Response to Pressure Pain

as Moderated by Hypnotic Susceptibility,

Type of Suggestion Strategy, and Choice

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Abstract

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The present study examined the relationship between hypnotic
susceptibility and ability to control pain, by comparing high and
low susceptible subjects' response to pressure pain when these
subjects employed either an imagery or a distraction pain
attenuating strategy. The effect of providing subjects with a
choice of which strategy to employ was investigated. In addition,
the subjects' imagery ability and the types of cognitive strategies
they engaged in were assessed. Subjects who scored either 9 or
above or 4 and below on the Harvard Group Scale of Hypnotic
Susceptibility: Form A, were asked to participate in a pain study.
All 84 subjects first received a baseline trial on a modified
version of the Forgione-Barber Strain Gauge Pain Stimulator, within
susceptibility levels. Subjects who were able to keep their finger
in the apparatus for 60 seconds were randomly assigned to a Choice,
a No Choice, or a Control condition. The 36 high and low
susceptible subjects in the Choice condition were given the option
of using either an imagery suggestion strategy or a distraction
strategy on the second trial. The 32 high and low susceptible

subjects in the No Choice condition were told about both strategies but were assigned randomly to either the imagery or the distraction strategy group. The 16 subjects in the Control group did not receive a strategy. Both pain intensity and pain tolerance were measured. Results indicated that an equivalent number of high and low susceptible subjects, given a choice of strategy, chose the imagery and distaction strategies. There were no differences in either pain intensity or pain tolerance between high and low susceptible subjects in the Choice conditions. The Choice condition subjects exhibited significant pain reductions from the first to the second trial. No Choice and Control subjects did not reduce pain significantly. In addition, high and low susceptible subjects who chose the imagery strategy did not have higher imagery scores than those subjects who chose the distraction strategy. Subjects in the No Choice condition used fewer coping strategies than subjects in the Choice condition, on the second trial. The implication of these results and directions for future research are discussed.

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Introduction

Pain is often referred to as a complex or puzzling phenomenon. One reason for this description is that there appears to be no simple or direct relationship between the amount of pain experienced and the instigating circumstances, while another reason is that pain is multifaceted (i.e. consisting of sensory as well as psychological components). Until the 1950's, there was little interest, or at least very little research generated by psychologists in the area of pain. Since that time, the amount of clinical and experimental research published by psychologists has become voluminous (see, for example, J. Barber & Adrian, 1982; Barber, 1959; 1963; Hilgard & Hilgard, 1975; Liebeskind & Paul, 1977; Melzack, 1973; Melzack & Wall, 1965, 1982; Sanders, 1979; Sternback, 1974; 1978; Tan, 1982; Turk, Meichenbaum & Genest, 1982; Turner & Chapman, 1982a; 1982b; Weisenberg, 1977). Part of this increase in psychological research related to pain and pain management is due to the knowledge that psychological factors can play such an important role in pain perception, and is due, also, to attempts to include these factors in a theory of pain (e.g. Melzack & Wall, 1965). In addition, millions of individuals live with various types of chronic pain and, for the most part, traditional medical interventions have not been successful in alleviating them (Turk,

et al., 1982; Turner & Chapman, 1982a). While a number of psychological interventions have been found effective in treating chronic pain and intermittent acute pain (such as migraine), these types of therapies, their efficacy, and the rationale for their success have not been investigated thoroughly (see, for example, Weisenberg, 1977; Tan, 1982; Turner & Chapman, 1982a, 1982b). The popularity of hypnosis stems, in part, from the fact that it is one of the oldest and most well-known psychological techniques for pain control (Ellenberger, 1970). However, in spite of its use over the years and its sometimes dramatic success in pain management, the effectiveness of hypnosis, like other psychological interventions, is still not well understood (Turner & Chapman, 1982b). The purpose of this thesis is to address some questions related to use of hypnosis in pain control.

Overview of the Present Experiment

Experimental pain studies have indicated that hypnotic analgesia, or the provision of suggestions to imagine something inconsistent with the perception of pain, often lead to a decrease in reported pain intensity and/or an increase in pain tolerance. However, a number of these studies found that high

susceptible subjects were more likely than low susceptible
subjects to show pain reductions. For example, Hilgard and Morgan
(1975) found that 13 percent of low susceptible subjects could
reduce pain by 33 percent or more following hypnotic analgesia
suggestions, while 67 percent of high susceptible subjects could
reduce pain by this amount. The relationship between
susceptibility and pain reduction occurred even when the
analgesia suggestions were not preceded by hypnotic procedures
(see, for example, Barber & Hahn, 1962; Evans & Paul, 1970).
These results have led some investigators to conclude that high
susceptible subjects are better able to control pain than low
susceptible subjects. However, while high susceptible subjects
may be better able than low susceptible subjects to attenuate
pain with imagery suggestions, it may be premature to conclude
that high susceptible individuals are better at controlling pain
per se. Recent studies have indicated that low susceptible
subjects, given non-imaginal strategies, were as able to reduce
pain as high susceptible subjects given imagery related analgesia
suggestions (see, for example; Spanos, McNeill, Gwynn & Stam, in
press). As such, the role of susceptibility and type of strategy
used for pain attenuation is still not clear.

One purpose of the present study is to investigate in
greater detail the relationship between hypnotic susceptibility
and the type of strategy used for pain attenuation. This study
will compare imagery and distraction strategies in both high and

low susceptible subjects when these subjects are given the choice
of which strategy they want to use. It is important to assess
the effect of individual choice of the type of strategy employed
for pain attenuation before any firm conclusions can be made
regarding the role of susceptibility in pain attenuation. A
further goal of this study is to compare subjects who are given
the choice of which type of strategy they would use for pain
attenuation, with subjects who are not given a choice of
strategy, in order to assess any main effects or interactions
between the susceptibility level of the subject, the type of
strategy used, and whether the subject was provided with a
choice of the strategy to be used.

The next section of this introduction will present a brief
outline of some of the issues related to the complexity of pain,
followed by an overview of the area of hypnosis and hypnotic
analgesia. This section will include a review and critique of the
literature related to the three main variables of concern
(susceptibility, strategy type and choice of strategy), and their
relationship to pain attenuation. The final section of the
introduction will address research hypotheses and methodological
considerations.

The Complexity of Pain

One of the oldest, and best known studies to implicate the role of psychological factors in pain perception was conducted by Beecher (1946) during the Second World War. He investigated 215 men who were seriously wounded in battle and found that only 27% requested pain-relieving medication (morphine). When the soldiers were asked if they were experiencing pain, more than half (57%) said they had no pain or only slight pain, and only 24% rated the pain as bad. This appeared somewhat surprising since 48% had penetrating abdominal wounds. Yet, none of the men were suffering from shock or were insensitive to pain, since inept venipunctures resulted in complaints of pain. Beecher concluded that the pain experienced by these men was blocked by emotional factors. For these men, their physical injury meant that they would be released from an exceedingly dangerous environment to the safety of the hospital (and perhaps even go back home) and this knowledge resulted in great relief.

Beecher's conclusion set a precedent. He hypothesized that pain was not simply a reaction to sensory experiences but was also moderated and affected by cognitive and emotional events. This study and others that followed it, led to an interest in and a reformulation of the nature of pain. This reformulation occurred not only because the importance of psychological factors

in pain perception was now recognized, but also because the
assumed relationship between the extent of tissue damage and the
degree of pain was brought under scrutiny.

Various studies began to elucidate other important
variables. For example, Melzack and Scott (1957) found that an
animal's learning history affected its response to pain. In a
review of the literature on pain, Barber (1959) noted a number of
phenomena that the then-current specificity and pattern theories
of pain could not explain adequately. More evidence became
available to support the contention that tissue damage was
neither a necessary nor a sufficient condition for the experience
of pain. Surgical studies did not support the contention that
there were specific pain fibres, pathways, or a specific pain
centre in the brain. It was noted that cutting the spinothalamic
tract often relieved pain for only temporary periods of time, and
prefrontal lobotomy did not invariably lead to pain relief
(Barber, 1959). Interestingly, it was demonstrated that
prefrontal lobotomy often mitigated the discomfort-suffering
component of pain but not the sensation or perception of pain.
Similarly, it was found that narcotics, such as morphine, did not
alter the sensation of pain, but rather appeared to alter the
emotional reaction to it. In addition, similar results were
found for individuals who were congenitally insensitive to pain.
That is, these individuals had no difficulty differentiating a
painful stimulus from other stimuli, were able to localize the

painful stimuli, and exhibited a pain threshold that was close to
normal. In all of the above three examples (i.e., prefrontal
lobotomy, narcotics, and congenital insensitivity), the
individuals involved "felt" the sensation of pain, however, they
were not "bothered" by the sensation (Barber, 1959). The studies
reviewed by Barber indicated that pain has various components and
that one component could be disrupted (e.g. the discomfort-
suffering component) without altering other components, such as
the sensation of pain (i.e. the individual's report that the
stimulus was "painful") (Barber, 1959).

By the 1960's, the idea that pain is a complex psychological
experience affected by both cognitive and emotional factors was
becoming more accepted. The inability of the specificity and
pattern theories to account for the new observations led to the
development of the gate control theory of pain (Melzack & Wall,
1965). While incorporating some aspects of both the specificity
and pattern theories, Melzack and Wall proposed that there is a
neurological gate in the substantia gelatinosa that modulates
sensory patterns before they reach the central transmission cells
in the dorsal horn. Various factors can open and close the gate.
A new and important aspect of this theory is the concept of a
central control trigger, which allows psychological variables,
such as prior experience, emotion and attention, to influence the
gate through stimulation of descending efferent fibres (Melzack &
Wall, 1965). Although there were a large number of observations

prior to this theoretical formulation which suggested that psychological factors played a role in pain perception, this was the first neurological theory to incorporate these factors. The gate control theory has not been accepted without criticism, and the exact brain mechanisms involved in "gating" are not well understood (Iggo, 1972; Liebeskind & Paul, 1977; Weisenberg, 1977). Nevertheless, no other theory has yet been developed to account for such diverse findings as: phantom limb pain, the alteration of the pain response by analgesics, placebos and hypnosis, the persistence of pain after healing and surgery, and the role of cognition and emotion in pain perception.

Given the complexity of pain, it becomes a difficult term to define adequately (Weisenberg, 1977). As has been discussed, pain is multidimensional, incorporating sensory as well as psychological variables or components (Barber, 1959; 1963; Melzack, 1973; Turk, et al, 1982). In an attempt to incorporate these factors, the International Association for the Study of Pain provides the following definition:

"An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage." (International Association for the Study of Pain, Subcommittee on Taxonomy, 1979, p. 250).

By the inclusion of the last term ("or described in terms of such damage"), this definition becomes broad enough to incorporate various types of chronic and acute pain in which tissue damage is not a primary concern, for example, migraine and other types of headaches, phantom limb pain, labour contractions, etc.

Hypnosis and Pain Control

There are a number of different perspectives regarding hypnosis, and due to these different conceptualizations, hypnosis, like pain, becomes difficult to define adequately (Sheehan & Perry, 1977). Nevertheless, there are some basic points of agreement among all investigators in the way hypnosis is conceptualized. For example, White (1941) described hypnosis as "goal-directed striving"; Arnold (1946) as "intense imagining"; Shor (1959) as the disappearance of a "generalized reality orientation"; Sarbin and Coe (1972) described hypnosis as "believed-in imaginings", and J. Hilgard (1970/79) called it "imaginative involvement". These descriptions dispel at least two of the most common myths about hypnosis. For the most part,

the terms imply that the hypnotized person is not a passive

individual or an automaton but rather is an active participant in

the experience (see, for example: Hilgard & Hilgard, 1975; Orne,

1959; Sarbin & Coe, 1972; Spanos & D'Eon, 1980; Spanos &

Radtke-Bodorik, 1980). The hypnotized person is not asleep, as

the metaphor hypnosis implies, but is selectively aware of what

is going on. In addition, the hypnotized person is not at the

whim of the hypnotist, and will not follow the suggestions of the

hypnotist without evaluation (see, for example, Barber, 1961;

Orne, 1972; Perry, 1979). Similarly, the hypnotized person

contributes to or creates the experience through his or her

absorption in the suggestion-related imaginings (Tellegen &

Atkinson, 1974). It is also generally accepted that hypnosis

utilizes a wide variety of cognitive variables and/or skills, for

example, willingness to co-operate, imagery and absorption

ability, motivation, instructional factors, etc. (Perry, 1983;

Spanos & Barber, 1974).

Thus, it appears that there is a general consensus that

hypnosis is a situation in which an individual suspends critical

judgement, without relinquishing it completely, and becomes

absorbed in thoughts and imaginings that are guided by the

suggestions of a hypnotist (Sarbin & Coe, 1972; Shor, 1959). The

similarity between the cognitive processes underlying hypnosis

and those underlying other cognitve behaviour therapies has been
evaluated and outlined (Spanos & Barber, 1976; Spanos, De Moor &
Barber, 1973; Weitzenhoffer, 1972). Given the upsurge of
interest in cognitive psychology and cognitive behaviour therapy
in the last decade (Wilson, 1978) and some similarity of hypnosis
to these techniques, it is not surprising that hypnosis is
commonly viewed as one type of cognitive intervention (Turk, et
al., 1983; Turner & Chapman, 1982b; Wadden & Anderton, 1982). In
fact, this conceptualization is not new. More than 25 years ago,
Barber (1958) titled one of his first papers, "Hypnosis as
Perceptual-Cognitive Restructuring", a concise way of describing
the current consensus within which hypnosis can be viewed.

1. Characteristics of Analgesia Suggestions

Hypnotic analgesia typically refers to pain reducing
suggestions that follow a hypnotic induction procedure, while
analgesia suggestions, or suggestion strategies, refer to the
same types of pain reducing suggestions without an induction.
Many different kinds of suggestion strategies, including hypnotic
analgesia, have been found effective in reducing pain in both
experimental and clinical settings. Depending on the study, and
on the dependent measures used, both hypnotic analgesia and other

types of suggestions have been found to increase either pain

threshold (i.e. the point at which the subject reports the

stimulus as "painful"), and/or increase pain tolerance (i.e. the

point at which the subject is no longer willing to accept further

stimulation), and/or reduce the magnitude of reported pain as

compared to a baseline trial (see, for example: Tan, 1982; Turk,

et al., 1983; Wadden & Anderton, 1982; Weisenberg, 1977). That

is, most studies first assess subjects' response to a pain

stimulus on a baseline trial, then introduce a treatment

variable, such as an analgesia suggestion, and then re-test

subjects on a second trial.

Some clinical case reports appear to indicate that total

pain relief is, or can be, provided by hypnotic analgesia (see,

for example, J. Barber, 1977; Crasilneck & Hall, 1973; Hilgard &

Hilgard, 1975; Rausch, 1980). However, for the most part, both

experimental and clinical studies indicate that hypnotic

analgesia usually results in pain attenuation, rather than in the

elimination of the sensation of pain altogether (see, for

example, Crasilneck & Hall, 1973; Hilgard & Hilgard, 1975;

.Melzack & Perry, 1975; Sachs, Feuerstein & Vitale, 1977). In

spite of the relaxation associated with hypnosis, it is not the

hypnotic situation per se, i.e. being hypnotized, which results

in pain attenuation but rather the presentation of pain reducing

suggestions (Crasilneck & Hall, 1973; Hilgard, 1971). [The extent

to which hypnotic induction procedures facilitate a subject's

response to an analgesia suggestion will be evaluated in the next section.]

Three types of strategies are used in hypnotic contexts to facilitate hypnotic analgesia (Hilgard & Hilgard, 1975). One is direct suggestions for pain reduction, another is to attempt to alter the experience of pain itself, and a third is to direct attention away from the experience of pain. While the latter two strategies may or may not involve imagery, imagery is typically used. Analgesia suggestions that are designed to alter the experience of pain itself often request subjects to imagine something inconsistent with the experience of pain. Examples of such suggestions are: imagining that a hand about to undergo a painful procedure is numb and insensitive like a piece of rubber; imagining that a local anaesthetic has been injected in the area; imagining that there are switches in the brain that can be turned off to make the area insensitive; or that the pain is in a smaller less vulnerable area (see, for example, J. Barber, 1980; Barber & Calverly, 1969; Barber & Hahn, 1962; Evans & Paul, 1970; Hilgard & Hilgard, 1975; Spanos, Radtke-Bodorik, Ferguson & Jones, 1979). Examples of suggestions designed to take the subject's attention away from a painful situation include: imagining a pleasant beach scene; developing a pleasant dream, reliving a happy past experience; or thinking about playing a favourite sport (see, for example, Hilgard & Hilgard, 1975).

It is not surprising that most hypnotic analgesia suggestions involve imagery and/or imagination. In hypnotic contexts generally, imagery/imagination is used to facilitate response to suggestions, and analgesia suggestions are no exception (Hilgard & Hilgard, 1975; Sheehan, 1979). The use of imagination in hypnotic suggestions is likely to occur because, from the time of the 1784 Commissions of Inquiry into the nature of animal magnetism, hypnosis and imagination have been found to be interrelated (Sheehan, 1979; Sheehan & Perry, 1976). It is also important to note that high susceptible subjects generally do well on paper and pencil measures of imagery, while poor imagers generally obtain lower susceptibility scores than vivid imagers (see, for example, Sheehan, 1979; Perry, 1973; Sutcliffe, Perry & Sheehan, 1970). Whether it is imagery per se, or the ability of the subject to become absorbed in the suggested imagery strategy is not clear. This is particularly difficult to assess because there is also a relationship between absorption and hypnotic susceptibility (see, for example, Tellegen & Atkinson, 1974). Or, indeed, it may be that some combination of susceptibility level, imagery ability and the ability to become absorbed is necessary to respond positively to hypnotic analgesia suggestions (Chaves & Barber, 1974; Chaves & Doney, 1976; Chaves & Scott, 1979; Spanos, Horton & Chaves, 1975; Spanos, et al., 1979).

In an attempt to understand the reduced pain reported by

hypnotic subjects following suggestions for analgesia,
investigators have examined three different, but interrelated,
questions. The first question is, what role does the hypnotic
induction play in facilitating a subject's response to an
analgesia suggestion? Another question is, to what extent does
the susceptibility level of the subject affect his/her response?
With the variety of cognitive strategies and techniques available
to ameliorate pain, are certain types of strategies more
effective than others? Does the type of strategy used interact
with the susceptibility level of the subject? The following
sections will address each of these four questions. However, a
number of studies to be cited address two or more of the above
questions at the same time. As such, these studies will be
described in the sections to which they most pertain, although
they will be referenced in other sections as well.

2.   The Role of a Hypnotic Induction Procedure

Hypnotic induction procedures usually include the following
components: 1) defining the situation as hypnosis; 2) removing
fears and misconceptions; 3) securing cooperation; 4) suggesting
or requesting that the subject close his/her eyes; and 5)
suggesting relaxation, and/or sleep, and/or hypnosis (Barber &
De Moor, 1972). Following the induction procedure, the subject is
usually given a series of suggestions, either to assess his/her
response to these items and/or to expedite some clinical goal.

The usefulness of the typical hypnotic induction procedure in facilitating response to suggestions, in general, has been questioned (see, for example, Banyai & Hilgard, 1976; Barber & De Moor, 1972; Hilgard, 1971; Lazarus, 1973). [However, this does not imply that all of the above-noted investigators think that hypnosis, as defined separately from a hypnotic induction procedure, does not facilitate response to suggestions.] Along a similar vein, a number of studies have assessed the merits of a hypnotic induction procedure in facilitating the effectiveness of analgesia suggestions.

Barber and Hahn (1962) conducted one of the first studies to compare a hypnotic analgesia suggestion with waking-imagined analgesia (i.e. suggested analgesia). These researchers assessed the response of four groups of subjects to cold pressor. These subjects had previously scored in the upper quartile of the Barber Suggestibility Scale. One group was provided with a hypnotic induction procedure followed by a direct analgesia suggestion that the hand to be immersed was numb and insensitive. Another group of subjects, who were not given a hypnotic induction, were asked to imagine a pleasant situation and to try to think of the water as pleasant. There were two control groups; a non-instructed group that received the cold pressor test without suggestions, and a group that was exposed to water at room temperature. No differences were found between the hypnotic analgesia and the suggested analgesia groups in terms of

subjective pain reports (taken retrospectively). In addition,
the uninstructed group reported significantly more discomfort and
pain then the hypnotic analgesia or the suggested analgesia
groups.

One criticism that was levied against this study was due to
the type of instructions that the subjects in the suggested
analgesia group received (Hilgard, 1971). Subjects in this group
were given instructions that were designed to motivate the
subjects, but one section stated that failure to follow the
instructions would "ruin this part of the experiment" (Barber &
Hahn, 1962, p. 412). It has been suggested that this type of
coercive instructional demand can prompt subjects to falsify
their reports (Hilgard, 1971).

Barber and Calverley (1969) examined the effects of a
hypnotic induction procedure, suggestions of analgesia, and a
distraction task on subjective and physiological responses to
pressure pain. Subjects were exposed to the apparatus for one
minute, both during a baseline trial and during the treatment
trial. Results indicated that a hypnotic induction procedure did
not facilitate response to the analgesia suggestions. This study
is difficult to evaluate, in terms of the above-noted criticism,
because the instructions given to the subjects were not
published.

Spanos, Barber and Lang (1974) investigated the effect of
the presence or absence of a hypnotic induction procedure, the
presence or absence of analgesia suggestions, and the presence or
absence of demands for honesty (Bowers, 1967) on subjects'
response to pressure pain. The analgesia suggestion used was to
imagine the hand as numb and insensitive. Results indicated that
the suggestions for analgesia were equally effective for hypnotic
and non-hypnotic subjects. In addition, the demands for honesty
did not affect subjects' pain reports. While the type of
instructions used in the Barber and Calverley (1969) study are
not clear, the study by Spanos, Barber and Lang (1974) found that
a hypnotic induction procedure did not facilitate response to an
analgesia suggestion, even when demands for honesty were used in
the pain assessment.

Three studies have been reported that found greater pain
attenuation with suggestions that followed a hypnotic induction
procedure as compared to suggestions that did not, in high
susceptible subjects (Hilgard, Macdonald, Morgan & Johnson, 1978;
Spanos & Hewitt, 1980; Stacher, Schuster, Bauer, Lahoda & Schulze,
1975). However, all three of these studies used within-subjects
designs (i.e. subjects were tested in both the hypnotic analgesia
and the suggested analgesia conditions). A study conducted by
Stam and Spanos (1980) indicated that the superiority of hypnotic
analgesia to suggested analgesia can occur as a carry-over effect
that results when the same subjects are tested under both

conditions.

A number of other studies, using between-subjects designs, have supported the finding that hypnotic induction procedures do not facilitate response to analgesia suggestions in experimental settings (Evans & Paul, 1970; Spanos, et al., 1979; Spanos, Kennedy & Gwynn, 1983). Taken together, these results indicate that it is the analgesia suggestions themselves which are important in pain attenuation, not the hypnotic induction procedure (Hilgard, 1971).

3. The Role of Hypnotic Susceptibility

Hypnotic susceptibility refers to the degree to which an individual is able, and willing, to respond to hypnotic suggestions. The degree of susceptibility is usually assessed by one of a number of standardized scales which contain a series of test suggestions, on which an individual is scored as either passing or failing each test suggestion. Hypnotic susceptibility can be viewed either as a trait or as a skill (Perry, 1977). For the most part, a person's degree of hypnotic susceptibility remains stable over time, and is not readily modifiable (Perry, 1977).

In experimental settings, susceptibility is often found to be a moderating and predictive variable. Thus, for the most part, experimentalists emphasize the importance of assessing susceptibility and stress the relationship between susceptibility

and response to suggestion (see, for example, Bowers & Kelly,
1979; Hilgard, 1965; Mott, 1979; Orne & O'Connell, 1967). On the
other hand, some clinicans state that most individuals are
sufficiently susceptible to benefit from hypnosis
therapeutically, and that the assessment of susceptibility in
clinical contexts, presents too many therapeutic drawbacks.
Compared to experimentalists, clinicians are more divided on the
issue of the importance of susceptibility, with some saying
susceptibility is important and others saying it is not (see, for
example, J. Barber, 1977; 1980; Frankel, Apfel, Kelly, Benson,
Quinn, Newmark & Malmaud, 1979; Perry, Gelfand, & Marcovitch,
1979; Perry & Mullen, 1975). Thus, both the relevance of
hypnotic susceptibility, and the importance of assessing this
factor are controversial. To some extent, these issues arise
because the demands and the goals of experimental and clinical
situations are very different (Orne & O'Connell, 1967).

A number of studies have evaluated the role of hypnotic
susceptibility in relation to the subject's response to hypnotic
analgesia suggestions, and three of the more pertinent studies
will be described. McGlashan, Evans and Orne (1969) compared
high and low susceptible subjects in their response to an
ischemic pain stimulus. Subjects were tested in three sessions;
(1) a baseline session, (2) a hypnotic analgesia session, and (3)
a "placebo" analgesia session which consisted of the
administration of a placebo described to the subjects as a

"powerful analgesic drug". Pain threshold and pain tolerance were measured, with subjects being asked to rate the intensity of pain at tolerance on a 10-point scale. Results indicated that low susceptible subjects reported equivalent pain reductions on both the hypnotic analgesia and the placebo trials, as compared to baseline trials. High susceptible subjects, while showing the same pain reductions as low susceptible subjects on the placebo trial, reported significantly less pain on the trial with hypnotic analgesia, as compared to the trial with placebo. These researchers concluded that the pain reductions found with hypnotic analgesia are greater than those due to placebo effects alone, and that high susceptible subjects are better able to reduce pain than low susceptible subjects following the administration of an anagesia suggestion.

Evans and Paul (1970) examined the effects of suggested analgesia and a hypnotic induction procedure on subjects' response to a cold pressor pain stimulus. Subjects were equated for their level of susceptibility [as assessed by a modified version of the Harvard Group Scale of Hypnotic Susceptibility (Shor & Orne, 1962)] and assigned to one of four groups: 1) hypnotic induction alone; 2) hypnotic induction plus analgesia suggestion; 3) self-relaxation alone; or 4) self-relaxation plus analgesia suggestion. The analgesia suggestion was that the arm and hand would be numb and that the subject would be comfortable and relaxed. The two groups that received the analgesia

suggestion on the second trial reported reductions in pain as
compared to the baseline trial, while the group receiving the
hypnotic induction procedure alone did not change. However, in
both the groups reporting pain reductions on the second trial
(groups 2 and 4), the degree of reduction was related to hypnotic
susceptibility. That is, high susceptible subjects were more
likely than low susceptible subjects to reduce pain, regardless
of whether or not hypnosis preceded the analgesia suggestion.

Spanos, Radtke-Bodorik, Ferguson and Jones (1979) further
investigated the role of hypnotic susceptibility and response to
analgesia suggestions. These investigators assigned eight high,
eight medium, and eight low susceptible subjects to one of four
groups: 1) hypnotic induction alone; 2) hypnotic induction plus
analgesia suggestion; 3) analgesia suggestion alone; or 4)
control, i.e. no hypnotic induction, no suggestion. The analgesia
suggestion requested subjects to imagine that their hand and arm
were numb and insensitive like a piece of rubber and they were
asked to report the amount of pain they felt in response to a
cold pressor stimulus according to a 10-point scale. Results
indicated that while pain reductions were not related to the
administration of a hypnotic induction procedure, they were
related both to the provision of an analgesia suggestion and to
hypnotic susceptibility. That is, subjects who had been
administered the analgesia suggestion (groups 2 and 3) reported
less pain on the second trial than on the baseline trial. High

and medium susceptible subjects, regardless of which group they were in, reported significant reductions in pain from baseline to treatment trials, while low susceptible subjects did not. In addition, the types of cognitive activities the subjects engaged in during the treatment trial, were also assessed. These cognitions were dichotomized into coping or catastrophizing cognitions. Analyses of these reports indicated that high susceptible subjects used more strategies (and reported less pain) than low susceptible subjects. Subjects administered suggestions for analgesia used more coping strategies than subjects not administered a suggestion. However, the most important finding related to this cognitive assessment was not that coping strategies led to pain decrements, but rather that catastrophizing cognitions most often led to pain increments.

All of the above studies found that high susceptible subjects showed greater pain reductions following an analgesia suggestion than low susceptible subjects, results that have been supported by other investigators as well (Hilgard & Hilgard, 1975; Knox, Gekoski, Shum & McLaughlin, 1981; Spanos, Stam & Brazil; 1981). In addition, the relationship between susceptibility and response to analgesia suggestions is supported by clinical studies (Andreychuk & Skriver, 1975; Cedercreutz, Lahteenmaki & Tulikoura, 1976; Gottfredson, 1973; Stam, McGrath & Brooke, 1983). For example, Stam, et al. (1983) assigned 61

patients suffering from temporomandibular joint dysfunction and
pain syndrome, to one of three groups, (1) hypnosis and cognitive
coping skills, (2) relaxation and cognitive coping skills, or (3)
a control group. Results indicated that hypnotic susceptibility
was significantly correlated with reductions in reported pain in
both treatment groups (groups 1 and 2) and that these groups did
not differ from one another. It must be reiterated, however, that
while there may be a relationship between susceptibility and pain
attenuation, some clinicians think that most individuals are
sufficiently susceptible to benefit from hypnotic analgesia
suggestions (J. Barber, 1977; 1980).

In summary, while the study by McGlashan, et al. (1969) did
not assess analgesia suggestions without a hypnotic induction
procedure, the studies by Evans and Paul (1970) and by Spanos, et
al. (1979) provide further support for the contention that the
hypnotic induction procedure does not facilitate response to
analgesia suggestions in either high or low susceptible subjects.
In addition, both experimental and clinical studies indicate that
hypnotic susceptibility is a good predictor of responsiveness to
suggestions for analgesia, even when the suggestions are not
preceded by a hypnotic induction procedure.

4. A Taxonomy and Evaluation of Pain Reducing Strategies

In order to gain an appreciation of the similarity of hypnotic analgesia to other types of pain reducing strategies, it is useful to examine how these latter strategies have been classified. A number of different taxonomies have been developed to differentiate various types of pain reducing strategies (Chaves & Brown, 1978; Scott & Barber, 1977; Spanos, et al., 1979; Turk, 1975). For the most part, these taxonomies were developed to classify self-generated pain reducing strategies; however, they have also been used for the classification of suggested strategies, such as hypnotic analgesia (Turk, et al., 1983).

First, pain reducing strategies can be divided into those that are overt, and those that are covert (Wack & Turk, 1981). Overt strategies would include such activities as rubbing the afflicted area or taking medication, etc., while covert strategies refer to various cognitive activities that have been found to result in pain attenuation. In addition to these strategies, there are also strategies that are designed to alter the appraisal of the painful situation itself (Turk, et al., 1983). Thus, there are studies that investigate the effect of preparatory information on pain perception (see, for example, Leventhal, Brown, Shacham & Engquist, 1979; Staub & Kellettt, 1973;

Thompson, 1981) or the effect of having the subject reinterpret
or relabel the sensation as something other than pain (see, for
example, Nisbett & Schachter, 1966; Thompson, 1981).

However, of main interest here are those cognitive
activities, whether suggested or not, that have been found
effective in pain attenuation. Turk (1975) specifies six
categories of strategies that divert attention from pain:

1) Imaginative inattention: for example, imagining an
experience incompatible with pain, such as lying on a beach.

2) Imaginative transformation of pain: for example,
imagining that the area where the pain is experienced is numb or
insensitive.

3) Imaginative transformation of context: for example, being
aware of the pain, but imagining that it is in a different
context, such as being wounded in battle but having to continue
in spite of the pain to save a comrade.

4) Focusing attention on the physical characteristics of the
environment: for example, counting the number of hooks on a
coatrack.

5) Mental distractions: for example, making plans for a
party without the production of vivid mental pictures.

6) Somatization: for example, being aware of the pain but
dissociating that area of the body from oneself.

It is important to note that the above categories of
cognitions, whether coping or non-coping, can be divided into

those that employ imagery and those that do not. As has been
pointed out, hypnotic analgesia often uses imagery to facilitate
suggestions. Three of the above categories, i.e., imaginative
inattention, imaginative transformation of pain, and
somatization, are common examples of hypnotic analgesia
suggestions. Thus, it is clear that the above-noted taxonomies
can be used to classify the various examples of hypnotic analgesia
already described.

Not all cognitive activity serves the purpose of attenuating
pain. Chaves & Brown (1978) classify three types of cognitive
activity which have been found to exacerbate the experience of
pain: negative self-statements, catastrophizing thoughts and
catastrophizing images. Following these taxonomies, Spanos, et
al., (1979) developed four broad categories for classifying
cognitive activity: 1) Distraction, which includes attention
diversion and coping self-statements; 2) Coping Imagery, which
includes imaginative inattention, imaginative transformation of
pain and imaginative transformation of context; 3) Relaxation,
which includes somatization and dissociation; and, 4)
Catastrophizing, which includes negative self-statements,
catastrophizing thoughts and catastrophizing images.

Hypnotic analgesia suggestions, as well as other types of
suggestion strategies, sometimes combine more than one kind of
strategy. For example, a subject may be told to imagine that the
hand and arm are numb and insensitive, in addition to imagining

that the arm is dissociated (see, for example, J. Barber & Gitelson, 1980; Hilgard & Hilgard, 1975). Not surprisingly, it has been found that even without suggestions, some subjects generate their own cognitive pain attenuating strategies in aversive situations (see, for example, Barber & Cooper, 1972; Chaves & Brown, 1978; Chaves & Doney, 1976; Copp, 1974). While it has often been assumed that subjects employ the pain attenuating strategies that have been suggested, this is not always the case. Even though a subject has been given a suggestion strategy, s/he may change the suggestion or engage in non-coping cognitions, such as "catastrophizing", that are likely to exacerbate the experience of pain (see, for example, Barber & Cooper, 1972; Chaves & Brown, 1978; Scott, 1978). Thus, while the content of a suggested strategy may be known, whether or not the subject a) employs the suggested strategy, or b) uses some other strategy, or c) engages in non-coping cognitions, is not known unless it is assessed by the investigator (Chaves & Brown, 1978; Spanos, Brown, Jones & Horner, 1981, Turk, et al., 1983).

There are a number of experimental studies that examine cognitive strategies for pain control, and there have been two recent evaluations of these studies (Tan, 1982; Turk, et al., 1983). Using the taxonomy developed by Turk (1975), Turk, Meichenbaum and Genest (1983) reviewed the treatment studies that evaluated the relative efficacy of a number of different types of cognitive strategies on subjects' response to various pain

stimuli. These investigators concluded that the cumulative

picture is that of equivocal results. That is, no particular

cognitive control strategy was uniformly successful. However

there was some indication that imagery strategies are more

effective than strategies with no obvious imagery component. As

has been noted, individuals often use their own cognitive coping

strategies in aversive situations, and these investigators point

out that these strategies may be as effective or more effective

than the one that the investigator suggests. Tan (1982)

supported the above conclusions in his review of the literature

on cognitive and cognitive-behavioural methods for pain control.

While most investigators have not attempted to account for the

underlying mechanism responsible for their findings, Tan (1982)

points out that a number of recent investigators have

incorporated the concept of self-efficacy in explaining their

results (Bandura, 1977). The importance of this concept in

understanding the effectiveness of various pain attenuating

strategies has been supported by other investigators as well,

and Turk, et al. (1982), concluded that it may not be a specific

type of strategy, but rather the subjects' attitudes and

confidence about these strategies which lead to pain attenuation.

.5. Hypnotic Susceptibility and Response to Imagery

and Distraction Strategies

This section will discuss those experimental studies (not already cited) which examine the relationship between hypnotic susceptibility, analgesia suggestions and other types of pain control strategies, on a subject's response to noxious stimulation. Few experimental studies have attempted to examine and explain the response to analgesia suggestions of low susceptible subjects. Approximately 13 percent of low susceptible subjects are able to reduce pain by 33 percent or more following hypnotic analgesia suggestions, while 67 percent of high susceptible subjects can do so (Hilgard & Morgan, 1975). This might be accounted for by the observation that some low susceptible subjects have imagery that is as vivid as that of high susceptible subjects (Sutcliffe, et al., 1970; Perry, 1973). Nevertheless, it has been assumed that low susceptible subjects typically do not respond to these suggestions because they do not have the skills and/or abilities necessary to reduce pain. However, a number of recent studies have investigated the response of low susceptible subjects to pain control strategies, other than analgesia suggestions, to determine whether these subjects are able to reduce pain to the same degree as high susceptible subjects who are given analgesia suggestions. For

example, it has already been pointed out that most analgesia

suggestions involve imagery, and imagery ability tends to be

correlated with hypnotic susceptibility. Thus, it has been

suggested that the increased responsiveness of high susceptible

subjects to analgesia suggestions is due to the skill these

subjects have in the use of the strategy, rather than to any

specific ability of high susceptible subjects to reduce pain

(Spanos, et al., in press; Spanos, et al., 1981).

Spanos, Stam and Brazil (1981) examined the effect of an

analgesia suggestion, a non-imaginal distraction task, and control

instructions on the response of high and low susceptible subjects

to a cold pressor apparatus. These researchers hypothesized that

low susceptible subjects in the distraction group would show pain

decrements equivalent to high susceptible subjects who received

the analgesia suggestions. However, results indicated that the

non-imaginal distraction task was not effective in reducing pain

in either high or low susceptible subjects. In addition, the

pain ratings indicated that the analgesia suggestion was

effective in reducing pain, but only for high susceptible

subjects.

A similar study, but one that obtained somewhat different

results, was conducted by Farthing, Venturino and Brown (1982).

High and low susceptible subjects were assigned to one of four

conditions: analgesia suggestion alone, verbal distraction task

alone, a combination of suggestion plus distraction, or a control

condition. The verbal distraction task was a list of words that subjects were instructed to remember, while the analgesia suggestion requested subjects to imagine their hand as numb and insensitive like a piece of rubber. Results indicated that high susceptible subjects reduced pain from a baseline trial to the second trial in all three treatment conditions. Low susceptible subjects were able to reduce pain to the same extent as high susceptible subjects, but only with the distraction strategy. Low susceptible subjects, given the combined treatment, were no more able to reduce pain than control subjects. These results are interesting, in light of the finding that low susceptible subjects were able to use the distraction strategy effectively when it was provided alone. It was hypothesized that when low susceptible subjects attempt to divide their attention between the ineffective analgesia suggestion and the normally effective distraction task, the effectiveness of the distraction task in reducing pain is reduced. These investigators concluded that "only high hypnotizables can successfully divert attention inwardly in order to control pain" (Farthing, et al., 1982, p. 2).

A study by Spanos, McNeil, Gwynn and Stam (in press) basically replicated the study by Spanos, et al. (1981); however, another distraction task was used (shadowing words as opposed to tracking a moving target). Results of this study support the results obtained by Farthing, et al. (1982). That is, high

susceptible subjects reduced pain from a baseline trial to the second trial in both the analgesia and the distraction conditions. Low susceptible subjects exhibited the same pain reductions as high susceptible subjects in the distraction condition (but not the analgesia condition). These investigators concluded that low susceptible subjects are as proficient as high susceptible subjects in reducing pain when they are able to employ strategies that suit their abilities.

A study by Spanos, Kennedy and Gwynn (1983) evaluated the role of susceptibility and various pain control strategies further. High, medium and low susceptible subjects were assigned to one of three treatments: 1) brief instructions to try and reduce pain; 2) the same suggestion preceded by a hypnotic induction procedure; and 3) a control condition. The suggestion strategy requested subjects to do anything they could to reduce pain. Results indicated that susceptibility was correlated with reductions in reported pain in the group that received the suggestion preceded by the hypnotic induction procedure. However, in the instruction alone treatment, there was no relationship between susceptibility and pain reduction, and subjects at all susceptibility levels reduced pain as much as high susceptible subjects (and significantly more than controls).

This study indicated that while low susceptible subjects were as able as high susceptible subjects to reduce pain in one condition, the addition of the hypnotic induction procedure to

the same suggestion strategy resulted in 80% of the low

susceptible subjects in that group failing to report any pain

reduction. Obviously the low susceptible subjects did not lack

the ability to reduce pain in this situation; rather, it appears

that the provision of a hypnotic induction procedure inhibited

the low susceptible subjects from engaging in the pain reducing

strategy. The investigators proposed two hypotheses to account

for this finding. The first possibility is that low susceptible

subjects may have negative expectancies concerning their success

at hypnotic responding, or negative attitudes towards hypnosis

and, accordingly, may have failed to exercise the pain reducing

strategies because they thought they would be unable to do so.

Alternately, these subjects may have purposely failed to initiate

such strategies because they construed themselves as

independent-minded people who could not be manipulated easily.

The implication of these results is that, for low susceptible

subjects, defining the situation as hypnosis tends to inhibit

their ability or the use of their ability to control pain.

Two studies have compared hypnotic analgesia and stress

inoculation training on a subject's response to cold pressor.

Girodo and Wood (1979) assigned medium-high and high susceptible

subjects to one of seven groups following a baseline pain

assessment. Four groups of subjects received self-statement

training (part of this training involved visualizing a person

coping in a stressful situation), and then received either: 1) a

stress inoculation training rationale while hypnotized; 2) the rationale without hypnosis; 3) a hypnotic induction procedure only; or 4) instructions to repeat the self-statements before the second trial. Three additional instruction groups served as comparison groups: 1) task-motivation instruction; 2) hypnotic induction and task-motivation instruction; or 3) no instruction control group. Groups 2 and 3 (i.e. the subjects provided with the rationale without hypnosis and those provided with a hypnotic induction procedure) increased their pain thresholds from the baseline to the second trial, results which the investigators concluded were likely due to the positive expectancies created in both conditions. However, there was no difference among the four treatment groups on tolerance, pain rating at tolerance, maximum pain intensity, or average pain intensity from the baseline to the second trial. In addition, there was no correlation between susceptibility and response to any of the treatments. It was noted, however, that because only medium-high and high susceptible subjects were assessed, the lack of a relationship may be due to the truncated range of scores (Runyon & Haber, 1980).

Spanos, Ollerhead and Gwynn (1983) assigned subjects to one of four treatments: 1) hypnotic analgesia; 2) brief instructions to do whatever you can to reduce pain; 3) stress inoculation; or 4) no instruction control group. Overall, all instructional treatments were found to be equally effective in reducing

subjective pain reports as compared to baseline pain reports.
While pretested hypnotic susceptibility correlated with the
degree of pain reduction reported by subjects in the hypnotic
analgesia treatment, susceptibility did not correlate with pain
reductions in either of the other two treatment groups.

These studies, and those presented in the previous section,
indicate that analgesia suggestions are more effective for high
as compared to low susceptible subjects in attenuating pain
(whether or not they are preceded by a hypnotic induction
procedure). However, these studies indicate that distraction
strategies, strategies which request subjects to do whatever they
can to reduce pain, and stress inoculation procedures result in
low susceptible subjects exhibiting the same degree of pain
reduction as high susceptible subjects given analgesia
suggestions.

Research Hypnotheses and Methodological Considerations

In summary, a number of experimental pain studies have
indicated that hypnotic analgesia, or the provision of
suggestions to imagine something inconsistent with the perception
of pain, often leads to a decrease in reported pain intensity
and/or an increase in pain tolerance or threshold. Research by

Barber and Hahn (1962), Evans and Paul (1970), and by Spanos and
his colleagues (Spanos, et al., 1974; Spanos, Kennedy & Gwynn,
1983; Spanos, et al., 1979; Stam & Spanos, 1980) indicated that
equivalent decrements in pain were produced regardless of whether
the suggestions were preceded by a hypnotic induction. However,
some of these studies found that the degree of pain reduction was
correlated with the subject's pre-test level of hypnotic
susceptibility (Barber & Hahn, 1962; Evans & Paul, 1970; Hilgard
& Hilgard, 1975; Spanos, et al., 1979; Spanos, et al., 1981).
That is, high susceptible subjects were more likely than low
susceptible subjects to show pain reductions. The relationship
between susceptibility and pain reduction has been reported even
when the analgesia suggestions were not preceded by hypnotic
procedures. These results have led some investigators to
conclude that high susceptible subjects are better able to
control pain than low susceptible subjects. It is important to
note that the most commonly employed suggestions for pain
attenuation in these studies involved imagery, and that
significant correlations between hypnotic susceptibility and
imagery ability have often been demonstrated (Sheehan, 1979).
Thus, while high susceptible subjects may be better able than low
susceptible subjects to attenuate pain with imagery suggestions,
it may be premature to conclude that high susceptible individuals
are better at controlling pain per se (Spanos, McNeill, Gwynn &
Stam, in press). While some investigators have indicated that

non-imaginal distraction tasks are not as effective as analgesia
suggestions in controlling pain (Hilgard, 1977; Spanos, Stam &
Brazil, 1981), recent studies have found that low susceptible
subjects, given non-imaginal strategies, reduced pain to the same
degree as high susceptible subjects given imagery related
analgesia suggestions (Farthing, Venturino & Brown, 1982; Spanos,
Kennedy & Gwynn, 1983; Spanos, et al., in press; Spanos,
Ollerhead & Gwynn; 1983). Nevertheless, the role of
susceptibility and type of strategy used for pain attenuation is
still not clear.

One purpose of the present study is to investigate in
greater detail the relationship between hypnotic susceptibility
and the type of strategy used for pain attenuation. A few
studies have attempted to incorporate individual abilities, or
preferences, for certain types of pain reducing strategies
through various experimental manipulations. For example,
subjects have been provided with multiple cognitive strategies
(Scott & Barber, 1977), given the choice of different types of
imagery strategies (Worthington, 1978), or requested to do
whatever they could in order to reduce pain (Spanos, Ollerhead &
Gwynn, 1983). However, none of these studies gave high and low
susceptible subjects the choice of either an imagery or a
non-imagery strategy for pain attenuation. .The present study is
designed to compare imagery and distraction strategies in both
high and low susceptible subjects when these subjects are given

the choice of which strategy they want to use. It is important
to assess the effect of individual choice of the type of strategy
employed for pain attenuation before any firm conclusions can be
made regarding the role of susceptibility in pain attenuation.

A further goal of this study is to compare subjects who are
given the choice of which type of strategy they would use for pain
attenuation, with subjects who are not given a choice of strategy
(as is typically the case). In this manner, the effect of the
provision of a choice of strategy on pain reduction would be
adequately assessed as well as examining any main effects or
interactions between the susceptibility level of the subject, the
type of strategy used, and whether the subject was provided with
a choice of the strategy to be used.

As such, the research hypotheses are:

1. Overall, subjects in the Choice of strategy conditions
would exhibit greater pain reductions and increases in tolerance
from the baseline to the treatment trial as compared both to
subjects not given a choice a strategy (i.e. No Choice conditions)
and to subjects in the Control group.

2. Subjects in the No Choice conditions would exhibit
greater pain reductions and increased tolerance as compared to
subjects in the Control group.

3. Subjects in the Control group would not show pain
reductions or increased tolerance from the baseline to the second
trial.

4. High susceptible subjects given a choice of an imagery versus a distraction strategy for pain reduction would be more likely to choose the imagery strategy. Conversely, low susceptible subjects would be more likely to choose the distraction strategy.

5. High susceptible subjects who chose the imagery strategy and low susceptible subjects who chose the distraction strategy would show equivalent pain decrements and equivalent increases in tolerance (from a baseline to a treatment trial). In addition, these subjects would show greater pain reductions and increased tolerance as compared to low susceptible subjects who chose the imagery strategy and high susceptible subjects who chose the distraction strategy.

6. Low susceptible subjects who chose the imagery strategy and high susceptible subjects who chose the distraction strategy would show equivalent pain decrements and equivalent increases in tolerance.

7. High susceptible subjects in the No Choice imagery condition would show greater pain decrements and increased tolerance as compared to low susceptible subjects in this condition.

8. Low susceptible subjects in the No Choice distraction condition would show greater pain decrements and increased tolerance as compared to high susceptible subjects in this condition.

9. High susceptible subjects in the No Choice imagery condition and low susceptible subjects in the No Choice distraction condition would show equivalent pain decrements and equivalent increases in tolerance.

There were three methodological considerations in the design of this study: 1) which pain measure(s) to use; 2) what type of pain stimuli to employ; and 3) what kind of distraction task to use.

The various studies described assessed pain in a number of different ways. Some investigators measured pain tolerance (e.g., (McGlashan, et al., 1969), some measured pain magnitude (e.g., Farthing, et al., 1982), while others measured pain threshold (e.g., Girodo & Wood, 1979). In addition, a number of investigators measured pain in more than one way (e.g., Girodo & Wood, 1979). All pain measure have their limitations. For example, tolerance has been criticized as measuring heroism, pain threshold is easily manipulated by instructional variables, and there is some dispute as to how pain intensity should be assessed (see, for example, Hilgard & Hilgard, 1979; Stam, Petrusic & Spanos, 1981). Thus, investigators who employ more than one pain measure, and obtain the same results, can be more confident that the results they obtain are meaningful. For this reason, the current study assessed both pain magnitude and pain tolerance.

In addition, various studies have employed different pain producing stimuli (for example: cold pressor, pressure, muscle

ischemia and electric shock). Cold pressor (which usually
involves the immersion of one hand and part of the arm in
circulating ice water) and pressure pain (which produces focal
pressure to the skin over bone and is usually applied to the
index finger) have a number of advantages over other experimental
pain devices. Cold pressor produces noxious sensations
relatively quickly and the pressure apparatus provides continuous
aching pain that is similar in some respects to many kinds of
clinical pain (Forgione & Barber, 1971; Malow & Olson, 1981;
Merskey, 1974). The slow-building continuous pain makes it
possible to evaluate and/or manipulate cognitive processes more
readily than with short duration types of pain such as electric
shock. On the other hand, both cold pressor and pressure
apparati produce noxious sensations more quickly than muscle
ischemia.

One advantage of pressure pain as compared to cold pressor
is that physical characteristics of pressure pain are more readily
kept constant. That is, the water temperature of cold pressor
has to remain constant and the subject's arm has to be immersed
to the same degree, etc. These variables are not introduced when
a pressure apparatus is used. In addition, the pain produced by
the force of the pressure device is less likely to be confounded
by physical characteristics of the subject, such as heart rate,
blood pressure or the amount of insulating body fat. These
variables can influence the sensation of pain produced by other

pain stimuli, such as cold pressor (Forgione & Barber, 1971).
Nevertheless, response to pressure pain (in terms of pain
threshold, ratings of intensity and pain tolerance) is highly
correlated with these same ratings for cold pressor pain (Brown,
Fader & Barber, 1973; Davidson & McDougall, 1969). Another
important aspect of pressure pain is that even at the highest
pain intensity, the stimulus provides little hazard to subjects
(Forgione & Barber, 1971). A number of investigators have used
the Forgione-Barber pain stimulator, or modifications of it (e.g.
Barber & Cooper, 1972; Brown, Fader & Barber, 1973; Chaves &
Barber, 1974; Chaves & Doney, 1976; Chaves & Scott, 1979;
Dougher, 1979; Malow & Olson, 1981; Scott & Barber, 1977; Spanos,
et al., 1974; Spanos, Hodgins, Stam & Gwynn, 1983).

Different distraction tasks were employed in the studies
cited and some tasks were obviously not as effective as others.
For example, the rotary pursuit apparatus (used for subjects to
track a moving object) employed in the study by Spanos, et al.
(1981) was not an effective distraction strategy. Subjects in
the study by Spanos, et al. (in press) shadowed words as a
distractor and this task was found to be effective. The present
study requested that subjects shadow letters as a distraction
strategy. When piloted, this task was simple for subjects to
learn and subjects were able to continue the task without
interruption throughout the test interval.

by the apparatus as painful on either of the two trials. Thus, a total of 82 subjects were included in the analyses. The mean age was 25.9 for the 42 male subjects (SD = 6.8) and 28.1 for the 40 female subjects (SD = 9.3).

Experimental Design

The design of the study included three between-subject factors: 1) susceptibility level (high and low); 2) decision regarding choice of strategy (choice present vs choice absent); and 3) type of strategy used or selected (imagery vs distraction). In addition, there was one within-subject factor (subjective pain ratings following three 20-second intervals). The study also included a control group that did not receive either a strategy or a choice of strategy (see Table 1). Provision of the choice condition resulted in a non-equal number of subjects in one cell of the design.

Randomization Process. Subjects were randomly assigned to either the Control, the Choice or the No Choice conditions. In the No Choice condition, subjects were further randomly assigned to either the Distraction or to the Imagery strategy conditions (see Appendix A). This random order was used for both high and low susceptible subjects, with the only stipulation being that an equal number of males and females be assigned to each cell of the design. This stipulation was not possible for the Choice condition because subjects in that group assigned themselves. In

Table 1

Experimental Design

	Choice Condition		No Choice Condition		Control Condition
	Imagery	Distraction	Imagery	Distraction	
	Rating Intervals	Rating Intervals	Rating Intervals	Rating Intervals	Rating Intervals
High Susceptible Subjects					
Low Susceptible Subjects					

addition. it was randomly determined whether the subject's right or left index finger was used on the first trial, in order to avoid any possible effects due to handedness.

Apparatus

The pain stimulator used in this study was a modified version of the Forgione-Barber Strain Guage Pain Stimulator (Forgione & Barber, 1971) (see Appendix B). This device consists of a circular weight (900 g) at the end of a movable bar (231 g). The second phalanx of the subjects' index finger was placed on a elevated stand and the bar, which was tapered to approximately 1 mm wide at this point, was lowered onto the finger. This apparatus delivers 2041 g of force at the point where the subject's finger was placed. Depending on whether the right or left index finger was used, the apparatus was positioned to ensure that the remaining four fingers were resting on the platform between the elevated stand and the bar attachment.

Assessment Materials

1. The Harvard Group Scale of Hypnotic Susceptibility: Form A (HGSHS:A), (Shor & Orne, 1962). Individuals differ in their degree of hypnotic susceptibility and a number of standardized and reliable measures of susceptibility have been developed (Hilgard, 1965). The HGSHS:A consists of a hypnotic induction procedure and

12 standardized test suggestions. This is a tape recorded
procedure which usually is administered to groups of individuals.
The 12 test suggestions can be subdivided into "ideomotor"
suggestions, "challenge" suggestions and "cognitive" suggestions.
The four ideomotor suggestions (head falling, eye closure, hand
lowering and moving hands together) request subjects to engage in
and experience a motor response, for example, "Your arm is
feeling heavy and is moving down". The five challenge
suggestions (arm immobilization, finger lock, arm rigidity,
communication inhibition and eye catalepsy) inform subjects that
they will be unable to carry out a normally simple response, for
example, "You will not be able to bend your arm, regardless of
how hard you try". The three cognitive suggestions (fly
hallucination, post-hypnotic suggestion and amnesia) are
generally the most difficult for subjects to experience, and
involve more complicated distortions of memory or reality. The
HGSHS:A correlates moderately well (r = .60) with the Stanford
Scale of Hypnotic Susceptibility: Form C (SSHS:C, Weitzenhoffer &
Hilgard, 1962) which is an individually administered scale.

2. <u>Cognitive Style Assessment and Scoring</u>. Both closed and
open-ended questionnaires were administerd to subjects after
completion of both the baseline (Trial 1) and the treatment
trials (Trial 2). These questionnaires were designed to assess
the subjects' cognitions during the preceding trial (see Appendix
C). This assessment served a number of purposes: it provided

information about whether or not subjects engaged in self-generated strategies to reduce pain during the baseline trial; and, it allowed subjects to be classified according to their predominant cognitive style on both Trial 1 and Trial 2.

Two raters independently rated subjects' cognitions for the presence of 1) coping strategies and/or 2) non-coping strategies, and/or 3) neutral or indeterminate strategies. A scoring guide was developed for this purpose (see Appendix D). The raters then determined the subjects' predominant cognitive style during the preceding trial. Inter-rater reliability was 81.1%, and all discrepancies were resolved through discussion.

3. Tellegen's Absorption Scale (TAS), (Tellegen & Atkinson, 1974). This scale is designed to assess a subjects' "capacity for absorbed and self-altering attention" (Tellegen & Atkinson, 1974, p. 276) (see Appendix E). The scale consists of 34 true/false items. Scores on the TAS have been found to correlate consistently with hypnotic susceptibility (Bowers, 1978; Finke & Macdonald, 1978; Spanos & McPeake, 1975; Tellegen & Atkinson, 1974).

4. Shortened Version of the Betts' Questionnaire Upon Mental Imagery (Betts QMI), (Sheehan, 1967). This is a 35-item questionnaire that measures imagery ability in seven sensory modalities (visual, auditory, cutaneous, kinesthetic, gustatory, olfactory and organic) (Sheehan, 1967) (see Appendix F). Sheehan (1967) reported a test-retest reliability of .78. Given that

hypnotic suggestions often involve imagery, a number of

investigators have hypothesized a relationship between hypnotic

susceptibility and imagery ability. The majority of studies have

found a relationship between imagery ability and hypnotic

susceptibility (Hilgard, 1970; Shor, Orne & O'Connell, 1966;

Spanos, Valois, Ham & Ham, 1973; Sutcliffe, Perry & Sheehan,

1970). However, other studies have not supported these findings

(Lehman, 1973; Morgan & Lam, 1969; Perry, 1973) (see review by

Sheehan, 1979).

     5. Rosenbaum Self-Control Schedule (SCS), (Rosenbaum,

1980a). This is a 36-item self-report measure which was "designed

to assess the extent to which individuals have already in their

behavioural repertoire self-control skills to handle stressful

events" (Rosenbaum, 1980a, p. 111) (see Appendix G). Reliability

and validity data have been reported to be satisfactory

(Rosenbaum, 1980a). There is some question as to the relationship

between hypnotic susceptibility and the Rosenbaum SCS (Rosenbaum,

1980b). However, a relationship between ability to control pain

in experimental settings and scores on the Rosenbaum SCS has been

reported (Rosenbaum, 1980b).

Procedure

     Hypnotic Susceptibility Assessment Session. Subjects were

tested in groups of up to 12 individuals on the HGSHS:A. On the

basis of their scores, subjects were requested to return for a

second session involving pain perception.

First Trial, All Subjects. Prior to the first trial, all subjects were given a verbal description of the procedure which explained that their index finger would be placed in the pain apparatus on two separate occasions and that the weight was uncomfortable (see Appendix H). Subjects were requested to try to leave their finger in the apparatus for at least one minute and for as long after one minute as possible. Subjects were also told that if, at any time, the pain became too intense, they could end the experiment. Subjects were then requested to sign a consent form which reiterated the basic procedure (Appendix I). The procedure for rating the pain was then more clearly specified (see Appendix J). Subjects were requested to rate the pain on a 0 to 10-point scale (see Appendix K), where 0 represented 'no pain'; 1 was 'just recognizable as pain'; 5 was 'moderate pain'; and 10 was 'excruciating pain' which was defined as the point at which the subjects wanted to stop the experiment. Subjects were told that every 20 seconds, they would be asked to give the number from the scale that best corresponded to the intensity of pain they were experiencing.

The subjects' finger was then placed in the apparatus and, when they were ready, the bar was lowered over the finger and a stopwatch was started. Every 20 seconds, the experimenter said "rate" and the subjects' responses were recorded. If the subjects

were able to keep their finger in the apparatus for a total of four minutes, the experimenter lifted the bar off the finger and stated that the first part of the experiment was completed. If the subjects were unable to keep their finger in the apparatus for 60 seconds, the experimenter continued with the experiment as if the subject was in the control group but, as stated previously, these subjects were not included in the analyses.

After the first trial, all subjects completed the cognitive style assessment questionnaires (Appendix C). In addition to the written instructions provided with the questions, instructions were also given verbally, in order to ensure that subjects understood the manner in which the questionnaires were to be completed.

Second Trial, No Choice/Imagery Condition. Both high and low susceptible subjects who were assigned to the No Choice/Imagery condition were told that various strategies were found to be effective in reducing the intensity of the pain produced by the apparatus. They were then given a brief description of both the imagery strategy and the distraction strategy (see Appendix L). These instructions were given to all experimental groups; however, subjects in the No Choice/Imagery condition were told that they were to use the imagery strategy on the next trial (see Appendix L). The imagery strategy used was a modified version of the strategy used by Barber and Calverley (1969) and Spanos, Barber and Lang (1974). The strategy gave subjects repeated suggestions to imagine their hand as numb and

insensitive, like a piece of rubber (see Appendix M). Subjects were then given the imagery strategy and were asked to practice using it for 45 seconds prior to the second trial. During this practice trial, subjects were instructed to give mock ratings of the pain every 20 seconds, even though their finger was not placed in the apparatus during the practice trial. Subjects were cautioned that the task was difficult and that they were to try not to become discouraged. Following the practice trial, a questionnaire was administered to assess the subjects' expectations of the strategy's efficacy in controlling pain on the upcoming trial (see Appendix N).

Subjects were then informed that the procedure on the second trial would be identical to that of the first, with the exception that their other index finger would be used, and they were to use the imagery strategy. Subjects were reminded that they would be asked to rate the pain every 20 seconds and that they were to rate the pain as it was when the experimenter said "rate" (see Appendix M). After completion of the second trial, subjects were asked to complete the same cognitive style assessment questionnaires that were administered during the pretest (Appendix C). Subjects were then requested to complete the following: Tellegen's Absorption Scale (TAS), (Tellegen & Atkinson, 1974) (Appendix E); Betts QMI (Sheehan, 1967), (Appendix F); and the Rosenbaum Self-Control Schedule (SCS), (Rosenbaum, 1980) (Appendix G). Subjects were then debriefed about the nature of the experiment and requested not to discuss

the exact details of the study with anyone who may be

participating in the study. The subjects were then paid.

Second Trial, No Choice/Distraction Condition. High and low

susceptible subjects who were assigned to the No

.Choice/Distraction condition received identical instructions as

the No Choice/Imagery condition subjects, with modifications due

to the difference in the strategy used. That is, subjects were

told that various strategies were found to be effective in

reducing the intensity of the pain produced by the apparatus.

Then subjects were given a brief description of both the imagery

strategy and the distraction strategy, but were told that they

would be using the distraction strategy on the second trial (see

Appendix L).

The distraction strategy used was a shadowing task which

involved repeating letters, out loud, that were presented at a

rate of three letters every two seconds. The letters were

recorded on an audio cassette and the subjects listened to the

tape through headphones. The letters were presented randomly on

the tape (see Appendix O); however, the letters "m", "n", "j" and

"g" were omitted because they are difficult to distinguish from

each other, and the letter "w" was omitted because it is

multi-syllabic. The tape consisted of a 45-second practice

trial, followed by four complete minutes of the task. Letters

were read for 17 seconds, and then the experimenter said "rate" on

the tape. This was followed by a 2.5 second pause during which

no letters were read. This procedure (letters, rating, pause) was repeated until the termination point of four minutes. Thus, the entire tape lasted approximately five minutes, including the practice trial.

Subjects were cautioned that the task was difficult and that they were to try not to become discouraged. In the event of missing a few letters, subjects were instructed to continue from the next convenient letter, and to let the others pass. Subjects were then given the headphones in order to listen to the 45-second practice trial. They were instructed to give mock ratings of the pain even though their finger was not placed in the apparatus during the practice trial (see Appendix P). After the practice trial, the questionnaire designed to assess the subjects' expectations of the strategy's effectiveness was administered (see Appendix N). Subjects were then informed that the procedure on the second trial would be identical to that of the first, with the exception that the index finger of their other hand would be used and that they were to use the distraction strategy. Subjects were reminded that when the experimenter said "rate" every 20 seconds, they were to rate the pain currently being experienced (see Appendix P). After this trial, subjects completed the same questionnaires as had the No Choice/Imagery condition subjects, and they were then debriefed

and paid.

Second Trial, Choice/Imagery Condition. High and low susceptible subjects who were assigned to the Choice condition were told that various strategies were found to be effective in reducing the intensity of the pain produced by the apparatus, and were given a brief description of both the imagery and distraction strategies. Subjects were then asked which strategy they thought would be most effective in reducing the pain to be experienced on the next trial, as compared to that which was experienced on the first trial (see Appendix L).

Once the strategy was chosen, the procedure for this group was identical to the No Choice/Imagery condition. That is, subjects who chose the imagery strategy were asked to practice using it for 45 seconds while they gave mock ratings of the pain every 20 seconds (see Appendix M). The questionnaire which was, designed to assess the subject's' expectations of the effectiveness of the strategy was then administered (see Appendix N). Subjects then completed the second trial, at which point the questionnaires were completed, the subjects were debriefed and paid.

Second Trial, Choice/Distraction Condition. High and low susceptible subjects who were assigned to the Choice condition and who chose the Distraction strategy were given the same instructions as those subjects in the Choice/Imagery condition (see above description and Appendix L).

The subjects who chose this strategy received the same

instructions as those in No Choice/Distraction condition. That is, subjects were given details of the strategy and asked to practice it for 45 seconds and to give mock pain ratings (see Appendix P). The questionnaire designed to measure the subjects' expectations of the strategy's effectiveness was then administered (see Appendix N), followed by completion of the second trial (see Appendix P). After this trial, the final questionnaires were completed and subjects were debriefed and paid.

Second Trial, Control Group. After completion of the cognitive assessment questionnaires following the first trial, high and low susceptible subjects in the control condition were told that they were to go through the same procedure on the second trial as they had on the first, but with their other index finger (see Appendix Q). The procedure was identical to the first trial and the same instructions were reiterated. Subjects then completed the questionnaires already outlined (see Appendices C, E, F, and G) and were debriefed and paid.

Results

The data analyses are presented in the following order:

1. Comparability of Groups: a) Trial 1 Pain Ratings; b) Gender Variable Analyses; c) Susceptibility Variable Analyses.

2. Pain Rating Analyses: a) Control Group Analyses; b) Treatments by Susceptibility Analyses; c) Treatments by Control Group Analyses; d) Descriptive Data.

3. Tolerance Analyses: a) Descriptive Data; b) Control Groups Analyses; c) Treatment by Susceptibility Analyses; d) Treatments by Control Groups Analyses.

4. Cognitive Style Data Analyses: a) Descriptive Data; b) Pain Rating Analyses; c) Tolerance Analyses.

5. Questionnaire and Correlational Data Analyses: a) Expectancy Data Analysis; b) Betts QMI Analysis; c) Rosenbaum SCS Analysis; d) TAS Analysis; e) Correlational Analysis.

1. Comparability of Groups

a) <u>Trial 1 Pain Ratings.</u> The five treatment groups were compared to determine whether or not they differed on the three 20-second interval pain ratings during the first trial. A 5 x 3 split-plot analysis of variance (ANOVA) with one between-subject variable (treatment and control groups) and one within-subject variable (three pain rating intervals: 20, 40 and 60 seconds) was

computed on the first trial pain ratings. These results, as
presented in Table 2, show a significant main effect for the rating
intervals variable, which indicates that as time went on, the
apparatus was rated as more painful (see Table 3). However, the
groups did not differ significantly on the first trial pain ratings,
and there was no significant group by rating interval interaction.
The comparability of the groups on the three Trial 1 pain ratings
justifies the use of change scores in analyzing the pain rating
data. The use of change scores simplifies the analyses by reducing
the number of within-subject variables from two (Trial 1/Trial 2 x
three pain rating intervals) to one (change scores for the three
pain rating intervals). The use of change scores (or difference
scores) has been suggested by Huck & McLean (1975) in order to
avoid potentially confusing results, as well as to avoid redundant
re-analyses and problems with respect to post hoc investigations
(see also Harris, 1975). As such, all pain rating analyses were
computed on the change scores.

　　　b) <u>Gender Variable Analyses.</u> For both the No Choice
conditions and the Control group, an equal number of male and
female high and low susceptible subjects were randomly assigned to
each cell of the design. In the Choice condition, this was not
possible since female subjects, regardless of their susceptibility
level, tended to choose the distraction strategy over the imagery
strategy (see Table 4). More specifically, 13 out of the 16 female
subjects (81%) chose the distraction strategy and 3 (19%) chose the

Table 2

Treatment and Control Groups x Rating Intervals

Analysis of Variance on Trial 1 Pain Ratings

	df	MS	F
Treatment and Control Groups	4	29.6	2.1
Error	77	14.4	
Rating Intervals	2	185.1	179.0*
Groups x Rating Intervals	8	.3	.3
Error	154	1.0	

*$p < .001$

Note: $n = 82$

Table 3

Trial 1 Pain Ratings

at the Three Pain Rating Intervals

Rating Intervals	$\underline{M}$	$\underline{SD}$
1. 20 seconds	3.1	2.2
2. 40 seconds	4.9	2.5
3. 60 seconds	6.1	2.5

Note: $\underline{n} = 82$

Table 4

Distribution of Subjects Within the Design

	Choice Condition		No Choice Condition		Control
	Imagery	Distraction	Imagery	Distraction	
High Susceptible					
Male	7	3	4	4	4
Female	1	7	4	4	4
$\underline{n}$	8	10	8	8	8
Low Susceptible					
Male	6	2	4	4	4
Female	2	6	4	4	4
$\underline{n}$	8	8	8	8	8

Note. Total $\underline{n}$ = 82

imagery strategy. The reverse was true for the male subjects,
again, regardless of susceptibility level. Of the 18 male subjects
in the Choice condition, 13 (72%) chose the imagery strategy and 5
(28%) chose the distraction strategy. This differential selection
of strategies by males and females was significant, $\chi^2[1] = 9.7$,
$p < .01$).

In order to determine if males and females rated pain
differently across the treatment groups, a 5 x 2 x 3 split-plot
ANOVA, with two between-subject variables (treatment and control
groups x male/female) and one within-subject variable (three pain
rating intervals: 20, 40 and 60 seconds) was computed on the pain
rating change scores. Neither the gender main effect nor the
gender by treatment interaction was significant (see Table 5).
Thus, all further analyses collapse gender across each group. (The
treatment effect, however, was significant. It will be discussed
in a subsequent section entitled Pain Rating Analyses.)

c) Susceptibility Variable Analyses. It had been predicted
that in the Choice condition, high susceptible subjects would be
more likely to choose the imagery strategy and low susceptible
subjects would be more likely to choose the distraction strategy.
While there was a gender difference in the type of strategy chosen,
there was no difference between the number of high and low
susceptible subjects who chose the imagery and distraction
strategies, ($\chi^2[1] = .1$, $p > .10$). The imagery strategy was chosen

Table 5

Treatment and Control Groups x Male/Female x Rating Intervals

Split-Plot Analysis of Variance on Pain Rating Change Scores

	df	MS	F
Treatment and Control Groups	4	37.0	3.8*
Gender	1	9.6	1.0
Groups x Gender	4	9.0	.9
Error	72	9.7	
Rating Intervals	2	2.1	1.6
Groups x Rating Intervals	8	1.1	.8
Gender x Rating Intervals	2	1.3	2.0
Groups x Gender x Rating Intervals	8	.6	.5
Error	144	1.4	

*$p < .007$

Note. $n = 82$

by 8 high and 8 low susceptible subjects, and the distraction

strategy was chosen by 10 high and 8 low susceptible subjects.

A 5 x 2 ANOVA with two between-subject variables (treatment

and control groups x high/low susceptibility) was conducted on

susceptibility scores to determine if the groups were comparable

with respect to susceptibility levels. The means involved in this

analysis are presented in Table 6. While there was a significant

difference in susceptibility between high and low susceptible

subjects, as expected, there was no overall difference in

susceptibility scores across the treatment groups and there was no

treatment group by susceptibility interaction (see Table 7). This

analysis indicates that the various treatment groups consisted of

subjects with comparable susceptibility scores. Thus, the mean

susceptibility score across groups was 10.1 for high susceptible

subjects and 2.0 for low susceptible subjects.

2. Pain Rating Analyses

The mean Trial 1, or baseline, pain rating at the 60 second

interval for the 82 subjects was 6.1 with a standard deviation of

2.5. The mean pain rating for Trial 2 was 5.1 with a standard

deviation of 2.7. Overall, these data indicate that the apparatus

was rated as moderately painful by the end of one minute. At the

same time, the data were not limited by ceiling or floor effects.

a) <u>Control Group Analyses.</u> The control groups were analyzed

in order to determine if repeated testing with the pain apparatus,

Table 6

Means Susceptibility Scores for

High and Low Susceptible Subjects in All Groups

Groups	High		Low	
	M	SD	M	SD
1. Choice/Imagery	10.4	1.2	2.6	1.5
2. Choice/Distraction	10.3	1.2	2.3	1.3
3. No Choice/Imagery	9.8	1.0	1.5	1.3
4. No Choice/Distraction	9.6	.7	2.4	1.4
5. Control	10.5	.8	1.4	1.2

Note. n = 82

Table 7

Treatment and Control Groups x Susceptibility Level

Analysis of Variance on Susceptibility Scores

	df	MS	F
Treatment and Control Groups	4	1.8	1.3
Susceptibility Level (High/Low)	1	1334.0	956.0*
Groups x Susceptibility	4	2.0	1.4
Error	72	1.4	

*$\underline{p} < .001$

Note. $\underline{n} = 82$

in and of itself, resulted in any changes in pain reports. A 2 x 3 split-plot ANOVA with one between-subject variable (high/low susceptibility) and one within-subject variable (three pain rating intervals: 20, 40 and 60 seconds) was computed on the pain rating change scores for the subjects in the control groups. None of the main effects or the interaction were significant (see Table 8). That is, high and low susceptible control subjects did not differ on their pain ratings from Trial 1 to Trial 2.

b) Treatments by Susceptibility Analyses. The effects of treatments on the pain rating change scores was assessed with a 2 x 2 x 2 x 3 split-plot factorial ANOVA that contained three between-subject variables (choice/no choice x imagery/distraction x high/low susceptibility) and one within-subject variable (three pain rating intervals: 20, 40 and 60 seconds). The only significant effect was the main effect for the Choice/No Choice variable (see Table 9). Choice subjects exhibited significantly greater pain reductions from Trial 1 to Trial 2 than No Choice subjects (see Table 10). There was no significant main effect for susceptibility nor were there any significant interactions involving susceptibility. In addition, there was no main effect for the type of strategy used or chosen (imagery vs distraction) nor were there any significant interactions involving the strategy variable.

c) Treatments by Control Groups Analyses. In order to further clarify the results involving the Choice variable, pain rating change scores for the Choice and the No Choice groups were

Table 8

Susceptibility Level x Rating Intervals

Split-Plot Analysis of Variance on Pain Rating

Change Scores for the Control Groups

	df	MS	F
Susceptibility Level (High/Low)	1	.3	.0
Error	14	7.4	
Rating Intervals	2	.1	.1
Susceptibility x Rating Intervals	2	1.3	1.1
Error	28	1.1	

Note: $\underline{n} = .16$

Table 9

Choice Factor x Strategy Type x Susceptibility Level

x Rating Interval, Split-Plot Analysis of Variance

on Pain Rating Difference Scores

	df	MS	F
Choice Factor (Choice/No Choice)	1	109.7	10.5*
Strategy Type (Imagery x Distraction)	1	13.5	1.3
Choice x Strategy	1	13.7	1.3
Susceptibility Level (High/Low)	1	2.2	.2
Choice x Susceptibility	1	11.9	1.1
Strategy x Susceptibility	1	23.1	2.2
Choice x Strategy x Susceptibility	1	3.4	.3
Error	58	10.4	
Rating Intervals	2	2.3	1.6
Choice x Rating Intervals	2	2.0	1.4
Strategy x Rating Intervals	2	.3	.2
Choice x Strategy x Rating Intervals	2	.1	.1
Susceptibility x Rating Intervals	2	1.9	1.4
Choice x Susceptibility x Rating Intervals	2	.5	.4
Strategy x Susceptibility x Rating Intervals	2	.1	.1
Choice x Strategy x Susceptibility x Rating Intervals	2	.1	.1
Error	116	1.4	

*$p < .002$

Note. $n = 66$

Table 10

Mean Pain Rating Change Scores for Subjects

in the Choice and No Choice Groups

	M	SD	n
Choice	-1.7	1.9	102
No Choice	-.2	2.2	96

n is the total number of scores that went into the
calculation of each mean (which is equal to the number
of subjects per group x 3 rating intervals).
Total number of subjects = 66.

compared separately with the pain rating change scores for the Control groups. A 2 x 3 split-plot ANOVA with one between-subject variable (choice/control groups) and one within-subject variable (three pain rating intervals: 20, 40 and 60 seconds) was computed on the pain rating change scores. This analysis indicated that the pain rating change scores in the Choice groups differed significantly from those in the control group, while no other effect was significant (see Table 11). Table 12 indicates that subjects in the Choice groups exhibited greater mean pain reductions from Trial 1 to Trial 2 than did Control group subjects. This analysis was then repeated with the No Choice groups. A 2 x 3 split-plot ANOVA with one between-subject variable (no choice/control groups) and one within-subject variable (three pain rating intervals: 20, 40 and 60 seconds) was computed on the pain rating change scores. This analysis indicated that there was no difference between the No Choice and the Control groups on the pain rating change scores and that there was no interaction between these groups and the pain ratings (see Table 13). The means and standard deviations for these groups are reported in Table 12.

d) Descriptive Data. The distribution of subjects in the various treatment conditions was examined in order to determine whether high and low susceptible subjects differed on the degree or extent of pain reduction exhibited from Trial 1 to Trial 2. For example, a subject who rated the pain as '9' at the 60-second rating interval in Trial 1 and as '6' at the same interval in Trial

Table 11

Split-Plot Analysis of Variance on

Pain Rating Change Scores over the Three Rating Intervals

for the Choice and Control Groups

	df	MS	F
Choice and Control Groups	1	46.6	5.4*
Error	48	8.6	
Rating Intervals	2	.9	.9
Groups x Rating Intervals	2	1.9	1.8
Error	96	1.1	

*p < .05

Note. n = 50

Table 12

Mean Pain Rating Change Scores for Subjects in the

Choice, No Choice and Control Groups

	M	SD	n
Choice	-1.7	1.9	102
Control	-.5	1.7	48
No Choice	-.2	2.2	96

n is the total number of scores that went into the
calculation of each mean (which is equal to the number
of subjects per group x 3 rating intervals).
Total number of subjects = 82.

Table 13

Split-Plot Analysis of Variance on

Pain Rating Change Scores over the Three Rating Intervals

for the No Choice and Control Groups

	df	MS	F
No Choice and Control Groups	1	2.6	.2
Error	46	10.3	
Rating Intervals	2	.0	.0
Groups x Rating Intervals	2	.1	.0
Error	92	1.5	

Note. $\underline{n}$ = 48

2, would be classified as exhibiting a 33% reduction in pain from Trial 1 to Trial 2. Four classification categories were used: 1) 33% pain reduction or more; 2) 20% pain reduction or more; 3) some pain reduction; and, 4) no pain reduction or a pain increase on the second trial (see Table 14). There were only minor differences in the number of high and low susceptible subjects who reduced pain by 33% or more (13 high vs 11 low susceptible subjects) or by 20% or more (18 high vs 15 low susceptible subjects). Overall, 21 (or 62%) of the high susceptible subjects and 18 (or 56%) of the low susceptible subjects in the treatment groups showed some pain reduction.

While there was no difference between high and low susceptible subjects on the amount of pain reduction from Trial 1 to Trial 2, there was considerable contrast between the Choice and the No Choice subjects on the amount of pain reduction. A significant relationship was found between the number of subjects in the Choice vs the No Choice groups who obtained some pain reduction vs no pain reduction, $x^2 [1] = 12.0$, $p < .01$) (see Table 14). In the Choice groups, 27 of 34 high and low susceptible subjects (79%) exhibited some pain reduction. The majority of these subjects (18 subjects, or 53%) exhibited a pain reduction of 33% or more. In the No Choice groups, only 12 of 32 high and low susceptible subjects (37.5%) exhibited some pain reduction and only half of these (6 subjects, or 18.7%) exhibited a pain reduction of 33% or more.

Table 14

Distribution of Subjects in the Treatment Groups who Exhibited Pain Reductions or Increases from Trial 1 to Trial 2

	Susceptibility	Choice Condition Imagery	Distraction	No Choice Condition Imagery	Distraction
33% pain reduction or more[a]	High	6	4	1	2
	Low	3	5	1	2
20% pain reduction or more (includes above subjects)	High	7	7	2	2
	Low	5	5	2	3
Some pain reduction (includes above subjects)	High	7	8	2	4
	Low	5	7	2	4
		$n = 27$		$n = 12$	
Pain remained the same or increased	High	1	2	6	4
	Low	3	1	6	4
		$n = 7$		$n = 20$	

Note. Total $n = 66$

Note. This table reflects pain reductions, or increases, from Trial 1 to Trial 2 that were obtained at the 60-second pain rating

[a] This category includes all subjects who reduced their pain to 0 on the second trial.

3.   Tolerance Analyses

The mean tolerance score for the first trial was 162.9 seconds
with a standard deviation of 70.9.   The mean tolerance score for
the second trial was 173.8 seconds with a standard deviation of
68.2.

Subjects who reached the four-minute termination point on
Trial 1 were eliminated from the tolerance data analyses because
they would not be able to show any increase in tolerance on Trial
2. Any treatment effects would be masked for these subjects on
Trial 2 because they were already demonstrating the maximum
possible tolerance scores on the first trial (see Footnote 1).

a) Descriptive Data.   During Trial 1, 32 of the 82 subjects
(39%) reached the four-minute termination point in the tolerance
assessment, while 35 subjects (43%) reached this point during Trial
2. Table 15 presents a distribution of subjects in the various
groups who reached the four-minute termination point. There were
no differences between the number of high and low susceptible
subjects who kept their finger in the appparatus for the maximum
allowable time from Trial 1 to Trial 2 (χ^2[1] = 0, p > .05).   In
addition, there was no difference between the number of Choice
subjects (16) and the number of No Choice subjects (14) who reached
the four-minute termination point on Trial 2.

Table 15

Number of High and Low Susceptible Subjects

Reaching the Four-Minute Termination Point

in the Treatment and Control Groups

	Choice		No Choice		Control
	Imagery	Distraction	Imagery	Distraction	
TRIAL 1					
High Susceptible $\underline{n}$ = 17	37.5%(3)[a]	30%(3)	62.5%(5)	37.5%(3)	37.5%(3)
Low Susceptible $\underline{n}$ = 15	37.5%(3)	37.5%(3)	37.5%(3)	25%(2)	50%(4)
TRIAL 2					
High Susceptible $\underline{n}$ = 19	50%(4)	62.5%(5)	50%(4)	50%(4)	25%(2)
Low Susceptible $\underline{n}$ = 16	37.5%(3)	50%(4)	25%(2)	50%(4)	23.5%(3)

[a] Numbers in parenthesis indicate the number of subjects.

b) <u>Control Groups Analysis</u>. The control groups were analyzed in order to determine whether or not there were any changes in tolerance from Trial 1 to Trial 2. Change scores from Trial 1 to Trial 2 were computed and a percent change score was calculated. A t-test computed between Trial 1 and Trial 2 percent change in tolerance scores for high and low susceptible subjects was not significant, ($\underline{t}[7] = .4$, $\underline{p} > .05$). The means for this analysis are presented in Table 16.

c) <u>Treatments by Susceptibility Analyses.</u> The effects of treatments on tolerance were assessed by a 2 x 2 x 2 factorial ANOVA with three between-subject factors (choice/no choice x imagery/distraction x high/low susceptibility), and was computed on the percent change in tolerance scores. Again, the only significant effect was the main effect for the Choice/No Choice variable ($\underline{p} = .05$) (see Table 17). As Table 18 indicates, Choice subjects endured the pain an average of 29% longer on the second trial compared to first trial, while No Choice subjects exhibited little change from Trial 1 to Trial 2.

d) <u>Treatments by Control Groups Analyses.</u> Percent change in tolerance scores for the Choice and No Choice groups was compared separately with the Control group change scores. Choice subjects exhibited significantly greater percent change in tolerance scores as compared to the Control subjects ($\underline{t}[29] = 5.0$, $\underline{p} < .05$) while No Choice subjects did not differ significantly from Controls ($\underline{t}[26] = 0$, $\underline{p} > .05$). The means for these analyses are presented in Table 18. Thus, the only groups which exhibited an overall change in

81

Table 16

Percent Change in Tolerance Scores for Control Subjects

	M	SD	n
High Susceptible	-.7	6.7	4
Low Susceptible	6.0	31.6	5

Table 17

Choice Factor x Strategy Type x Susceptibility
Analysis of Variance on Percent Change in Tolerance Scores

	df	MS	F
Choice Factor (Choice/No Choice)	1	5099.9	4.0*
Strategy Type (Imagery/Distraction)	1	526.1	.4
Choice x Strategy	1	115.9	.1
Susceptibility Level (High/Low)	1	2732.4	2.1
Choice x Susceptibility	1	79.1	.1
Strategy x Susceptibility	1	1753.1	1.4
Choice x Strategy x Susceptibility	1	1859.2	1.4
Error	33	1292.6	

*$\underline{p}$ = .05

Note. $\underline{n}$ = 41

Table 18

Mean Percent Tolerance Change Score for Subjects

in the Choice, No Choice and Control Groups

	M	SD	n
Choice	29.0	31.6	22
No Choice	3.2	40.0	19
Control	3.0	23.0	9

Note. Total n = 50.

tolerance from Trial 1 to Trial 2 were the Choice groups.

4. Cognitive Data Analyses

Subjects were classified according to their predominant type of cognitive strategy or strategies that they used on both the first and the second trials. Three categories were used for this classification: 1) predominantly coping cognitions; 2) predominantly non-coping cognitions; and, 3) neutral or indeterminate cognitions.

a) Descriptive Data. While the subjects' cognitions were sometimes difficult to classify, there were many clear-cut cases. For example, the following transcript illustrates a variety of coping strategies:

> "normally, while experiencing pain, I focus my
> thoughts on it, by convincing myself it is an
> interesting, almost 'enjoyable' sensation...so
> along with enjoying the pain, I relaxed..
> The pain became a warm, then almost hot
> sensation..."

In spite of the aversive situation, there was at least one subject who maintained a sense of humour, and wrote:

"...(I thought) maybe I'll keep saying '1' until
she starts worrying..."

Following are two examples of somewhat typical non-coping
strategies:

"I felt as if my finger was cut at the end. I
didn't think a minute was that long."

"I was wondering if perhaps some damage was not
being done to my finger." ·

Sixty-eight of the 82 subjects (83%) were classified as
engaging in some form of cognitive activity during both the first
and second trials. Of the subjects that could be classified, 39
(57%) used coping strategies on both the first and second trials.
The total number of subjects classified as using coping strategies
on the first trial was 53 (or 78%); while the total number of
subjects classified as using coping strategies on the second trial
was 47 (or 69%).

High and low susceptible subjects did not differ on the extent
to which they coped on the first trial (27 and 26 subjects
respectively), (see Table 19). On the first trial, 7 high and 8
low susceptible subjects engaged in non-coping cognitions. On the

Table 19

Cognitive Style Classification

of High and Low Susceptible Subjects

on Trial 1 and Trial 2

		Susceptibility Level		
Trial 1	Trial 2	High	Low	$\underline{n}$
coping	coping	20	19	39
coping	non-coping	7	7	14
non-coping	non-coping	1	6	7
non-coping	coping	6	2	8

Note. Total $\underline{n}$ = 68

second trial, 8 high and 13 low susceptible subjects engaged in
non-coping cognitions. The relationship between the number of high
and low susceptible subjects classified as non-copers on Trial 1
and Trial 2 was not significant ($\chi^2_{[1]} = 1.1$, $\underline{p} > .05$).

Table 20 shows the distribution of subjects in the treatment
and control groups who reported coping or non-coping cognitions
during the two trials. In the Control group there was one more
non-coping subject on the second trial than there was on the first
trial. In the Choice condition, there were 20 coping and 6
non-coping subjects on both Trial 1 and Trial 2. However, in the No
Choice condition, there was a significant increase in the number of
non-coping subjects on Trial 2 as compared to the Choice condition
(from 6 non-coping subjects on Trial 1 to 11 non-coping subjects on
Trial 2) ($\chi^2_{[1]} = 5.5$, $\underline{p} < .05$).

b) Pain Rating Analyses. In order to determine if cognitive
style was related to pain ratings, a 4 x 3 split-plot ANOVA with
one between-subject variable (four cognitive style groups) and one
within-subject variable (three pain rating intervals: 20, 40 and 60
seconds) was computed on the pain rating change scores. This
analysis indicated a significant group effect (see Table 21). The
means for this analysis are reported in Table 22. Duncan's Multiple
Range Test (Kirk, 1968) indicated that subjects who used coping
strategies on the second trial reported significantly less pain
than subjects who engaged in non-coping strategies ($\underline{p} < .05$).

To further examine these results, the pain ratings of subjects
classified as coping on the second trial were compared to the pain

Table 20

Distribution of Coping and Non-coping Subjects

in the Treatment and Control Groups

on Trial 1 and Trial 2

	Choice	No Choice	Control
Trial 1			
Copers	77% (20)[a]	79% (22)	79% (11)
Non-copers	23% (6)	21% (6)	21% (3)
Trial 2			
Copers	77% (20)	61% (17)	71% (10)
Non-copers	23% (6)	39% (11)	29% (4)
n	26	28	14

[a]Numbers in parentheses indicate the number of subjects.

Subjects who were not able to be classified on one of the trials were excluded from the analysis.

Table 21

Cognitive Style Groups x Rating Intervals

Split-Plot Analysis of Variance on Pain Rating Change Scores

	df	MS	F
Cognitive Style Groups	3	57.8	7.2*
Error	64	8.0	
Rating Intervals	2	1.4	1.0
Group x Rating Intervals	6	1.8	1.3
Error	128	1.4	

*$p < .001$

Note. Total $n = 68$

Table 22

Mean Pain Rating Change Scores for Subjects

in the Four Cognitive Style Groups

Cognitive Style Group	$\underline{M}$	$\underline{SD}$	$\underline{n}$
1. coping - coping	-1.6_a	1.8	117
2. coping - non-coping	$.5_b$	2.1	42
3. non-coping - non-coping	$.8_b$	2.0	21
4. non-coping - coping	-1.7_a	1.7	24

a,b   Means with different letter subscripts differ significantly
($\underline{p} < .05$) by the Duncan's Multiple Range Test.

$\underline{n}$ is the total number of scores that went into the
calculation of each mean (which is equal to the number
of subjects per group x 3 rating intervals).
Total number of subjects = 68.

ratings of subjects classified as not coping. A 2 x 3 split-plot
ANOVA with one between-subject variable (coping vs non-coping) and
one within-subject variable (three pain rating intervals: 20, 40
and .60 seconds) was computed on the Trial 2 pain ratings. This
analysis indicated significant main effects for groups and for the
pain rating intervals (see Table 23). The rating interval main
effect simply indicated that as time went on, the apparatus was
rated as more painful (see Table 24). The mean pain scores for
subjects classified as copers and non-copers are reported in Table
25. These means indicate that subjects who coped had lower overall
pain ratings than subjects who did not.

c) Tolerance Analyses. A one-way ANOVA was computed on the
percent change in tolerance scores for the four cognitive style
groups. Subjects who had reached the four-minute termination point
on the first trial were not included in this analysis (see Footnote
1). This analysis indicated a significant difference among the
groups (see Table 26). The means for this analysis are reported in
Table 27. Duncan's Multiple Range Test indicated that subjects who
used coping strategies during the second trial, exhibited
significantly greater percent change in tolerance scores than
subjects who engaged in non-coping cognitions ($p < .05$). Subjects
who used coping strategies on the second trial increased their
tolerance by 31% or more. Subjects who engaged in non-coping
cognitions on the second trial decreased their tolerance by 25% or
more. These data indicate that subjects who engaged in coping
cognitions on the second trial not only reported less pain but also

Table 23

\ Split-Plot Analysis of Variance on

Trial 2 Pain Rating Scores for

Copers vs Non-Copers x Rating Intervals

	$\underline{df}$	$\underline{MS}$	$\underline{F}$
Groups (Copers/Non-copers)	1	162.1	11.5*
Error	66	14.0	
Rating Intervals	2	115.3	118.0*
Groups x Rating Intervals	2	3.1	3.2
Error	132	1.0	

*$\underline{p}$ < .001

Note. $\underline{n}$ = 68

Table 24

Mean, Pain Scores for Subjects

Classified as Copers and Non-copers

on the Three Trial 2 Rating Intervals

Rating Intervals	M	SD
1. 20 seconds	2.5	2.0
2. 40 seconds	4.1	2.6
3. 60 seconds	5.1	2.7

Note. $n = 68$

Table 25

Mean Pain Scores on Trial 2 for

Subjects Classified as Copers and Non-copers

	M	SD	n
Copers	3.3	2.5	141
Non-copers	5.2	2.6	63

n is the total number of scores that went into the
calculation of each mean (which is equal to the number
of subjects per group x 3 rating intervals).
Total number of subjects = 68.

Table 26

Analysis of Variance on

Percentage Change in Tolerance Scores

in the Four Cognitive Style Groups.

	df	MS	F
Cognitive Style Groups	3	10,148.0	19.6*
Error	36	517.5	

*$p < .001$

Note. $n = 68$

Table 27

Mean Percent Change in Tolerance Scores

from Trial 1 to Trial 2 for the Four Cognitive Style Groups

Group	M	SD	n
1. Coping – Coping	31.4_a	23.0	20
2. Coping – Non-coping	-30.6_b	22.5	7
3 Non-coping – Non-coping	-25.4_b	22.7	5
4. Non-coping – Coping	37.6_a	22.3	8

Note. Total $\underline{n}$ = 68

a, b Means with different letter subscripts differ
significantly ($\underline{p}$ < .05) by Duncan's Multiple Range Test.

exhibited greater pain tolerance on the second trial than subjects who engaged in non-coping cognitions.

5. Questionnaire and Correlational Data Analyses

a) Expectancy Data Analysis. After the practice trial, subjects in the treatment groups completed a questionnaire designed to assess the extent to which they expected the strategy to be effective in controlling pain on the upcoming trial. A 2 x 2 x 2 ANOVA with three between-subject variables (choice/no choice x imagery/distraction x high/low susceptibility) was computed on subjects' response to this questionnaire. As Table 28 indicates, this analysis indicated a marginal effect for both the Choice/No Choice (p = .057) and for the susceptibility variable (p = .057). The interaction between the Choice/No Choice variable and susceptibility was not significant. The main effect for the imagery/distraction variable was not significant nor any interaction involving this variable. The mean expectancy scores for the Choice and the No Choice subjects are reported in Table 29. These means indicated that, in general, Choice subjects expected the strategy to be between 'moderately' and 'considerably' effective in helping to control pain, regardless of the strategy chosen. In general, the No Choice subjects expected the strategy to be 'a little' effective, regardless of which strategy they were asked to use. The mean expectancy scores for high and low

Table 28

Choice Factor x Strategy Type x Susceptibility,

Analysis of Variance on Expectancy Scores

	df	MS	F
Choice Factor (Choice/No Choice)	1	3.3	3.8*
Strategy Type (Imagery/Distraction)	1	.7	.7
Choice x Strategy	1	.9	1.0
Susceptibility Level (High/Low)	1	3.3	3.8*
Choice x Susceptibility	1	1.1	1.3
Strategy x Susceptibility	1	.0	.0
Choice x Strategy	1	.1	.1
Error	58	.9	

*p = .057

Note. n = 66

Table 29

Mean Expectancy Scores for Subjects
in the Choice and No Choice Conditions

	M	SD	n
Choice	2.4	1.0	34
No Choice	2.0	.9	32

susceptible subjects are displayed in Table 30. These means indicate that high susceptible subjects, regardless of whether they were in the Choice or the No Choice conditions, expected the strategy they were using to be between 'moderately' and 'considerably' effective in helping to control pain. In general, low susceptible subjects expected the strategies to be 'a little' effective. It is important to reiterate that both the effect for the Choice/No Choice groups, and the effect for susceptibility, were marginal.

b) Betts QMI Analysis. In order to determine if subjects who chose the imagery strategy had higher imagery scores than subjects who did not choose the imagery stratey, a 2 x 2 ANOVA with two between-subject variables (high/low susceptibility x imagery/distraction) was computed on the Betts QMI scores of subjects in the Choice conditions. None of the results of this analysis were significant (see Table 31). Thus, high and low susceptible subjects who chose the imagery strategy did not have better imagery as assessed by the Betts QMI than subjects who chose the distraction strategy.

c) Rosenbaum SCS Analysis. An analysis was computed on the Rosenbaum (SCS) scores in order to determine if high and low susceptible subjects, or subjects who chose the imagery vs the distraction strategies, would differ along this variable. A 2 x 2

Table 30

Mean Expectancy Scores for

High and Low Susceptible Subjects

in the Treatment Conditions

	$\underline{M}$	$\underline{SD}$	$\underline{n}$
High Susceptible	2.4	.9	34
Low Susceptible	2.0	1.0	32

Table 31

Susceptibility x Strategy Type

Analysis of Variance on Betts QMI Scores

of Choice Condition Subjects

	df	MS	F
Susceptibility (High/Low)	1	982.2	1.3
Strategy Type (Imagery/Distraction)	1	247.8	.3
Susceptibility x Strategy	1	166.8	.2
Error	30	748.3	

Note. n = 34

ANOVA with two between-subject variables (high/low susceptibility x imagery/distraction) was computed on the Rosenbaum SCS scores of subjects in the Choice conditions. None of the effects of this analysis were significant (see Table 32).

d) TAS Analysis. An analysis was computed on subjects' response to Tellegen's Absorption Scale in order to determine if high and low susceptible subjects, or subjects who chose the imagery vs the distraction strategies, differed on this variable. A 2 x 2 ANOVA with two between-subject variables (high/low susceptibility x imagery/distraction) was computed on the TAS scores. This analysis indicated a significant main effect for susceptibility (see Table 33). That is, high susceptible subjects in the Choice condition scored significantly higher on the TAS than low susceptible subjects (see Table 34). However, there was no difference between subjects who chose the imagery or the distraction strategy on the TAS scores, nor was the interaction between susceptibility and choice of strategy significant.

e) Correlational Analyses. Correlations among the various questionnaires and the pain measures were computed (see Table 35). The means for these variables are reported in Table 36. The cognition pretest and cognition posttest scores were determined from the subjects' cognitive style classification. That is, subjects who were classified as copers received a score of 1, subjects classified as non-copers received a score of -1, and subjects classified as neutral or indeterminate received a score of 0. These scores were determined for both Trial 1 and Trial 2.

Table 32

Susceptibility x Strategy Type

Analysis of Variance on Rosenbaum's SCS Scores

of Choice Condition Subjects

	df	MS	F
Susceptibility (High/Low)	1	1977.7	3.0
Strategy Type (Imagery/Distraction)	1	532.2	.8
Susceptibility x Strategy	1	768.0	1.2
Error	30	655.9	

Note. $\underline{n} = 34$

Table 33

Susceptibility x Strategy Type

Analysis of Variance on TAS Scores

of Choice Condition Subjects

	df	MS	F
Susceptibility (High/Low)	1	334.2	10.1*
Strategy Type (Imagery/Distraction)	1	.9	.0
Susceptibility x Strategy	1	20.9	.6
Error	30	32.9	

*$p < .01$

Note. $n = 34$

Table 34

Mean TAS Scores for

High and Low Susceptible Subjects

in the Choice Conditions

	M	SD	n
High Susceptible	24.9	5.7	18
Low Susceptible	18.7	5.5	16

Table 35

Inter-Correlation Among Dependent Measures

	2	3	4	5	6	7	8	9	10	11
1 Hypnotic Susceptibility	.04	-.05	-.11	.03	.13	.37**	.36**	.30*	.07	.13
2 60-second Pain Rating (Pretest)		.61**	-.38**	-.56**	-.32*	-.12	-.15	.11	-.07	.10
3 60-second Pain Rating (Posttest)			.50**	-.35*	-.57**	-.13	.02	.04	-.14	-.38**
4 60-second Pain Rating (Change Score)				.20	-.33*	.19	.02	-.07	-.09	-.55**
5 Tolerance (Pretest)					.55**	.05	.12	-.04	.40**	-.10
6 Tolerance (Posttest)						.12	.00	-.06	.37**	.37**
7 TAS							-.54**	.32*	.06	.16
8 Betts QMI								-.30*	-.03	.00
9 Rosenbaum SCS									.16	-.03
10 Cognitive Style Score (Pretest)										.20
11 Cognitive Style Score (Posttest)										—

Note. $\underline{n} = 82$

*$\underline{p} < .01$

**$\underline{p} < .001$

Table 36

Means and Standard Deviations
for the Dependent Measures

Variables	$\underline{M}$	$\underline{SD}$
Hypnotic Susceptibility		
Overall Mean	6.2	4.2
High	10.1	1.0
Low	2.0	1.4
60 Second Pain Rating (Pretest)	6.1	2.5
60 Second Pain Rating (Posttest)	5.1	2.7
60 Second Pain Rating (Change Score)	-1.0	2.3
Tolerance (Pretest)	162.9	70.9
Tolerance (Posttest)	173.8	68.2
TAS	23.5	6.6
Betts QMI	79.7	32.9
Rosenbaum SCS	27.3	26.8
Cognitive Style Score (Pretest)	1.5	.8
Cognitive Style Score (Posttest)	1.3	.9

Note. $\underline{n}$ = 82.

Susceptibility correlated with both the TAS and Betts QMI, supporting previous findings. Susceptibility also correlated with the Rosenbaum SCS. The Rosenbaum SCS correlated with both the TAS and the Betts QMI, and these two measures intercorrelated. None of these measures (i.e. susceptibility, Rosenbaum SCS, TAS, or the Betts QMI) correlated with any of the pain rating or pain tolerance data. In addtion, none of these measures correlated with any of the cognition classification scores. A relationship had been predicted between the Rosenbaum SCS and the pain measures, which was not supported.

The various pain measures intercorrelated as expected. There were a number of correlations between the cognitive classification variables and the pain measures. Cognitive classification pretest was correlated with tolerance pretest and posttest, and cognitive classification posttest correlated with tolerance posttest and the percent change in tolerance score. In addition, cognitive classification posttest was correlated with the 60 second pain rating posttest and the 60 second pain rating change score.

Discussion

This section will begin with a general assessment of the experimental design. Results indicated that the pain apparatus was rated as moderately painful at the end of one minute, that the pain increased over time, and the pain ratings were not limited by ceiling or floor effects. The groups were comparable, in terms of Trial 1 pain ratings, as well as in terms of susceptibility levels. There were no significant changes in the pain ratings between Trial 1 and Trial 2 for the control group, therefore, it can be deduced that any pain reductions from Trial 1 to Trial 2 found in any of the other groups can be attributed to treatment effects. In addition, the distraction task appeared to be an effective pain reducing strategy, when used by the subjects who chose it.

While there were no differences between the number of subjects in the various groups that kept their finger in the apparatus until the four minute tolerance termination point, overall there were a substantial number of subjects who were able to reach this point (43% on the second trial). Many of the studies that had employed pressure pain had requested subjects to keep their fingers in the apparatus for two minutes, at which point the subject was asked to give a pain rating (see, for example: Barber & Cooper, 1972; Chaves & Barber, 1974; Chaves &

Doney (1976). These data would tend to indicate that the ceiling
time for termination should have been lengthened. However, one
study which employed a 10-minute ceiling for pain endurance found
that five of the 12 subjects (42%) reached this termination point
(Scott, 1978). These results indicate that lengthening the
tolerance ceiling, even up to 10 minutes, may not have changed
the results. As has already been noted it may be that tolerance
is, overall not as sensitive a pain measure as are intensity
ratings of pain. Nevertheless, the tolerance data and the pain
rating data in this study substantiated each other.

Treatment and Control Groups Compared

In the Choice conditions, subjects were able to choose the
pain reducing strategy that they felt would be most effective for
them. As such, one prediction of the study was that the subjects
in these conditions would report lower pain ratings and greater
tolerance on the second trial than the subjects in the Control
and the No Choice conditions. This prediction was supported by
both the pain rating analyses and the tolerance analyses.

Since subjects in the No Choice conditions had a specific
strategy for pain reduction, even though they did not choose it,
it was predicted that these subjects would also report greater
pain reductions and tolerance increments on the second trial,

than control subjects. Contrary to this prediction subjects in
the No Choice conditions failed to differ significantly from
controls on either pain rating or pain tolerance differences.
Previous studies, which provided subjects with similar
distraction strategies and identical imagery strategies as
employed in this study, found that these strategies were
effective in reducing pain from a baseline trial (for example,
Farthing, et al., 1982; Spanos, et al., in press). In this
study, these same strategies were effective in the Choice
condition. In addition, the probability is that any given
subject would have been matched, approximately half the time, with
the strategy that s/he would have chosen (if s/he had been given
the choice, as indicated by the selection of strategies by Choice
condition subjects). Therefore, on this basis alone there should
have been at least a marginal pain reduction from the first to
the second trial. Given this background, why were the strategies
not effective for the No Choice conditions?

It appears that informing subjects that there are two
strategies than can be used, but not giving them the option of
which strategy they can employ, results in a negative subject
effect (Masling, 1966; Weber & Cook, 1972). High and low
susceptible subjects responded in a similar manner to this
instructional manipulation, and in none of the four groups did
subjects in the No Choice condition report a pain reduction after
the strategy had been provided. Given these results, it appears

that these subjects did not, in fact, employ the pain reducing strategy. Instead, they concentrated on the negative aspects of the situation in spite of the strategy. This hypothesis is supported by the cognitive data analyses. While both the Choice and the Control groups maintained the same number of coping and non-coping subjects from Trial 1 to Trial 2, there was a significant increase in the number of non-coping subjects in the No Choice condition on Trial 2. Other than the brief instruction outlining the two strategies, there were no other instructional or procedural differences that could explain the response of these subjects, as compared to the response of subjects in other studies that employed similar or identical types of strategies (e.g. Farthing, et al., 1982; Spanos, et al., in press).

The Effect of the Choice Variable

Perhaps the most important and interesting results found in this study concern the subjects' responses in the Choice of strategy condition. It had initially been hypothesized that high and low susceptible subjects would choose strategies that fit with their abilities, and that this choice would result in equivalent pain decrements from the first to the second trial, for these two groups of subjects. While high susceptible subjects would be able to reduce pain with imagery suggestions,

low susceptible subjects would show similar decrements only when they could choose a strategy that did not involve imagery. The assumption behind this hypothesis was that pain may be reduced by many different routes. However, results of this study indicate that the relationship between susceptibility and strategy type is somewhat more complicated than had been initially hypothesized.

First of all, contrary to the original prediction, it was found that as many low susceptible as high susceptible subjects chose the imagery strategy, and conversely that as many high susceptible as low susceptible subjects chose the distraction strategy. While it was recognized that low susceptible subjects would not necessarily be aware that the distraction strategy might be effective, it had been thought that they would at least avoid the imagery strategy. Similarly, it had been predicted that high susceptible subjects would be more likely to choose the imagery strategy, since these are the subjects that tend to report good imagery ability.

In addition, it was found that all four groups in the choice condition did equally well. Low susceptible subjects reduced pain as much as high susceptible subjects with the imagery strategy, and high susceptible subjects reduced pain as much as low susceptible subjects with the distraction strategy. As has been noted, a number of studies have indicated that high susceptible subjects can use a distraction task effectively (Farthing, et al., 1982; Spanos, in press). However, this is the first study

to find that low susceptible subjects were able to use an imagery strategy as effectively as high susceptible subjects.

These data do not support the contention that low susceptible subjects are less able than high susceptible subjects to reduce pain using imagery strategies (Spanos, et al., in press) nor does it support the contention that low susceptible subjects are unable to divert attention inwardly in order to control pain (Farthing, et al., 1982). Contrary to these hypotheses both high and low susceptible subjects used both strategies effectively. The present results are complicated somewhat by the fact that there were no differences between the imagery scores of the high or low susceptible subjects who chose the imagery strategy as compared to those who chose the distraction strategy.

A number of hypotheses may be developed to account for these data. While high susceptible subjects may tend to have better imagery ability than low susceptible subjects, it does not necessarily follow that they will prefer an imagery strategy, or even that they know that they have superior imagery skills. It may be that subjects are not as aware of their abilities as experimenters assume. Alternatively, in terms of low susceptible subjects, it may be that any difference between subjects on some paper and pencil measure of a skill does not necessarily imply that a motivated subject is unable to use that skill, to an adequate degree, for a desired effect. Again, when motivated, it

is possible that a subject may only need some imagery ability to
use the analgesia suggestion effectively, not necessarily a high
level of imagery ability.

Another possible explanation is that the subjects' imagery
ability was not accurately assessed. Recent studies of paper and
pencil measures of imagery, have led some investigators to
question whether or not these measures actually assess imagery
ability (Ernest, 1977; Hiscock, 1978). Nevertheless, numerous
studies which found a relationship between imagery and
susceptibility, used the Betts questionnaire (Sheehan, 1979). In
addition, a significant correlation between susceptibility and
imagery was found in this study as well. Thus, it is not that
imagery was not reliably assessed, nor that there was no
relationship between susceptibility and imagery ability, but
rather it appears that imagery ability as assessed by this scale
was simply not a good predictor of whether or not the subjects
would choose an imagery strategy.

No other differences between high and low susceptible
subjects were found that could account for the data. For example,
there were no differences between the self-control scores of
those subjects who chose the distraction strategy as compared to
those who chose the imagery strategy, for either high or low
susceptible subjects. While there was a difference between high
and low susceptible subjects in the Choice condition on TAS
scores, these scores were not related to the type of strategy

chosen.

Thus the main finding of this study is that subjects who were given a choice of strategy exhibited the only significant pain reduction from the first to the second trial. Neither the susceptibility level of the subject, nor any other subject ability or preference affected the results. This is combined with the fact that no one strategy was found to be more effective than any other, thus, the only variable that could account for these data is the choice variable. Two factors are apparent when providing subjects with a choice. This manipulation allows an individual to use his/her own skill with, or preference for, a particular type of strategy. This is combined with the fact that the subjects themselves choose the strategy, thereby providing them with greater motivation and/or expectation that the strategy will be beneficial. As has been noted, it is difficult to account for these results in terms of different skills or abilities, mainly because both high and low susceptible subjects were able to use either strategy effectively - when they chose it.

However, the concept of perceived self-efficay (Bandura, 1977) could account for the salience of the Choice variable over other variables, such as the susceptibility level of the subject or the type of strategy used. Bandura notes that it is an individual's perception of efficacy which mediates coping efforts, not necessarily an individual's actual ability to cope.

Bandura (1977, p. 193) states:

"...expectations of personal mastery affect both
initiation and persistence of coping behavior.
The strength of people's convictions in their own
effectiveness is likely to affect whether they will
even try to cope with given situations."

In addition to the data already described as supporting this
hypothesis, there are additional data that address the question
more directly. Subjects in the groups were asked to rate the
degree to which they thought the strategy would be effective in
helping them to reduce pain on the second trial. While the
various groups of subjects who had been given a choice of
strategy did not differ from one another on this rating, they all
differed from the subjects in the No Choice groups. The No
Choice subjects rated their expectation of reducing the pain on
the second trial as significantly less than the Choice subjects.

A number of experimental studies have examined the effect of
expectation on subjects response to experimental pain (Beers &
Karoly, 1979; Chaves & Barber, 1974; Grimm & Kanfer, 1976; Chaves
& Doney, 1976; Scott & Leonard, 1978). For example, Chaves and
Barber (1974) told subjects that since they were not familiar
with the procedure they would feel less pain on the next trial
(i.e. positive expectancy). Similarly, Beers and Karoly (1976)
told subjects that the second trial would be less unpleasant.
While Chaves and Doney (1976) told subjects that they were
investigating techniqus that were effective in reducing pain. For

the most part, these studies did not find that the manipualation

of expectation alone was effective in reducing pain. However,

while these studies included positive expectancies about the

painful experience, they did not, in fact, provide subjects with

an actual strategy, or let them choose a strategy. That is, they

did not directly address issues that might affect the subject's

perceived mastery over pain, but rather they manipulated their

expectancy about the pain and/or situation per se.

However, there are other experimental studies which do

support the proposal that the concept of perceived self-efficacy

can account for the data obtained in this study (Kanfer &

Seidner, 1973; Neufeld & Thomas, 1977; Worthington, 1978). For

example, Neufeld and Thomas (1977) presented subjects with

variations in the stated efficacy of relaxation as a coping

technique, and assessed both pain threshold and tolerance with

cold pressor. Subjects did not differ on their physiological and

subjective measures of actual relaxation, indicating that any

differences between groups would be due to the cognitive

appraisal of coping efficacy and not actual coping efficacy.

Results indicated that high presented efficacy increased

tolerance as compared to low presented efficacy, the latter of

which had no effect.

Worthington, (1978) provided subjects with a choice of

imagery content and measured their self-reports of pain as well

as tolerance to cold pressor. While the imagery content variable

i.e. pleasant versus neutral imagery was not significant, the choice variable was. That is, subjects who were provided with the choice of which imagery strategy to use reported significant decreases in pain and greater tolerance as compared to a control group. As has been proposed here, this investigator hypothesized that the ability to choose the content of their imagery might have promoted attributions of self-efficacy. This study indicates that this effect occurs not only when comparing imagery strategies but also when comparing an imagery strategy to a non-imaginal strategy. It is important to note that in both of the above studies it was the subjects' belief about the efficacy of a particular strategy that they were to use which was affected and which resulted in a significant effect.

The current study may have implications for the role of susceptibility and pain control in clinical settings. As was noted, many clinicians state that in the clinical setting susceptibility does not appear to be as important a variable when using hypnosis, as it is in experimental settings. Nevertheless, while this viewpoint has been stated for some time, the empirical evidence relevant to it is not clear cut (Perry, et al., 1979). This study found, in an experimental setting, that the susceptibility variable was superceded by the choice variable. Taken together, it may be that in clinical settings, when a clinican works out a treatment plan with the client's participation, that treatment efficacy is facilitated. While

clinicians may not in fact provide clients with defined choices,
it is not uncommon for a clinician to work with a client to find
out what kind of imagery or thoughts the client most enjoys and/or
uses and then to incorporate them as part of the therapy (see, for
example, Hilgard & Hilgard, 1975). These individualized
interventions are likely to enhance the self-efficacy of low
susceptible as well as high susceptible clients and thereby
enable the low as well as the high susceptible subjects to achieve
significant reductions of clinical pain.

The same efficacy instructions may, however, be interpreted
in different ways. In part, it is perhaps different
interpretations which result in differences in coping behaviour.
That is, as Bandura (1977) proposes it may not be that people
differ in their ability to cope but rather in their belief that
they can, and it is that belief which affects their subsequent
cognitive (and often coping) behaviour. Certainly the results of
this study support this hypothesis. Subjects in the No Choice
group were given a strategy and were told that it had been found
effective, nevertheless, as has already been discussed, they did
not exhibit the same pain reductions as Choice subjects.

The response of low susceptible subjects in hypnotic
contexts in general can be examined in light of the self-efficacy
hypothesis. That is, low susceptible subjects may perceive the
hypnotic context as one in which they cannot respond (rather than
do not want to respond) (Spanos, Kennedy & Gwynn, 1983). Whether

or not the subject passively does not try, or actively resists,
the result is that they are unlikely to respond well to
suggestions to reduce pain. As has been clearly indicated, these
subjects will select an imagery strategy and will work with it
successfully when they are exposed to a relatively subtle
manipulation - the provision of a choice of which strategy to
use. In clinical settings, where the desire to reduce pain would
be even greater, it is probable that motivation would be a
particularly important variable (Perry, et al., 1979). However,
it may also be that motivation interacts with, and is part of, a
subjects' perceived self-efficacy, and this interaction is
important clinically.

Overall, the results of this study support the contention
that pain perception is complex and affected by a number of
psychological variables. While the data do not suggest that
susceptibility is irrelevant to pain attenuation, they do suggest
that other cognitive variables, such the provision of a choice of
two different pain attenuating strategies can, under some
circumstances, be more salient.

Gender Differences in Strategy Chosen

One finding that had not been predicted concerned an
interaction between gender and choice of strategy. In the Choice

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condition, both high and low susceptible females tended to choose the distraction strategy while both high and low susceptible males tended to choose the imagery strategy. Overall, it has been noted that females score higher than males on paper and pencil measures of imagery (Sheehan, 1979). Thus, if anything, these findings suggest that females would be more likely than males to choose the imagery strategy. Why the opposite result was obtained is unclear. Perhaps, given that the experimenter was female, there was some interaction between the gender of the subject, the gender of the experimenter, and the type of strategy chosen. Perhaps male subjects, knowing that their performance would be monitored on the distraction task, preferred the more covert imagery strategy. However, this does not explain why so many females chose the distraction strategy. It is also possible that the relationship between sex and type of strategy chosen is spurious and it will be interesting to see if this relationship replicates in future work.

Directions for Further Research

There are two aspects of the current study that warrant further investigation. In terms of experimental research, it would be worthwhile replicating the study to see if the relationship between the gender of the subject and the choice of

pain reducing strategy is confirmed. In addition, a clearer understanding of the role of choice factors and susceptibility would be obtained if the study were expanded and Choice and No Choice subjects were compared with another two groups of subjects who were each given one of the two strategy types (but were not told about the other type of strategy). The original hypotheses would likely be supported with this type of design. That is, it would be predicted that subjects who were given either imagery or distraction strategies (without being told of the other strategy) would report reduced pain on the second trial as compared to the type of instructions received by subjects in the No Choice condition in this study. Such a study could either support or challenge some of the hypotheses proferred to account for the results obtained in this study.

However, it is in terms of clinical research that results of this study may be examined for more practical purposes. It would be important to evaluate if, in fact, choice is an important variable in pain attenuation in a clinical setting. A study systematically examining the variables used in this study may shed some light on both the role of hypotic susceptibility and the role of choice of stratgy, and any interaction between these variables, on clinical pain. While the strategies would have to be modified to suit clinical pain, it would be important to assess whether the role of susceptibility is superseded by the choice variable in this setting. In this situation as well, it

would be interesting to compare subjects provided with a choice

of strategy and subjects told of the strategies but not provided

with the option, to subjects who were given one of the two

strategy types but were not told about the other type of strategy.

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Footnotes

1. Tolerance analyses were also computed using all subjects; that is, including those subjects who reached the four minute termination point on the first trial, as well as those who did not. The results of these analyses did not differ appreciably from those reported.
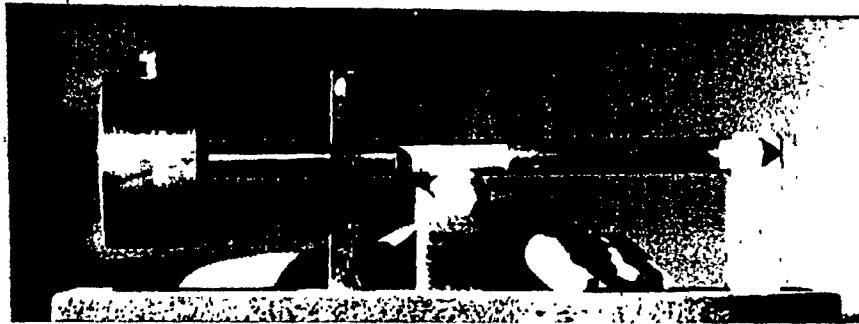
Appendix·A

Random Assignment of Subjects to Conditions

Hand Used on First and Second Trials	Treatment Condition	Condition for No Choice Subjects
right/left	Choice	
right/left	No Choice	Imagery
left/right	Control	
right/left	No Choice	Distraction
right/left	Control	
right/left	Choice	
right/left	Control	
right/left	No Choice	Distraction
left/right	Control	
left/right	Choice	
right/left	No Choice	Imagery
right/left	Choice	
left/right	Choice	
right/left	No Choice	Distraction
left/right	Choice	
right/left	No Choice	Imagery
right/left	No Choice	Distraction
right/left	No Choice	Imagery
left/right	Choice	
right/left	Choice	
right/left	No Choice	Imagery
left/right	No Choice	Imagery
left/right	Choice	
right/left	Control	
left/right	Control	
left/right	Choice	
left/right	No Choice	Distraction
right/left	No Choice	Distraction
left/right	Choice	
left/right	Choice	
left/right	Control	
left/right	No Choice	Distraction
left/right	Choice	
right/left	No Choice	Imagery
right/left	No Choice	Imagery
left/right	Choice	
left/right	Choice	
right/left	Control	
left/right	Choice	
left/right	No Choice	Distraction
left/right	Choice	
left/right	Choice	

Note: The same random order was used for both high and low susceptible subjects.

Appendix B

Modified Version of the Forgione-Barber

Strain Guage Pain Stimulator

Appendix C

Cognitive Style Questionnaire

I am interested in finding out what kinds of things you thought about, imagined, or felt when you had your finger in the apparatus. Something is going through our minds all the time. Please write down what you can remember of what you were thinking about, imagining or saying to yourself while your finger was in the apparatus.

It is important that you didn't leave anything out of your description. Please think carefully and add anything else that you can remember about what you were experiencing.

The following questionnaire is designed to get a general assessment of how often, how long, and how intense or vivid your thoughts were. Select up to three main thoughts and relate each one separately to the following questions.

1. Please write below a few words to describe the thoughts and/or images you had and separately rate how often each of these thoughts and/or images crossed your mind, according to the following classification:

    (a) only once
    (b) two to four times
    (c) five to seven times
    (d) eight to ten times
    (e) more than ten times

    Thought/Image #1 _____   Rating a b c d e

    Thought/Image #2 _____   Rating a b c d e

    Thought/Image #3 _____   Rating a b c d e

2. In addition, please rate how long these same thoughts and/or images usually lasted, according to the following classification:

    (a) just fleeting
    (b) a few seconds
    (c) five to ten seconds
    (d) ten to twenty seconds
    (e) more than twenty seconds

    Thought/Image #1 _____   Rating a b c d e

    Thought/Image #2 _____   Rating a b c d e

    Thought/Image #3 _____   Rating a b c d e

3. Finally, please rate <u>how intense or vivid</u> these thoughts and/or images were, according to the following classification:

   (a) rather vague
   (b) somewhat clear
   (c) moderately vivid/intense
   (d) considerably vivid/intense
   (e) extremely vivid/intense

   Thought/Image #1 _____   Rating   a b c d e

   Thought/Image #2 _____   Rating   a b c d e

   Thought/Image #3 _____   Rating   a b c d e

C

Appendix D

Guide for Scoring Coping and Non-coping Cognitions[1]

The purpose of this guide is to help you rate the verbal testimony given by subjects who participated in a pain experiment. The index finger of each subject was placed in an apparatus which applied constant pressure to the finger. This was done on two occasions, once with the index finger of each hand. On each trial the subject was asked to keep his/her finger in the apparatus as long as possible (although the trial was terminated after four minutes). After each trial, the subject completed a short questionnaire designed to assess what the individual had been thinking about during the previous trial. The question was worded: "I am interested in finding out what kinds of things you thought about, imagined, or felt when you had your finger in the apparatus. Something is going through our minds all the time, but often we don't pay much attention to these thoughts. Please write down what you can remember of what you were thinking about, imagining or saying to yourself while your finger was in the apparatus" (see attached).

The subject's comments have been divided into separate thoughts and numbered. Your job will be to rate each separate thought (i.e.

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1. This scoring guide is a modified version of the scoring guides developed by Chaves and Brown, 1978; and by Spanos, Radtke-Boderik, Ferguson and Jones, 1979.

each numbered comment) for the presence or absence of certain cognitive activities. There are a maximum of four thoughts to classify for each subject on each trial. For rating purposes, the three major categories of cognitive activities are: 1) coping strategies; 2) non-coping cognitions and, 3) indeterminate or no strategy. Each thought will be examined to determine which category of cognitive activity it represents. The categories are mutually exclusive for the separate thoughts. One subject may, however, have one thought rated as a coping strategy and another rated as a non-coping thought.

Cognitive Coping Strategies

A coping strategy is an active cognitive event that is hypothesized to have some consequences on the perception of pain. Cognitive coping strategies are defined as cognitive activities (thoughts, images) which the subject employs to help him/her cope with the pain. There are a variety of cognitive coping strategies as described below:

a) Distraction: The subject is to be rated as using a coping strategy if he/she reports focusing his/her attention on something other than the noxious stimulation. For example, doing mental arithmetic, thinking about what was done earlier in the day, or about what to do later on, would be examples of distraction coping strategies. This strategy is also known as "attention diversion". Focusing attention on some bodily process, such as rate of breathing or heart rate, would also be classified as a distraction coping strategy. This strategy is also known as "somatization". Finally, saying helpful things to oneself during the trial period, such as, "this isn't so bad", "take it easy", etc. should also be rated as a

distraction coping strategy. This type of statement is often referred to as "coping self-statements".

Coping imagery should not be classified as distraction. For example, if a subject reports "I imagined that I was lying on a beach under the warm sun", this is an example of coping imagery, not a distraction coping strategy.

b) <u>Relaxation</u>: An example of a relaxation coping strategy is when a subject describes his/her experience during the trial with terms such as relaxed, calm, or drowsy. The subject should not be given a rating in this classification if he/she reports trying unsuccessfully to achieve such a state. For example, "I tried to relax, but could not", should not receive a relaxation coping classification.

c) <u>Coping Imagery</u>: A subject is classified as using a coping imagery strategy if he/she reports imagining a situation that is unrelated to the painful situation or imagines a situation that is inconsistent with feeling pain. For example, imagining lying on a warm sunny beach would involve coping imagery unrealted to the painful situation. Imagining that one's hand was like rubber or it was numb and insensitive, are examples of imaginings inconsistent with feeling pain in the noxious situation. Subjects' testimony should be rated as using coping imagery only if their report indicates that their experiences involved imagery. Thus, if a subject simply reported that they thought about their shopping list, they would be rated as using a distraction coping strategy, not coping imagery.

However, if they reported imagining themselves at home writing down a shopping list, or imagined themselves in the store shopping, they would be rated as using coping imagery.

Non-coping Cognitions

Non-coping cognitions are defined as cognitive activities (thoughts, images) which are hypothesized to interfere with an individual's ability to cope with pain. There are a variety of non-coping cognitions as described below:

a) <u>Negative self-statements</u>: A subject who reports thoughts which imply an inability to cope with the situation, such as, "this is awful" or "I can't stand this anymore", is rated as engaging in a non-coping thought labelled negative self-statements.

b) <u>Catastrophizing thoughts</u>: A subject who exaggerates the noxious aspects of the situation and thinks of unrealistic or frightening consequences, is rated as engaging in a catastrophizing thought. For example, "I wondered if my finger would ever be the same", or "I thought the bar was cutting into my flesh".

c) <u>Catastrophizing imagery</u>: The subject is rated as using catastrophizing imagery if he/she imagines a situation that is more noxious than the one he/she is in, e.g. "I thought about my hand being amputated and I imagined the blood all around".

Neutral or No Strategy

Any statement which implies that the subject is simply reporting on how the pain felt, or what they thought about the apparatus or the situation in a neutral fashion is neither a cognitive coping strategy nor a non-coping thought. These types of thoughts are rated

"indeterminate" or "no strategy". For example, if a subject reported:

"After one minute I noticed that the pain decreased and then I wondered why..", his/her thought would be rated as "no strategy". The statement neither describes a strategy that would help to cope with the pain nor does it imply that the subject was engaging in cognitions that would exacerbate the pain or make the situation worse. In other cases the subject simply does not provide enough information to rate the report. In these instances it is preferable to be conservative and to rate the strategy "neutral" or "no strategy" than to rate it in a manner that is not representative of the way the subject was thinking.

Thus, the rater's job will be to classify each separate thought according to one of the three major categories of cognitive activities: 1) Coping strategy; 2) Non-coping thoughts; or, 3) Neutral or No strategy. Both coping and non-coping cognitive activity can be further subdivided as outlined in this manual. It is important for the rater to report which sub-category of the general categories is being examined in order to accurately classify the strategy. However, it is only necessary for the rater to determine whether the thought represents a coping, a non-coping or a neutral strategy.

In cases where a subject engages in both coping and non-coping cognitions (i.e. mixed cognitions), it is up to the rater to determine which is the predominant cognitive style. For example, if a subject reports: "I felt as though the apparatus was going to break my finger and I couldn't stand it, but then I told myself to relax, and it worked, I felt better", the predominant cognitive strategy would

be coping. If a subject stated: "Things were going well, and I felt I could handle it, but then I started to wonder if I would ever be able to use my hand again, and I had to stop the pain", the predominant cognitive style would be non-coping. The questionnaire attached to the open-ended questions can be helpful in determining the approximate weighting of various thoughts or images (see attached). For example, if a subject reported that s/he thought in a non-coping manner only once, for a few seconds, it would be weighted more lightly than a non-coping thought which was present five to seven times, and lasted five to ten seconds.

Appendix E

Tellegen's Absorption Scale (TAS)

In this booklet, you will find a series of statements a person might use to describe his or her characteristics. Each statement is followed by two choices -- True and False. Read the statement and decide which choice better describes you. Then circle your answer on the answer sheet.

Please answer every statement, even if you are not completely sure of the answer. Read each statement carefully, but don't spend too much time deciding on the answer.

In marking your answers on the answer sheet, please be sure that the number of the statement in the booklet is the same as the number on the answer sheet.

1. Sometimes I feel and experience things as I did when I was a child.

2. I can be greatly moved by eloquent or poetic language.

3. While watching a movie, a television show, or a play, I may become so involved that I forget about myself and my surroundings and experience the story as if it were real and as if I were taking part in it.

4. If I stare at a picture and then look away from it, I can sometimes "see" an image of the picture, almost as if I were still looking at it.

5. Sometimes I feel as if my mind could envelope the whole world.

6. I like to watch cloud shapes change in the sky.

7. If I wish, I can imagine (or daydream) some things so vividly that they hold my attention as a good movie or story does.

8. I think I really know what some people mean when they talk about mystical experiences.

9. I sometimes "step outside" my usual self and experience an entirely different state of being.

10. Textures -- such as wool, sand, wood -- sometimes remind me of colours or music.

11. Sometimes I experience things as if they were doubly real.

12. When I listen to music, I can get so caught up in it that I don't notice anything else.

13. If I wish, I can imagine that my body is so heavy that I could not move it if I wanted to.

14. I can often somehow sense the presence of another person before I actually see or hear him or her.

15. The crackle and flames of a wood fire stimulate my imagination.

16. It is sometimes possible for me to be completely immersed in nature or in art and to feel as if my whole state of consciousness has somehow been temporarily altered.

17. Different colours have distinctive and special meanings for me.

18. I am able to wander off into my own thoughts while doing a routine task and actually forget that I am doing the task, and then find a few minutes later that I have completed it.

19. I can sometimes recollect certain past experiences in my life with such clarity and vividness that it is like living them again or almost so.

20. Things that might seem meaningless to others often make sense to me.

21. While acting in a play, I think I could really feel the emotions of the character and "become" him or her for the time being, forgetting both myself and the audience.

22. My thoughts often don't occur as words but as visual images.

23. I often take delight in small things (like the five-pointed star shape that appears when you cut an apple across the core or the colours in soap bubbles).

24. When listening to organ music or other powerful music, I sometimes feel as if I am being lifted into the air.

25. Sometimes I can change noise into music by the way I listen to it.

26. Some of my most vivid memories are called up by scents and smells.

27. Certain pieces of music remind me of pictures or moving patterns of colour.

28. I often know what someone is going to say before he or she says it.

29. I often have "physical memories"; for example, after I've been swimming I may still feel as if I'm in the water.

30. The sound of a voice can be so fascinating to me that I can just go on listening to it.

31. At times I somehow feel the presence of someone who is not physically there.

32. Sometimes thoughts and images come to me without the slightest effort on my part.

33. I find that different odours have different colours.

34. I can be deeply moved by a sunset.

Appendix F

Shortened Version of the Betts' Questionnaire
Upon Mental Imagery (Betts QMI)

Instructions for Doing Test

The aim of this test is to determine the vividness of your imagery.
The items of the test will bring certain images to your mind. You are
to rate the vividness of each image by reference to the accompanying
rating scale, which is shown at the bottom of the page. For example,
if your image is "vague and dim" you give it a rating of 5. Record
your answer in the brackets provided after each item. Just write the
appropriate number after each item. Before you turn to the items on
the next page, familiarize yourself with the different categories on the
rating scale. Throughout the test, refer to the rating scale when
judging the vividness of each image. A copy of the rating scale will
be printed on each page. Please do not turn to the next page until you
have completed the items on the page you are doing, and do not turn
back to check on other items you have done. Complete each page before
moving on to the next page. Try to do each item separately independent
of how you may have done other items.

The image aroused by an item of this test may be -

Perfectly clear and vivid as the actual experience   ..Rating 1

Very clear and comparable in vividness to the actual experience..Rating 2

Moderately clear and vivid   ..Rating 3

Not clear or vivid, but recognizable   ..Rating 4

Vague and dim   ..Rating 5

So vague and dim as to be hardly discernible   ..Rating 6

No image present at all, you only "knowing" that you are
thinking of the object   ..Rating 7

An example of an item on the test would be one which asked you to
consider an image which comes to your mind's eye of a red apple. If your
visual image was moderately clear and vivid you would check the rating
scale and mark "3" in the brackets as follows:

Item		Rating
5.	A red apple	(3)

Now turn to the next page when you have understood these instructions
and begin the test.

Think of some relative or friend whom you frequently see, considering carefully the picture that rises before your mind's eye. Classify the images suggested by each of the following questions as indicated by the degrees of clearness and vividness specified on the Rating Scale.

<u>Item</u>   <u>Rating</u>

1. The exact contour of face, head, shoulders and body .... (   )

2. Characteristic poses of head, attitudes of body, etc. ..... (   )

3. The precise carraige, length of step, etc. in walking ..... (   )

4. The different colours worn in some familiar costume .... (   )

Think of seeing each of the following, considering carefully the picture which comes before your mind's eye; and classify the image suggested by each of the following questions as indicated by the degrees of clearness and vividness specified on the Rating Scale.

5. The sun as it is sinking below the horizon .... (   )

<u>Rating Scale</u>

The image aroused by an item of this test may be -

Perfectly clear and as vivid as the actual experience ....   Rating 1

Very clear and comparable in vividness to the
                        actual experience ....   Rating 2

Moderately clear and vivid ....   Rating 3

Not clear or vivid, but recognizable ....   Rating 4

Vague and dim ....   Rating 5

So vague and dim as to be hardly discernible ....   Rating 6

No image present at all, you only "knowing" that you are
                        thinking of the object ....   Rating 7

Think of each of the following sounds, considering carefully the image which comes to your mind's ear, and classify the images suggested by each of the following questions as indicated by the degrees of clearness and vividness specified on the Rating Scale.

Item	Rating
6. The whistle of a locomotive	( )
7. The honk of an automobile	( )
8. The mewing of a cat	( )
9. The sound of escaping steam	( )
10. The clapping of hands in applause	( )

Rating Scale

The image aroused by an item of this test may be -

Perfectly clear and as vivid as the actual experience	Rating 1
Very clear and comparable in vividness to the actual experience	Rating 2
Moderately clear and vivid	Rating 3
Not clear or vivid, but recognizable	Rating 4
Vague and dim	Rating 5
So vague and dim as to be hardly discernible	Rating 6
No image present at all, you only "knowing" that you are thinking of the object	Rating 7

Think of "feeling" or touching each of the following, considering
carefully the image which comes to your mind's touch, and classify
the images suggested by each of the following questions as indicated
by the degrees of clearness and vividness specified on the Rating
Scale.

Item	Rating
11. Sand	( )
12. Linen	( )
13. Fur	( )
14. The prick of a pin	( )
15. The warmth of a tepid bath	( )

Rating Scale

The image aroused by an item of this test may be –

Perfectly clear and as vivid as the actual experience .... Rating 1
Very clear and comparable in vividness to the
                              actual experience .... Rating 2
Moderately clear and vivid .... Rating 3
Not clear or vivid, but recognizable .... Rating 4
Vague and dim .... Rating 5
So vague and dim as to be hardly discernible .... Rating 6
No image present at all, you only "knowing" that you
                              are thinking of the object ..... Rating 7

Think of performing each of the following acts, considering
carefully the image which comes to your mind's arms, legs, lips,
etc., and classify the images suggested as indicated by the
degree of clearness and vividness specified on the Rating Scale.

Item		Rating
16.	Running upstairs	( )
17.	Springing across a gutter	( )
18.	Drawing a circle on paper	( )
19.	Reaching up to a high shelf	( )
20.	Kicking something out of your way	( )

Rating Scale

The image aroused by an item of this test may be -

Perfectly clear and as vivid as the actual experience .... Rating 1

Very clear and comparable in vividness to the
actual experience .... Rating 2

Moderately clear and vivid .... Rating 3

Not clear or vivid, but recognizable .... Rating 4

Vague and dim .... Rating 5

So vague and dim as to be hardly discernible .... Rating 6

No image present at all, you only "knowing" that you
are thinking of the object ..... Rating 7

Think of tasting each of the following, considering carefully the image which comes to your mind's mouth, and classify the images suggested by each of the following questions as indicated by the degrees of clearness and vividness specified on the Rating Scale.

Item   Rating

21. Salt .... ( )
22. Granulated (white) sugar .... ( )
23. Oranges .... ( )
24. Jelly .... ( )
25. Your favourite soup .... ( )

Rating Scale

The image aroused by an item of this test may be –

Perfectly clear and as vivid as the actual experience .... Rating 1
Very clear and comparable in vividness to the
                            actual experience .... Rating 2
Moderately clear and vivid .... Rating 3
Not clear or vivid, but recognizable .... Rating 4
Vague and dim .... Rating 5
So vague and dim as to be hardly discernible .... Rating 6
No image present at all, you only "knowing" that you
                            are thinking of the object ..... Rating 7

Think of smelling each of the following, considering carefully the image which comes to your mind's nose, and classify the images suggested by each of the following questions as indicated by the degrees of clearness and vividness specified on the Rating Scale.

Item   Rating

26. An ill-ventilated room .... ( )
27. Cooking cabbage .... ( )
28. Roast beef .... ( )
29. Fresh paint .... ( )
30. New leather .... ( )

Rating Scale

The image aroused by an item of this test may be -

Perfectly clear and as vivid as the actual experience ..... Rating 1

Very clear and comparable in vividness to the
                        actual experience .... Rating 2

Moderately clear and vivid .... Rating 3

Not clear or vivid, but recognizable .... Rating 4

Vague and dim .... Rating 5

So vague and dim as to be hardly discernible .... Rating 6

No image present at all, you only "knowing" that you
                        are thinking of the object ..... Rating 7

Think of each of the following sensations, considering carefully the image which comes before your mind, and classify the images suggested as indicated by the degrees of clearness and vividness specified on the Rating Scale.

Item   Rating

31. Fatigue .... ( )
32. Hunger .... ( )
33. A sore throat .... ( )
34. Drowsiness .... ( )
35. Repletion as from a very full meal .... ( )

Rating Scale

The image aroused by an item of this test may be -

Perfectly clear and as vivid as the actual experience ... Rating 1
Very clear and comparable in vividness to the
                              actual experience .... Rating 2
Moderately clear and vivid .... Rating 3
Not clear or vivid, but recognizable .... Rating 4
Vague and dim .... Rating 5
So vague and dim as to be hardly discernible .... Rating 6
No image present at all, you only "knowing" that you
                              are thinking of the object .... Rating 7

Appendix G

Rosenbaum Self-Control Schedule (SCS)

Name: _____

Directions: Indicate how characteristic or descriptive each of the
     following statements is of you by using the code given below.

     + 3   very characteristic of me, extremely descriptive

     + 2   rather characteristic of me, quite descriptive

     + 1   somewhat characteristic of me, slightly descriptive

     - 1   somewhat uncharacteristic of me, slightly undescriptive

     - 2   rather uncharacteristic of me, quite undescriptive

     - 3   very uncharacteristic of me, extremely nondescriptive

____ 1. When I do a boring job, I think about the less boring parts
         of the job and the reward that I will receive once I am
         finished.

____ 2. When I have to do something that is anxiety arousing for
         me, I try to visualize how I will overcome my anxieties
         while doing it.

____ 3. Often by changing my way of thinking, I am able to change
         my feelings about almost everything.

____ 4. I often find it difficult to overcome my feelings of
         nervousness and tension without any outside help.

____ 5. When I am feeling depressed, I try to think about pleasant
         events.

____ 6. I cannot avoid thinking about mistakes I have made in the
         past.

____ 7. When I am faced with a difficult problem, I try to approach
         its solution in a systematic way.

____ 8. I usually do my duties quicker when somebody is pressuring
         me.

___ 9. When I am faced with a difficult decision, I prefer to postpone making a decision even if all the facts are at my disposal.

___ 10. When I find that I have difficulties in concentrating on my reading, I look for ways to increase my concentration.

___ 11. When I plan to work, I remove all the things that are not relevant to my work.

___ 12. When I try to get rid of a bad habit, I first try to find out all the factors that maintain this habit.

___ 13. When an unpleasant thought is bothering me, I try to think about something else.

___ 14. If I would smoke two packages of cigarettes a day, I probably would need outside help to stop smoking.

___ 15. When I am in a low mood, I try to act cheerful so my mood will change.

___ 16. If I had the pills with me, I would take a tranquilizer whenever I felt tense and nervous.

___ 17. When I am depressed, I try to keep myself busy with things that I like.

___ 18. I tend to postpone unpleasant duties even if I could perform them immediately.

___ 19. I need outside help to get rid of some of my bad habits.

___ 20. When I find it difficult to settle down and do a certain job, I look for ways to help me settle down.

___ 21. Although it makes me feel bad, I cannot avoid thinking about all kinds of possible catastrophes in the future.

___ 22. First of all, I prefer to finish a job that I have to do and then start doing the things I really like.

___ 23. When I feel pain in a certain part of my body, I try not to think about it.

___ 24. My self-esteem increases once I am able to overcome a bad habit.

_____ 25. In order to overcome bad feelings that accompany failure,
I often tell myself that it is not so catastrophic and that
I can do something about it.

_____ 26. When I feel that I am too impulsive, I tell myself "stop
and think before you do anything".

_____ 27. Even when I am terribly angry at somebody, I consider my
actions very carefully.

_____ 28. Facing the need to make a decision, I usually find out all
the possible alternatives instead of deciding quickly and
spontaneously.

_____ 29. Usually I do first the things I really like to do even if
there are more urgent things to do.

_____ 30. When I realize that I cannot help but be late for an
important meeting, I tell myself to keep calm.

_____ 31. When I feel pain in my body, I try to divert my thoughts
from it.

_____ 32. I usually plan my work when faced with a number of things
to do.

_____ 33. When I am short of money, I decide to record all my expenses
in order to plan more carefully for the future.

_____ 34. If I find it difficult to concentrate on a certain job, I
divide the job into smaller segments.

_____ 35. Quite often, I cannot overcome unpleasant thoughts that
bother me.

_____ 36. Once I am hungry and unable to eat, I try to divert my
thoughts away from my stomach or try to imagine that I am
satisfied.

Appendix H

Preliminary Instructions, All Subjects

The experiment will involve assessing your response to this
pain stimulus. I'll show you how it works. The middle of one of
your index fingers will be placed under the bar, and when you're
ready I will slowly let the weight down and you will feel the pressure
of the weight on your index finger. Although most people find the
weight uncomfortable, I would like you to try to keep your finger
in the apparatus for at least one minute, and for as long after one
minute as possible. I will tell you when one minute is up. However,
you may remove your finger from the apparatus at any time that you
feel too uncomfortable. During the time that your finger is in the
apparatus I will ask you to rate the sensations you are experiencing
on a scale that ranges from 0 to 10. I will ask you to put one of your
index fingers in the apparatus on two separate occasions. That is,
left/right finger first followed by the right/left finger. After
each occasion I will ask you to fill out a few short questionnaires
related to you experiences. If this procedure is acceptable, I would
like you to read and sign this consent form, ok?

Appendix I

Informed Consent Form

This session may involve some discomfort. As such, we would like to be sure you are aware of the main procedures involved before you agree to participate further. Following is a written description of the procedure I have described to you verbally.

During this experiment, one of your index fingers will be placed in the pressure apparatus. About every 20 seconds you will be asked to rate the intensity of the sensations that you experience on a 0 to 10 scale. We would like you to try to keep your finger in the pressure apparatus for at least one minute, and for as long after one minute as you can. However, if your finger becomes too uncomfortable, you may withdraw it from the apparatus at any time. You will have one of your index fingers placed in the apparatus on two occasions, and after each occasion you will be asked to fill out a few short questionnaires.

I, _____, understand the procedure involved and agree to participate. I also understand that I have the freedom to withdraw from the experiment at any time.

_____   _____
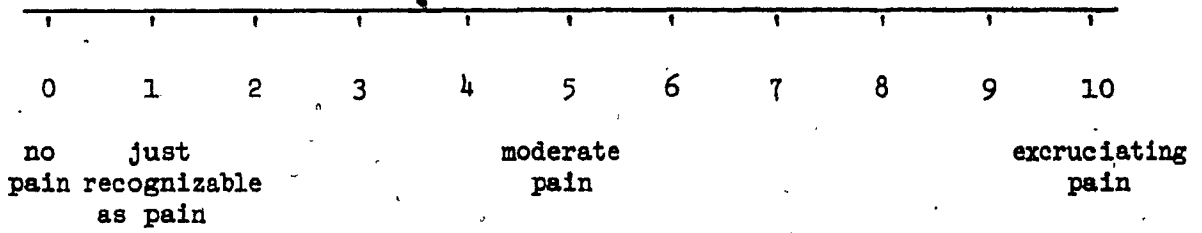Participant Signature   J. D'Eon, Investigator

_____
Date

Appendix J

Instructions Prior to Trial 1, All Subjects

Before we begin I'd like to explain to you how to rate the
sensations you will experience. Here is a 0 to 10 scale, where 0
means no pain, 1 means the sensations are just recognizable as pain,
5 means moderate pain, and 10 means excruciating pain, or the point
at which you want to stop. The other numbers on the scale represent
various gradients of sensations you may experience. Now, every
20 seconds I will say "rate", and when I say "rate" I would like you
to give me a number from the scale which best corresponds to your level
of pain. Please don't spend a long time thinking about the rating,
just quickly state in a clear voice the number that best corresponds
to the sensations you are experiencing. As I said before, try to
keep your finger in the apparatus for at least one minute, and for as
long after one minute as possible. I will tell you when one minute
is up. Now, when you are ready I would like you to say "begin" and
I will lower the bar over your index finger. Whenever you want to stop
just say "stop" or remove the bar from your finger.

Appendix K

Pain Scale

```
|----|----|----|----|----|----|----|----|----|----|
0    1    2    3    4    5    6    7    8    9    10

no    just                    moderate                 excruciating
pain recognizable                pain                       pain
     as pain
```

Appendix L

Instructions for Treatments

Now that you have been through the procedure once, I would like to see if we can alter the sensations you experienced. It has been found that there are a few strategies that are effective in reducing the intensity of this pain stimulus. One strategy that has been found effective is to imagine something inconsistent with the pain, such as thinking about and imagining your hand as numb and insensitive. Another strategy is to do a task which is inconsistent with the pain, such as quickly repeating letters, one at a time, as they are heard over a set of headphones. This task is called shadowing.

Choice of Strategy Condition: Which strategy do you think would be most effective for you in reducing pain during the next trial, as compared to the first - imagining your finger as numb, or repeating letters, the shadowing task?

No Choice of Strategy, Imagery Condition: What I would like you to do is to use the strategy which involves imagining your finger as numb and insensitive.

No Choice of Strategy, Distraction Condition: What I would like you do do is to use the strategy which involves shadowing, or repeating letters.

Appendix M

Imagery Instructions

I want you to succeed in not being disturbed by the weight by doing
the following. Try to the best of your ability to imagine and
think of your (right/left) hand as numb and insensitive. Think of
your (right/left) hand as unable to sense any pain or discomfort.
Please try to imagine your hand as numb and insensitive as if it were
a piece of rubber. Although this is a difficult task, do not get
discouraged. Continue imagining your hand as numb and insensitive as
long as you can. What I would like you to do is to continuously
imagine and think that your (right/left) hand has no feeling. Keep
thinking that it is unable to feel any pain or discomfort, or feeling
of any kind. Please try to the very best of your ability to think
continuously and to imagine vividly that your hand is numb, insensitive
and like a piece of rubber until the weight is off. I will give you
a 45-second practice trial before we actually put your finer in the
apparatus. Every 20 seconds, I will say "RATE", just like before, and
I would like you to state clearly the number from the scale that best
represented the sensations you experienced when I said "RATE". That
is, please do not stop imagining your finger as numb and insensitive,
just quickly state the number that best corresponds to the sensations
you experienced. Ok?

    -- PRACTICE TRIAL --

    (Expectation Questionnaire administered.)

Now, I would like you to do this task while your finger is in the apparatus. Just as in the practice trial, I will ask you to rate the sensations you are experiencing, every 20 seconds. Again, without thinking about it too much, state the number from the scale which best corresponds with the sensations you are experiencing. As before; I would like you to keep your finger in the apparatus for at least one minute and for as long after one minute as you can. Now, keep thinking and vividly imagining that your (right/left) hand is becoming more and more numb and insensitive. Tell me when to begin and when to end.

Appendix N

Expectation Questionnaire

To what extent do you expect this strategy to help you to control pain during the next trial?

a) Not at all

b) A little

c) Moderately

d) Considerably

e) As much as possible

Note. For scoring purposes:

$a = 0$
$b = 1$
$c = 2$
$d = 3$
$e = 4$

Appendix O

Random Letters Used for the Shadowing Task

PRACTICE

X P U E Z H Z U Q Z D Z H P K A X L D F B B Q P R U   RATE _____

R I S B T C A C C S I V Y Y X F E B I I E K R I C L   RATE _____

O Q B X S R X L D

1st MINUTE

X D B A R I E U O T Q H T H U F R F P I P Z B F I V   RATE _____

U H Q F S Y R S B E Z B H F U Q D K D S E P P E B Y   RATE _____

Z K R K T X C D S K T O H X P E Y T Z K H A U C C F   RATE _____

2nd MINUTE

Z X I A A E D T X A L S G Y Z L V P Q Z U L E D C B   RATE _____

Q D E R C I I O D P V I L D E R A H L X Z F B O S I   RATE _____

X O B A R I E U O T Q H I H U F R F P I P Z B F I V   RATE _____

3rd MINUTE

U H Q F S Y R S B E Z B H F U Q D K D S E P P E B Y   RATE _____

Z K R K T X C D S K T O H K P E Y T Z K H A Y C C F   RATE _____

Z X I A A E D T X A L S G Y Z L V P Q Z U L E D C B   RATE _____

4th MINUTE

X P U E Z H Z U Q Z D Z H P K A X L D F B B Q P R U   RATE _____

R I S B T C A C C S I V Y Y X F E B I I E K R I C L   RATE _____

X D B A R I E U O T Q H T H U F R F P I P Z B F I V   RATE _____

Note. Letters W, J, G, M, and N were not included.

Appendix P

Distraction Instructions

I want you to succeed in not being disturbed by the weight by doing

the following. I would like you to shadow the letters you hear over

the headphones. This means that you are to repeat, out loud in a

clear voice, the letters that come over the headphones, as you hear

them. The letters come quickly and I would like to to try to repeat

each letter as you hear it, one at a time. Please do not string the

letters together, i.e. af gp dk. Continue repeating each letter as

you hear it and if you get off track, or loose a few letters, that's

okay. Don't try to correct mistakes or catch up, just try to get the

ones you hear correct, continue from the next letter if you miss one.

Although it is a difficult task, try not to get discouraged.

I will give you a 45-second practice trial before we actually put

your finger in the apparatus. Every 20 seconds, I will say "RATE"

on the tape, just like before, and I would like you to state clearly

the number from the scale that best represented the sensations you

experienced when I said "RATE". That is, because you only have a few

seconds, do not spend a lot of time thinking about the rating, just

quickly state the number that best corresponds to the sensations you

experienced. You may find that you too will say "RATE" after you hear

it on the headphones; that's okay, then just try to rate the sensation

as quickly as possible. Ok?

— PRACTICE TRIAL --

(Expectation Questionnaire administered.)

Now, I would like you to do this task while your finger is in the apparatus. Just as in the practice trial, I will ask you to rate the sensations you are experiencing every 20 seconds. Again, without thinking about it too much, state the number from the scale that best corresponds with the sensations you experience. As before, I would like you to keep your finger in the apparatus for at least one minute and for as long after one minute as you can. Now, keep trying to shadow the letters as you did before. Tell me when to begin and when to end.

Appendix Q

Instructions for Control Group

Now that you have been through the procedure once, I would like you to go through it again, exactly as before, except this time we will use your other finger. Again, I will ask you to rate the sensations you are experiencing every 20 seconds. Without thinking about it too much, please give me the number from the scale which best corresponds to the sensation you are experiencing. As before, I would like you to keep your finger in the apparatus for at least one minute and for as long after one minute as possible. However, if at any time you want to stop just say "stop", or remove the bar from your finger.