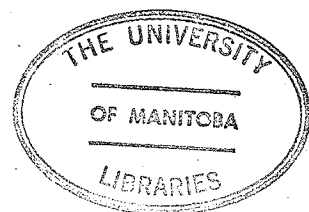


THE EFFECTS OF DIFFERENT TECHNIQUES OF
ACUPUNCTURE ON KNEE PAIN

A Thesis
Presented to the
Faculty of Graduate Studies
University of Manitoba

In Partial Fulfillment
of the Requirements for the Degree of
Master of Arts

by
Janice Ramsay
February, 1976



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Abstract

The purpose of the present investigation was to determine which of three techniques of acupuncture (distal, local, or combined distal-local) had analgesic effects on knee pain. The three techniques of acupuncture were determined by location of needle insertion relative to the area of treatment. These techniques were compared with similar placebo techniques where needles were inserted one centimetre away from the correct acupuncture point. To determine change in pain, subjects rated their knee pain twice before and five times after treatment.

The results indicated that there was a significant reduction in pain following treatment and that this analgesia was the same across groups and techniques. Because there was no difference in degree of analgesia between placebo and acupuncture subjects, it was concluded that a placebo effect was responsible for the pain reduction in this study.

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THE EFFECTS OF DIFFERENT TECHNIQUES OF
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Acupuncture, an ancient Chinese medical practice, has recently roused the interest of North Americans. Although predominantly a Chinese tradition, the practice of acupuncture has not been limited to China. In fact, as both Melzack (1973a) and Mann (1973) have noted, acupuncture techniques have been practiced in many other countries as observed in historical documents of Egyptians, South Africans, Brazilians, and the Eskimo of Canada. Traditional Chinese acupuncture involves stimulation of discrete points of the skin to restore physical and/or psychological well-being (Mann, 1973).

Mann (1973) indicated that acupuncture would cure or would help diseases of the head such as migraine, trigeminal neuralgia, and senility of cerebral arteriosclerosis; diseases involving the limbs such as rheumatoid and osteoarthritis, tennis elbow, and intermittent claudication; diseases of the digestive system such as ulcers, bad breath, diarrhea, constipation, hepatitis, and chronic vomiting; diseases of the respiratory system, such as asthma,

emphysema, bronchitis, and colds could be cured or helped as could diseases of the cardio-vascular system such as tachycardia, hyper- or hypotension, and feeling cold easily. Other problems which Mann suggested could be solved with acupuncture are dysmenorrhea, impotence, nymphomania, weak eyesight, conjunctivitis, hay fever, nose bleeds, tonsillitis, acne, psoriasis, depression, stage fright, yawning, anemia, fatigue, excessive perspiration and being poor in mathematics. Although this is only a sample of Mann's list, it serves the purpose of indicating the wide variety of disease processes which are considered to be suitable for treatment by acupuncture.

General Acupuncture Procedure

Techniques of Stimulation

The most common technique used in acupuncture has been that of needle insertion, although other types of stimulation have been used (Mann, 1973). These have included vibration, ultrasound, electrical stimulation, and the technique of moxibustion which involves placing small burning balls of moxa on the skin. Some researchers have favoured procedures like injection of xylocaine into acupuncture points (Mannheim, 1974) or stimulation of

acupuncture points by ultrasound (Rossman, Wexler, & Oyle, 1974), or skin surface electrical stimulation (Kaslow & Lowenschuss, 1974) while others have concluded that best effects are obtained from needle acupuncture (Mann, 1973). As yet there have been no publications of experimental explorations determining whether there are differences in effects associated with the various techniques. However, needle acupuncture seems to have been the technique of choice for most researchers.

There are a number of different procedures which may be employed in needle acupuncture. Traditionally, many different ways of inserting the needles were used and each procedure was supposed to be effective for specific disease processes (Mann, 1973). More recently, what is done with the needles once they have been inserted has been of greater concern than the method of insertion. For example, once inserted, the needles can be left untouched for a period of time, or can be twirled between the acupuncturist's thumb and first finger, or an electric current can be passed between the needles. The technique of choice is electrical stimulation (S. C. Man, personal communication, 1974), chosen, it would seem, on the basis of clinical experience for there has been no systematic study of the differences

between techniques.

Acupuncture Points and Meridians

The Chinese have found and mapped about 1000 acupuncture points (Mann, 1973). Since so many points have been identified, some system of classification was needed. The main classificatory system involved grouping points which fell along a common pathway or meridian. Twelve meridians have been found and have been most often named for the primary organ affected. These are: the lung, large intestine, bladder, kidney, pericardium, gall bladder, stomach, spleen, heart, small intestine, liver, and the triple warmer (Mann, 1973). Mann has failed to offer an explanation of what the triple warmer is, but S. C. Man (personal communication, 1975) indicated that the triple warmer was so named because it consisted of an upper warmer, a middle, and a lower warmer. Each of these three was thought to affect specific systems. The upper warmer was for circulatory and respiratory functions, the middle warmer for digestive functions, and the lower for reproductive functions. Apparently, stimulation of a triple warmer point affected all of these specific systems but was not associated with a single specific body organ like the other

meridians.

The meridian classificatory system was further refined by categorizing the points within a meridian on the basis of the type of effect produced. In a secondary classification, the acupuncture points are arranged into tonifying points which, when acupunctured, are thought to result in stimulation of the intended site and sedating points which, in contrast to tonifying ones, result in sedation at the intended site. Other types of points were alarm points, connecting points, entrance and exit points, and the picturesque Window in the Sky points (Mann, 1973). Unfortunately, Mann's description of these points is inadequate and no alternative English source is available.

Various combinations of acupuncture points as determined by ancient Chinese formulae are used to treat specific diseases. Mann's (1973) system of coding the acupuncture points was to use one or more letters from the meridian name as well as the number assigned to the acupuncture point within that meridian. One example given by Mann (1973) was the treatment of a patient's chronic bladder problems by stimulating the bladder point B58 and the kidney point K6. This combination of stimulation, according to Mann, was responsible for terminating this patient's

symptoms.

Theoretical Explanations of Acupuncture

Several theories have been proposed to account for acupuncture. One of these involved an ancient Chinese concept of complementary opposites, the theory of Yin and Yang. According to this position everything can be classified as being Yin or Yang and if either the Yin or the Yang state alone is known, then the unknown can be determined. Therefore, knowing that day is a Yang state permits the prediction that night, the complementary opposite of day, is a Yin state (Mann, 1973). Within the natural world, Yin and Yang must be in a state of harmony and this is true also for the human body which is a part of the natural world. When Yin and Yang of the human body are disharmonious, then disease occurs (Melzack, 1973a; Mann, 1973) and traditionally, acupuncture was performed to restore health by re-establishing a balance between Yin and Yang. Although this theory is no longer in vogue among more modern Chinese doctors (Melzack, 1973a), S. C. Man (personal communication, 1973) has pointed out that a similar concept of complementary opposites exists in western medicine. When disease occurs, there may be either an excess, that is Yang, or a deficiency, a Yin state. Consequently, from such

imbalances, there are conditions such as hyper- and hypoventilation, hyper- and hypocalcemia, and hyper- and hypoacidity. The medical goal is to restore balance in the body with such diseases.

Another ancient Chinese theory is the theory of elements. All matter, including the organs of the human body, were classified as being of one of the five elements: wood, fire, earth, metal, or water. Then by the theory, the elements were thought to be capable of creating or destroying one another when disharmonious conditions existed. For example, an inflamed gall bladder can produce a diseased heart as in cholecystic heart disease and a diseased heart can involve the lungs.

As in the Yin and Yang theory, the element theory assumed that acupuncture functioned to restore the body to a state of harmony required for health by attaining harmony between the elements. The specific acupuncture points to be stimulated for achievement of harmony depended on traditional formulae.

When the phenomenon of acupuncture was recently introduced to North America some of those who could not accept it as a physiological process suggested that acupuncture effects were simply due to hypnosis (Chisholm,

1972; Kroger, 1972, 1973; MacIntosh, 1973). However, Melzack (1973a) in dismissing a hypnotism theory indicated that there were four reasons why hypnotism was not responsible for reported acupuncture effects. In the first place, the lengthy training sessions required of the patient for hypnosis were not evident in acupuncture because the acupuncturist had often not met the patient prior to the procedure. Secondly, that the rate of success for hypnosis has been reported to be much lower than that for acupuncture, has suggested that the two are different processes. Thirdly, normal, spontaneous behaviour is absent in hypnotized patients but not in acupunctured patients. Finally, Melzack stated that while hypnosis cannot be carried out with animals, there have been reports written of successful surgery using acupuncture anesthesia on a variety of animals. For example, Satory (1972) reported on the use of acupuncture for horses.

Members of the medical profession have used the ambiguous term hypnotic-suggestion (Kroger, 1973) which means suggestion rather than anything about hypnosis and the term may have been a source of confusion and error in the literature. Although hypnosis and suggestion may involve the same psychological process, suggestion does not involve the

elaborate and precise procedure that hypnosis does. There is little doubt that acupuncture is not a form of hypnosis as shown by Melzack (1973a); however, the acupuncture phenomena may be the result of suggestion. That is, any change in disease process following acupuncture may be the result of suggestion that acupuncture alters the disease state.

Belief that a procedure or a drug is effective has been shown to be capable of altering disease processes (Gardner, 1966; Melzack, 1973a, 1973b). Concerning the testing of any hypothesis of acupuncture effects, it is therefore essential that a theory of suggestion be discounted. Those researchers who have failed to do so cannot state that the effects were not the result of some process other than suggestion.

Mann (1973) has proposed a dual process theory to account for the effects of acupuncture which includes a segmental and an intersegmental theory. The segmental reflex theory considered two reflexes, a cutaneo-visceral reflex and a viscero-cutaneous reflex. With a cutaneo-visceral reflex, stimulation of a skin point was believed to affect a specific viscera within the same dermatome, that is, within the area innervated by a dorsal spinal nerve. With the viscero-cutaneous reflex, stimulation or disturbance of some

viscera was thought to affect a specific skin area, again, within the same dermatome. Therefore, from this theory, stimulation of acupuncture points resulting in changes at other yet nearby sites is caused by a segmental reflex.

Only acupuncture points on the abdomen, back, and arms fit a segmental reflex theory. Stimulation of leg and head acupuncture points, according to Mann (1973) does not result in changes in the same dermatome but instead the effect is at some more distant area. This is called distal acupuncture. For these exceptions, Mann devised another theory, the intersegmental reflex theory. Here, stimulation of acupuncture points in one dermatome could affect disease processes in another (and often distant) dermatome.

Mann's general reflex theory attempts to account for the resolution of all disease processes affected by acupuncture. Although Mann offers some support for such a reflex involvement in some diseases, it is improbable that such an explanation could cover the broad scope of disease processes for which acupuncture has been reported as a curative measure. Theoretically, successful use of acupuncture, for example, to improve mathematical ability (Mann, 1973) would mean that mathematical skills are under control of reflexes because stimulation of acupuncture

points would produce an intersegmental reflex response which would in some way control brain events to enhance mathematical skill. Similarly, many other processes would be under control of reflexes. Furthermore, according to the theory only physiological events in the skin and body organs are capable of producing changes attributed to segmental or intersegmental reflexes. The influence of various psychological states, for example, anxiety in reducing pain threshold (Melzack, 1973b), had no place in Mann's theory.

Melzack's (1973a) theory is restricted to the effects of acupuncture on pain. Its development was consistent with the gate control theory of pain proposed by Melzack and Wall (1965). With regard to the effectiveness of acupuncture, Melzack has acknowledged how important are suggestion and the belief that acupuncture relieves pain. Both of these could lead to an alteration in pain perception.

In addition, Melzack believed that when needles are inserted near the intended site of analgesia, the stimulation from acupuncture would activate large fibers of sensory nerves. According to the gate control theory, impulses travelling along the large fibers stimulate the substantia gelatinosa which, once a critical level of activity is attained, inhibits transmission in the small

fibers of sensory nerves. Once blocked, these small fibers no longer transmit information about pain.

When the needles are far from the intended site of analgesia, Melzack thought it possible that the acupuncture stimulation affects the brainstem. In turn, the descending impulses of the brainstem inhibit further upward transmission of impulses. The importance of the brainstem in pain mechanisms is evidenced by Melzack's reports of findings that direct stimulation of discrete parts of the brainstem may result in analgesia over extensive areas of the body. The power of Melzack's theory of acupuncture is that it is consistent with a well-developed and supported theory of pain mechanisms.

While Melzack (1973a) noted that suggestion does account for some of the acupuncture effect, others (Chisholm, 1972; Kroger, 1972, 1973; MacIntosh, 1973) have assigned suggestion a much larger role. It remains the task of those who hold other views to discount the suggestion theory. Therefore, researchers must devise experimental manipulations to determine the role of suggestion in any acupuncture effect. Furthermore, there must be some way of determining whether any changes which follow acupuncture are the result of spontaneous remissions or alterations in the

disease process that would occur even in the absence of acupuncture treatment. These important experimental controls unfortunately are not often seen in the literature on acupuncture.

Clinical Studies of Acupuncture

The data presented by Mann (1973) came from his own records and also from records of others. There are basic and significant faults with all of the data for there is no evidence of the use of a control group to test spontaneous remission and no indication that a placebo was employed to test the effects of suggestion. Therefore, where success following acupuncture was observed, exact statements concerning the reason for those changes cannot be made.

The outcomes following acupuncture were generally classified as cured, improved, or failure. Lacking are operational definitions of those class names indicating precisely in what way they differ and how assignment of patients to these groups was accomplished. Furthermore, the records are so incomplete that there is not enough information to determine the degree of patient selection bias present. There is no doubt that this was a select group of patients for, in the French records Mann presented, the patients had all failed to improve after conventional

medical procedures. However, it is not known if there was an additional selection process by the acupuncturist. Even in the absence of other methodological problems, it would be virtually impossible to draw conclusions from Mann's data because the number of patients in most disease groups was very small, often fewer than three.

The French data contained an impressive list of diseases that could be "cured" by acupuncture including the problem called bad at mathematics which presumably would usually be treated by professionals other than medical doctors but for which the French acupuncturists obtained a 100% successful cure among four individuals. Some of the diseases cured were among those for which psychological factors are often implicated like asthma, paroxysmal tachycardia, gastric ulcers, chronic vomiting, nervous hypertension, excessive sleepiness, and insomnia.

The Cantonese statistics Mann reported were taken from a Chinese journal and concerned 49 patients with appendicitis, treated by acupuncture and for whom "good results" were obtained. There was no indication whether or not some of these patients had appendectomies but the inference seemed to be that they were treated and cured by acupuncture alone. However, it seems possible that this

represents a select group of patients for whom symptoms would have disappeared even without acupuncture, surgery, or any other treatment.

Mann's (1973) persistent use of the word cure in reference to the effects obtained from acupuncture should be criticized. Cure has implied complete resolution of the pathology. Many of the disease processes, as mentioned by Mann have known no cure by any traditional western medical approach and it would be odd if acupuncture could "cure" not one but many of these diseases. It appears that Mann frequently used the word cure erroneously where symptomatic treatment would have been more appropriate. In the Chinese language, unlike English, there is no distinction between the words treat and cure (S. C. Man, personal communication, 1975). (Man(2)).

The recent literature on acupuncture reveals a number of clinical studies about the effects of acupuncture on different disease processes. For example, Kaslow and Lowenschuss (1974) used surface electrode stimulation of all acupuncture points on the outer ear to determine the effect of acupuncture on seven patients with hearing loss. The patients gave subjective reports on hearing changes and also listened to the experimenter's watch and reported if the

ticking could be heard. The experimenters concluded that acupuncture was effective in restoring hearing ability. A similar study on sensori-neural deafness in 10 patients was completed by Peng (1973). While Peng gave pretreatment audiograms to all patients, his report of an 80% success rate was based completely on subjective estimates of hearing abilities. Kao, Baker, Leung, Slippen, and Ampolsakdi (1973) did pre- and post-treatment audiograms on five patients treated by acupuncture. While it was concluded that hearing had improved, (no statistical analysis was presented) this was tempered by the caution that the results could have been caused by the suggestion associated with acupuncture rather than the acupuncture itself.

Other researchers (Marcus & Goldenberg, 1974; Rintelmann, Oyer, Forbord, & Flowers, 1974) have pointed to the lack of experimental control in hearing studies like that of Kaslow and Lowenschuss (1974) and Peng (1973) where no control or placebo groups were employed, no experimental blind was used, and measurement methods were often inadequate. However, there is little to recommend their own studies. Marcus and Goldenberg (1974) conducted a single case study of a man with hearing loss. Audiometric tests were completed before and after acupuncture and no change

was found. Another study (Rintelmann, et al, 1974) also used the case history design for a single patient and obtained results similar to those of Marcus and Goldenberg (1974). Other than that more appropriate testing methods were used, both of these studies are guilty of poor experimental control, for there were no control and placebo treatment phases and no experimental blind. In view of the failure of both groups of researchers to demonstrate correct use of a single organism experimental design, the conclusions of these studies are no less tenuous than the earlier studies.

Tabarka and Cupalova (1973) reported a substantial decrease in bedwetting for children treated with acupuncture. The 29 children were given 30 acupuncture treatments and occurrences of enuresis recorded. About 62% of the children had 50 to 100% improvement in the number of episodes of enuresis. Once again there was a lack of essential experimental control in this study where no control, no placebo, and no experimental blind were included in the experimental design.

Another disease process for which acupuncture had been used was for cerebral vascular accidents or strokes (Roustan, 1974; Ng & Liu, 1974). Ng and Liu reported a single case of a left cerebral vascular accident where,

following acupuncture, the patient was able to walk and talk and blood pressure dropped to a more normal range. They indicated that they had treated a total of 23 patients with cerebral vascular accidents and had a 100% success rate. However, this data was not further reported. Roustan (1974) reported another case of stroke with a response to acupuncture. Again, the case history method of study as used by these researchers had little to recommend it.

Kobos (1973) believed that acupuncture improved hair growth and so used the technique with apparent success for baldness. Kajos (1973a) treated fifty-one patients for allergic rhinitis and disappearance of the disease occurred for 40%, while another 50% of the patients had a reduction in the number of attacks. Bergsmann and Bischko (1973) attempted to reduce pulse rate and increase peddling performance with acupuncture. The subjects had a pre-acupuncture trial where pulse was counted and peddling was done and a day later, immediately after acupuncture, a second trial was conducted. The anticipated changes in pulse and peddling were found and were concluded to be the result of the acupuncture. However, because of the design, it is not clear whether these changes might be the result of suggestion or of increased familiarity with the procedure

and equipment.

Wen and Cheung (1973a) utilized acupuncture for drug addiction where the 40 subjects in the study had a duration of addiction that ranged from three to 58 years. Wen and Cheung reported that about 15 minutes after acupuncture, the withdrawal symptoms of the subjects began to disappear. Later results showed that addiction had been overcome for 39 of the subjects. Twenty-two of these subjects had no trace of drugs on urine testing while the remaining subjects did not have the urine tests done. Sainsbury (1974) also related the case of one female heroin addict where withdrawal symptoms disappeared after 15 minutes of acupuncture.

The analgesic effects of acupuncture for pain has been widely investigated by the case study approach. One area of study is nerve pain such as in trigeminal neuralgia, sciatica, and cervical pain. With trigeminal neuralgia, there is facial pain which is caused by disease of the fifth cranial nerve. Several researchers have reported successful attempts at alleviating the pain of the disease through acupuncture (Gresser, 1973; Wen & Cheung, 1973b; Kajdos, 1973b; Peng, Omura, Cheng, & Blancato, 1974). Gresser used an innovative technique of acupuncture where a permanent needle was put in at the appropriate site allowing the

patient, by applying pressure to the site, to have acupuncture whenever pain was present.

Effective acupuncture analgesia has been reported for lower back pain (Leung, 1973; Kajdos, 1973c; Dudukgian, 1973; Kim & Yount, 1974a), pain from cervical spinal disease (Kajdos, 1973d), torticollis or wry neck (Kajdos, 1973e), gastric ulcer pain (Shifman, 1973), delivery by caesarian section (Kakizaki, Tany, Ishizuka, & Kimura, 1973), migraine headaches (Kim & Yount, 1974b) and various other pain syndromes (Leung, Fan, & Sechzer, 1974; Catton & Kim, 1975).

With pain experimentally induced by electrical stimulation of tooth pulp, it was found that analgesia for this pain occurred when acupuncture was administered (Anderson, Ericson, Holmgren, & Lindquist, 1973). One group of subjects had needle acupuncture while the other had skin surface electrode stimulation. The researchers reported, without the aid of statistics, that both groups had increases in pain threshold but that there was no difference for the size of the increase.

While these many clinical studies are suggestive of the possibility that acupuncture may be an effective treatment for a variety of disease syndromes, it is clear that they all suffer serious methodological errors. These

methodological errors make it impossible to conclude that acupuncture alone was responsible for the positive results obtained by researchers. Experimental controls particularly for placebo and suggestion, spontaneous remission, and patient and doctor expectancy effects are essential to any sound conclusions in this research area. This argument can of course be used for negative findings as well. The report of Wallis, Shnider, Palahniuk, and Spivey (1974) of little or no analgesic effects from acupuncture for labour pain could well have been produced by suggestion conveyed to the patient that acupuncture would not work.

Experimental Studies of Acupuncture

Studies of Non-pain States

A series of experiments by Eisenberg, Taub, and DiCarlo (1974) attempted to correct the methodological errors of clinical studies concerning acupuncture and deafness. The first study reported was a pilot study in which four patients were treated, two with needles in the correct acupuncture points and two with needles in incorrect sites (placebo controls). The audiologist was blind with respect to the treatment condition, providing an additional control over experimenter bias. The researchers found that

one patient with correct acupuncture had improved audiograms while the other did not. Both patients in the placebo condition showed no improvement on the audiograms. However, when subsequently given correct acupuncture both control patients showed improved audiometric performance. In a second experiment the methodology was the same except the patients were informed that a placebo was being used and that they could receive either a placebo or correct acupuncture. No difference was found for pre- and post-treatment audiologic studies for either acupuncture or placebo groups.

The researchers interpreted the results as demonstrating that motivational factors were responsible for the differences in results between the pilot and second study. They believed that the patients of the pilot study who had no knowledge that a placebo was used, were more highly motivated than the patients who knew about the placebo.

A third study was attempted in order to test the effects of different motivational levels. There was no problem encountered in obtaining new patients who were highly motivated to receive acupuncture. However, the only low motivation patients that could be found were those who

had been involved with the second study and they were so poorly motivated that they declined to participate in another acupuncture study. As an alternative, the researchers contacted the patients of the pilot study and did follow-up audiologic studies. Afterwards, the patients were told that the results of the previous studies had been negative but that they would receive an additional series of acupuncture treatments. In contradistinction to the results of the first acupuncture treatments, these patients had no audiological improvements after the second set of acupuncture treatments. The conclusion offered was that the positive results of the pilot study were the result of suggestion of improvement, a suggestion which was not present in the second or final studies.

Kubista and Cucera (1973) investigated whether acupuncture could be used to shorten the time of labour in pregnancy. Acupuncture was administered once per week for three weeks before labour for 38 women. The time of their labour was compared to that of other women who delivered at about the same time. A statistically significant difference between the two groups was reported but the statistical procedures used were not given. A second study (Kubista & Kucera, 1974) used the same experimental design for 60 women

and obtained the same results. Although there were control groups in both studies, there was no indication how the patients were selected and how they were assigned to the two groups. Inclusion of a placebo treatment and experimental blind in both studies would have made it seem more likely that the shortening of labour was the result of the acupuncture and not some other factor.

Calehr (1973), in examining asthmatics and acupuncture used a no treatment control group for comparison purposes. Nothing was said about method of assignment (random or selective) of patients to the control and treatment groups. Different treatment formulae were used for different patients according to their needs as determined by the acupuncturist. The conclusion was that the post-treatment asthmatic status of the acupunctured group was better than the control group. Calehr believed that the difference between the groups was caused by the acupuncture, but without placebo control, without random assignment to groups, and without an experimental blind, such a statement could not be made.

The study of Ionescu-Tirgoviste (1973) concerned control of blood pressure. He administered angiotensin, a drug which causes an increase in blood pressure, and

measured the blood pressure of 30 subjects. For a select group of those ten subjects who had the smallest increase in blood pressure after angiotensin, he performed acupuncture using a formula to cause a hypotensive effect. The other 20 subjects were given a second drug, delta cortisone. A comparison of the two groups demonstrated a hypotensive effect for the acupuncture group and a hypertensive effect for the delta cortisone group. However, it was not clear whether these could be considered valid comparisons nor was the purpose of using the delta cortisone clear. Furthermore, the essential experimental controls over placebo and expectancy effects were lacking. In addition, the method of selection of the subjects for the two groups may have been accomplished in such a way as to bias the results in favour of the hypothesis.

Theiman (1974) used a single-subject design to determine the effects of acupuncture on cardiac disease symptoms of tachycardia, palpitations, chest pressure, and irregular heart rate. He obtained data about these symptoms over two week periods for each successive treatment of: a baseline period, standard medical treatment, sham acupuncture where blunt needles were pressed on the sites, and needle acupuncture with manual rotation of the needles.

It was not stated whether or not the patient knew about the sham treatment and the experimenter who collected the data was not blind with respect to the experimental sessions. The patient had tachycardia for the first six weeks of the study and a normal heart rate for the last two, that is, after correct acupuncture. Data on the other symptoms was subjective and was found to indicate a reduction in symptoms after the first two weeks of the study. Apparently, treatment of any kind resulted in a reduction of any symptoms other than tachycardia. Tachycardia disappeared only with correct acupuncture.

With only one sequence of presentations of the four treatments there is no way to determine that the tachycardia would not have disappeared after the sixth week regardless of the type of treatment given at that time. In order to conclude that acupuncture reduced heart rate, it would be necessary to demonstrate termination of tachycardia with acupuncture given any possible sequence of the four treatments.

Studies of Pain Syndromes

Most of the experimental studies have considered the effect of acupuncture on various pain syndromes. For

example, Gunsberger (1973) evaluated the effect of acupuncture on sore throats. Unwisely, he assigned to the control group all patients who had refused acupuncture treatment. Such a maneuver permits the charge that the control group represented a group characteristically different from the others. Patients in a second group were told that they were having acupuncture but instead had vaseline rubbed on the acupuncture points. A third group received correct acupuncture at two sites and a fourth group received correct acupuncture at only one site. In one to two days following treatment there was a reduction in pain for approximately 30% of the sham acupuncture and the control group patients. In the correct acupuncture group having one site stimulated, there was reduction in pain for 40% of patients. Of the patients who had had acupuncture to two sites, 90% had less pain.

Because there is no reason to believe that the patients would have an expectation of different results for different numbers of needles, the difference in results for the third and fourth groups has suggested that there may be more to acupuncture than suggestion alone. Of course, there is still the chance in this study that the experimenters presented a subtle bias to their patients. Such a criticism

could have been avoided with use of an experimenter blind.

Painful phantom limbs in 15 amputee war veterans was the subject of a study by Ramsay, Man, and McIntyre (1) in which a separate-sample pretest-posttest design was employed. The veterans were randomly assigned to either a control or an acupuncture treatment group. The control group subjects were questioned about their phantom pains of the three days prior to the interview. As all subjects had to be treated, the control group was given acupuncture following the interview; however, the results of the treatment were not of interest at that time and no questions about pain were asked. The experimental group were first treated by one experimenter and then interviewed a week later by a second experimenter who again asked questions about frequency, duration, and intensity of pain for the three days prior to the interview. On the basis of changes in frequency, duration, and intensity, the reduction in pain for the experimental group was found to be significant and the effectiveness of the treatment was maintained over a four month follow-up. The authors indicated that pain was diminished following acupuncture but noted that, in the absence of an experimenter blind and placebo control, the cause of the change in pain could not be specified. They

recommended further study using appropriate experimental controls.

In another study (Man & Baragar, 1973a) 40 normal subjects who were prevented from observing the procedure were given correct acupuncture for one randomly selected knee and acupuncture at incorrect sites on the other knee. There was no stimulation of the needles during the entire 60 second period that the needles were in place. Cutaneous sensitivity to pain by pin prick and to vibration, touch, warmth, and cold were tested at five minute intervals following needle removal. A reduction in pain sensitivity was found in 92.5% of subjects for the knee which had correct acupuncture and this sensitivity lasted about 20 minutes. There was essentially no change for the other cutaneous sensations in the correctly treated knee. For the incorrect knee, there was pain reduction in only 5% of subjects. The conclusion was that acupuncture, using traditional sites, produced a temporary analgesia. However, it should be noted that the methods of presenting the stimuli lacked control for there was no way to ensure that all subjects received the same amount of stimulation. There was also no indication that an experimenter blind was used to guard against differential cutaneous stimulation and

also, of course, to prevent biasing the subjects toward certain responses.

A second study by Man and Baragar (1973b) investigated the role of suggestion in acupuncture. Again 40 normal subjects were assigned to one of four groups: one group received correct acupuncture for 60 seconds, a second group received 60 seconds of acupuncture at an incorrect site, a third group received only skin cleansing as a placebo, and the fourth group was a no treatment control group. Pain sensitivity was determined by running a pinwheel over the necks and upper backs of all subjects at five minute intervals. The study employed an experimenter blind because the experimenter doing cutaneous testing was naive with respect to the type of treatment that subjects had been given.

The degree of change in sensitivity was rated for each subject at each five minute interval. There were no changes in sensitivity for the untreated control and sham groups while minimal changes occurred for the group receiving incorrect acupuncture and minimal to moderate changes for the correct acupuncture treatment group. No statistical analysis was reported so that it could not be determined whether there was a significant difference between the

correct and placebo acupuncture groups. Man and Baragar concluded that their study ruled out suggestion as the cause of acupuncture analgesia. However, in the tabled data appearing in the article, there was very little difference in pain for correct and incorrect acupuncture groups during the last four recording trials. In addition, there appeared to be only a small difference on the second and third trials, a difference unlikely to have been statistically reliable.

While it is possible that a different scale of measurement for pain (particularly one that covered a wider range) and also a different method of producing pain might have given more positive results, this study by Man and Baragar (1973b) could easily be interpreted in a different manner. That is, it could be suggested that the lack of a substantial difference between the incorrect and correct acupuncture groups indicated, in the first place, that acupuncture functions as a placebo if the incorrect site is thought of as a placebo site, or, secondly, that site of needle insertion is irrelevant if the use of an incorrect site is thought of as true acupuncture.

A later study by Man and Baragar (1974) considered acupuncture for a clinical pain syndrome. Twenty patients

with bilateral knee pain of rheumatoid arthritis were randomly assigned to one of two groups. All subjects had one randomly selected knee treated with a steroid injection. For one group, the second knee was treated by acupuncture at the correct site, while for the other group, the second knee was treated with a placebo acupuncture, where needles were inserted at incorrect sites. The technique of this study differs from the earlier ones (Man & Baragar, 1973a, 1973b) in two ways. First, the needles were left inserted for the much longer period of 15 minutes. Second, electrical stimulation of the needles was used.

The patients gave ratings of their pain to a technician who was blind concerning the type of treatment given. Ratings were obtained over a four month period of time using the same scale as the earlier study (Man & Baragar, 1973b). Again, no statistical evaluation was presented and the data were given in a tabular form similar to earlier studies. The differences between the acupunctured knees of the two groups were much more pronounced. There was essentially no change in pain for those subjects who had placebo acupuncture while most subjects of the correct acupuncture group had a moderate reduction in pain which lasted for two months.

The authors concluded that the acupuncture procedure, rather than suggestion, caused the pain reduction. With the better quality of methodology of this study, such a conclusion may, in fact, be warranted. Further support for that conclusion came from a study by Anderson, Jamieson, and Man (1974) about the effects of acupuncture on hand pain caused by immersion in ice-water. Thirty female subjects were randomly divided into three groups where one group received acupuncture with electrical stimulation for 15 minutes, a second group received the same treatment except that the needles were in the incorrect site, and the third group had only alcohol swabs rubbed over the sites. These last two groups were considered to be placebo groups. There was no pretreatment measurement of pain but instead there were two post-treatment pain trials where, for each trial, the subjects rated their pain every ten seconds for 60 seconds for the hand which was treated. The experimenter who measured pain sensitivity did not know the manner in which the subjects had been treated and because the subjects had been blind folded during treatment, the experiment had a double-blind procedure. Subjects reported not knowing what treatment had been given to them.

For both trials, the pain ratings of the treated hands

of the two placebo groups were not significantly different. However, the pain ratings of the acupuncture group were significantly lower than both placebo groups. It should also be noted that subjects had rated the pain of pin prick applied to the treated hand just before the first trial of ice water stimulation. Contrary to the results obtained with ice water stimulation, no significant differences between groups were found to pin prick. This should serve as a caution for anyone selecting pin prick as a method of testing pain sensitivity.

Distal and Local Acupuncture for Pain

Mann (1973) found it necessary to develop two theories about acupuncture in order to account for two different effects. One of these (segmental reflex theory) was the effect on nearby sites by acupuncture. For example, stimulation of acupuncture points at the hand as in the Anderson, Jamieson, and Man (1974) study would cause analgesia of the hand. This is local acupuncture.

The second acupuncture effect for which Mann developed a theory (intersegmental reflex theory) was distal acupuncture where stimulation of some acupuncture points could be expected to affect a distant site. An example would

be stimulation of the pinna of the ear to produce some desired effect in the foot. Another technique, one which combines distal and local acupuncture, has been considered to have the greatest power of the three (Mann, 1973; S. C. Man, personal communication, 1974)). At the Dong-Aou Sanatorium in China (1974) very little difference was noted for the effectiveness of the three techniques. The rate of success observed was: 99% for local acupuncture, 95% for distal acupuncture, and 100% on three cases for combined local-distal acupuncture. The data of this research group represented clinical observations rather than the results of experimental manipulation.

Examination of distal acupuncture alone has been the concern of other researchers (Leung & Spoerel, 1974; Chun & Heather, 1974). The acupuncture points for distal sites of the head, hand, foot, and ear have been mapped but the ear is the most commonly used site. The data which has come from some studies (Leung & Spoerel, 1974; Chun & Heather, 1974) is not very reliable as no experimental controls were employed. Both studies used patients with chronic pain syndromes of many different types.

Leung and Spoerel (1974) presented information about 27 cases where distal acupuncture had been used. The needles

were inserted in the pinna of the ear for 30 minutes with no electrical stimulation. Immediate reduction in pain was found for 25 of the patients. Although the conclusion was that distal acupuncture was effective, this clinical study did not have the necessary experimental controls to determine whether such a finding was due to acupuncture or to a placebo or suggestion effect. Chun and Heather's (1974) 46 patients reported on the success of distal acupuncture of the ear by skin surface electrical stimulation. Relief of chronic pain was good or excellent in only 50% of the patients. Once again there were no experimental controls in this study.

Ramsay, Man, and McIntyre (2) looked at the effect of distal acupuncture on pain in the right knees of 30 normal and healthy female subjects. By random assignment, the subjects were placed in one of three groups (acupuncture, placebo, or control). The subjects of the three treatment groups were treated alike except that no treatment was given to the control subjects who just remained in the laboratory with the second experimenter for an appropriate length of time. The acupuncture group subjects, had a fenestrated drape placed over their heads in a manner to expose only their left ears. The needles were inserted and electrically

stimulated for five minutes. The placebo subjects were similarly draped but only had an alcohol swab rubbed over the left ear. All subjects had been prepared in a manner which would lead them to expect the acupuncture procedure to be pain-free. So it is unlikely that they anticipated a pin prick to occur after the alcohol swab sensations. Though the control subjects knew they were not being treated, the placebo and acupuncture subjects were unaware of the differences in treatment for the two groups. Pain thresholds to electrical stimulation were determined once before the treatment session and once more five minutes after the treatment.

On the basis of Chinese theory, the experimenters expected that, for acupuncture of the left ear, there would be analgesia for the right knee. However, both knees were tested on the chance that Chinese theory might be in error.

Analysis failed to show any significant differences among the groups for right or left knee. In attempting to account for the failure to find a distal acupuncture effect, the experimenters suggested that their technique might have been at fault. One possible fault was that a five minute period of needle insertion and stimulation might have been too brief. Another was that the effect occurred but was so

transient that it was gone by the time the second pain testing session was commenced.

The experimenters resolved to correct the problems of the study and so designed a second experiment (3) on the analgesic effects of acupuncture for the elbow as well as the knee. Twenty-four normal male and female subjects were paid a nominal sum for participating in the study. Eight of those subjects formed the control group who received everything except the treatment. The remaining 16 subjects were randomly assigned to one of four treatment groups: left elbow, right elbow, left knee, or right knee. Once again, it was assumed that treatment of one ear produced an effect in the contralateral limb. Furthermore, distal acupuncture treatment for the elbow would not have any effect on the knees, and conversely, treatment for the knees would not alter pain sensitivity of the elbows. Because subjects were unaware of this relation, any pain reduction in the knees where the elbows had been treated, or any effect in the elbows where the knees were treated, would be considered a placebo effect. Therefore, the 16 subjects in the treatment group received both acupuncture and a placebo while the control subjects were untreated.

Pain thresholds to radiant heat were obtained for each

subject at both elbows and both knees. There were three sessions occurring at 15 minute intervals during which thresholds were measured. One session occurred before and two during the treatment. Each session consisted of two trials separated by five minutes, so that in total, pain thresholds were measured six times per subject. After the first session, the needles were inserted and electrical stimulation commenced and maintained during the second and third sessions lasting a total of 30 minutes.

One E recorded the threshold measures and a second experimenter administered acupuncture. The first experimenter was blind with respect to the treatment given the subjects. Although the experimenter was in the laboratory during the acupuncture, the subjects heads were hidden by a drape and the experimenter could not determine if needles were or were not inserted.

In the analysis, the group x session interaction was significant for the knee but not for the elbow. The pain threshold in the knees for the control group decreased over sessions while the threshold for the placebo group increased over sessions. What was most interesting was that thresholds did not change for the acupuncture group. For the elbow there were similar increases in the pain thresholds for all

groups across sessions. Predictions of an increased pain threshold for the acupuncture group compared to the other two groups were not supported.

Because a second experiment had failed to indicate a significant distal acupuncture effect, the experimenters were tempted to conclude that there was no pain reduction associated with distal acupuncture. However, they suggested that first distal acupuncture should be studied in people who have pain syndromes because experimentally induced pain is unlikely to simulate a clinical pain.

The Present Research

The purpose of the present investigation is, in part, to carry out the recommendations of the Ramsay, Man, and McIntyre (3) study. Distal acupuncture had been found ineffective in relieving experimental pain of electric shock and radiant heat (Ramsay, et al, (2), (3)). However, the same results might not be found with clinical pain syndromes because of the differences in experimental and clinical pain. For instance, the duration and intensity of experimental pain are limited by experimental ethical considerations, whereas there are no such limits with pain syndromes. As well, subjects volunteer for experimental pain

while there rarely is any choice in the matter of clinical pain. Furthermore, the implications of pain are likely to be quite different for experimental and clinical pain. Subjects may believe that experimenters will not cause any harm during the experiment while clinical pain may be a sign of a life threatening situation. For these reasons, experimental pain may not simulate clinical pain and distal acupuncture may give different results for clinical pain.

A second purpose of the present research is to extend investigations to techniques other than distal acupuncture alone for, according to Chinese theory (S. C. Man, personal communication, 1974), there are differences in degree of effect for the different techniques. As there have been no adequate investigations of the three techniques, the present research proposes to examine distal, local, and combined distal-local acupuncture.

Because most of the data collected has primarily concerned the knee (Ramsay, et al, (2), (3)), it seemed most advantageous to again consider knee pain with the present investigation.

Experimental Hypotheses

Several hypotheses were formulated:

- 1) It was suggested that the degree of analgesia would be the same for the distal placebo and distal acupuncture groups.
- 2) However, in the local and combined groups, analgesia would be greater for acupuncture subjects than for placebo subjects of corresponding groups.
- 3) For lack of a distal acupuncture effect, it was expected that the local acupuncture treatment would be as great as the combined acupuncture effect.
- 4) Given the occurrence of a placebo effect, then the combined placebo and local placebo effect should be greater than the distal placebo effect.

Method

Experimental Design

The study involved a mixed design with two between-subjects factors manipulated factorially and one within-subjects factor. The between-subjects factors were acupuncture technique at three levels (distal, local, and combined distal-local), and type of treatment (acupuncture or placebo) at two levels yielding six independent groups. The within-subject factor was trials and all subjects were tested seven times, twice before acupuncture and five times

after treatment.

Since data was collected on frequency, duration, and intensity of pain, as well as a combination of the three used as a pain index, four parallel analyses were undertaken, one for each of the pain measures.

Subjects.

Advertisements were placed in the two main Winnipeg newspapers requesting volunteers with knee pain to undergo acupuncture. Additionally one of the radio stations conveyed the information which had appeared in the newspapers. Although many people volunteered, only 91 were considered suitable. The suitability criteria were defined as: presence of knee pain for a duration of at least one month with a frequency of no less than one occurrence of pain per week; age between 18 and 60 years; and no prior acupuncture treatments. If the subjects met these criteria they were interviewed and given a medical examination to ensure that acupuncture would not be a health risk and to confirm that the subjects met the preliminary requirements. Seven subjects were eliminated during the interview and examination leaving a total of 84 subjects. These were randomly assigned to groups on the basis of gender disease

combinations where approximately equal numbers of combinations were in each of the six groups.

Apparatus.

Stainless steel, 28 gauge acupuncture needles were used and a continuous DC current of five Ma was provided by a 626 SUI-WEI stimulator.

A questionnaire concerning frequency, duration, and intensity of pain was constructed. The questionnaire and written instructions are contained in Appendix A and B. In the questionnaire, frequency, duration, and intensity were defined. The task of the subjects was to rate their pain for each of these on a ten point scale where zero was no pain and ten the most possible pain. An open response type of question was included to obtain information about any changes in drugs or treatments for the subjects.

Procedure.

When subjects appeared for their medical examinations, they were questioned by the experimenter about their knee pain. For those subjects who had bilateral pain, if the pain of both knees conformed to the preliminary criteria, one knee was randomly selected as the knee to be treated. The

subjects were instructed to complete a questionnaire on their knee pain for the one week period prior to the interview. Then a medical doctor examined all of the subjects and established a diagnosis of the cause of the knee pain.

One week after this interview the subjects returned and another pain questionnaire was completed. To maintain the experimental blind concerning the treatment given to the subjects, the experimenter left the room and the acupuncturist performed the treatment according to the group the subject represented.

The distal acupuncture group had two needles inserted in the correct ear points of the ear contralateral to the knee being treated. The local acupuncture group had two needles placed subcutaneously at the knee acupuncture points, G 34 and SP 9, and the combined acupuncture group had needles in the same points that both the distal and the local groups did. The placebo groups were treated similarly except that the needles were placed near the correct acupuncture points and not in any other acupuncture points. Alligator electrodes were clipped to the needles and continuous DC current of five Ma was passed between the needles for 15 minutes. The subjects were unaware of the

distinctions between the placebo and acupuncture groups.

After treatment the subjects were given five pain questionnaires to be filled out at home. The first one was to be completed two days after treatment and the second, one week after treatment. Thereafter, the remaining three questionnaires were completed weekly. On the days that the subjects were to complete pain forms, most were contacted by phone and reminded. The four subjects living outside Winnipeg were reminded by mail.

The subjects all returned on the day that the last pain form was completed. All questionnaires were collected and the nature of the experiment explained. Those subjects serving in either the placebo or acupuncture conditions who had minimal or no effect were then given acupuncture using the local technique.

Results

Of the 84 subjects who served in the experiment one female subject failed to appear for the final interview, one male subject did not complete the study because of business commitments in another city, and a female subject suffered a cerebral-vascular accident a week after treatment and was unable to complete the study. These three subjects were all members of different groups. In order to maintain equal

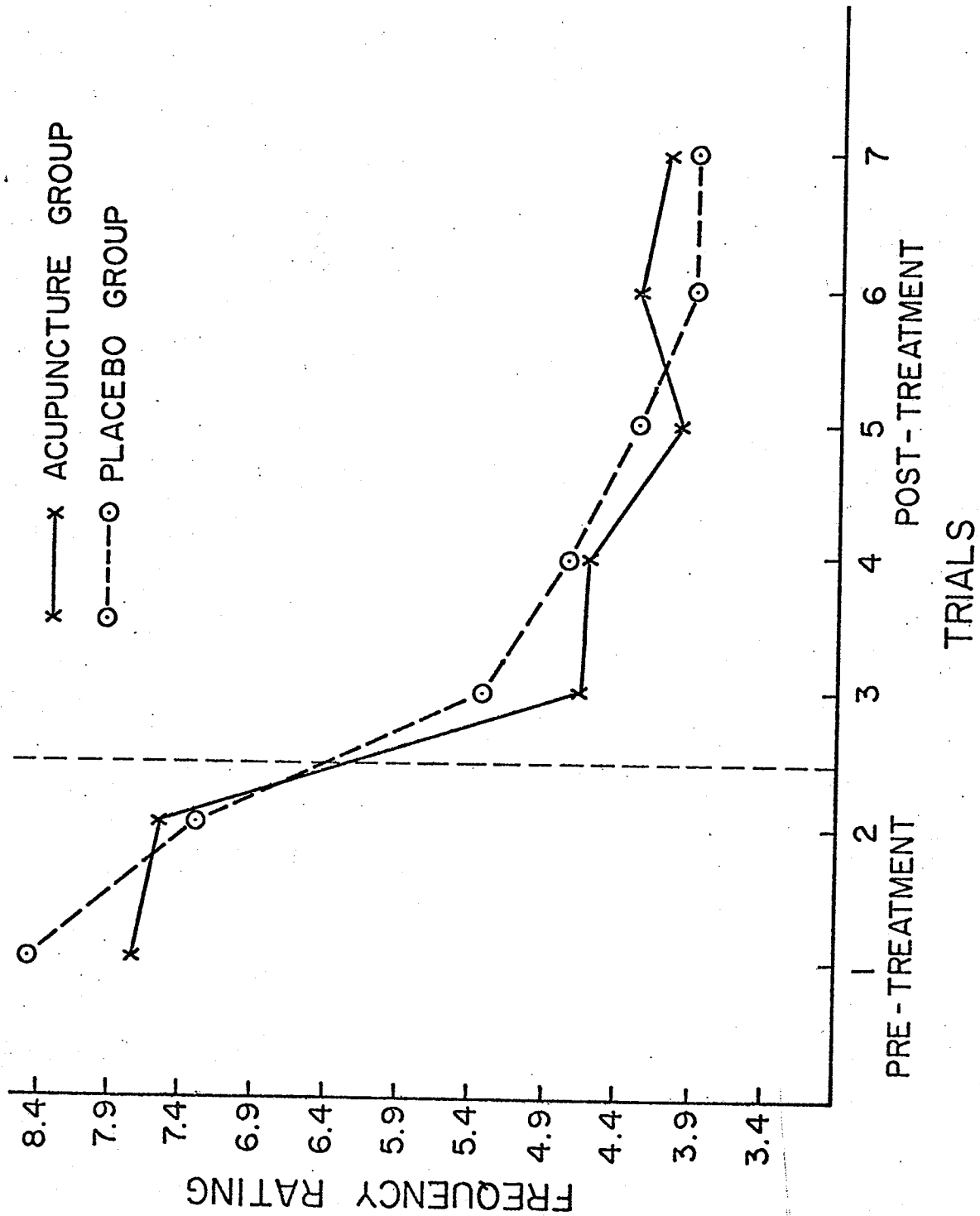


Figure 1. Frequency of knee pain over trials for placebo and acupuncture groups.

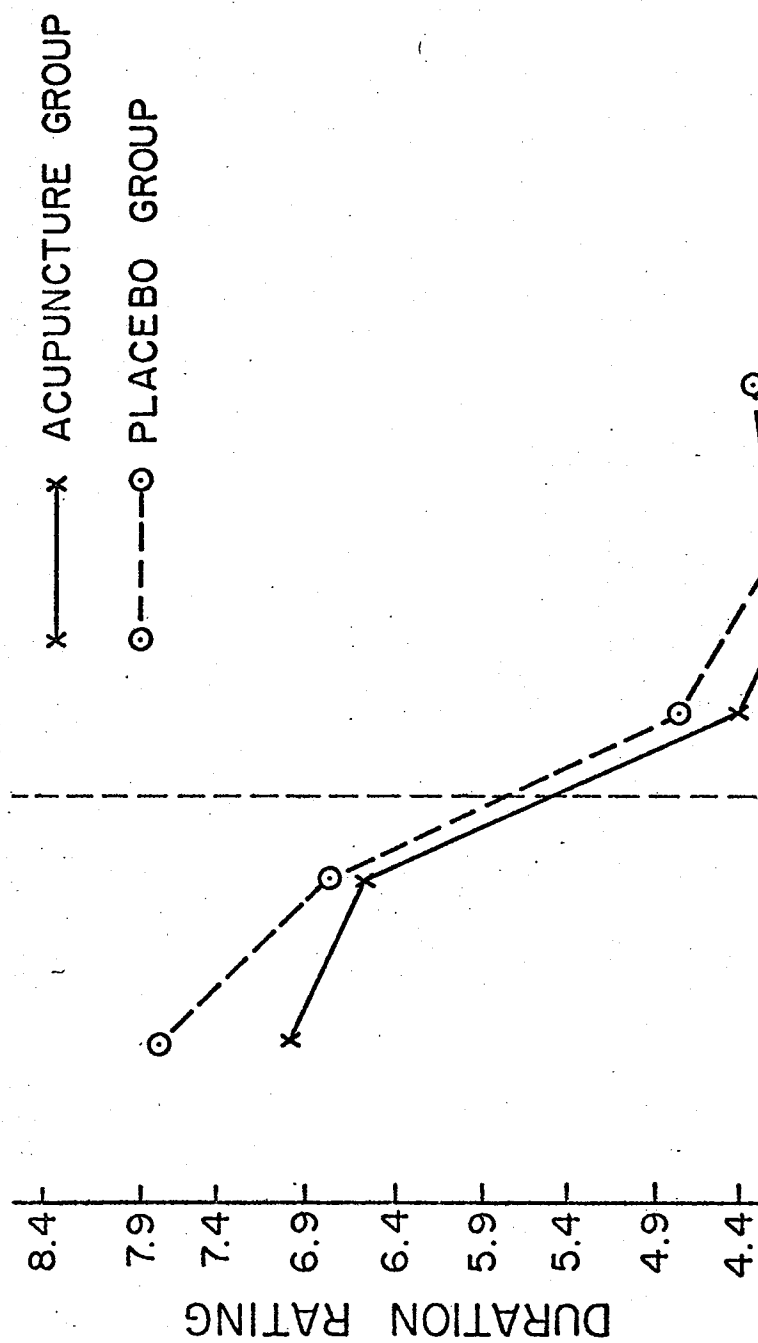
sized groups, one subject was randomly selected out of each of the three remaining groups leaving 13 subjects per group. The raw data of the remaining 78 subjects is contained in Appendix C.

Four separate mixed analyses of variance were performed on the data for each of, frequency, duration, and intensity of pain as well as for the pain index (the score obtained by summing the frequency, duration, and intensity scores). Summary tables for each of the analyses are contained in Appendix D. The main effect of technique was not significant for any of the four dependent measures ($F(2,432)=0.16$ (frequency), $F(2,432)=1.52$ (intensity), $F(2,432)=0.87$ (duration), $F(2,432)=0.70$ (pain index)) nor did technique interact with either of the other variables (treatment or trial) in any analysis.

Figures 1 to 4 show the mean pain ratings over trials for acupuncture and placebo groups for the four dependent measures. Figure 1 shows the data for pain frequency.

Insert figure 1 about here

The analysis indicated no main effect for treatment ($F(1,432)=0.12$) or for a trials by treatment interaction



($F(1,432)=0.84$). However, the main effect of trials was significant ($F(6,432)=55.32$). Post hoc analyses indicated a significant difference between trial 1 and 2 (pretreatment trials) and a significant difference between these and all other trials (post-treatment trials). Further, trial 3 frequency ratings were significantly higher than those of trials 5, 6, and 7.

Figure 2 plots the data for duration and the results are comparable to those for frequency.

Insert figure 2 about here

The main effect of trials was significant ($F(6,432)=32.58$) but there was no effect due to treatment group ($F(1,432)=0.34$) or the trials by treatment interaction ($F(6,432)=0.30$). The post hoc trial comparison indicated no differences between trial 1 and trial 2 and a significant difference between these and all other trials.

Figure 3 gives the data for intensity.

Insert figure 3 about here

Again trials was a significant main effect ($F(6,432)=14.35$)

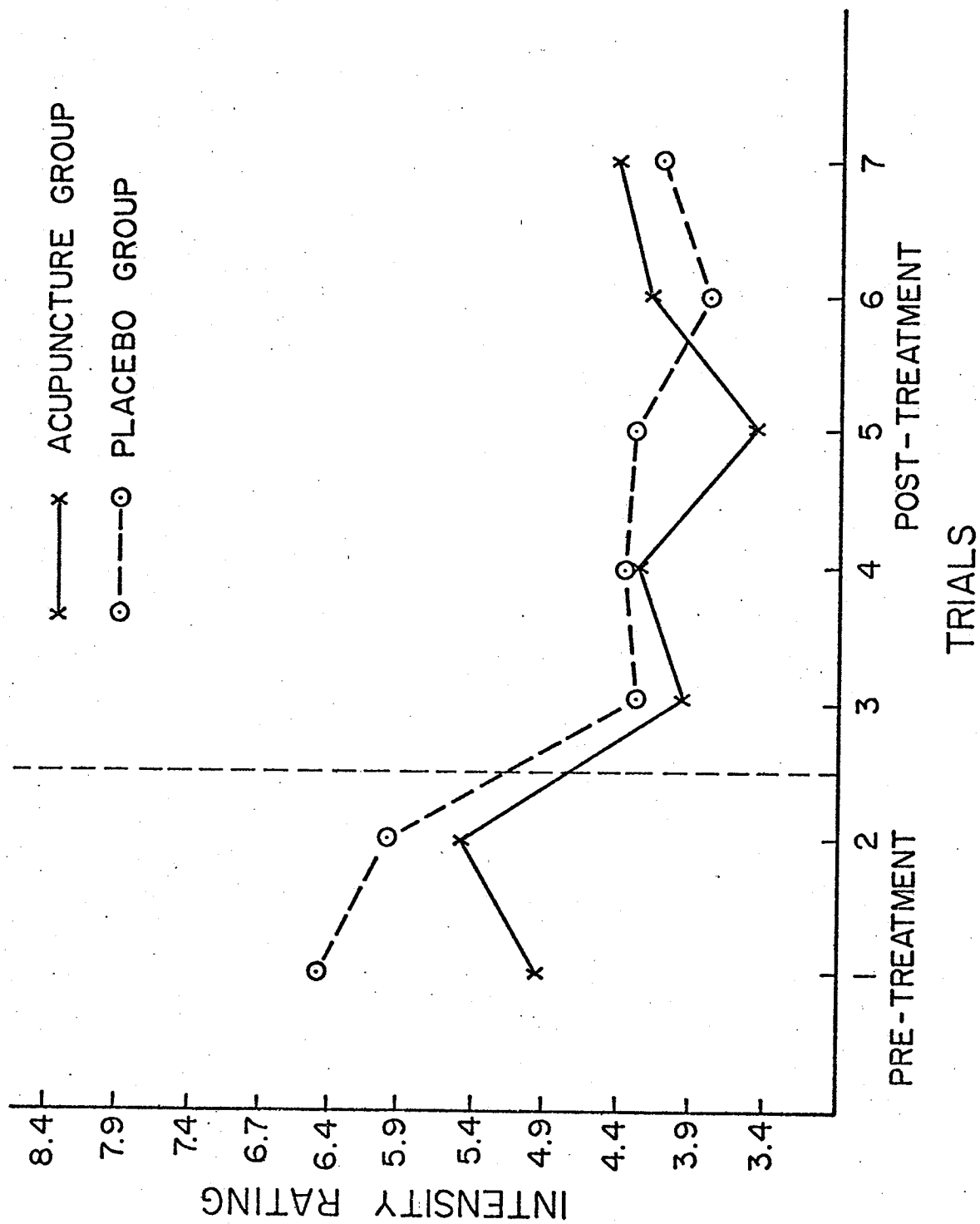


Figure 3. Intensity of knee pain over trials for placebo and acupuncture groups.

and the post hoc analysis indicated a change in intensity ratings following acupuncture. While there was no main effect for treatments ($F(1,432)=0.47$) there was a significant treatment x trials interaction ($F(6,432)=2.22$). Post hoc probing of this interaction showed that the first acupuncture pretreatment trial was significantly lower than both pretreatment trials of the placebo group. Furthermore, this trial did not differ from a number of post-treatment trials, those being all but the second last trial of the placebo group and all but the first and third post-treatment acupuncture trials.

Figure 4 summarizes the data for the pain index and the analysis can be summarized in the same way as that of duration.

Insert figure 4 about here

The main effect of treatment ($F(1,432)=0.30$) and the treatments x trials interaction ($F(6,432)=0.92$) were not significant while the main effect of trials ($F(6,432)=39.88$) was due to a significant post-treatment drop in ratings.

To determine if response to treatment was dependent on factors such as disease, gender, age, and pre-experimental

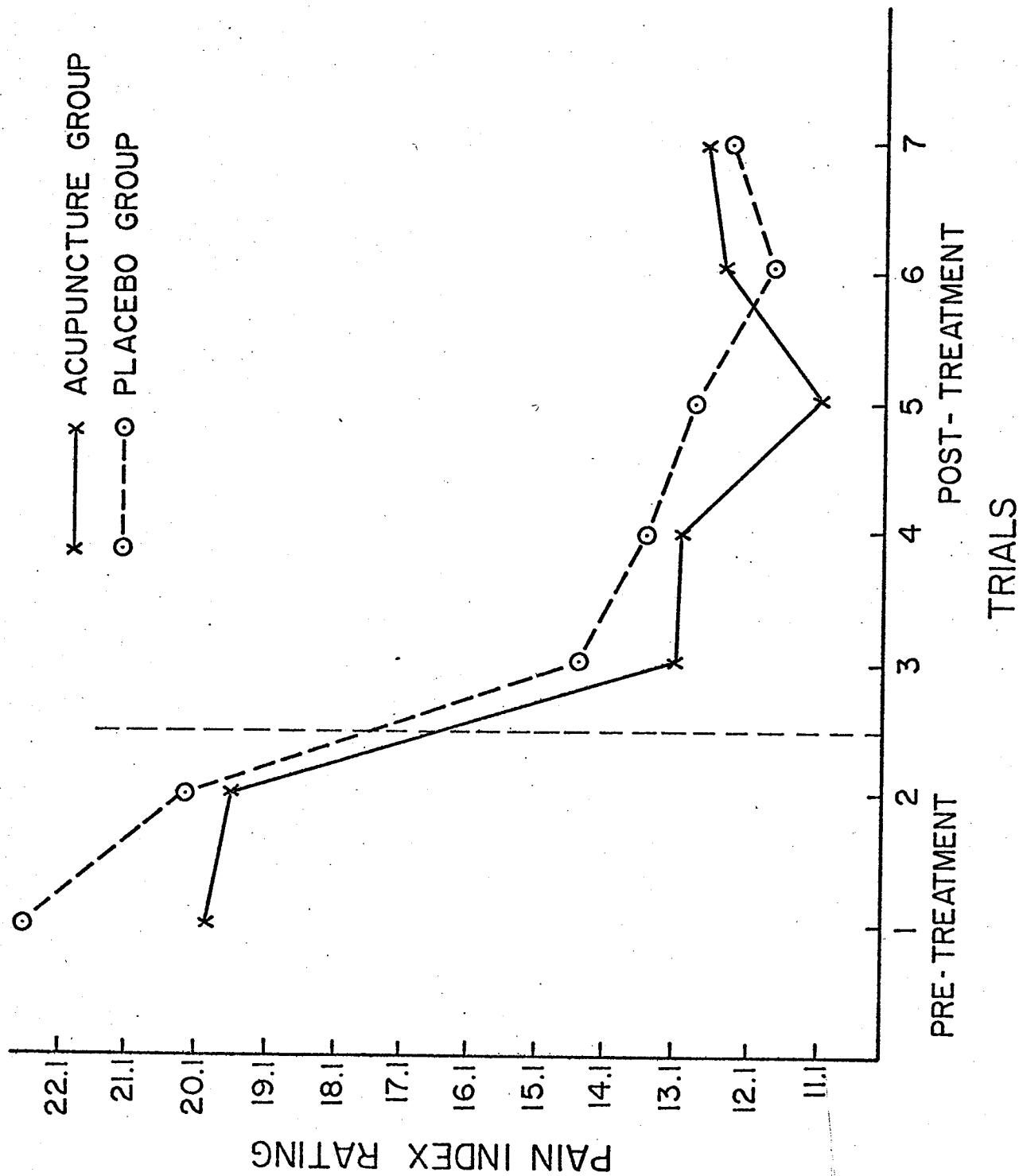


Figure 4. Pain index for knee pain over trials for placebo and acupuncture groups.

duration of pain, further analyses were conducted. Pearson correlations were obtained for age and duration of pain by use of the post-treatment difference scores, that is, each post-treatment pain index subtracted from the second pretreatment pain index. The correlations were usually quite weak except in two instances. There was a moderately strong positive correlation for age and the pain difference score of the distal acupuncture group. The actual value of the correlation depended upon the trial because the correlation was lower on the last two trials. Duration had a moderate to strong negative correlation with pain difference scores of the distal-local placebo group. Other correlations were weak and the values varied for the five trials.

CHI-square analyses were performed for gender with the pain difference scores and for disease type with the pain difference scores. There were separate analyses for each of the treatment technique combinations and as none reached significance, there were no differences in pain scores on the basis of gender or of the three types of diseases.

Summary tables of the data analyses are located in Appendix D.

Discussion

The results of the present study do not confirm most

of the experimental hypotheses. Acupuncture at correct sites as prescribed by Chinese theory did not produce an analgesic effect more powerful than the placebo effects of acupuncture at an incorrect site. Furthermore no differences were found in the degree of effectiveness for combined, local and distal acupuncture techniques as Chinese theory suggested. Finally, a predicted increased analgesic effect for combined and local placebo acupuncture compared to distal placebo acupuncture did not materialize. The only hypothesis confirmed was that distal placebo and distal acupuncture analgesic effects were the same.

These negative findings are to be taken against the fact that there is a consistent and dramatic drop in the frequency, duration, and intensity of reported pain following either acupuncture or placebo treatments. From a clinical point of view the treatment worked but acupuncture served only as a very powerful placebo.

Investigators (Mannheim, 1974) have argued that any points on the skin can be used in acupuncture, that is, that it is not necessary to be as exacting as the Chinese acupuncture maps indicate. In the present study then, where needles were inserted near but not in the prescribed correct sites (placebo treatment) the argument would be that only a

very powerful acupuncture effect has been found. That is, all subjects had needles inserted with electrical stimulation applied and as such all belonged to a single overall acupuncture condition.

That the current findings should not be interpreted in this manner is given by several lines of evidence. Anderson, Man, and Jamieson (1974) did find a differential placebo acupuncture effect with analgesia occurring only for the acupuncture group. This indicated that there is some difference for acupuncture points relative to non-acupuncture points which weakens the argument that any site will serve as an acupuncture point. Furthermore, the fact that local acupuncture proves effective for experimentally induced pain (Anderson, et al, 1974) while distal acupuncture does not (Ramsay, et al, (2)) suggests that site of insertion is of some importance.

However, while the Anderson, Jamieson, and Man (1974) study does not support such an hypothesis, it also makes it difficult to interpret the results of the present study as indicating that the analgesic properties of acupuncture are based on a placebo effect. Yet, the results of this investigation seem to clearly indicate that acupuncture has no physiological basis.

A number of methodological differences may account for the dissimilarities in results. For example, Anderson's subjects were much more homogeneous because they were female, young, and college educated. In this study, subjects ranged in age from 18 to 60 years with a mean of 45.87 years. There were male and female subjects who had varied educational backgrounds from unskilled labourers to college educated. However, analyses failed to show that age, gender, or duration of pain were important factors in the occurrence or degree of analgesia. It is possible however, that the homogeneous group of the Anderson study reacted to subtle cues from the experimental team or to their own expectancy effects in a way quite different from the subjects of the current experiment.

In the Anderson study, pain was induced by ice-water stimulation. In this study, pain occurred as the result of disease processes and varied in degree between subjects and within any subject from day to day. The differences in the two types of pain could be expected to produce some differences in responses of the subjects. Though the pain of ice-water stimulation can be very intense (Hilgard, 1969) it is not qualitatively similar to clinical pain. These differences in type of pain (experimental or clinical) may

account for differences in results of the two studies but it seems unlikely that they are entirely responsible.

The one major methodological difference between the Anderson study and the present one that may account for different findings is the duration of time after treatment for which the analgesic effect was tested. Anderson, Jamieson, and Man have done a short-term analysis of analgesia compared to the long-term analysis in this study. Anderson's subjects had pain responses tested to ice-water stimulation within a few minutes of removal of needles. The subjects of the present study were not tested until two days after removal of the needles and, thereafter, weekly for a month. The subjects who had acupuncture in the Anderson study were the only ones to demonstrate some analgesia. In this study, all groups, whether placebo or acupuncture, had significant analgesic responses.

Had pain been rated in this study within a few minutes of removal of the needles, results similar to Anderson's may have been found. There may have been a real acupuncture effect for clinical pain with a residual placebo effect immediately after removal of the needles. There is good reason to suspect that there really is short-term alteration of pain sensitivity, if not by Anderson's results

then by reports of subjects (2) where sensations are often described as numbness or tingling. However, the changes are transient, lasting less than ten minutes.

These transient changes may have been responsible for the loss of sensitivity to ice-water pain found in Anderson's acupuncture subjects. However, the present investigation had subjects rate their pain for the first time, two days after acupuncture. By this time transient acupuncture effects were lost.

Therefore, it seems that Anderson's findings of analgesia were the result of a short-term acupuncture effect. The analgesia found in the subjects of this study was the result of a placebo effect and not of any physiological changes in sensation.

This means that, if acupuncture is to be used as a physiologically based analgesia, then its analgesic properties would have to be considered to be present only during needle insertion, only in the area of needle insertion, and only for correct needle placement. Acupuncture might, therefore, be used as a local anesthetic for minor surgical procedures or otherwise as a placebo.

Conclusions

The present investigation was not successful in

demonstrating either a difference among acupuncture techniques (local, distal, or combined) or between acupuncture and placebo conditions. It is possible, therefore, that the claims of true analgesia and cures of clinical syndromes reported in the literature are the result of a placebo response or at most a short-term change in cutaneous sensitivity.

A question of immediate importance is whether the analgesic effect demonstrated by Anderson et al (1974) will hold for clinical pain as well. This would suggest that acupuncture might work in the short run to relieve pain and be used more widely than at present as an anesthetic. Research in acupuncture should, therefore, be directed at its short range analgesic properties. The questions of greatest immediate importance will concern the duration and depth of analgesia.

Regardless of any physiological evidence in favour of a direct analgesia due to acupuncture, medical doctors should not ignore the rather dramatic placebo effects that have been demonstrated in this study. The data suggests that acupuncture may be used as an alternative to chemical analgesics to produce an equivalent or superior analgesia without the risks of chemical toxicity.

Footnotes

1. Unpublished study entitled "Acupuncture effects on phantom limb pain," 1974.
2. Unpublished study entitled "Distal acupuncture effects: I," 1973.
3. Unpublished study entitled "Distal acupuncture effects: II," 1974.

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Appendix A

PAIN QUESTIONNAIRE

On the following pages are questions about your pain. These questions apply ONLY to the area treated by acupuncture. Fill out one form at the times specified at the top of each page. It is important that you complete the questions at the times as indicated on the form.

The questions concern frequency, duration, and intensity of your pain. Select and circle a number from zero (0) to ten (10) which best represents your pain. A zero (0) is no pain and a ten (10) is the most pain possible. When you are choosing a number you are to consider your pain from the last time the form was completed until the present time.

If there have been any changes in your medications or in treatments given for the area, note these in the space provided. Any general comments or observations can be made here too.

Bring this questionnaire with you on your first office visit after all the forms have been completed.

PAIN QUESTIONNAIRE

Complete this page on _____

Consider the pain in your _____ since the last time you completed one of these forms.

1. FREQUENCY refers to the number of occurrences of pain or how often pain happens. A zero (0) would mean that there has been no pain since the last form was completed, a one (1) would mean that pain has occurred almost never, and a ten (10) would mean that pain has occurred almost continuously. Circle the number which best represents your pain.

0 1 2 3 4 5 6 7 8 9 10

2. DURATION refers to the length of time that the pain lasts. A zero (0) would mean that there has been no pain since the last form, a one (1) would mean that the time that the episodes of pain lasted were very short, and a ten (10) would mean that the time the episodes lasted were extremely long. Circle the number which best represents the duration of your pain.

0 1 2 3 4 5 6 7 8 9 10

3. INTENSITY refers to the amount or degree of the strength of pain. A zero (0) would mean that there has been no pain since the last form, a one (1) would mean that the pain was very mild, and a ten (10) would mean that the pain was extremely strong. Circle the number which best represents the intensity of your pain.

0 1 2 3 4 5 6 7 8 9 10

4. Specify any changes in drugs or in the treatments for the area treated by acupuncture.

APPENDIX C

Raw Data

Distal Acupuncture Group

Frequency

Subject	Trial						
	1	2	3	4	5	6	7
1	10	10	4	3	3	4	5
2	5	4	4	4	3	4	3
3	10	10	1	7	3	1	1
4	4	3	3	2	2	9	7
5	5	2	3	5	3	2	2
6	10	10	10	10	10	10	10
7	5	8	7	7	7	7	7
8	9	9	9	9	8	7	7
9	10	10	1	1	2	1	1
10	10	10	10	10	10	10	10
11	10	7	1	2	1	3	3
12	9	8	7	5	2	1	0
13	3	4	2	2	1	4	3

Distal Acupuncture Group

Duration

Subject	Trial						
	1	2	3	4	5	6	7
1	10	10	4	3	3	4	4
2	7	5	5	5	4	4	3
3	6	6	2	2	2	2	1
4	4	1	1	1	1	6	10
5	5	1	3	3	3	2	2
6	10	10	10	10	10	10	10
7	10	10	10	10	10	10	10
8	8	9	6	7	6	6	8
9	1	10	1	1	1	1	1
10	6	10	10	9	9	9	9
11	10	6	2	4	3	5	2
12	6	5	7	2	2	1	0
13	5	4	2	3	1	3	3

Distal Acupuncture Group

Intensity

Subject	Trial						
	1	2	3	4	5	6	7
1	10	8	4	3	3	4	5
2	8	6	5	5	3	5	3
3	6	6	1	4	2	2	1
4	3	1	1	1	1	8	10
5	4	2	4	2	2	2	2
6	10	10	10	10	10	10	10
7	6	7	7	7	7	7	7
8	6	9	8	8	7	7	9
9	1	1	1	1	1	1	1
10	6	10	8	10	10	10	10
11	5	9	3	6	3	6	4
12	3	4	3	2	2	1	0
13	5	6	4	4	3	5	4

Distal Acupuncture Group

Pain Index

Subject	Trial						
	1	2	3	4	5	6	7
1	30	28	12	9	9	12	14
2	20	15	14	14	10	13	9
3	22	22	4	13	7	5	3
4	11	5	5	4	4	23	27
5	14	5	10	10	8	6	6
6	30	30	30	30	30	30	30
7	21	25	24	24	24	24	24
8	23	27	23	24	21	20	24
9	12	21	3	3	4	3	3
10	22	30	28	29	29	29	29
11	25	22	6	12	7	14	9
12	18	17	17	9	6	3	0
13	13	14	8	9	5	12	10

Distal Acupuncture Group

Subject Traits

Subject	Age	Duration of Pain	Knee Treated	Gender	Disease
1	53	12 years	right	male	rheumatoid arthritis
2	25	1 year	left	female	rheumatoid arthritis
3	54	17 years	right	female	rheumatoid arthritis
4	51	12 years	left	female	rheumatoid arthritis
5	31	2 years	left	female	rheumatoid arthritis
6	49	3 years	left	male	osteoarthritis
7	57	3 years	right	male	osteoarthritis
8	50	6 years	right	female	rheumatoid arthritis
9	57	16 years	left	female	osteoarthritis
10	53	1 year	left	female	osteoarthritis
11	22	5 months	right	male	traumatic arthralgia
12	43	9 years	right	male	traumatic arthralgia
13	19	7 years	right	female	traumatic arthralgia

Local Acupuncture Group

Frequency

Subject	Trial						
	1	2	3	4	5	6	7
14	5	4	6	5	4	4	4
15	10	10	9	8	6	6	7
16	3	5	2	3	2	2	4
17	4	6	6	3	6	2	3
18	10	9	6	6	4	4	3
19	4	6	3	3	2	3	0
20	10	5	1	1	1	0	1
21	10	10	8	7	6	5	5
22	10	10	3	5	7	7	8
23	10	10	7	10	10	10	10
24	10	10	3	4	3	7	10
25	8	4	1	2	1	1	2
26	10	5	5	5	5	5	4

Local Acupuncture Group

Duration

Subject	Trial						
	1	2	3	4	5	6	7
14	3	2	4	4	3	3	3
15	10	10	8	6	7	6	6
16	4	6	6	4	2	2	7
17	1	4	7	5	4	3	2
18	10	9	6	6	4	4	3
19	3	4	3	2	2	2	0
20	8	4	1	3	1	0	2
21	10	10	7	6	5	5	5
22	10	10	3	4	5	5	7
23	10	10	5	10	10	10	10
24	10	10	3	2	2	6	10
25	6	3	1	1	1	1	2
26	10	8	3	4	6	3	3

Local Acupuncture Group

Intensity

Subject	Trial						
	1	2	3	4	5	6	7
14	2	5	2	2	2	2	2
15	9	8	6	8	6	7	8
16	3	4	4	5	1	1	9
17	8	6	6	4	4	5	6
18	5	5	3	3	3	3	2
19	3	3	4	2	1	2	0
20	9	3	1	3	1	0	1
21	10	10	7	6	5	5	5
22	5	7	3	5	5	5	7
23	3	6	5	8	8	8	8
24	5	7	4	5	4	7	10
25	3	2	1	1	1	1	5
26	2	2	3	4	5	6	3

Local Acupuncture Group

Pain Index

Subject	Trial						
	1	2	3	4	5	6	7
14	10	11	12	11	9	9	9
15	29	28	23	22	19	19	21
16	10	15	12	12	5	5	20
17	13	16	19	12	14	10	11
18	25	23	15	15	11	11	8
19	10	13	10	7	5	7	0
20	27	12	3	7	3	0	4
21	30	30	22	19	16	15	15
22	25	27	9	14	17	17	22
23	23	26	17	28	28	28	28
24	25	27	10	11	9	20	30
25	17	9	3	4	3	3	9
26	22	15	11	13	16	14	10

Local Acupuncture Group

Subject Traits

Subject	Age	Duration of Pain	Knee Treated	Gender	Disease
14	58	9 years	right	male	rheumatoid arthritis
15	52	10 years	left	male	rheumatoid arthritis
16	22	17 years	left	female	rheumatoid arthritis
17	18	2 years	right	female	rheumatoid arthritis
18	44	2 years	right	female	rheumatoid arthritis
19	38	14 years	left	female	rheumatoid arthritis
20	45	3 years	right	female	rheumatoid arthritis
21	50	2 years	right	male	osteoarthritis
22	40	15 years	left	female	osteoarthritis
23	49	6 years	right	female	osteoarthritis
24	45	18 years	left	male	traumatic arthralgia
25	27	4 years	left	male	traumatic arthralgia
26	46	13 years	right	female	traumatic arthralgia

Combined Distal-Local Acupuncture Group

Frequency

Subject	Trial						
	1	2	3	4	5	6	7
27	4	8	4	1	0	0	0
28	8	6	1	1	1	1	0
29	10	9	1	1	1	0	1
30	5	8	6	5	5	6	9
31	10	10	7	6	6	4	4
32	10	10	9	5	2	3	1
33	10	8	9	8	6	6	5
34	9	8	2	1	1	1	1
35	8	9	3	3	1	10	3
36	3	7	1	2	2	2	3
37	3	4	2	3	4	3	3
38	10	10	10	10	10	10	10
39	10	9	5	5	4	3	2

Combined Distal-Local Acupuncture Group

Duration

Subject	Trial						
	1	2	3	4	5	6	7
27	5	5	3	2	0	0	0
28	1	2	1	2	1	1	0
29	10	9	1	1	1	0	1
30	6	5	5	4	5	6	9
31	10	8	5	5	5	4	3
32	6	8	7	3	3	2	1
33	10	9	9	5	5	5	4
34	10	5	1	1	1	1	1
35	9	4	4	3	1	5	2
36	2	5	1	1	1	3	4
37	2	2	1	1	2	2	2
38	10	10	10	10	10	10	10
39	10	8	4	4	3	2	3

Combined Distal-Local Acupuncture Group

Intensity

Subject	Trial						
	1	2	3	4	5	6	7
27	6	6	2	2	0	0	0
28	5	6	1	5	1	1	0
29	4	3	1	1	1	0	1
30	2	5	4	4	5	5	9
31	6	7	8	5	4	4	3
32	5	6	7	7	2	3	1
33	4	6	7	7	7	7	4
34	5	5	1	1	1	1	1
35	3	6	3	2	1	8	1
36	2	3	1	1	1	3	5
37	2	3	1	1	2	2	2
38	10	8	9	8	8	8	8
39	5	5	4	3	3	3	3

Combined Distal-Local Acupuncture Group

Pain Index

Subject	Trial						
	1	2	3	4	5	6	7
27	15	19	9	5	0	0	0
28	14	14	3	8	3	3	0
29	24	21	3	3	3	0	3
30	13	18	15	13	15	17	27
31	26	25	20	16	15	12	10
32	21	24	23	15	7	8	3
33	24	23	25	20	18	18	13
34	24	18	4	3	3	3	3
35	20	19	10	8	3	23	6
36	7	15	3	4	4	8	12
37	7	9	4	5	8	7	7
38	30	28	29	28	28	28	28
39	25	22	13	12	10	8	8

Combined Distal-Local Acupuncture Group

Subject Traits

Subject	Age	Duration of Pain	Knee Treated	Gender	Disease
27	53	9 years	right	male	rheumatoid arthritis
28	30	2 years	right	male	rheumatoid arthritis
29	46	4 months	right	female	rheumatoid arthritis
30	50	8 years	right	female	rheumatoid arthritis
31	53	2 years	right	female	rheumatoid arthritis
32	27	15 years	left	female	rheumatoid arthritis
33	40	6 months	left	female	rheumatoid arthritis
34	51	3 years	left	male	osteoarthritis
35	32	4 years	right	male	osteoarthritis
36	42	1 year	left	female	osteoarthritis
37	55	2 years	right	female	osteoarthritis
38	23	1 year	right	male	traumatic arthralgia
39	59	1 year	right	female	traumatic arthralgia

Distal Placebo Group

Frequency

Subject	Trial						
	1	2	3	4	5	6	7
40	5	5	5	7	3	4	2
41	2	4	2	2	8	4	2
42	10	5	3	3	3	2	1
43	10	10	10	10	10	10	10
44	9	7	4	3	2	2	5
45	10	7	2	2	2	3	3
46	7	3	7	7	5	8	9
47	10	10	8	6	6	5	5
48	10	10	7	3	2	2	2
49	10	10	0	0	0	3	4
50	4	5	4	2	5	2	3
51	7	8	8	8	7	7	7
52	9	8	8	8	8	7	7

Distal Placebo Group

Duration

Subject	Trial						
	1	2	3	4	5	6	7
40	5	5	5	7	3	3	3
41	3	4	2	2	10	6	5
42	2	2	3	3	5	2	1
43	10	10	10	10	10	10	10
44	8	7	4	2	2	2	4
45	10	5	1	2	4	4	4
46	10	2	7	6	4	8	9
47	10	10	7	6	5	5	6
48	10	10	5	2	2	2	2
49	10	10	0	0	0	5	5
50	2	1	1	1	1	1	1
51	5	7	7	7	7	7	7
52	8	7	8	8	8	7	7

Distal Placebo Group

Intensity

Subject	Trial						
	1	2	3	4	5	6	7
40	8	8	8	9	4	4	3
41	3	5	2	3	8	5	5
42	2	8	8	7	9	5	1
43	10	10	10	10	10	10	10
44	8	7	3	2	2	2	5
45	5	3	2	2	5	5	5
46	5	2	5	4	4	8	9
47	5	7	4	4	4	4	6
48	5	5	4	3	2	1	1
49	10	10	0	0	0	6	6
50	3	3	2	1	3	1	2
51	7	9	7	8	8	7	8
52	9	7	8	8	9	7	7

Distal Placebo Group

Pain Index

Subject	Trial						
	1	2	3	4	5	6	7
40	18	18	18	23	10	11	8
41	8	13	6	7	26	15	12
42	14	15	14	13	17	9	3
43	30	30	30	30	30	30	30
44	25	21	11	7	6	6	14
45	25	15	5	6	11	12	12
46	22	7	19	17	12	24	27
47	25	27	19	16	15	14	17
48	25	25	16	8	6	5	5
49	30	30	0	0	0	14	15
50	9	9	7	4	9	4	6
51	19	24	22	23	15	21	22
52	26	22	24	24	25	21	21

Distal Placebo Group

Subject Traits

Subject	Age	Duration of Pain	Knee Treated	Gender	Disease
40	29	6 months	left	male	rheumatoid arthritis
41	24	18 years	left	male	rheumatoid arthritis
42	59	1 year	left	female	rheumatoid arthritis
43	54	5 years	right	female	rheumatoid arthritis
44	58	7 years	right	female	rheumatoid arthritis
45	60	2 years	right	female	rheumatoid arthritis
46	56	1 year	right	male	osteoarthritis
47	52	26 years	right	male	osteoarthritis
48	53	5 years	left	male	osteoarthritis
49	59	5 years	left	female	osteoarthritis
50	54	5 years	left	female	osteoarthritis
51	48	3 years	left	female	osteoarthritis
52	31	5 years	left	male	traumatic arthralgia

Local Placebo Group

Frequency

Subject	Trial						
	1	2	3	4	5	6	7
53	10	10	10	10	10	10	10
54	10	8	6	3	3	3	4
55	10	3	2	3	5	0	1
56	10	6	7	7	6	5	4
57	9	10	10	9	9	9	8
58	8	7	6	4	3	3	2
59	10	10	1	2	3	2	2
60	10	10	6	3	1	0	0
61	10	10	7	6	7	6	3
62	7	6	3	1	1	1	2
63	3	4	4	2	1	1	1
64	10	10	7	4	1	0	0
65	9	8	7	7	6	6	7

Local Placebo Group

Duration

Subject	Trial						
	1	2	3	4	5	6	7
53	1	10	10	10	10	10	10
54	10	8	6	3	3	3	4
55	10	3	1	2	8	0	1
56	10	6	7	7	6	5	4
57	10	10	10	9	9	8	7
58	10	10	5	5	4	3	2
59	10	10	0	1	2	2	2
60	10	10	5	2	1	0	0
61	10	10	7	6	8	6	3
62	9	6	4	1	2	1	7
63	5	5	3	2	2	1	1
64	10	10	1	1	1	0	0
65	8	8	8	8	8	8	8

Local Placebo Group

Intensity

Subject	Trial						
	1	2	3	4	5	6	7
53	3	3	3	3	3	3	3
54	6	6	4	2	2	2	3
55	6	2	1	6	7	0	1
56	8	7	7	6	5	4	3
57	9	10	9	8	7	7	7
58	5	5	4	3	2	2	1
59	10	10	0	1	4	2	2
60	10	10	4	2	1	0	0
61	10	10	5	5	6	5	3
62	7	8	3	1	2	1	7
63	1	3	2	5	1	1	1
64	10	10	4	1	1	0	0
65	9	7	10	10	9	8	8

Local Placebo Group

Pain Index

Subject	Trial						
	1	2	3	4	5	6	7
53	14	23	23	23	23	23	23
54	26	22	16	8	8	8	11
55	26	8	4	11	20	0	3
56	28	19	21	20	17	14	11
57	28	30	29	26	25	24	22
58	22	22	15	12	9	8	5
59	30	30	1	4	9	6	6
60	30	30	15	7	3	0	0
61	30	30	19	17	21	17	9
62	23	20	10	3	5	3	16
63	9	12	9	9	4	3	3
64	30	30	12	6	3	0	0
65	26	23	25	25	23	22	23

Local Placebo Group

Subject Traits

Subject	Age	Duration of Pain	Knee Treated	Gender	Disease
53	43	6 years	right	male	rheumatoid arthritis
54	47	2 years	left	male	rheumatoid arthritis
55	55	15 years	left	female	rheumatoid arthritis
56	52	5 years	right	female	rheumatoid arthritis
57	54	9 years	left	female	rheumatoid arthritis
58	22	3 years	left	female	rheumatoid arthritis
59	54	30 years	right	male	osteoarthritis
60	60	3 years	right	male	osteoarthritis
61	47	6 years	right	female	osteoarthritis
62	50	32 years	right	female	osteoarthritis
63	43	1 year	left	male	traumatic arthralgia
64	58	6 years	left	female	osteoarthritis
65	19	4 years	left	female	traumatic arthralgia

Combined Distal-Local Placebo Group

Frequency

Subject	Trial						
	1	2	3	4	5	6	7
66	10	10	4	2	0	0	0
67	10	10	10	10	10	10	10
68	10	10	1	1	1	1	1
69	7	6	6	7	8	8	8
70	8	7	8	8	8	8	8
71	10	10	8	8	8	9	10
72	7	3	0	0	0	1	0
73	10	6	3	2	1	1	1
74	10	10	10	10	1	5	3
75	10	6	3	3	2	2	2
76	7	3	1	3	4	3	6
77	3	3	3	3	3	2	2
78	10	10	9	8	5	1	1

Combined Distal-Local Placebo Group

Duration

Subject	Trial						
	1	2	3	4	5	6	7
66	10	10	3	2	0	0	0
67	10	10	10	10	10	10	10
68	10	10	1	1	1	1	1
69	5	5	7	8	7	7	8
70	8	6	8	8	8	8	8
71	10	10	8	8	8	9	10
72	5	2	0	0	0	1	0
73	8	10	1	1	1	1	1
74	1	1	10	1	1	1	1
75	10	2	1	1	2	2	2
76	6	1	0	2	3	3	8
77	3	4	3	3	3	2	2
78	10	10	9	8	1	1	1

Combined Distal-Local Placebo Group

Intensity

Subject	Trial						
	1	2	3	4	5	6	7
66	6	6	3	2	0	0	0
67	10	10	10	10	10	10	10
68	10	1	1	1	1	1	1
69	7	6	5	7	7	7	7
70	5	5	8	8	8	8	8
71	10	10	8	8	8	9	10
72	4	4	0	0	0	1	0
73	8	6	1	1	1	1	1
74	1	1	1	1	1	1	2
75	5	3	5	5	5	5	5
76	6	1	0	1	1	4	8
77	3	3	3	4	4	2	2
78	5	5	5	8	5	1	1

Combined Distal-Local Placebo Group

Pain Index

Subject	Trial						
	1	2	3	4	5	6	7
66	26	26	10	6	0	0	0
67	30	30	30	30	30	30	30
68	30	21	3	3	3	3	3
69	19	17	18	22	22	22	23
70	21	18	24	24	24	24	24
71	30	30	24	24	24	27	30
72	16	9	0	0	0	3	0
73	26	22	5	4	3	3	3
74	12	12	21	12	3	7	6
75	25	11	9	9	9	9	9
76	19	5	1	6	8	10	22
77	9	10	9	10	10	6	6
78	25	25	23	24	11	3	3

Combined Distal-Local Placebo Group

Subject Traits

Subject	Age	Duration of Pain	Knee Treated	Gender	Disease
66	37	4 months	left	male	rheumatoid arthritis
67	53	16 months	left	female	rheumatoid arthritis
68	37	2 years	right	female	rheumatoid arthritis
69	56	8 months	right	female	rheumatoid arthritis
70	60	15 years	right	female	rheumatoid arthritis
71	57	4 years	right	female	rheumatoid arthritis
72	53	25 years	left	male	osteoarthritis
73	61	15 years	right	male	osteoarthritis
74	55	13 years	left	female	osteoarthritis
75	53	12 years	right	female	osteoarthritis
76	59	6 months	right	female	osteoarthritis
77	54	20 years	right	male	traumatic arthralgia
78	43	5 months	left	female	rheumatoid arthritis

APPENDIX D₁

Analysis of Variance: Frequency

Source of Variation	df	MS	F
Group	1	4.58	0.119
Treatment	2	6.30	0.163
Trial	6	225.25	55.320*
Group x Treatment	2	2.27	0.059
Group x Trial	6	3.43	0.841
Treatment x Trial	12	2.96	0.727
Group x Treatment x Trial	12	2.93	0.720
Error	432	4.07	

* $p < 0.01$

APPENDIX D₂

Analysis of Variance: Duration

Source of Variation	df	MS	F
Group	1	14.51	0.343
Treatment	2	36.78	0.869
Trial	6	157.48	32.575 *
Group x Treatment	2	4.49	0.106
Group x Trial	6	1.47	0.304
Treatment x Trial	12	5.28	1.092
Group x Treatment x Trial	12	2.23	0.462
Error	432	4.83	

* $p \leq 0.01$

APPENDIX D₃
Analysis of Variance: Intensity

Source of Variation	df	MS	F
Group	1	17.59	0.466
Treatment	2	57.49	1.522
Trial	6	52.40	14.345 *
Group x Treatment	2	2.67	0.071
Group x Trial	6	8.11	2.221 **
Treatment x Trial	12	3.62	0.991
Group x Treatment x Trial	12	5.90	1.614
Error	432	3.65	

* $p \leq 0.01$

** $p \leq 0.05$

APPENDIX D₄

Analysis of Variance: Pain Index

Source of Variation	df	MS	F
Group	1	98.16	0.304
Treatment	2	227.32	0.704
Trial	6	1206.04	39.875 *
Group x Treatment	2	24.27	0.075
Group x Trial	6	27.78	0.918
Treatment x Trial	12	28.36	0.938
Group x Treatment x Trial	12	29.09	0.962
Error	432	30.25	

* $p \leq 0.01$

APPENDIX D

Chi Square⁵

On Three Levels of Disease

Group	Post-treatment Trial				
	3	4	5	6	7
Distal Acupuncture	10.83 (14)*	20.58 (18)	19.14 (18)	22.75 (20)	25.99 (22)
Local Acupuncture	19.81 (18)	22.90 (20)	22.90 (18)	18.78 (16)	15.89 (18)
Combined Acupuncture	18.57 (20)	25.99 (20)	23.45 (22)	25.99 (24)	19.27 (20)
Distal Placebo	25.99 (18)	25.99 (24)	23.83 (22)	23.83 (22)	14.08 (18)
Local Placebo	25.99 (24)	22.75 (22)	18.96 (20)	22.21 (20)	18.96 (18)
Combined Placebo	21.45 (22)	16.11 (18)	21.67 (20)	23.62 (22)	25.99 (20)

* degrees of freedom in brackets

APPENDIX D₆

Chi Square

On Two Levels of Gender

Group	Post-treatment Trials				
	3	4	5	6	7
Distal Acupuncture	10.32 (7)*	8.98 (9)	8.31 (9)	8.98 (10)	10.99 (11)
Local Acupuncture	10.89 (9)	8.77 (10)	8.77 (9)	10.18 (8)	10.89 (9)
Combined Acupuncture	10.89 (10)	10.89 (10)	10.89 (11)	12.99 (12)	8.78 (10)
Distal Placebo	10.99 (9)	12.99 (12)	12.99 (11)	12.99 (11)	12.99 (9)
Local Placebo	12.99 (12)	10.89 (11)	8.77 (10)	8.77 (10)	8.77 (9)
Combined Placebo	12.99 (11)	7.52 (9)	8.31 (10)	12.99 (11)	12.99 (10)

* degrees of freedom in brackets

APPENDIX D₇

Pearson Correlation Coefficients

Age with Score

Group	Post-treatment Trial				
	3	4	5	6	7
Distal Acupuncture	0.15	0.23	0.03	0.16	-0.01
Local Acupuncture	0.26	0.02	0.02	-0.11	0.26
Combined Acupuncture	0.33	0.36	0.05	0.32	-0.01
Distal Placebo	0.24	0.37	0.43	0.21	0.07
Local Placebo	0.42	0.41	0.29	0.49	0.42
Combined Placebo	-0.48	-0.41	-0.67	-0.72	-0.70

APPENDIX D₈
 Pearson Correlation Coefficients
 Duration of Pain with Score

Group	Post-treatment Trial				
	3	4	5	6	7
Distal Acupuncture	0.58	0.64	0.59	0.41	0.29
Local Acupuncture	0.29	0.25	0.21	-0.19	-0.46
Combined Acupuncture	-0.26	0.08	0.33	0.19	0.20
Distal Placebo	0.23	0.27	-0.03	0.21	0.14
Local Placebo	0.51	0.35	0.11	0.24	-0.04
Combined Placebo	-0.13	0.07	-0.11	-0.15	0.001

APPENDIX D₉

Duncan's Multiple Range Test on the Significant Trials Effect Frequency

Comparison Among Trial Means							
Trials Ranked	1	2	3	4	6	5	7
1		0.667*	3.115*	3.436*	3.987*	4.000*	4.064*
2			2.448*	2.769*	3.320*	3.333*	3.363*
3				0.321	0.872*	0.885*	0.949*
4					0.551	0.564	0.628
6						0.044	0.077
5							0.064
7							

$$W_2 = 0.632$$

$$W_3 = 0.666$$

$$W_4 = 0.689$$

$$W_5 = 0.705$$

$$W_6 = 0.718$$

$$W_7 = 0.727$$

* significant on comparison with W_r where $W_r = q_r \times \text{MS error}$.

APPENDIX D₁₀

Duncan's Multiple Range Test on the Significant Trials Effect Duration

Comparison Among Trial Means							
Trials Ranked	1	2	3	7	4	5	6
1		0.667	2.770*	3.180*	3.218*	3.347*	3.423*
2			1.565*	2.513*	2.551*	2.680*	2.756*
3				0.410	0.448	0.577	0.653
7					0.038	0.167	0.243
4						0.129	0.205
5							0.418
6							

$$W_2 = 0.689$$

$$W_3 = 0.727$$

$$W_4 = 0.752$$

$$W_5 = 0.769$$

$$W_6 = 0.784$$

$$W_7 = 0.794$$

* significant on comparison with W_r where $W_r = q_r \times \text{MS error}$.

APPENDIX D₁₁

Duncan's Multiple Range Test on the Significant Trials Effect

Intensity

Comparison Among Trial Means							
Trials Ranked	2	1	4	7	3	6	5
2		0.039	1.513*	1.526*	1.642*	1.783*	1.911*
1			1.474*	1.487*	1.603*	1.744*	1.872*
4				0.013	0.129	0.270	0.398
7					0.116	0.257	0.385
3						0.141	0.269
6							0.128
5							

$$W_2 = 0.598$$

$$W_3 = 0.631$$

$$W_4 = 0.652$$

$$W_5 = 0.667$$

$$W_6 = 0.680$$

$$W_7 = 0.689$$

* significant on comparison with W_r when $W_r = q_r \times \text{MS error}$.

APPENDIX D₁₂

Duncan's Multiple Range Test on the Significant Trials Effect Pain Index

Comparison Among Trial Means							
Trials Ranked	1	2	3	4	7	6	5
1		1.333	7.499*	8.141*	8.782*	9.166*	9.333*
2			6.166*	6.808*	7.449*	7.833*	8.000*
3				0.642	1.283	1.667	1.834
4					0.641	1.025	1.192
7						0.384	0.551
6							0.167
5							

$$W_2 = 1.726$$

$$W_3 = 1.819$$

$$W_4 = 1.880$$

$$W_5 = 1.925$$

$$W_6 = 1.962$$

$$W_7 = 1.987$$

* significant on comparison with W_r where $W_r = q_r \times \text{MS error}$.

APPENDIX D₁₃
Duncan's Multiple Range Test
on the Intensity Group x Trial Interaction

Comparison Among Group and Trial Means														
Ranks	P8**	P9	A2***	A1	A7	P11	P10	P12	A4	A6	P14	A3	P13	A5
P8		0.462	0.923	1.462*	2.077*	2.154*	2.180*	2.180*	2.257*	2.282*	2.359*	2.487*	2.667*	3.026*
P9			0.461	1.000*	1.615*	1.692*	1.718*	1.718*	1.795*	1.820*	1.897*	2.025*	2.205*	2.564*
A2				0.539	1.154*	1.231*	1.257*	1.257*	1.334*	1.359*	1.436*	1.564*	1.744*	2.103*
A1					0.615	0.692	0.718	0.718	0.795	0.820	0.897	1.025*	1.205*	1.564*
A7						0.077	0.103	0.103	0.180	0.205	0.282	0.410	0.590	0.949
P11							0.026	0.026	0.103	0.128	0.205	0.333	0.513	0.872
P10								0.000	0.077	0.102	0.179	0.307	0.487	0.846
P12									0.077	0.102	0.179	0.307	0.487	0.846
A4										0.025	0.102	0.230	0.410	0.769
A6											0.077	0.205	0.385	0.744
P14												0.128	0.308	0.667
A3													0.180	0.539
P13														0.359
A5														

$W_2 = .875, W_3 = .921, W_4 = .949, W_5 = .970, W_6 = .985, W_7 = 1.000, W_8 = 1.009, W_9 = 1.019, W_{10} = 1.025, W_{11} = 1.025, W_{12} = 1.037, W_{13} = 1.037, W_{14} = 1.046.$

* Comparison significant on comparison with W_I where $W_I = q_I \times MS$ error.

** P8 = placebo group first trial, P9 = Placebo group second trial, etc.

*** A2 = Acupuncture group second trial, A3 = Acupuncture group third trial, etc.