and amount of analgesia utilized in the postoperative period?
2. Is there a relationship between locus of control and method of administration of analgesia in the pharmacologic group, cognitive-behavioral group or somatophysiologic group?
3. Is there a relationship between locus of control and the effectiveness of a cognitive behavioral method of pain control as measured by pain perception, amount of analgesia used and postoperative complication rate?
4. Is there a relationship between locus of control and the effectiveness of a somatophysiologic method of pain control as measured by pain perception, amount of analgesia used and the postoperative complication rate?
5. Is there a relationship between the method of administration of analgesia and the patient's pain perception, amount of analgesia utilized and number of postoperative complications?
6. Is there a relationship between locus of control, pain relief modalities and method of administration of the analgesia?

SUBSTANTIVE HYPOTHESES

1. Patients with external locus of control will report more pain than those patients identified as internal locus

of control.

2. Patients demonstrating internal locus of control, utilizing the patient controlled analgesia device (PCA) will have lower pain perception, fewer postoperative complications and utilize less analgesia than the patients identified as external locus of control.
3. Patients identified as internal locus of control will report less pain, have fewer postoperative complications and use less analgesia if they use an adjunctive method of pain control (cognitive behavioral or somatophysiological) than patients identified as external locus of control.

RATIONALE FOR STUDY

A disadvantage in using large amounts of analgesic medication for the postoperative patient is that in order to alleviate the patient's pain, he becomes oversedated and unable to participate in the necessary activities to prevent postoperative complications. White (1976) describes a narrow therapeutic window of pain relief necessary for active participation of the patient in his self-care requisites. This window allows for pain relief without oversedation and breakthrough pain.

Nonpharmacologic analgesia has been described in the literature with varying degrees of success. Some methods appear to work very effectively but when the same study is replicated, the results are not as encouraging. Could this be a result of the subjective nature of pain and the complexity of measuring this multidimensional perception or

might the varying results be the result of differing social learning theories (locus of control). If the patient could be pretested to determine his locus of control, whether internal or external and his adjunctive mechanism for pain relief chosen from an empirical data bank (which details the method most effective for each locus of control) it is likely that the patient's pain perception could be reduced enabling him to participate more fully in his self-care modalities, decreasing postoperative complications.

This study will attempt to involve the patient utilizing nonpharmacologic approaches in combination with an analgesia to obtain the therapeutic window of comfort which will allow the patient to fully participate in his postoperative care.

DEFINITION OF TERMS

The meaning of many terms in common use today are open to various interpretations due often to the ambiguity of the terms themselves as well as the various backgrounds of the reader. In this section, terms used in the study are operationally defined for the purpose of this study only.

1. Pain - Whatever the patient says it is, existing whenever he says it exists.
2. Postoperative - Pain perception measured at 48 hours after the surgical procedure.
3. TENS -Transcutaneous electrical nerve stimulator. Electrical stimulation of the peripheral nerves using conventional or high frequency (40-400 cycles per second). Pulse width between 20 and 250 microseconds.

This stimulates the large myelinated afferent nerves to the dorsal horn. The onset of analgesia is produced within 20 minutes. Low frequency stimulation can also be performed but will not be used for this study. In low frequency stimulation, strong rhythmic muscular contraction of the underlying muscles are produced which are thought to release endorphins.

4. PCA - Patient controlled analgesia. The patient activates a hand-held device to incrementally administer small doses of analgesia to himself via his intravenous line when he perceives pain. Built-in safety devices prevent overdosage of this technique.
5. Auditory stimulation - Immediately following induction of general anesthesia, tape recorded messages will be delivered the entire length of the operation to the anesthetized patient.
6. Locus of control-A dimension of the social learning theory, external or internal. External: reinforcements are produced by luck, fate or powerful others; Internal: reinforcements are produced by the person's own actions.
7. Postoperative complications - Three common complications encountered in the intensive care unit will be used to measure the postoperative complication rate. They include: atelectasis, pneumonia (both as evidenced by chest x-ray) and pyrexia.

DELIMITATIONS OF STUDY

1. This study will use an intact group. As a mixed model,

patients will not be randomly assigned to initial groups, but assigned to the locus of control group dependent upon their pretesting determination of locus of control. They will be randomly assigned to the treatment modalities.

2. Study will not be generalizable to the entire population. The sample will be comprised of men, many of whom will be elderly. There have been some studies that suggests the older population becomes more external in their locus of control as their age increases. In addition, findings from this acute pain study may not be generalizable to patients in a chronic pain population.

CHAPTER II

REVIEW OF RELATED LITERATURE

This chapter will provide a review from the literature on the actual physiology of pain, personality effects, such as locus of control upon pain and an overview of previous research utilizing the pharmacologic, cognitive-behavioral and somatophysiologic methods of pain reduction utilized in this study.

OVERVIEW OF PHYSIOLOGY OF PAIN

Nocioception is a neural mechanism by which noxious stimuli are detected. Although not synonymous with pain (because of its subjective nature) activation of the nociceptive pathways is responsible for the origin of pain. Peripheral nociceptors may arise from the skin, musculoskeletal structures and the viscera. The most widely studied are the cutaneous nerve receptors. They transduce and transmit mechanical, thermal and/or chemical stimuli along their axons to the spinal cord. These and all afferent neurons are found in the dorsal root ganglia in the spinal canal. These neurons synapse in the dorsal root and relay nociceptive messages to the brain stem and thalamus.

The cutaneous peripheral nociceptives contain one of several classes of axons, classified into three groups. This classification depends upon the degree of myelination and size in diameter. They are A-beta, A-delta and C fibers. The greater the diameter and thickness of the

neuron, the greater the conduction velocity. The largest and most myelinated neurons are the A-beta, while the A-delta are thinly myelinated and the C fibers are unmyelinated. Differences in myelination, thus conduction, are thought to account for delayed pain which may occur following the sharp, immediate, intense pain of a noxious stimulus. Impulses are thought to travel at a much higher speed via the myelinated fibers. In order to transmit nociceptive information, these neurons must be able to select which messages to transmit. They have two characteristics that aid in this process. One is a high threshold for stimulation and the other is the ability to recognize the intensity of the stimulus. In addition, these neurons are programmed to respond to different stimuli. For instance, some A-delta neurons respond to sharp objects and possess a high threshold for firing. The C fibers have even higher thresholds and may respond to noxious mechanical, thermal and chemical stimuli. Endogenous chemical substances excite these neurons, such as products of inflammation (bradykinin, histamine and serotonin). Prostaglandins are another biochemical substance which sensitizes all nociceptors to noxious stimuli. This, in fact, provides the rationale for why Aspirin and other non steroidal medications are effective in the relief of pain. The neurons themselves may release substances into the tissues which activate the nociceptive neurons and the most widely studied is substance P, a neuropeptide implicated in neurogenic inflammation. (Hyman and Casseon, 1989).

Within the dorsal horn the excitatory neurons synapse with other neurons which are inhibitory in nature. Some of these neurons release endogenous opioid peptides. Actually the inhibitory effects of the A-delta fibers may explain why acupuncture and the transcutaneous nerve stimulators are effective. (Hyman and Casseon, 1989).

In addition to the neurophysiological aspects of pain transmission and inhibition of noxious events, it is important to consider that suffering involves more than pure sensory mechanisms. Chapman and Turner (1986) describe an often overlooked pathway which may contribute to the emotional, aversive pain states. This pathway is thought to account for the often less localized visceral pain or referred pain. These stimuli may be mediated by ventral root afferents, by paleospinothalamic pathways, by brainstem centers and limbic structures activated by the paleothalamus which, itself is not topically well organized.

Psychological factors can affect the transmission of pain impulses at the periphery which is well in accord with Melzack and Wall's Gate Theory. Melzack and Wall (1970) state that the degree to which the gate allows or prevents transmission is determined by (1) the relative activity of the large fibers, A-beta fibers whose activities tend to inhibit transmission and small diameter fibers (A-delta and C fibers whose activity tends to transmit pain signals) and (2) by descending influences from the brain. Through these descending influences, cognitive processes such as attention, past experiences, anxiety and anticipation,

coping abilities may have a powerful influence on pain perception. Psychological effects upon the sympathetic nervous system may affect the microcirculation of the tissue and a change in the chemical environment may sensitize or activate nociceptor receptors. Additionally, muscle tension due to anxiety may increase muscle tone near a painful site and actually activate muscle nociceptors. With this in mind, one can easily see why psychological interventions that offer some supratentorial control over emotional states could be useful in attenuating painful stimuli (Chapman & Turner, 1986).

It is now known that there are at least 3 opiate receptors. They are known as the mu, kappa and sigma receptors. In order to relieve pain, opiates such as morphine bind to the mu receptors, located in the periaquatal gray matter, rostroventral medulla, medial thalamus and the dorsal horn of the spinal cord. Effects mediated by the mu receptors include analgesia, euphoria, pupillary constriction, respiratory depression and bradycardia. Effects mediated by the kappa receptors result in analgesia, sedation and miosis (pupillary constriction). Agonism of the sigma receptors may cause adverse and undesirable effects, including dysphoria, psychomotor stimulation, tachycardia, tachypnea and hallucinations. (White, 1986).

Numerous pharmacologic and nonpharmacologic methods are currently available to relieve pain. The pharmacologic approach has historically and still remains the primary treatment of pain. Both non-narcotic and narcotic agents

are used. The non-narcotic class of drugs including indomethocin, aspirin and other non-steroidal agents act by peripherally blocking the operation of the pain impulses at the pain receptors. This is thought to occur by preventing the synthesis of prostaglandins which are increased by the inflammatory response to tissue injury and which potentiate other mediators such as bradykinin and histamine (Ferreria, 1979). Narcotic agents and derivatives act centrally by binding with specific opiate receptors and are thought to produce analgesia by reducing the production of cyclic AMP which, in turn, causes an inhibition of nerve impulses (Collier, 1979).

Conventional administration of opiates has been to administer them intramuscularly or intravenously as needed or on a "prn" basis. After administering a parenteral opiate intramuscularly every 3 or 4 hours, it has been found that the minimal analgesic concentration will only be present during 35% of the dosing interval due to variations in absorption (White, 1986). Earlier pain investigators (Roe, 1963) described using small, more frequent intravenous doses to provide more effective pain relief, but also found that the small doses were short lived and labor intensive, requiring more valuable nursing time. In order to administer larger boluses to achieve longer periods of pain relief, one encounters the possibility of greater complications, such as respiratory depression, ileus and urinary retention. A newer concept described by Sechzer (1971) represents a significant advance in the management of postoperative pain. This

system is essentially regarded as a closed-loop whereby the patient determines the amount of analgesia administered to maintain adequate analgesia. Patient controlled analgesia (PCA) employs an infusion pump integrated with a timing device that allows patients to self-administer small doses of opiates when a pain is perceived and virtually experience immediate relief. Theoretically more constant serum levels of the opiate can be maintained, avoiding the highs and lows of the serum concentration which results from intermittent dosing. White (1986) describes a narrow "therapeutic window" or analgesic concentration range where the patient's pain is at an acceptable level without undesirable side effects. In addition, a reduction in anxiety from the slower effects of intermittent dosing or time interval from when the patient requests analgesia to the time of administration might be an added benefit to patients.

Patient controlled analgesia has been studied in a variety of patient populations; however most of the studies have been in the postoperative period. PCA has been compared with intermittent dosing as well as to other modes of analgesia administration such as epidural and intrathecal administration. McGrath, Thurston, Wright, et al (1989) compared PCA with intramuscular administration of meperidine and found no significant differences in pain scores and little differences in overall amount of meperidine, but significantly less meperidine utilized by the PCA group during the first 24 hours. Eisenach, Grice and Dewan (1988) looked at pain scores, side effects and

patient satisfaction in women receiving epidural morphine, iv PCA or im narcotics following cesarean section. They found that both PCA and epidural analgesia provided good analgesia and patient satisfaction; however, PCA provided more sedation while epidural morphine produced more pruritis and frequently required systemic narcotic supplementation. (Harrison, Sinatra, Morgese et al, 1988) also describe excellent analgesia from both epidural and PCA administration of narcotics. They also found a higher morbidity with epidural narcotics and viewed PCA administration as an attractive alternative. Many of these studies have been favorable, however some reports are that PCA shows no superiority to other types of pain relief modalities (Gonsalves, Covington, Broughan et al, 1990; Sinatra, Lodge, Sibert et al, 1989; Loper and Ready, 1989).

Many of the difficulties in studying pain have to do with the complexity of this multifaceted subject. Variations among patients of analgesic requirements are affected by their psychologic profile. Studies have shown that low pain tolerances of some patients are inversely proportionate to their high anxiety and neuroticism personality scores. (Austin, 1980). In addition, pain and anxiety are intimately related in each enhancing the other and affecting analgesic requirements (Wilson, 1984).

Locus of control is another personality characteristic which has been implicated in analgesic requirements. Rotter (1966) developed from social learning theory a concept of internal-external control of reinforcement which describes the degree to which an individual believes that

reinforcements are controlled by outside agents (luck, powerful others, chance, etc.). Internal control refers to individuals who believe that reinforcements are contingent upon their own behavior while external individuals believe that reinforcements are not under their control but under control of powerful others, fate, chance or luck.

Locus of control has been studied in relation to various variables. Lowery, Jacobsen and Keane (1975) found that Externals were significantly more anxious than Internals. Craig and Best (1977) found that Internals manifested greater pain tolerance however instructions on control had little effect on pain behavior. MacDonald (1971) in his study found that Externals are more threatened by physical disabilities and that Internals view emotional disorders as more debilitating than physical disabilities. The locus of control construct has been found to be useful in predicting a variety of health behaviors. Specific behaviors include seeking information regarding certain diseases (DeVito, Bogdanowicz and Reznikoff, 1982; Drantz, Baum and Wideman, 1980), compliance behaviors regarding medication, dietary habits and smoking behaviors as well as making and keeping appointments with health care deliverers (James, Woodruff and Werner, 1965; Kaplan and Cowles, 1978). Sugarek, Deyo and Holmes (1988) found externals to be more fatalistic regarding the diagnosis of cancer and value early diagnosis least.

Locus of control has been considered particularly relevant to the experience of pain. Crisson and Keefe

(1988) studied the relationship of locus of control orientation to pain coping strategies and psychological distress in chronic pain patients. They found that Externals tended to rely on maladaptive pain coping strategies and rated their ability to control or decrease pain as poor. They also exhibited greater psychological distress, relied greater on diverting attention and praying or hoping in dealing with their pain. They also reported feeling helpless to deal effectively with their pain problem. Mathews and Ridgeway (1981) reported that while locus of control and anxiety were significantly related in cholecystectomy patients, vital capacity, number of analgesics and length of stay were not related to locus of control. Pain resulting from headaches was studied by Jones and Page (1986); and Hudzinski and Levenson (1985). They found that external locus of control was significantly related to the severity of headaches of those experiencing weekly headaches and that internal locus of control was related to increased effectiveness of self control and the success of biofeedback as a treatment modality. Wise, Hall and Wong (1978) rejected the hypothesis that Externals required more pain medication and Clum, Scott and Burnside (1979); Jennings and Sherman (1987); and Johnson, Dabbs and Leventhal (1970) found that Internals utilize more medication and discuss that the reason for this may be that they require more information preoperatively and therefore expect to use medication to relieve that discomfort postoperatively while the Externals expect the environment or others to reduce their pain postoperatively. Johnson,

Magnani, Chan and Ferrante (1989) studied patient controlled analgesia in relation to locus of control and found that female patients with an external locus of control had higher levels of pain and greater dissatisfaction with patient controlled analgesia. An internal locus of control predicted lower pain scores and increased satisfaction with patient controlled analgesia. The authors postulated that the expectation that external forces rather than one's own actions alter the environment and lead to a state of "helplessness" may be the rationale for inadequate treatment by patient controlled analgesia while Internal believe that they stay healthy or sick as a result of their own behavior.

Cognitive-behavioral approaches to relieve pain and suffering have been studied. These approaches are effective in the cerebral cortex and have as their key component the ability to affect transmission of the painful stimulus. Techniques such as progressive muscle relaxation (Benson, 1975; Flaherty & Fitzpatrick, 1978; Levin, Malloy & Hyman, 1987; Wells, 1982; Wells, 1982; Wilson, 1981) biofeedback (Basmajian, 1983; Gregg, 1983; St. James-Roberts, Hutchinson, Haran & Chamberlain, 1983) music (Fisher and Greenberg, 1972; Peretti, 1975, Shatin, 1970) have been used. Hypnosis and suggestion while under general anesthesia are also described as cognitive-behavioral mechanisms of altering behavior. Mechanisms accounting for the ability to respond to auditory stimulation during anesthesia include insufficient anesthesia due to the increasing difficulties in ability to

appreciate the depth of anesthesia while using balanced anesthesia of muscle relaxants, narcotics and inhalation agents (Mainzer, 1979). Experimental studies in which auditory stimuli were administered to patients during surgery confirmed such registration via postoperative recall and recognition tests (Browne & Catton, 1973; Millar & Watkinson, 1983), postoperative hypnosis (Levinson, 1965) and postoperative nonverbal actions (Bennett, Davis & Giannini, 1985; Goldman, Shah & Hebden, 1987). Wolfe and Millet (1960), Hutchings (1961) and Abramson, Greenfield & Heron (1966) found indirect evidence that suggestions during general anesthesia could result in a beneficial effect on the postoperative course. More recent studies have produced differing findings. Eich, Reeves & Katz, 1985; Woo, Seltzer & Marr, 1987; Dubrovsky & Trustman, 1976) failed to show postoperative recall or effects of intraoperative suggestions while under general anesthesia; however, Evans & Richardson (1988) showed that patients in a suggestion group suffered from a significantly shorter period of pyrexia, spent less time in the hospital and those patients accurately guessed that they were indeed in the suggestion group; Bonnett (1966) felt that suggestions while under anesthesia were effective in 85% of cases and in no instance was there any evidence of detrimental effect of these suggestions; Bonke, Schmitz, Verhane (1986) had results that showed that exposure to positive suggestions during general anesthesia protected patients older than 55 years against prolonged postoperative stay in the hospital; McLintock (1989)

reported that there was a significant difference in morphine requirement between two groups with 23% less medication used by those patients exposed to a tape recording of positive suggestions during anesthesia.

Somatophysiologic methods for relieving pain include cutaneous stimulation, that is, application of heat, cold massage, acupuncture, transcutaneous electrical nerve stimulators and implanted electrical stimulation of the dorsal horn and thalamus (Jacox, 1989). Hargreaves & Lander (1989) examined the effects of transcutaneous electrical nerve stimulation on incisional pain caused by the procedure of cleaning and packing an abdominal surgical wound. They report that subjects who received TENS reported a significantly lower level of pain after dressing than did those subjects who received either placebo-TENS or no-treatment. They were unable to elicit that drug administration contributed to the level of reported pain. Merrill (1989) introduced an inexpensive lightweight disposable TENS unit called FastENS to his genitourinary patients undergoing penile prosthesis insertion, radical retropubic prostatectomy or radical nephrectomy procedures and found that patients treated with FastENS used 60% less pain medication and made 61% fewer pain requests than did control patients. Jameel, Yaffe & Serrette (1981) studied groups of patients to assess the effectiveness of TENS in alleviating postoperative pain, pulmonary complications and frequency of analgesic requests. Their data suggested that TENS minimizes the tendency toward postoperative alteration in respiratory mechanics and decreases the incidence of

pulmonary complications by alleviating incisional pain. They further suggest that TENS may act by modulating the activity of the receptor site so that pain perception is decreased. In addition enkephalins, beta endorphins and other neurotransmitters have been suggested as agents responsible for the relief or modulation of pain and TENS may be responsible for the release of these substances. Thomas, Tyle, Webster et al (1988) did not show the use of TENS useful in the relief of labor pain. They concluded that although the method does no harm, it probably does little good in this setting. Lim, Edis, Dranz et al (1983) also did not find a significant difference in the amount of analgesic used in postoperative patients even though the TENS group used 25% less morphine than the control group. Morphine requirements, however, were significantly reduced on the second postoperative day and improvements in respiratory function was noted in a prospective randomised controlled study of patients during the first 72 hours following cardiac surgery. (Navarathnam, Wang, Thomas et al, 1984). Postoperative pain relief with narcotic medications was evaluated and compared with TENS for 2 days following surgery by Sodipo, Adedeji & Olumide (1980) and the presence of ileus and hospital stay were identical in both groups; however, patients on TENS demonstrated a significant decrease in the amount of narcotics utilized. TENS was also found to be successful in treating ischemic limb or rest pain while the patient was awaiting reconstructive surgery (Cuschieri, Morran & Pollock, 1987). Additionally, Lanham, Powell & Hendrix (1984) found TENS to

be useful in the podiatric population. They report that TENS has greatly reduced the use of postoperative analgesics and narcotics in controlling pain of their postoperative patients.

Pain is a universal experience and is multifaceted in nature. Both pharmacological and nonpharmacologic approaches are available to address both physiologic, neuropsychologic and emotional aspects of pain. The ultimate goal of pain relief should be pursued using the various modalities either singly or in combination, simultaneous or sequential to fulfill this goal.

CHAPTER III

METHODOLOGY

The purpose of this study is to evaluate the effect locus of control has on three major pain relief modalities, utilizing two different methods of administration. The three major areas of pain relief modalities are 1) the pharmacologic approach; 2) the cognitive-behavioral approach; and 3) the somatophysiologic approach of pain relief. Methods of administration include patient controlled administration and intermittent intravenous injection of the analgesia. All of the pain relief modalities described in the literature for both chronic and acute pain fall into one of these three categories. This study attempts to determine if the method of administration of the pharmacologic agent is affected by locus of control and if the effectiveness of any of the remaining modalities is altered by locus of control, as well as elicit any interactive effects that may be present. For the purposes of this study, only acute pain is addressed at 48 hours postoperatively.

Prior to admission to the intensive care unit on the preoperative day, all patients who were scheduled to undergo elective abdominal surgery were solicited to participate in this study. At this time, Rotter's internal/external locus of control inventory scale (Appendix A) was administered in order to place the patients into either the internal control or external

control group. Appropriate explanations of the project were carried out and the patient's signature obtained on the consent form (Appendix B).

The analgesia chosen for use in this study is morphine sulfate, a conventional opioid to be administered postoperatively. To standardize dosing regimens, morphine was administered in a dose of 0.1 mg/Kg although to date, evidence has not been presented to link body weight and analgesic requirement (White, 1986).

The method of administration of this medication was intermittent intravenous injections by the registered nurse for half of the patients in each group. The remaining patients received their medication utilizing the patient controlled analgesia (PCA) device.

Patient controlled analgesia has recently been introduced as a safe and effective method of analgesia delivery using a device that allows the patient to self-administer small doses of intravenous drugs to achieve pain control. Advantages of this method include: (1) a reduced degree of sedation, (2) lowered patient anxiety associated with a sense of self-control of the clinical course and (3) reduced demand on nursing time (Lange, Dahn, Jacobs, 1988).

Morphine sulfate was administered via a Life Care PCA (Abbott Laboratories, North Chicago, Ill.) device according to the following protocol. Prepackaged 30 mg/30 ml vials will be utilized in the Life Care device. The initial loading dose was set for 0.1 mg/kg. The lockout interval (shortest allowable interval between doses) was set for 6 minutes and the 4 hour limit (maximum volume the patient

can administer during a 4 hour period) was set for 15 minutes. Each dose volume was 1 ml (1.0 mg). If pain was not relieved by the initial loading dose, an additional loading dose was administered by the patient. These doses were adjusted for different body masses encountered in these patients for comparison.

Preparations for the patients include preoperative explanation of the use of the PCA device. Other preoperative instructions for the groups were not be altered. Exclusions included any overtly psychotic patients, patients who are narcotic or tranquilizer dependent and patients who were unable to demonstrate an understanding of how to use the device for self-administration.

The loading dose, lockout interval dose volume and maximum volume allowed for a 4-hour period was prescribed by the physician according to the protocol. Morphine sulfate was begun immediately after surgery, when the patient received the hand-held device and repeated instructions on its use. Safety features to ensure safe operation include a double lock mechanism, preprogrammed maximum dosages to be delivered and minimum time intervals between injections.

Cognitive-behavioral treatment methods for chronic and acute pain are emerging in view of increasing evidence that factors such as predictability and control can influence the perceived intensity and distress of painful stimuli (Pearce, 1983). The method of cognitive-behavior treatment modality chosen for this study was auditory stimulation

while under general anesthesia. This method requires little effort on the part of the patient and entails having the patient listen to a prerecorded tape message during the entire length of his surgical procedure following induction of anesthesia. By listening during the entire surgical procedure, different planes of anesthesia will be included for potential effect. This message includes positive comments such as, "Your surgery is going well. When you awake you will want to move about freely, take deep breaths and clear your lungs. Your immune system will function well and you will be hungry. You will want to cooperate with your physician and nurse in performing all the activities which will speed your recovery. Your discomfort will be minimal following this surgery". (Appendix B)

Another group received a pain relief modality categorized as somatophysiological in nature. Transcutaneous nerve stimulators (TENS) were used to evaluate this modality. Pain modulation using electrical stimulation is based on the theory that endorphin stimulation can block pain presynaptically. Produced by electrical stimulation, this is thought to occur through the release of serotonin which stimulates the release of enkephalins at the spinal cord level as well as stimulate the C fibers which are inhibitory in nature. Preoperatively, the patient received an explanation of the TENS unit with an opportunity to see and operate the unit with written instructions (Appendix C). Upon admission to the intensive care unit, the patient had a set of TENS electrodes applied to his abdomen on either side of the incision with repeated instructions for

its use.

Following initial locus of control determination, the patients were randomly assigned to one of three groups: pharmacologic alone (PCA and intermittent), cognitive-behavioral (auditory stimulation) and somatophysiologic (TENS). Patients in the cognitive-behavioral and somatophysiologic groups also received the analgesic agent and were randomly assigned to either the PCA or intermittent groups. The pharmacologic (PCA and intermittent dosing) served as the control group of subjects.

Overall research design of this study is a 2 X 3 X 2 mixed factorial design. The fixed independent variables are locus of control, internal and external; random variables include the three major categories of pain relief modalities and an example of each: pharmacologic (morphine sulfate), cognitive-behavioral (auditory stimulation) and somatophysiologic (TENS); each of these groups were again be randomly assigned into a PCA or intermittently-dosed group. Dependent variables are: 1) pain perception of the patient; 2) number of postoperative complications and 3) amount of analgesia required by the different groups. The patient were be randomly assigned to these groups following determination of locus of control.

Subjects considered for this study were all patients who were scheduled for elective abdominal surgery or stable emergency patients requiring a midline incision. In an effort to maintain homogeneity of the discomfort encountered, other anatomic surgical procedures were not

considered. Patients were selected from those whose surgery was of a sufficiently large magnitude that required admission to the surgical intensive care unit of a large metropolitan teaching hospital. Demographic data was obtained which included age, type of operation, sex, height and weight. Because patients were selected from a VA Medical Center, more of the patients were male which may effect the generalizability of the findings. In addition, most of the patients fell into the age group of 50-75 years which may limit generalizability of the study to patients of those age categories. Approval and cooperation of the patient's attending physician was obtained prior to enlisting the patient into the study. Institutional review board approval and informed consent were obtained.

Rotter's IE scale was utilized to determine the patient's locus of control. This scale was first developed by Julian B. Rotter (1966) in an attempt to measure individual differences in a generalized belief. A comprehensive scale was developed and subsequently scaled down to a 29 forced-choice test which includes 6 filler items which are intended to make the purpose of the test more ambiguous. Rotter (1966) reports internal consistency from ten sources ranging from high school students to college students with ranges from .65 to .69.

Test-retest reliability for a 1 month period were reported consistent at .60 to .83. The author (Rotter, 1975) reports that this scale, like all personality measures, is subject to the conditions of testing and the nature of the person taking the test. Responses to these

questionnaires may be consciously or subconsciously distorted regardless of the best intentions and need to have as much standardization as possible in their administration.

The short-form McGill Pain Questionnaire (Appendix D) was utilized to evaluate the patient's perception of pain at 48 hours postoperatively in the intensive care unit.

The short form includes the pain intensity index and a visual analogue scale. Due to the short attention span, educational level and general overall condition, many patients were unable to complete the form; however every patient was able to utilize the visual analog scale. This portion of the test has also been used with good success with children who are yet unable to read. McGill's uncondensed version of this questionnaire has become one of the most widely used tests to measure pain, giving information on the sensory, affective and evaluative dimensions of the pain experience (McGill, 1987). The information provided becomes extremely valuable as it contains information regarding the intensity of pain as well as the qualities of pain (Melzack & Wall, 1983). The short form has been compared with the longer version in postoperative patients and the correlations have been consistently high and significant. The short-form McGill Pain Questionnaire was compared with the long-form questionnaire to obtain reliability and validity data by Melzack in 1987. He randomly compared both the long-form, and the short-form to patients who were having pain from a

variety of sources, postsurgical pain, labor pain, musculoskeletal pain in English and postsurgical pain with the form in French to French-speaking patients. His comparisons were done both before and after a therapeutic intervention. Correlation coefficients were unanimously statistically significantly correlated and averaged .75. This particular form was selected for this study due to its ease of administration. It is estimated to take 2-5 minutes to complete this form. This advantage is especially valuable to the patient who is experiencing discomfort.

Postoperative complications most often encountered in the immediate postoperative period are pulmonary in nature resulting from inability to maintain adequate pulmonary hygiene due to discomfort. Postoperative pulmonary complications include atelectasis and/or pulmonary infiltrate as evidenced by abnormal chest x-ray or auscultation at 24 and 48 hours following surgery and pyrexia as indexed by a significant elevation above normal (100.5° F) as measured by the maximum elevated temperature during the first 24 and 48 hours following surgery.

The final dependent variable was the amount of analgesia utilized by the groups at 24 and 48 hours postoperatively.

The principal investigator administered the McGill Pain Questionnaire at 48 hours postoperatively. Other data was collected by a record review by the principal investigator.

The following are the research hypotheses:

- H₁ Patients identified as internal locus of control utilizing the pharmacologic approach with patient controlled analgesia will experience less pain, use less analgesia and have fewer postoperative complications than those identified with external locus of control.
- H₀ There will be no difference in pain perception, amount of analgesia utilized and postoperative complication rate in patients identified with either external or internal locus of control who are assigned to the pharmacologic group utilizing the patient controlled analgesia device.
- H₂ Patients identified as internal locus of control utilizing the adjunctive cognitive behavioral method of pain control will experience less pain, utilize less analgesia and have fewer postoperative complications than patients identified as external locus of control.
- H₀ There will be no difference in pain perception, amount of analgesia utilized and postoperative complication rate in patients identified with either external or internal locus of control who are assigned to the cognitive behavioral method of pain control.
- H₃ Patients identified as internal locus of control utilizing the adjunctive somatophysiologic method of pain control will experience less pain, utilize less analgesia and have fewer postoperative complications than patients identified as external locus of control.
- H₀ There will be no difference in pain perception, amount of analgesia utilized and postoperative complication rate in patients with internal or external locus of control who are assigned to the somatophysiologic method of pain control.
- H₄ Patients in the pharmacologic group utilizing the PCA will experience less pain, use less analgesia and have fewer postoperative complications than patients assigned to the intermittent dosing group.
- H₀ There will be no difference in pain perception, amount of analgesia utilized or complication rate in patients receiving analgesia by PCA or intermittent dosing.
- H₅ Patients assigned to the cognitive behavioral group will have less pain, use less analgesia and have fewer postoperative complications if assigned to the PCA method of analgesia administration.
- H₀ There will be no difference in pain perception, analgesia used or complication rate in patients of the cognitive behavioral group receiving their analgesia by PCA or intermittent dosing.
- H₆ Patients assigned to the somatophysiologic method of

pain relief will experience less pain, use less medication and have fewer postoperative complications if receiving their analgesia by PCA.

- H₀ There will be no difference in pain perception, analgesia usage and complication rate of patients in the somatophysiological group receiving their analgesia by PCA or intermittent dosing.
- H₇ Patients identified as internal locus of control will experience less pain, utilize less analgesia and have fewer postoperative complications if assigned to the cognitive behavioral group receiving analgesia by PCA.
- H₀ There will be no differences in external and internal patients' pain perception, amount of analgesia utilized and complication rate assigned to the cognitive behavioral group utilizing PCA.
- H₈ Patients identified as internal locus of control will experience less pain, utilize less analgesia and have fewer postoperative complications if assigned to the somatophysiological group utilizing PCA.
- H₀ There will be no differences in external and internal patients' pain perception, amount of analgesia utilized and complication rate assigned to the somatophysiological group utilizing PCA.

Statistical analysis of this study will be performed using Analysis of Variance to determine the main and interactive effects of locus of control with method of pain control; locus of control with method of administration; method of pain control with method of administration; and locus of control with method of pain control with method of administration of analgesia.

CHAPTER IV

The following data analysis will answer the questions posed by this study regarding the effect a patient's personality type, that is, internal or external locus of control, has on his perception of pain, the amount of analgesia required and the frequency of postoperative complications as evidenced by pulmonary complications as well as interactions which may occur between and among different groupings. An introduction to the sample with descriptive statistics will be followed by analyses describing relationships between and among the groups studied with specific answers to the questions posed by the research hypotheses and questions.

A schematic drawing (Figure 1) is presented to illustrate the mixed factorial 2 X 3 X 2 design depicting LOC (locus of control) as either internal or external; three methods of pain control (pharmacologic, cognitive-behavioral and somatophysiological) with the pharmacologic method of pain control being further divided into two groups: patient controlled analgesia (PCA) and intermittent (INT) dosing. Because one may not ethically withhold pain medication from patients undergoing major abdominal surgery, patients randomly assigned to each of the pain relief modalities additionally received medication by patient controlled analgesia or intermittent dosing.

Approval from the Human and Animal Investigation Committee from Wayne State University and the Veterans Administration Medical Center, Allen Park, was obtained (Appendix E). Following a signed consent, 127 male

LOCUS OF CONTROL

		INTERNAL	EXTERNAL
DOSING	PCA		
	METHOD		
	PHARMACOLOGIC		
	INT		
COGNITIVE- BEHAVIORAL	PCA		
	METHOD		
	PHARMACOLOGIC		
	INT		
SOMATOPHYSIO- LOGIC	PCA		
	METHOD		
	PHARMACOLOGIC		
	INT		

Figure 1. Research design - 2 X 3 X 2 mixed design

patients agreed to participate in the study. At least 10 subjects were placed into each cell of the 2 X 3 X 2 design. In an effort to maintain homogeneity of subjects, only patients receiving midline abdominal surgical procedures were enlisted into the study. Table 1 provides descriptive analysis of demographic data collected on the subjects. Ages of the males ranged from 38 years to 81 years with the mean age of the group being 64 years. Height as measured in centimeters (cm) ranged from 152.0 cm to 188.1 cm with a mean height of 175.5 cm. Weight, measured in kilograms (Kg) ranged from 46.8 kg to 122.7 kg with a mean weight of 76.4 kg. Table 2 depicts a breakdown of the abdominal operations performed on the subjects included in this study. Midline incisions of similar magnitude (extending inferior xiphoid process to superior pubis) were utilized for these surgical procedures. No effort was made to account for or control for the method or type of anesthetic agent utilized in these patients. Standard inhalation and/or balanced anesthesia was utilized; however all patients receiving epidural analgesia were excluded from the study.

Utilizing analysis of variance (ANOVA) programs from the Statistical Package for Social Science (SPSS/PC+) the research hypotheses were addressed in a systematic fashion. Tables 3 depicts overall mean distributions with standard deviations of the dependent variables (amount of medication used and pain perception-VAS) and displays frequencies of complications (as evidenced by postoperative fever and abnormal lung findings) as they relate to individual cells

Table 1

Descriptives of variable - weight - age

WEIGHT - WT(KG)			
Mean	76.43	SE Mean	1.32
Std Dev	14.83	Variance	219.90
Kurtosis	.69	SE Kurtosis	.43
Skewness	.54	SE Skewness	.22
Range	75.90	Minimum	46.80
Maximum	122.70		

AGE - YEARS			
Range			
Minimum	43	Maximum	84
		Mean	64

Table 2

Operative procedures - Type and frequency of procedure performed

Surgical procedure	Number
Lysis adhesions	12
Drainage abdominal abscess	18
Colon Resection	25
Cholecystectomy with or without common bile duct exploration	13
Splenectomy	2
Gastric resection or repair	16
Aortic reconstruction	15
Small bowel resection	12
Abdominal Perineal resection	6
Pancreatectomy or pancreatic abscess	3
Nephrectomy	1
Esophagectomy	4
	127
	TOTAL

Table 3

Overall Summary of Mean Scores - Amount of medication utilized, pain perception scores and frequency of complication rate

		INTERNAL	EXTERNAL
PCA	Medication	46.21±15.90 (10)	60.05±23.94 (11)
	VAS	4.99±1.90	3.86±2.15
	Complication	2	2
PHARMACOLOGIC			
INT	Medication	54.67±22.29 (12)	61.55±17.39 (11)
	VAS	6.15±2.66	5.31±1.95
	Complication	4	4
PCA	Medication	78.70±34.18 (10)	79.25±32.05 (10)
	VAS	3.75±2.20	5.12±1.71
	Complication	1	5
COGNITIVE-BEHAVIORAL			
INT	Medication	84.70±37.43 (10)	51.50±27.27 (10)
	VAS	6.28±1.91	4.34±2.00
	Complication	6	2
PCA	Medication	50.55±34.93 (13)	81.30±19.05 (10)
	VAS	5.11±2.56	9.01±45.21 (10)
	Complication	3	7
SOMATOPHYSIOLOGIC			
INT	Medication	107.00±34.63 (10)	85.25±45.21 (10)
	VAS	6.86±1.52	6.01±2.52
	Complication	0	0

in the overall research design. Table 4 represents main effects between the amount of analgesia utilized, as well as,

2 and 3-way interactions. Table 5 depicts the groups that differ utilizing Scheffe's Multiple Comparison Test.

Utilizing analysis of variance, Figures 2-4 graphically display the main effects that locus of control (Figure 2) pharmacologic method of administration of the analgesia (Figure 3) and group assignment (Figure 4) have on the amount of medication required by the patients. It should be noted that group membership was significant at p .001 level in Figure 4. P values for Figures 2 and 3 are .85 and .093 respectively. With a significant main effect, further interactions were investigated and are described in Figures 5 and 6. Figure 5 displays a significant (p .005) interaction between locus of control and the pharmacologic method of administration of the analgesia. Figure 6 depicts the non-significant (p .10) relationship between locus of control and group membership. Another two way significant (p .01) interaction is shown in Figure 7 between the pharmacologic method of administration of analgesia and group membership. Figures 8, 9 and 10 follow with a 3-dimensional display of relationships between locus of control, pharmacologic method of administration of analgesia and group membership. This relationship was not a significant one (p .21).

Similar graphic displays are presented for the patient's pain perception as measured on a 10 cm visual analog scale (VAS). Table 6 shows main effects, as well

Table 4

Analysis of Variance - Main effects between amount of medication used, as well as, 2 and 3-way interactions between amount of medication used and locus of control, pharmacologic method of administration and group membership

* * * ANALYSIS OF VARIANCE * * *							
BY	MED LOC PHARM GROUP	TOTAL MEDICATION LOCUS OF CONTROL PHARMACOLOGIC					
Source of Variation			Sum of Squares	DF	Mean Square	F	Signif of F
Main Effects			15286.846	4	3821.711	4.282	.003
LOC			32.746	1	32.746	.037	.848
PHARM			2563.987	1	2563.987	2.873	.093
GROUP			13192.663	2	6596.331	7.390	.001
2-way Interactions			21571.154	5	4314.231	4.833	.000
LOC PHARM			7465.377	1	7465.377	8.364	.005
LOC GROUP			4249.497	2	2124.749	2.380	.097
PHARM GROUP			9207.296	2	4603.648	5.158	.007
3-way Interactions			2828.385	2	1414.192	1.584	.210
LOC PHARM GROUP			2828.385	2	1414.192	1.584	.210
Explained			39686.384	11	3607.853	4.042	.000
Residual			102645.973	115	892.574		
Total			142332.357	126	1129.622		

127 Cases were processed.
0 CASES (.0 PCT) were missing.

Table 5

Scheffe's Multiple Comparison Test - Depicts groups that differ statistically

- - - - - O N E W A Y - - - - -

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean		
Grp 1	44	55.8091	20.4559	3.0838	49.5899	To	62.0202
Grp 2	40	73.5375	34.2512	5.4156	62.5834	To	84.4916
Grp 3	43	78.8977	39.6113	6.0407	66.7071	To	91.0882
Total	127	69.2102	33.6090	2.9024	63.3082	To	75.1123
		Fixed Effects Model	32.3347	2.8692	63.5312	To	74.8893
		Random Effects Model		7.0744	38.7711	To	99.6493
Random Effects Model - Estimate of Between Component Variance					125.2427		

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	2	12686.3968	6343.1984	6.0670	.0031
Within Groups	124	129645.9599	1045.5319		
Total	126	142332.3567			

TOTAL MEDICATION

Mean	Group	G G G	r r r	P P P
		1	2	3
55.8091	Grp 1			
73.5375	Grp 2	*		
78.8977	Grp 3	*		

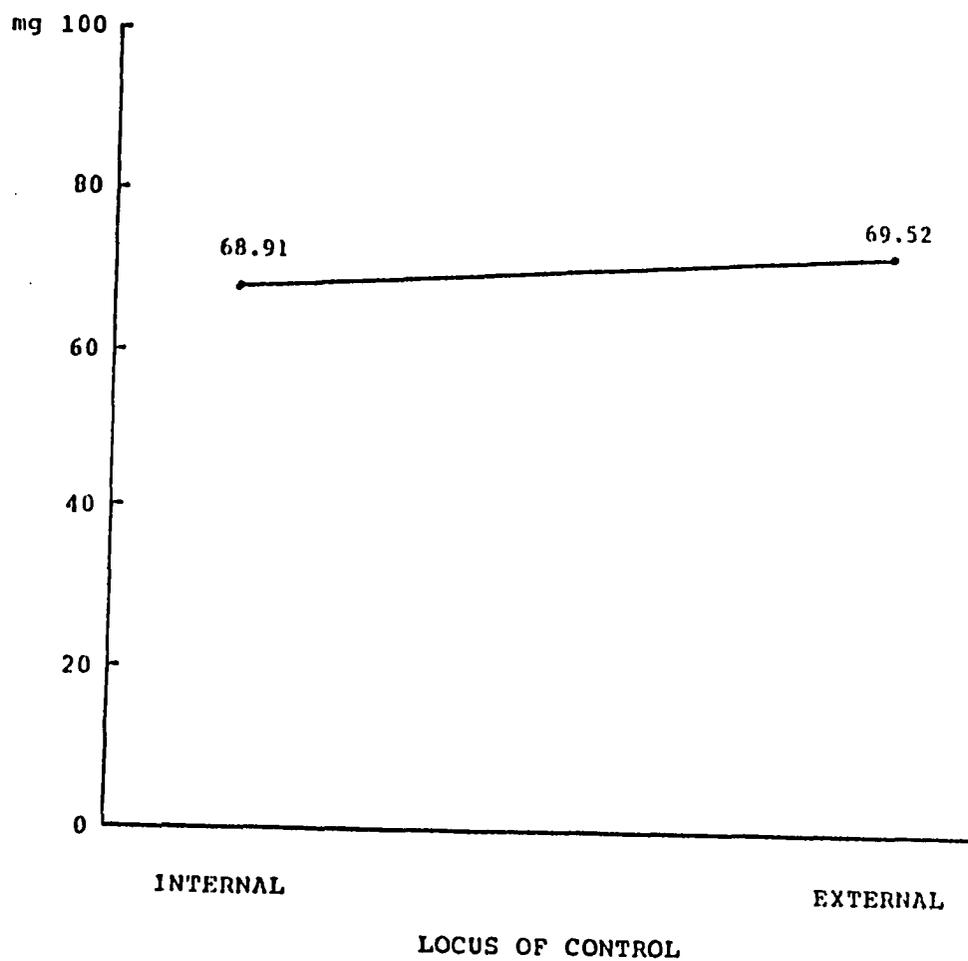


Figure 2. Main effects of internal and external locus of control on amount of analgesia required

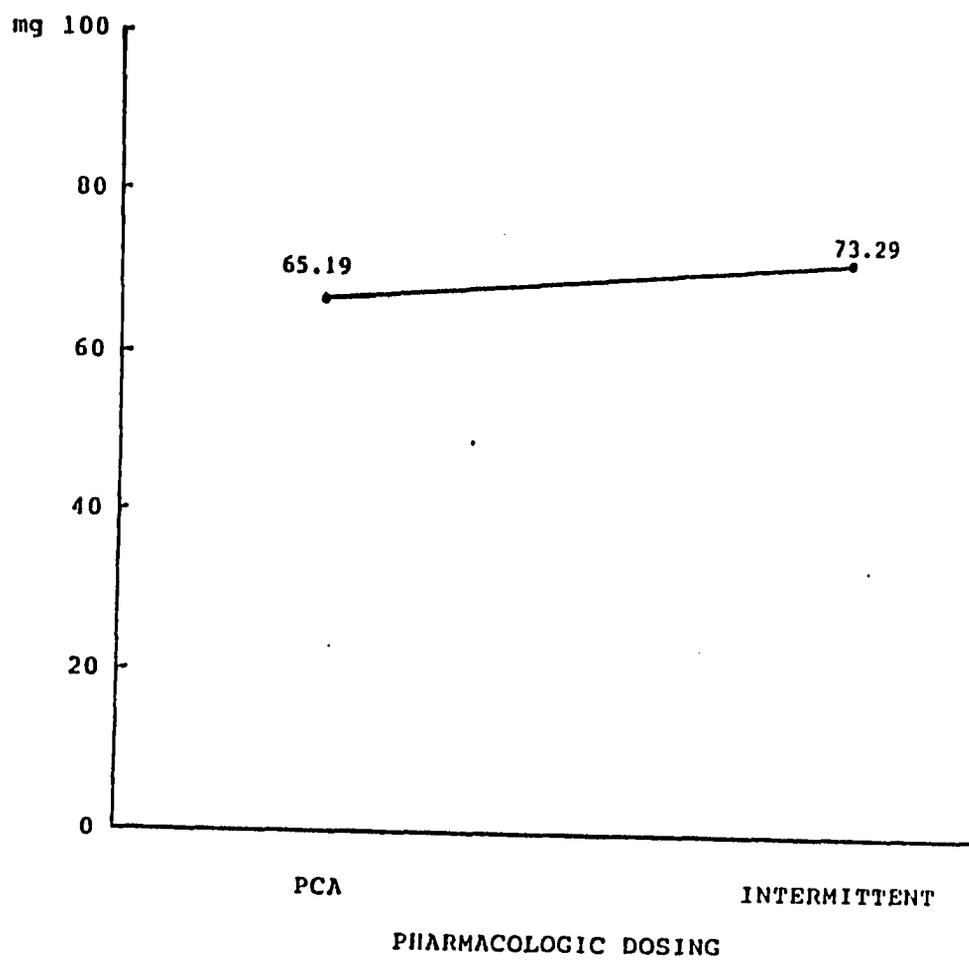


Figure 3. Main effects of pharmacologic method (patient controlled analgesia and intermittent) on amount of analgesia required

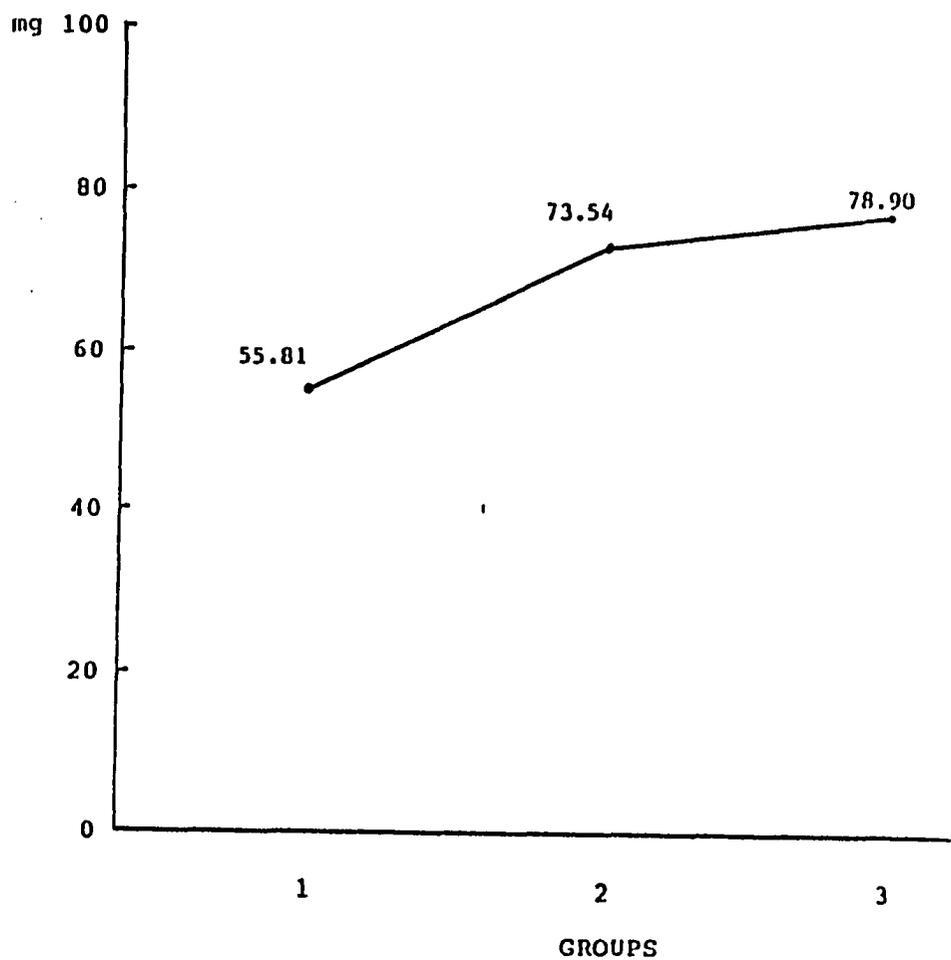


Figure 4. Main effects of group membership (1-pharmacologic, 2-cognitive behavioral, 3-somatophysiological) on amount of analgesia required

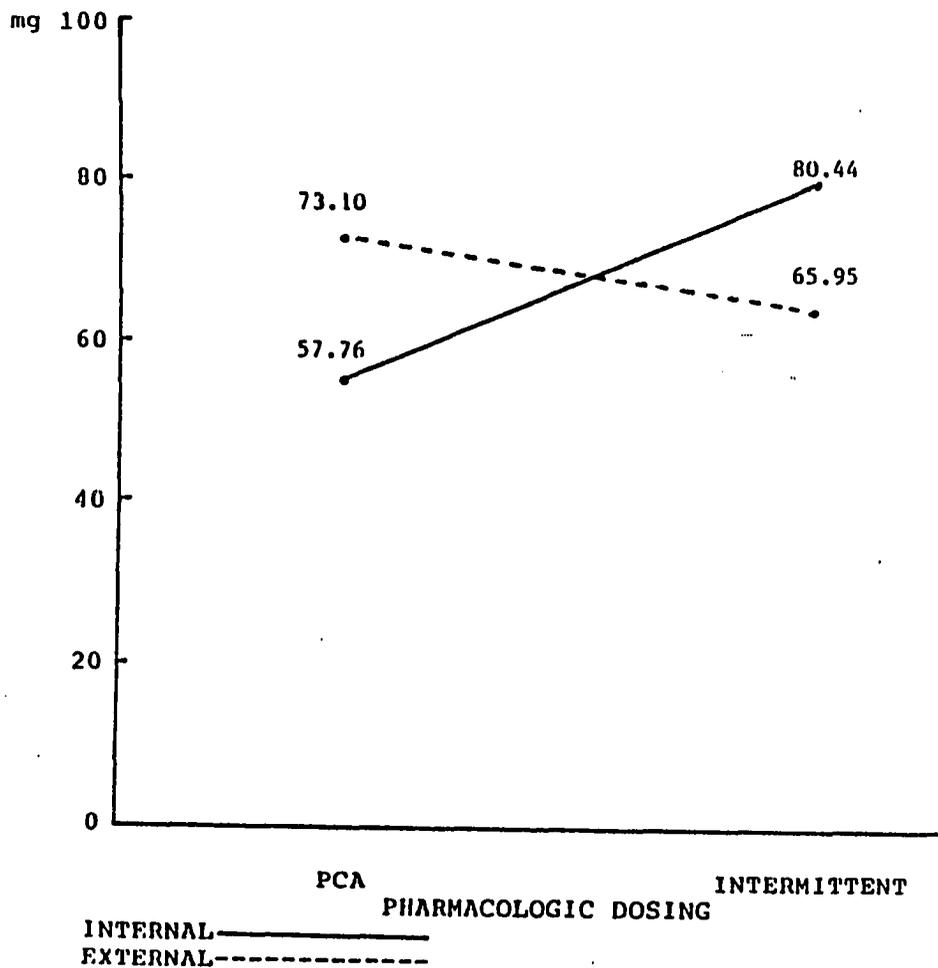


Figure 5. Two way interactions. Effect of internal and external locus of control, as well as, pharmacologic method of administration (PCA, Intermittent) on amount of analgesia required

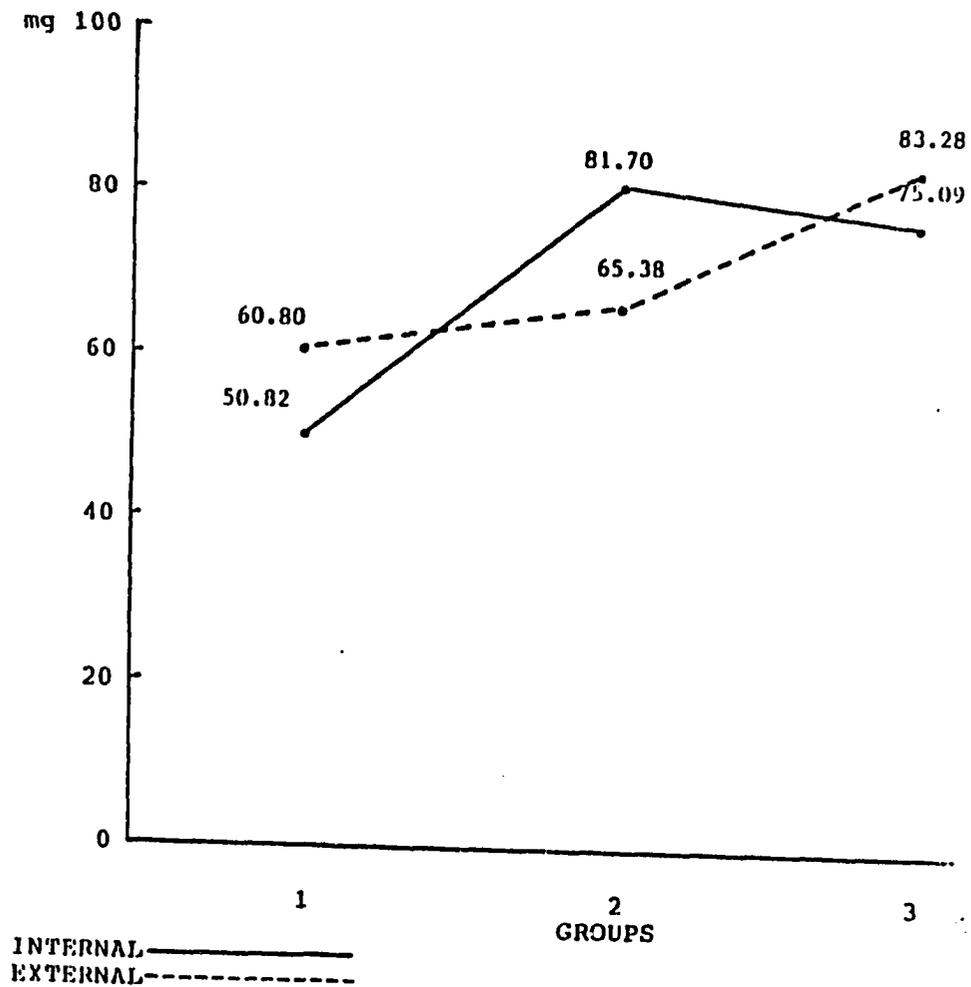


Figure 6. Two way interactions. Effect of locus of control (internal, external) and group membership (1-pharmacologic, 2-cognitive behavioral, 3-somatophysiological) on amount of analgesia required

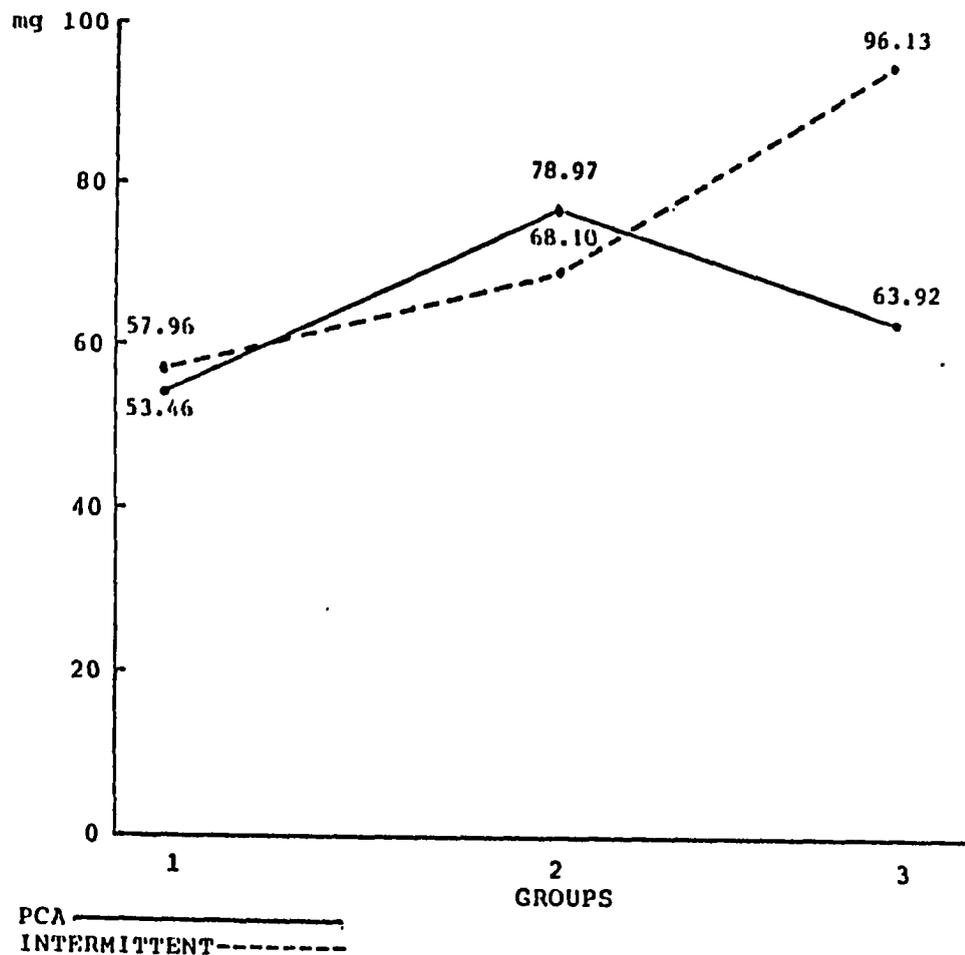


Figure 7. Two way interactions. Effect of pharmacologic method (PCA, Intermittent) and group membership (1-pharmacologic, 2-cognitive behavioral, 3-somatophysiologic) on amount analgesia required

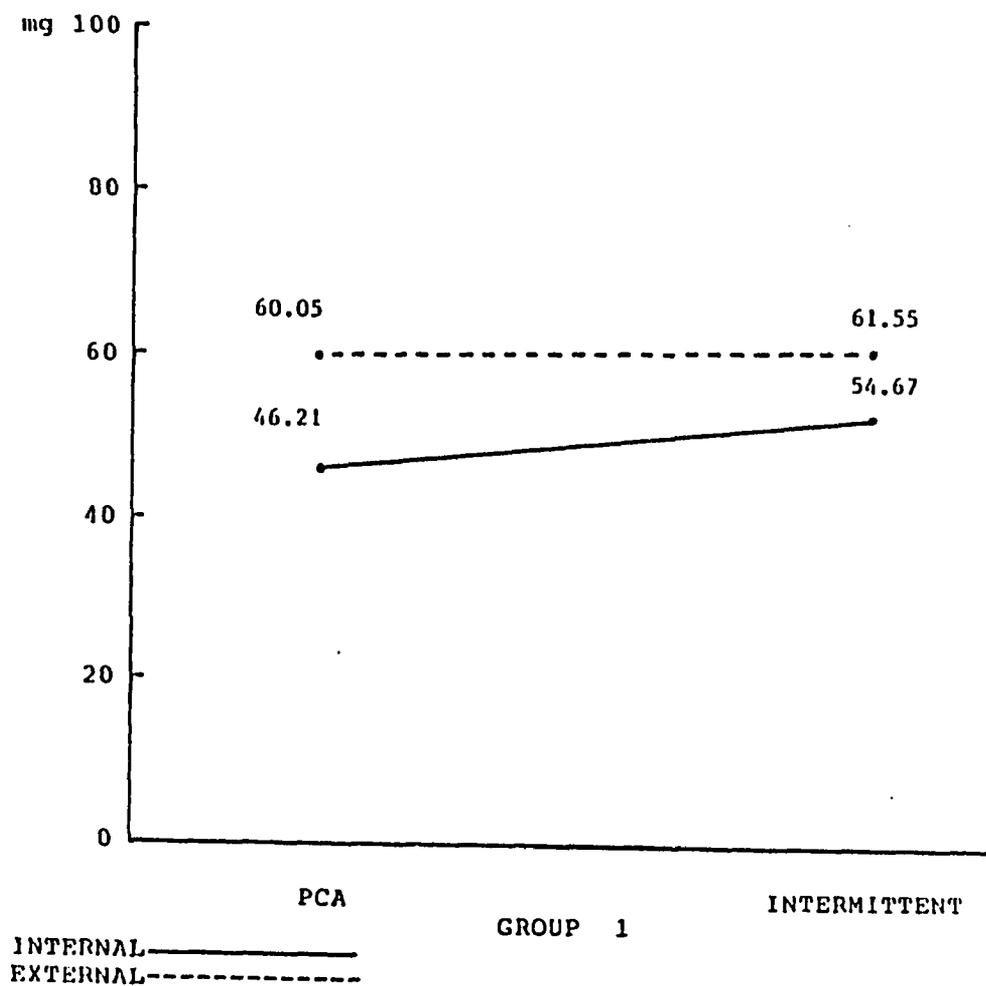


Figure 8. Three way interactions. Simple effects between locus of control (internal, external) pharmacologic method of administration (PCA, Intermittent) and group membership (pharmacologic only) on analgesia requirements

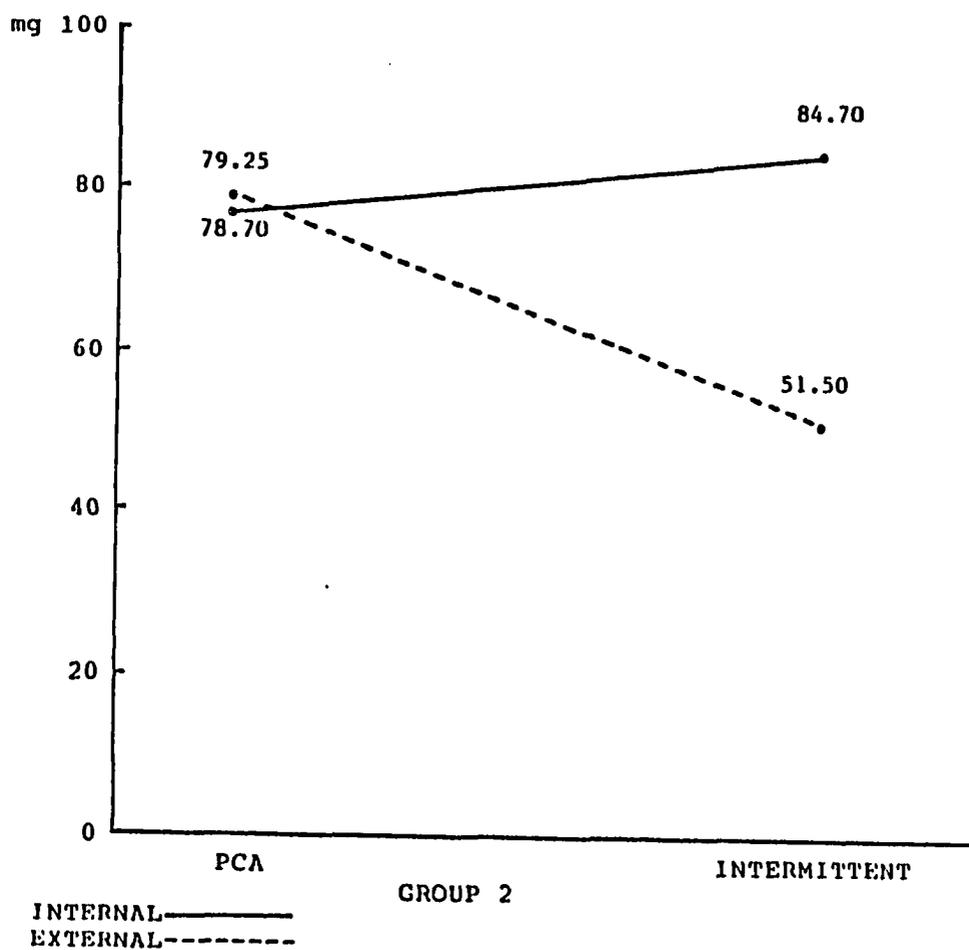


Figure 9. Three way interactions. Simple effects of locus of control (internal, external) pharmacologic method of administration (PCA, intermittent) and group membership (cognitive behavioral only) on analgesia requirements

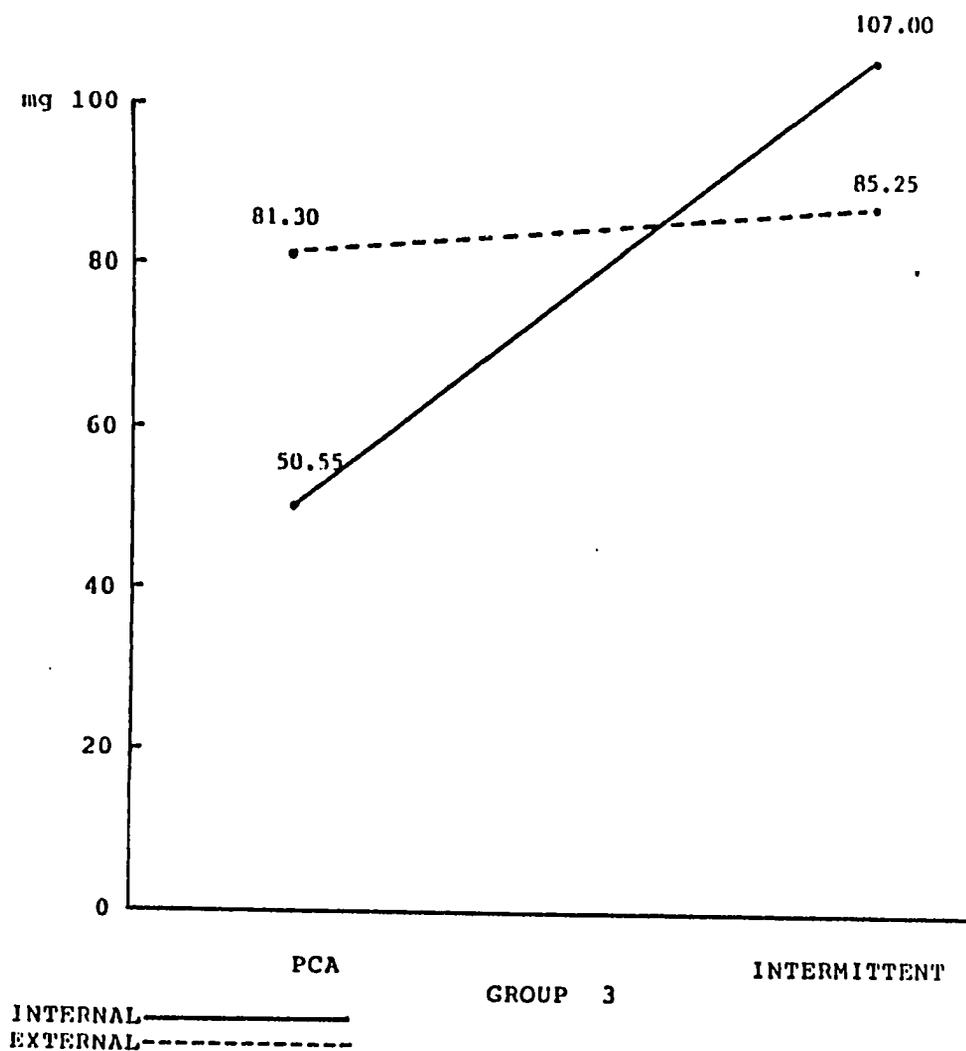


Figure 10. Three way interactions. Simple effects of locus of control (internal, external) pharmacologic method of administration (PCA, intermittent) and group membership (somatophysiology only) on analgesia requirements

as, 2 and 3-way interactions between pain perception and locus of control, pharmacologic methods of administration and group membership. Table 7 depicts the difference in group 3 from groups 1 and 2 using Scheffe's multiple comparison test. Main effects of internal and external locus of control are presented in Figure 11 and are not significant ($p .79$). Figure 12 also depicts a non-significant ($p .10$) relationship between the pharmacologic methods of analgesia administration; however, in Figure 13, one notices a significant ($p .000$) difference in group membership. Further analysis shown in Figure 14 shows a significant ($p .001$) 2-way interaction between the method of analgesia administration and locus of control, as well as a significant ($p .02$) relationship between locus of control and group membership (Figure 15). Figure 16 predicts no more than a chance relationship between methods of analgesia administration and group membership ($p .10$). Figures 17, 18 and 19 show a significant ($p .02$) 3-way relationship between locus of control, method of analgesia administration and group membership in terms of the amount of pain perceived by the patients postoperatively.

A similar analysis was performed for the complication rate and no significant differences were noted for the main effects of locus of control, pharmacologic method of analgesia administration or group membership (Table 8). Complications are displayed as total number of complications occurring in these groups in Figures 20-22. Because no main effect sources of variation were detected further analyses of this variable was not warranted. The

Table 6

Analysis of Variance - Main effects, as well as, 2 and 3-way interactions between pain perception and locus of control, pharmacologic method of administration and group membership

* * * A N A L Y S I S O F V A R I A N C E * * *

BY	PO2PAIN LOC PHARM GROUP	VAS(MM) LOCUS OF CONTROL PHARMACOLOGIC				
Source of Variation			Sum of Squares	DF	Mean Square	Signif of F
Main Effects			90.067	4	22.517	5.136
LOC			.308	1	.308	.791
PHARM			12.161	1	12.161	.099
GROUP			80.270	2	40.135	.000
2-way Interactions			108.931	5	21.786	4.969
LOC PHARM			51.075	1	51.075	11.650
LOC GROUP			36.656	2	18.328	4.180
PHARM GROUP			20.453	2	10.227	2.333
3-way Interactions			36.471	2	18.235	4.159
LOC PHARM GROUP			36.471	2	18.235	4.159
						MORE
Explained			235.469	11	21.406	4.883
Residual			504.188	115	4.384	
Total			739.657	126	5.870	

127 Cases were processed.
0 CASES (.0 PCT) were missing.

Table 7

Scheffe's Multiple Comparison Test - Depicts difference in Group 3 from Groups 1 and 2

```

----- O N E W A Y -----
Variable PO2PAIN VAS(MM)
By Variable GROUP

Analysis of Variance
Source D.F. Sum of Squares Mean Squares F Ratio F Prob.
Between Groups 2 77.5731 38.7865 7.2642 .0010
Within Groups 124 662.0839 5.3394
Total 126 739.6570
    
```

```

----- O N E W A Y -----

Group Count Mean Standard Deviation Standard Error 95 Pct Conf Int for Mean
Grp 1 44 5.1023 2.2920 .3455 4.4054 To 5.7991
Grp 2 40 4.8725 2.1158 .3345 4.1958 To 5.5492
Grp 3 43 6.6326 2.4958 .3806 5.8645 To 7.4006
Total 127 5.5480 2.4229 .2150 5.1226 To 5.9735

Fixed Effects Model 2.3107 .2050 5.1422 To 5.9539
Random Effects Model .5532 3.1677 To 7.9283
Random Effects Model - Estimate of Between Component Variance .7907
    
```

```

----- O N E W A Y -----
VAS(MM)

G G G
r r r
P P P

Mean Group 2 1 3
4.8725 Grp 2
5.1023 Grp 1
6.6326 Grp 3 * *
    
```

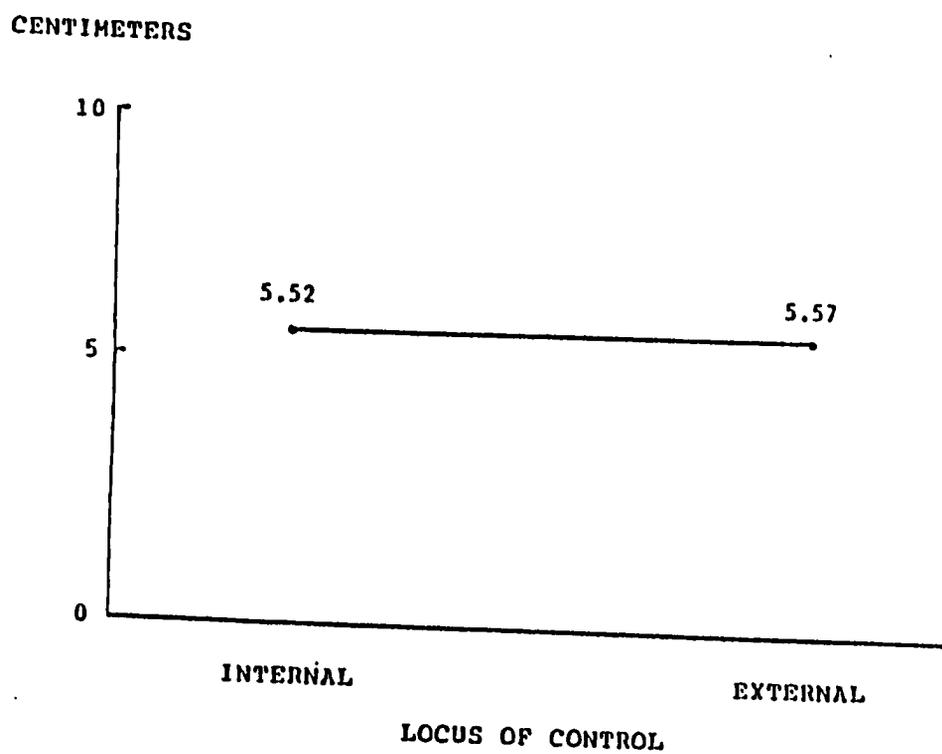


Figure 11. Main effects of locus of control (internal, external) on pain perception

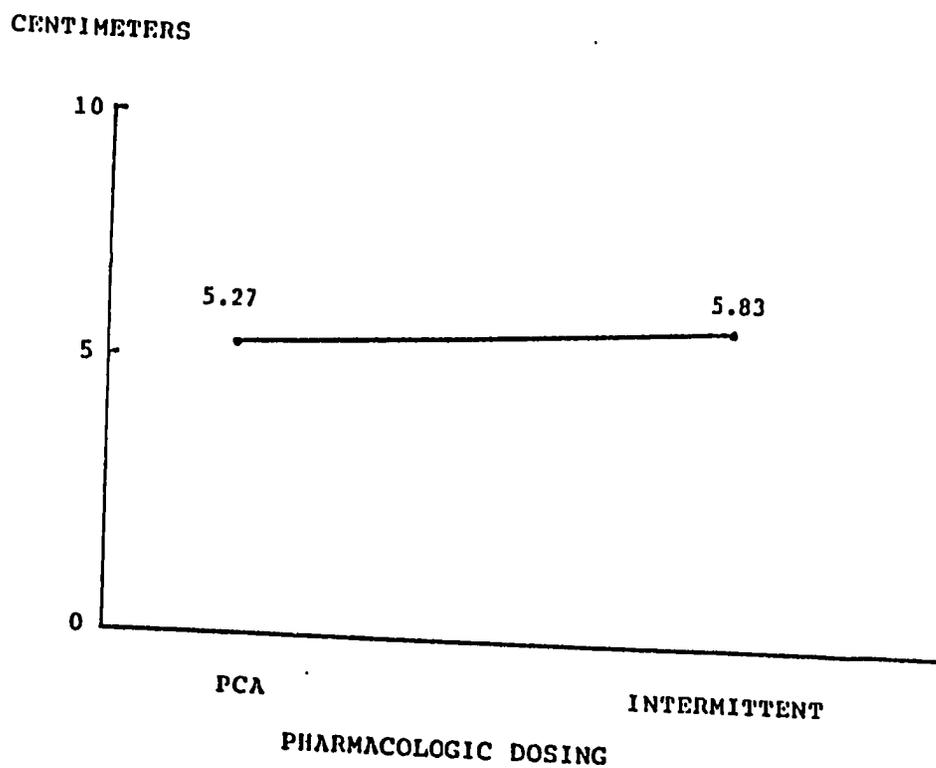


Figure 12. Main effects of pharmacologic method of administration (PCA, Intermittent) on pain perception

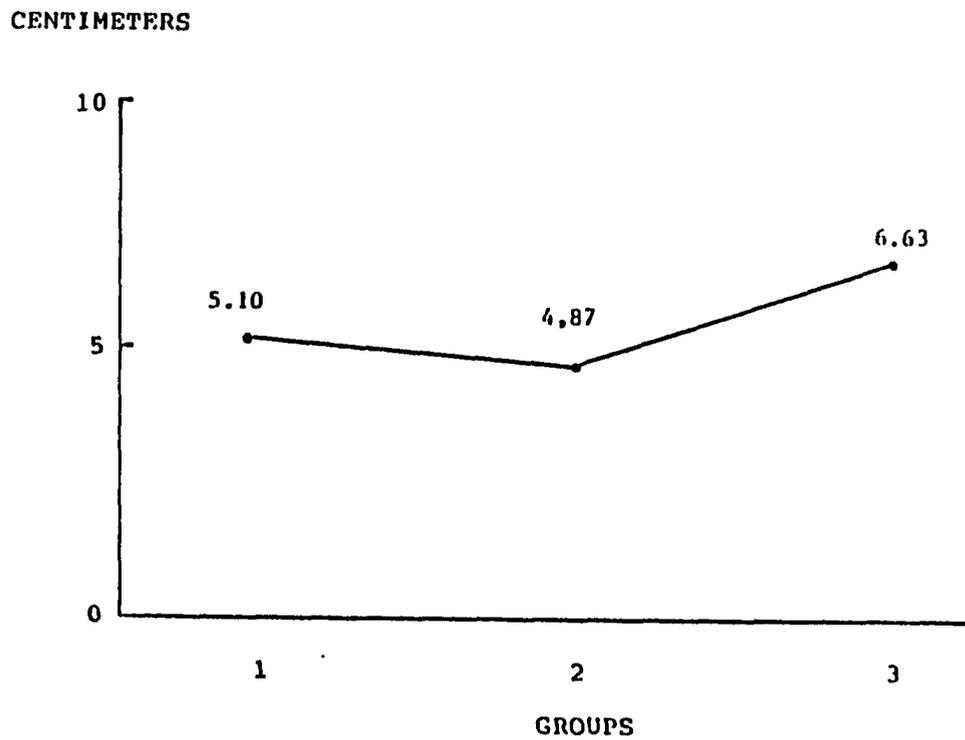
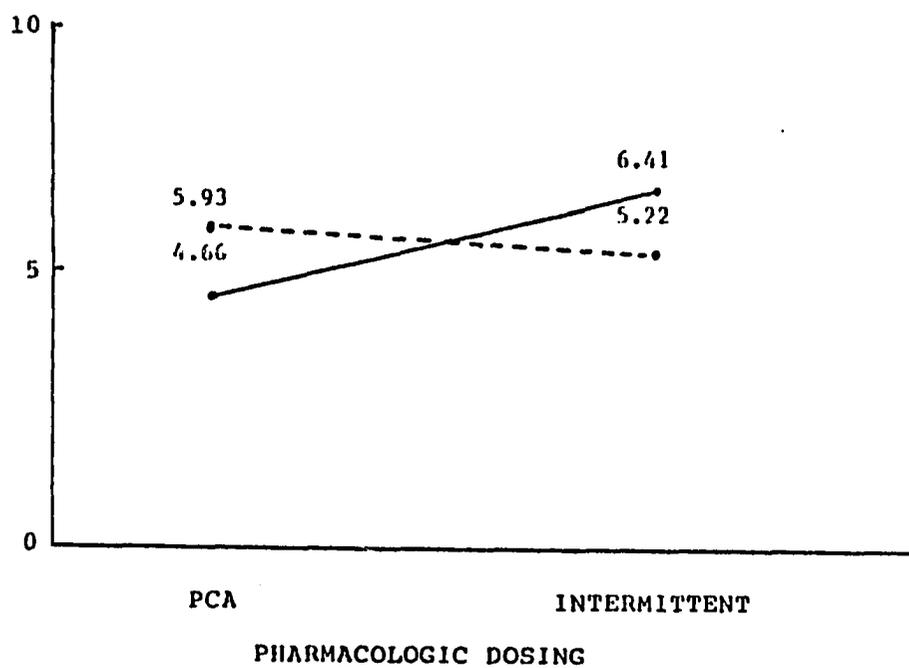


Figure 13. Main effects of group membership (1-pharmacologic, 2-cognitive behavioral, 3-somatophysiological) on pain perception

CENTIMETERS



INTERNAL ———
 EXTERNAL - - - -

Figure 14. Two way interactions. Effects of pharmacologic method (PCA, Intermittent) and locus of control(internal, external) on pain perception

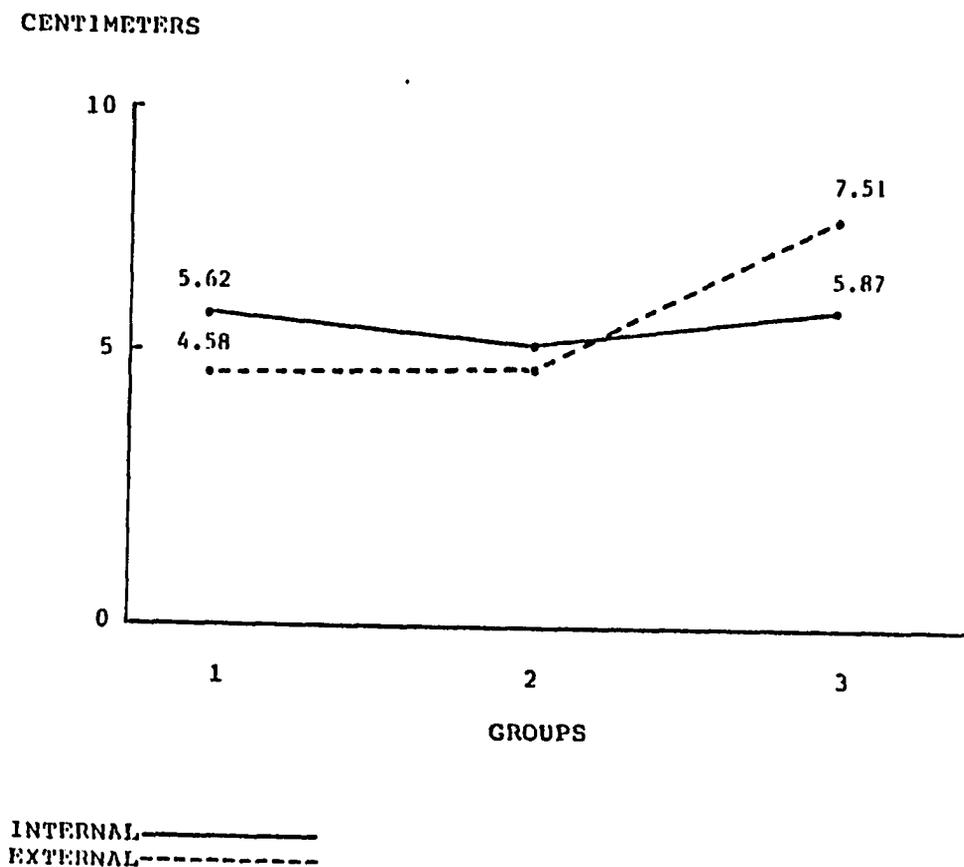


Figure 15. Two way interactions. Effects of locus of control (internal, external) and group membership (1-pharmacologic, 2-cognitive behavioral, 3-somatophysiologic) on pain perception

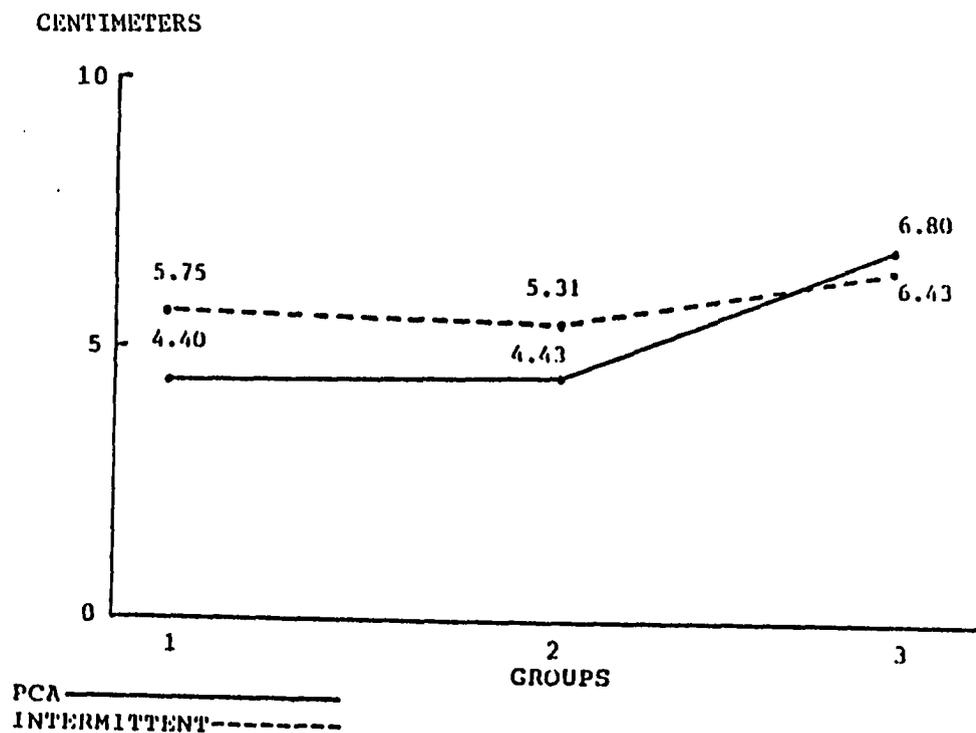


Figure 16. Two way interactions. Effects of pharmacologic method of administration (PCA, Intermittent) and group membership (1-pharmacologic, 2-cognitive behavioral, 3-somatophysiologic) on pain perception

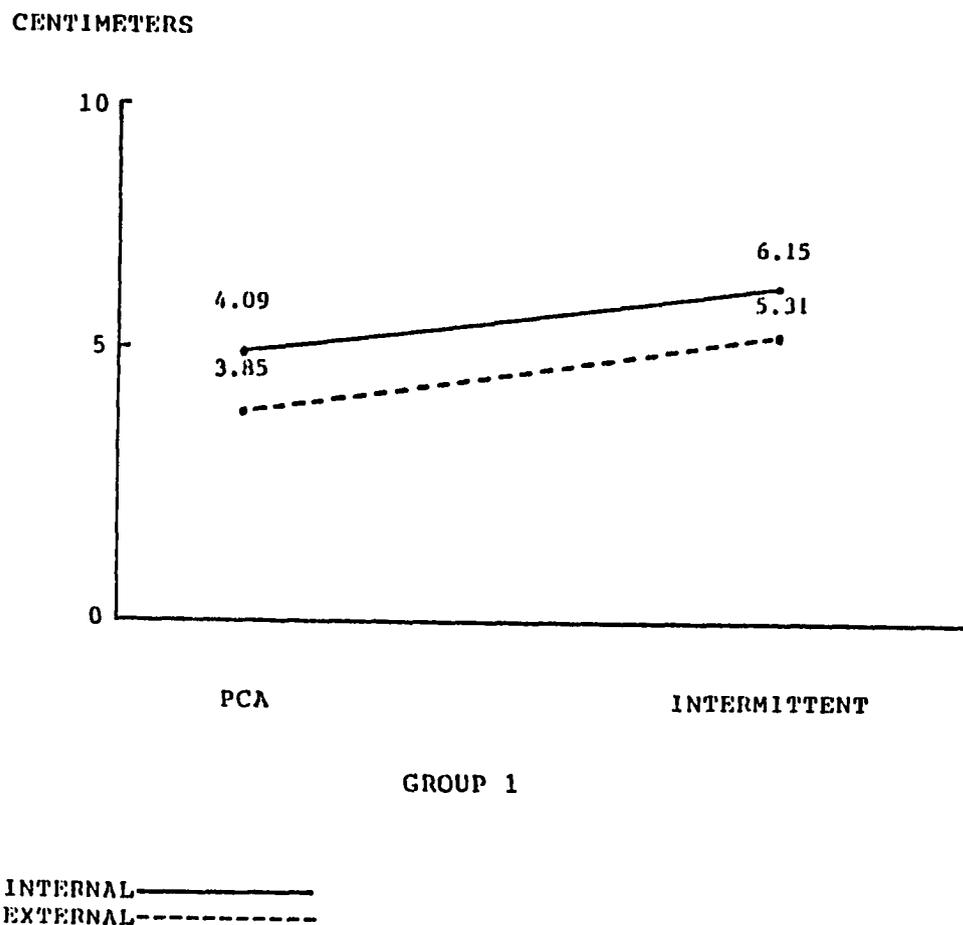
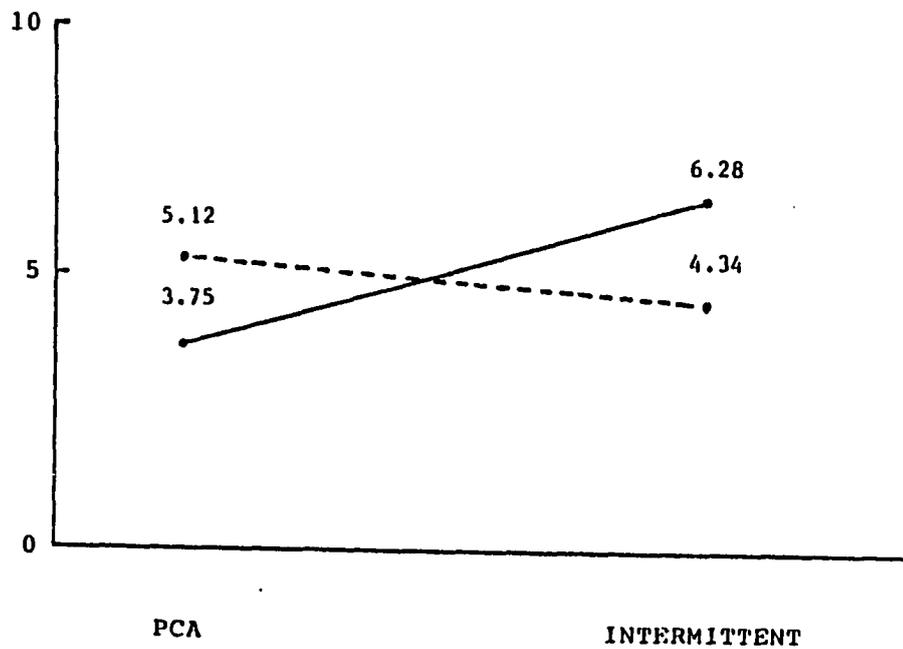


Figure 17. Three way interactions. Simple effects of locus of control (internal, external) pharmacologic method of administration (PCA, Intermittent) and group membership (pharmacologic only) on pain perception

CENTIMETERS

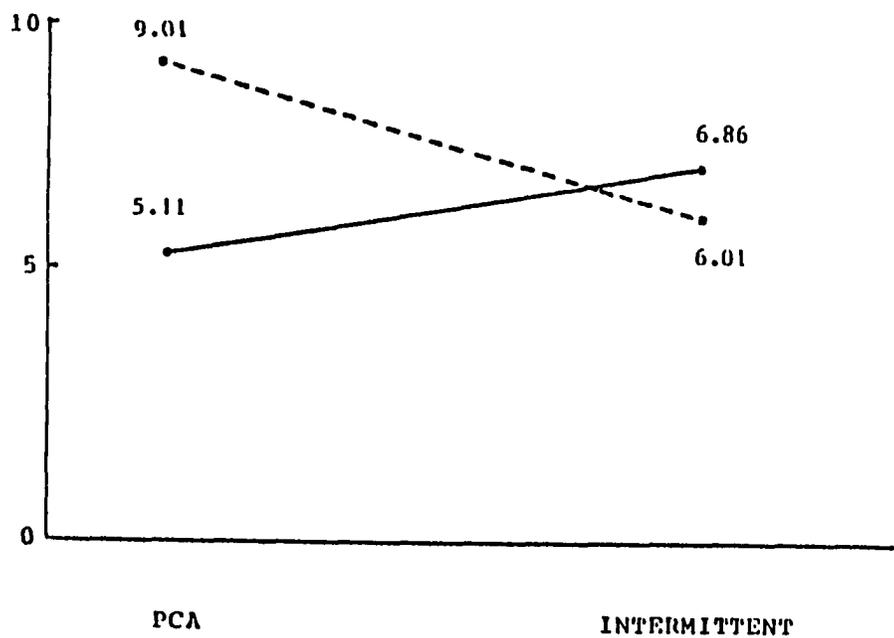


GROUP 2

INTERNAL—————
 EXTERNAL-----

Figure 18. Three way interactions. Simple effects of locus of control (internal, external) pharmacologic method of administration (PCA, Intermittent) and group membership (cognitive behavioral only) on pain perception

CENTIMETERS



GROUP 3

INTERNAL—————
 EXTERNAL-----

Figure 19. Three way interactions. Simple effects of locus of control (internal, external) pharmacologic method of administration (PCA, Intermittent) and group membership (somatophysiology only) on pain perception

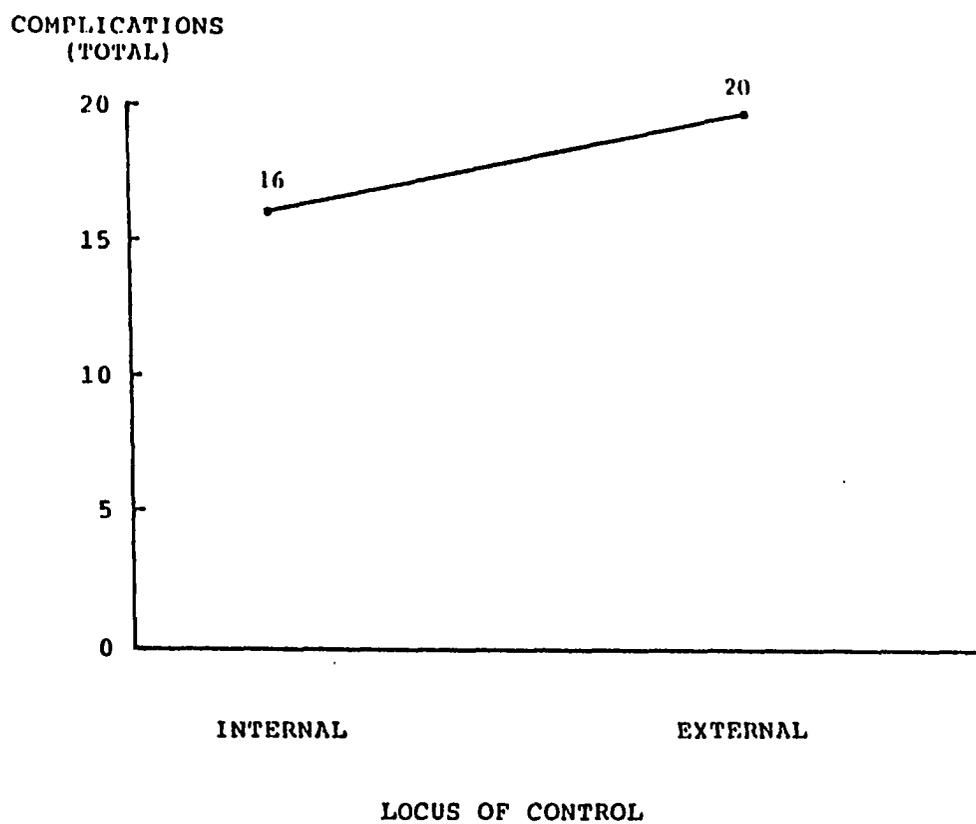


Figure 20. Main effects of locus of control (internal, external) on complication rate

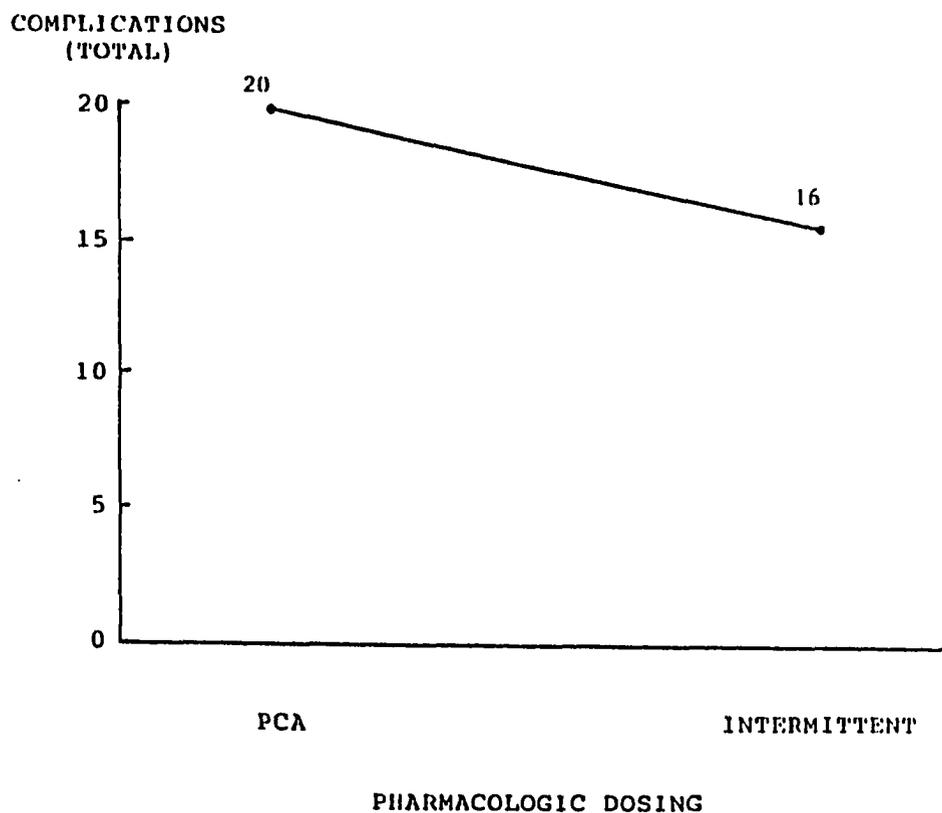


Figure 21. Main effects of pharmacologic method of administration (PCA, Intermittent) on complication rate

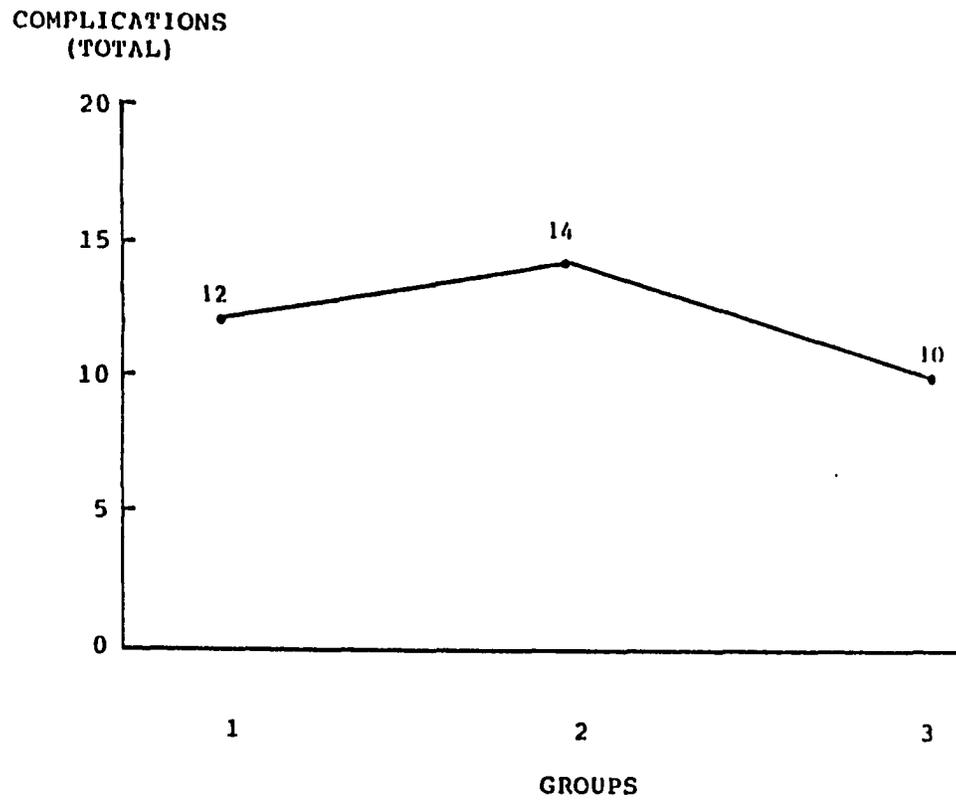


Figure 22. Main effects of group membership (1-pharmacologic, 2-cognitive behavioral, 3-somatophysiological) on complication rate

internal locus of control utilizing the pharmacologic approach with patient controlled analgesia will experience less pain, use less analgesia and have fewer postoperative complications than those identified as having external locus of control was supported in part. Recall that Figure 5 showed a significant ($p .005$) difference in group membership and that Figure 14 also showed a significant ($p .001$) difference in pain perception related to locus of control and pharmacologic administration of medication. Patients, however, did not experience fewer complications as a result of locus of control, method of administration of analgesia or group membership.

The second hypothesis which states that patients identified as internal locus of control utilizing the adjunctive cognitive behavioral method of pain control will experience less pain, utilize less analgesia and have fewer postoperative complications than patients who were identified as external locus of control failed to be supported by all data except pain perception. Figure 7, in fact, depicts internally oriented patients utilizing more medication than externals. Complication rates also failed to support this hypothesis.

Hypothesis three was supported in part by the amount of medication required by these patients. This hypothesis stated that patients identified as internal locus of control utilizing the adjunctive somatophysiologic (TENS) method of pain control and patient controlled analgesia would use less medication, perceive less pain and have fewer complications. Figure 7 shows that patients in group

3 use less pain medication ($p .01$); however no further support was gained from the pain perception data or complication rate.

The fourth hypothesis was not supported by any of the dependent variables. The prediction was that patients in the group utilizing PCA would use less medication, have less pain and fewer complications than the intermittently dosed patients and this was not upheld. Although patients in the PCA group did use less medication (65.19 mg versus 73.29 mg and rate pain less as 5.27 cm versus 5.57 cm) these differences were no different than chance.

Hypothesis five states that patients assigned to the cognitive behavioral group will use less medication, have less pain and fewer complications if assigned to the PCA method of analgesia dosing and this was supported by medication usage. Figure 6 displays the cognitive behavioral group with significant differences ($p .01$) between the amount of medication used by PCA group and intermittent group. Pain perception (Figure 14) and complication rates failed to support this hypothesis.

Hypothesis six was in part supported by the amount of medication required. See Figure 7 to recall that patients assigned to the somatophysiological (TENS) group who received their medication by PCA received 63.92 mg and intermittently dosed externally oriented patients received 96.13 mg. This was significant at $p .006$ level. Visual analog scores and complication rates did not support this hypothesis.

Patients identified as internal locus of control,

assigned to the cognitive behavioral group utilizing PCA were hypothesized in seven to use less medication, perceive less pain and have fewer complications and this hypothesis failed to gain support from the dependent variables.

The final hypothesis which stated that patients identified as internal locus of control assigned to the PCA group and the somatophysiological group would use less medication, perceive less pain and have fewer complications was supported by pain perception only. Figure 19 shows graphic depiction of PCA patients who are internally oriented rating pain at significantly lower ($p .02$) than their counterparts; however no support was found in the amount of medication required.

In answering the major research questions, locus of control does appear to be related to a patient's perception of pain and amount of analgesia required for relief; locus of control does appear to be related to the methods of analgesia administration and to the effectiveness of group membership; the method of analgesic administration appears to be related to pain perception and the amount of medication requires; however, there appears to be no relationship among and/or between these variables and the complication rate of this group of patients.

CHAPTER V

In summary, the purpose of this study was to study the actions and interactions of the various psychological and physiological interactions involved in the multifaceted subject of pain relief. A synthesis of the literature reveals that pain is a complex, multidimensional experience from which no human is immune. It is an experience that is influenced heavily by past and present psychological environment, as well as by various physiological changes which take place during the experience. That is, the release of chemical substances such as bradykinin, serotonin, substance P, and others, as well as, further modulation by recently discovered endorphins and enkephalins.

The conventional mainstay of pain relief has been the intermittent administration of medications for that purpose, both opiates and non-opiates such as non steroidal anti-inflammatory drugs. That is, the patient requests pain medication from the nurse, who checks his record to see if enough time has lapsed from his last dose to prevent any untoward effects, prepares the medication and administers it to the patient. Caveats associated with the administration of intermittent analgesic medication have been the "highs" and "lows" resulting from a high serum level of the medication immediately following administration which may cause excessive drowsiness and other symptoms such as respiratory depression, nausea and vomiting; the converse happens when there is a delay in obtaining medication from the health care delivery

personnel and low serum levels of the medication account for excessive pain and discomfort. A new approach developed to avoid this pitfall is the patient care delivery system (PCA) where an intermittent dosing device is attached to the intravenous tubing of the patient. A hand-held device allows the patient to administer small, frequent doses as the need arises. Multiple safety devices are built into the PCA to prevent accidental overdosing or errors in initial set up of the machine.

Psychological attributes have also been found to contribute to one's experience of pain and amount of required analgesia. Anxiety and coping behaviors have been identified as contributors to the pain experience and accounts in the literature link personality factors of internal and external locus of control with anxiety and coping behaviors. An individual identified as internal locus of control is one who believes that life events are the results of one's own actions while an externally oriented individual believes that events in one's life are the result of chance, powerful others or fate.

Three broad categories are also identified in the literature as pain relief modalities. They are pharmacologic (as discussed above), cognitive-behavioral and somatopsysiologic methods. Cognitive-behavioral methods include several psychological behavioral approaches such as progressive muscle relaxation, biofeedback, operant conditioning, hypnosis and positive suggestions while under general anesthesia. These methods have been studied with results as varied as the types of patients studied.

The somatophysiologic approach to pain relief includes methods such as acupuncture, transcutaneous nerve stimulations (TENS), massage, heat and cold. Again varied results have been obtained from total anesthesia to no relief at all.

The purpose of this study was to systematically divide patients into groups according to their personality types (internal versus external), then apply the different types of pain relief modalities to homogeneous groups of patients experiencing pain.

Patients were an intact group at the Veterans Administration Medical Center in Allen Park, Michigan. Patients ranged from 43 years to 84 years (mean 64 years) and were admitted for major abdominal procedures. Only those patients requiring a midline incision were included. No efforts were made to control for length of operation or type of anesthesia utilized; however, patients requiring epidural anesthesia/analgesia were excluded. Questionnaires were completed to determine locus of control orientation, then patients were randomly assigned to one of the three groups of pain relief (pharmacologic alone, cognitive-behavioral or somatophysiologic) and again randomly assigned to receive analgesic medication either by patient controlled analgesia or intermittent dosing.

Measurements of amounts of medication utilized, the patient's perceived pain and number of complications occurring in each group were gathered. Total medication was measured for the day of surgery, postoperative days 1 and 2 and total amount of medication required; patient's

pain perception was measured using a visual analog scale on the McGill Pain Questionnaire, short form; complications were calculated from the presence of a fever of greater than 100.5° F. and/or the presence of abnormal lung findings as evidenced by auscultation or chest x-ray.

The research question of whether there is a relationship between locus of control and the patient's experience of pain, measured by the dependent variables mentioned above was answered negatively. An unexpected finding was that no statistical differences were measured between the internal and external groups. In addition, no differences were noted between the method of administration of analgesia for the internals versus externals, although trends were in the direction of internals receiving less medication and perceiving less pain if receiving PCA medication. Indeed when looking at the overall picture, there was a statistical difference between locus of control and method of administration over the three groups in terms of pain perception (and that difference was primarily accounted for by the somatophysiologic group) but not amount of medication received. A relationship was observed in amount of medication used and pain perception between locus of control and the cognitive behavioral group, as well as for the somatophysiologic group (when not separated by method of administration). Lastly, although no relationship was noted among locus of control, pain relief modality and method of administration for amount of medication used as an overall interaction, there was a relationship when measuring pain perception and that

relationship was significant in the somatophysiologic group.

Complication rates as measured failed to support any relationship between the independent and dependent variables. Complication rates measured by the criteria set forth in this study may not have been specific enough for this study. Lange & Dahn (1988) found abnormal chest radiographic findings and fever to provide a good measure of pulmonary complications; however with the addition of abnormal auscultatory findings, enough non-specific findings were added to possibly inhibit specificity and sensitivity.

Viewing this rather complex design in simpler terms, one would expect the patients oriented as internally controlled to benefit more from a pain relief modality in which they could have maximal control, namely patient controlled analgesia and that the converse would be true for those externally controlled. They, by definition, should be more satisfied if control is removed from them and remains with "others". This assumption is illustrated in Figure 5 showing just that finding. An unexpected finding (Figure 4) was that those patients receiving no adjunctive methods of pain relief would require less medication. One would expect that by providing additional methods of pain control, less medication would be necessary. One might surmise that providing additional methods of pain relief for all groups increases attention given to discomfort or that, minimally, the adjunctive measures do not facilitate coping mechanisms for dealing

with discomfort. The relationship in Figure 7 is extremely interesting especially for those assigned to group 3 - intermittently dosed patients utilizing TENS. It appears that the addition of the TENS unit has a significant impact on medication use and further inspection shows that most of this impact results from the internally controlled PCA patients who have a TENS unit in place. One again could surmise that this adjunctive measure serves to remove some of the "control" which is a necessary component for these patients. Similar findings are found when inspecting the visual analog scores (VAS). Patients utilizing the TENS unit (group 3) also rated their pain higher (Figure 11) and this, in part, resulted from an increase in the internally oriented patients using patient controlled analgesia (Figure 19). Conversely, on this illustration, externally oriented patients using INT dosing rated their pain worse but had a significant decline with the use of TENS. As expected in Figure 12 as internal PCA patients lose control they reported more pain in the INT group. Interestingly pain scores changed very little for the external patients whether receiving analgesia by PCA or INT dosing.

Although the patients who received auditory stimulation in the form of recorded messages suggesting less pain, discomfort, etc. reported less pain (Figure 19) there seems to be little evidence that this modality has any effect on either the amount of medication required or patient's perceived pain. The TENS unit could have a beneficial effect on externally oriented patients but definitely tends to increase perceived pain and medication

requirements for internally controlled patients.

LIMITATIONS

This project involved only male patients who were, for the most part, elderly. One may not be able to generalize these findings to the general population. In addition, another population, such as the oncologic population suffering from chronic pain, might differ considerably from these findings. Additional numbers of patients, in order to have larger groups especially in complex analyses, might provide more information. The most frequent complication following a surgical procedure, especially a large abdominal procedure is pulmonary in nature. The findings that our measures did not show differences in complication rates for these groups was disappointing. Highest morbidity and mortality in a critical care results from progression of pulmonary complications often resulting in pneumonia and further demise. A method of prediction and more important, a method to improve complication rates would have been beneficial.

Practical implications resulting from this study involve benefits to both the patient and institution. Benefitting the patient is of prime importance and it appears, from these findings, that we can tailor pain relief modalities to modulate the patient's discomfort and medication usage. Patients who want "control" do extremely well with PCA alone and patients who want others to remain in control do well with INT dosing. If less discomfort is realized by the patients, less medication is utilized which, in turn, prevents untoward effects associated with

analgesic medication. This can, then, result in cost saving for the institution. Theoretically, the use of PCA for appropriate patients should translate into cost saving for nursing time. Although difficult to quantify, studies in this area would be beneficial. In addition, studies such as this in different pain populations would provide pertinent information to the health care delivery team. Some of the psychological implications may be more severe in patients who suffer from chronic pain.

It will be through additional research that the multifaceted subject of pain is better understood. Mysteries surrounding the "meaning of pain" continue and multidisciplinary approaches to pain relief appear to hold answers to successful pain relief.

APPENDIX A

PLEASE NOTE

Copyrighted materials in this document have not been filmed at the request of the author. They are available for consultation, however, in the author's university library.

89-91, Appendix A - the questionnaire

University Microfilms International

APPENDIX B

EXAMPLE OF TEST TO BE PROVIDED ON TAPE RECORDED MESSAGE TO BE USED DURING GENERAL ANESTHESIA

You are resting very quietly and safely. Your operation is going very smoothly. While you are asleep I would like to give you some helpful thought which may make your recovery less stressful and faster so that you can return to your routine activities.

Breathe very slowly and remain relaxed. When you awaken from the anesthesia, you will feel very refreshed. You will be hungry and your body will begin to heal very rapidly. Your immune system will be very competent and not allow any infections to occur. Your discomfort will be minimal and you will want to walk around, cough and deep breathe, knowing that each time you perform these activities, you are one step closer to recovery. You are very aware of your body and its needs. You will address any questions you have regarding your condition with your physician. Using this knowledge will help you improve faster. Your goal is to return to your normal life as fast as possible and you will do this by deep-breathing at least 10 times every hour; walking around in your room at least 4 times per day; exercising your arms and legs while confined to bed; coughing to keep your lungs free of any infection. You will see these results by being able to leave the Intensive Care Unit very early. Once you have returned to your ward, you will continue this pattern - that of doing everything you can to make your body heal faster. (Variations of this is repeated throughout surgery while the patient is under general anesthesia)

APPENDIX C

INSTRUCTIONS FOR USING TRANSCUTANEOUS NERVE STIMULATOR

You will be using an electroanalgesia means of pain control along with your pain medication. The advantage of this method is that it may allow you to use less pain medication and in turn, experience less drowsiness and sedation. The advantage of less drowsiness and sedation is to be able to participate more fully in activities which will speed your recovery such as walking, coughing and deepbreathing.

The TENS unit is composed of a small battery pack with the ability to increase or decrease electrical stimulation which may be felt by you as a tingle and occupies your nerve endings so that they are less able to detect painful impulses.

Disposable patches will be placed near your incision and you will be given instructions on adjusting the intensity of the stimulations.

Please do not hesitate to make adjustments in your TENS unit. Do not expect complete pain relief but rather an increase in pain relief by using this method along with your regular pain medication.

Feel free to ask the nurse any questions regarding this device or call me at any time. (Patricia Lange, RN, 562-6000, Ext. 3295).

APPENDIX D

PLEASE NOTE

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97, Short-Form McGill Pain Questionnaire

University Microfilms International

APPENDIX E

CONSENT FORM

"Does locus of control affect three methods of pain control - pharmacologic, cognitive-behavioral and somatopsysiologic?"

This research project to evaluate pain control following major abdominal surgery has been explained to me. I am aware that I will be randomly placed in one of three groups to evaluate three different pain relief modalities. All groups will receive conventional analgesia and two groups will receive additional pain relief modalities, auditory stimulation during general anesthesia and/or transcutaneous electrical nerve stimulation.

Auditory stimulation involves having earphones placed on me during my operation while I listen to positive suggestions on how I will feel when I recover from the anesthetic agent.

TENS (transcutaneous nerve stimulation) is a device which also is used for pain control. Disposable electrodes are placed on the abdominal wall near your incision and low electrical impulses are generated and applied to the skin near the incision which aids in the control of discomfort. There are no known harmful side effects from this pain relief modality.

I understand that a drug which is a standard injectable pain reliever will be used as the analgesia in this project. One group of patients will receive this drug in the usual manner, intramuscular injections every 3-4 hours as needed and the other group will receive the drug administered by a continuous pump directly into a pre-existing intravenous tube which can be controlled and administered as necessary by me. There are safety features which prevent an overdosage of the drug. As with any pain reliever, I am aware that I may be subject to any of the following risks and/or discomforts: sedation, nausea, dizziness, sweating, decreased blood pressure, headache or slowed breathing,

Complications resulting from the use of any intravenous tube may include swelling, inflammation and local infection of the area.

The advantage of receiving this medication by this method is that I can administer the medication as needed for my discomfort and I will have some control over my well-being. The drug (Morphine) is a conventional pain reliever prescribed following surgery.

If at any time I have any questions regarding this research project, I may contact Patricia Lange, MSN, CCRN, Department of Nursing, VA Medical Center, Allen Park, MI. 48101, (313) 562-6000, Ext. 3295.

If I experience any adverse effects from the project and require additional medical services, then adequate, accepted treatment will be available to me. I understand that in the case of physical injury resulting from the research procedures, no compensation and no medical treatment or compensation from Wayne State University is offered to me. I

understand that, (1) if I sustain physical injury as a result of my participation in this investigation and (2) if I am an eligible veteran, I will be entitled to medical care and treatment from the Veterans Administration. I may also be eligible for compensation under 38 USC 315, or, in some circumstances, under the Federal Tort Claim Act. However, if I am not eligible or if I am a nonveteran, I will be entitled only to receive medical care and treatment in the Allen Park Veterans Affairs Medical Center on a humanitarian emergency basis. Any compensation under this circumstance will be limited to situations where negligence occurred and would be controlled by the provisions of the Federal Tort Claims Act. Further information regarding this is available through Ms. Lange.

I further understand that all information is confidential.

My participation is voluntary. My decision to participate will not effect the care/services I receive here other than those explained to me as part of this study.

I am free to withdraw my consent and to discontinue my participation in the project at any time without explanation.

I understand that I will receive a copy of this form. On the basis of the above statements, I agree to participate in this project.

(Participant's Signature/or Subject's Representative) Date

(Witness' Signature) Date

(Witness's Signature) Date

I have fully explained this project to the above-named person and believe he/she has understood the information.

(Investigator's Signature) Date

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ABSTRACT

DOES LOCUS OF CONTROL INFLUENCE EFFICACY OF
NONPHARMACOLOGIC APPROACHES TO PAIN CONTROL

by

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December, 1990

Adviser: Donald Marcotte, Ph.D.

Major: Evaluation and Research

Degree: Doctor of Philosophy

This study is a mixed 2 X 3 X 2 factorial model of experimental design. One hundred twenty seven patients who were scheduled to undergo a laporatomy (midline incision) at a large teaching hospital were solicited for inclusion into the study. Following consent, the patient's locus of control was determined and then randomly assigned to one of three groups of pain relief: pharmacologic (medication only), cognitive-behavioral or somatophysiologic. They were further randomly assigned to the method of pharmacologic dosing, patient controlled analgesia (PCA) or intermittent (INT) dosing. Patients assigned to the cognitive-behavioral group received positive auditory stimulation of a tape recorded message while under general anesthesia. The message suggested that their discomfort would be minimal, that they would want to participate in activities directed toward recovery, etc. Patients assigned to the somatophysiologic group had the use of a transcutaneous nerve stimulator (TENS) postoperatively. It was hypothesized the patient's pain perception, amount of analgesia utilized and complication rate would be effected

by locus of control, method of administration and adjunctive pain relief modalities. Records of amounts of medication delivered on the day of surgery, postoperative days 1 & 2 were kept; at 48 hours postoperatively, patients were given a McGill's Pain Questionnaire for completion and indications of complications were noted. For the purposes of this study, complications were limited to pulmonary in nature. Pulmonary complications were identified as abnormal chest x-ray, fever of 100.5°F or atelectasis identified by auscultation.

Results showed that neither locus of control nor method of pharmacologic administration of analgesic medication had any effect on the dependent variables when measured alone; however, when measured in combination, provided some interesting results. Internally controlled patients used less medication if receiving their analgesic medication by patient controlled analgesia. Internals placed in the somatophysiological group (TENS) used significantly more medication with the adjunctive therapy. Internals perceived significantly less pain if receiving analgesia via PCA. Externals perceived significantly less pain in group 3 (TENS) if receiving intermittent dosing.

Interestingly, complication rate was not predicted by locus of control, method of administration of analgesia or group membership.

AUTOBIOGRAPHICAL STATEMENT

Mary Patricia Lange

Personal Data: Birthdate: September 9, 1943
Birthplace: Rome, Georgia

Education: RN diploma - Georgia Baptist Hospital School of
Nursing; Atlanta, GA, 1961
BSN - Madonna College; Livonia, MI, 1978
MSN - Wayne State University; Detroit, MI, 1988
PhD - Evaluation & Research (Education) Wayne
State University; Detroit, MI, 1990

Recent Work Experience: 1973-Present - VA Medical Center,
Allen Park, MI

Professional Organizations:

Society of Critical Care Medicine, 1982
American Association of Critical Care Nurses, 1982
American Heart Association, Scientific Division, 1982
Michigan Nurses Diagnosis Association, 1988
Michigan Nurses Association, 1988
Sigma Theta Tau - Lambda Chapter, 1989

Honors and Awards:

Hands and Heart Award - VA Medical Center, 1981
Society of Critical Care Medicine 2nd Annual Award for Pain
Relief - Orlando, FLA; May, 1988
Federal Women's Scholarship - 8th Annual Award, 1988
Fellow - College Critical Care Medicine, 1989
Editorial Board - Heart & Lung - Journal of Critical Care
Editor - Newsletter - Michigan Nursing Diagnosis
Association

Presentations: Multiple presentations both local and
national in areas of Pain, Ethics, Grief/Bereavement,
Cardiopulmonary concerns in Critical Care Nursing and
Physical Assessment.

Publications: Multiple publications in referred journals in
area of cardiopulmonary performance, altered immunologic
function, hepatic metabolism, Oxygen consumption, hepatic
blood flow and pain control using patient controlled
analgesia. Journals include Heart & Lung, Intensive Care
Medicine, Archives of Surgery, Surgery, Journal of Trauma,
and others.

