

ABSTRACT

STIMULUS TOLERANCE IN HYPNOTIC ANALGESIC AND IMAGINATION STATES

By

ROBERT JAMES GREENE

The present study was designed to: (1) Investigate the effectiveness of hypnotically suggested Analgesia and Pleasant Imagery conditions in modifying the tolerance of an increasingly intense electrical stimulus. (2) Determine the feasibility of increasing analgesic effects by a combination of these conditions (Analgesia plus Pleasant Imagery). (3) Explore the hypothesis that Ss with highest levels of State Anxiety would show the largest changes in tolerance.

Thirty-six female students who had exhibited the capacity to experience hypnotically induced analgesia and pleasant imagery served as Ss. Half of the Ss were assigned to a simulator group, half to a hypnosis group. The groups were matched on Ss' hypnotic susceptibility. Each S was tested for stimulus tolerance under the

three experimental conditions. Presentation orders were counter-balanced. The results indicated that simulators had no significant tolerance increases in any of the test conditions. For hypnosis Ss, the Analgesia and the Analgesia plus Pleasant Imagery conditions were both effective in modifying tolerance and the validity of the analgesic state was supported by pain ratings. The Analgesia condition produced the highest tolerance increases, with Ss reporting that they experienced diluting rather than additive effects in the Analgesia plus Pleasant Imagery condition. The Pleasant Imagery condition did not produce a significant group tolerance increase; however, a dichotomization of imagery on the basis of body-oriented content suggested that images which were not body-oriented did significantly modify tolerance levels.

Although the hypothesis relating State Anxiety to tolerance change received no support, the relevance of anxiety did appear in a consistent negative correlation between Trait Anxiety and all tolerance changes for simulator Ss.

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IN HYPNOTIC ANALGESIC
AND IMAGINATION STATES**

By

ROBERT JAMES GREENE

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to

**Marsha, who shared the joys and weathered the
storms — beautifully**

and

my parents, who provided conditions for growth

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INTRODUCTION

Pain has been defined by the physiologist Sheerington (1947) as "the psychical adjunct of an imperative reflex. " In recent years, the "psychical" (psychological) element of pain perception has received increasing attention. Beecher (1959) emphasized the importance of this area in his classic study of major wounds. This study concluded that the psychological component was a more crucial variable in the experience of pain than the injury itself. Currently, the assertion that psychological factors play a major role in pain is highlighted in most major experimental and theoretical texts on pain (Szasz, 1957; Petrie, 1967; Sternbach, 1968).

Attempts to modify the perception of a potentially painful stimulus with methods that do not produce a direct disruption of sensory mechanisms (such as anatomical lesions and drug actions) focus on psychological variables. Hypnosis is one psychological method which has been employed in many contexts to attempt to modify the perception of pain (Esdaile, 1850; Marmer, 1959; August, 1961; Kroger, 1963; Reyher, 1968). However, sound empirical studies of this procedure have been scarce. Hilgard (1969) has aptly summarized the present state of empirical data: "The experimental literature

on pain reduction (and pain production) in hypnosis is very confused. " With few exceptions, laboratory studies testing the effects of hypnosis on pain responses were conducted using methods and designs which make the data difficult to interpret (e. g. , Wolff and Goodell, 1943; West, Neill, and Hardy, 1952). Methodological problems have ranged from inadequate attention to order effects to the absence of control groups. Shor (1962) has reviewed some common shortcomings of studies in this area.

In addition to problematic research designs, many investigators have been interested only in physiological reactions, not in increasing tolerance or modifying the experience of a painful stimulus (see Dynes, 1932; Sears, 1932; Brown and Vogel, 1938; Doupe, Miller, and Keller, 1939).

While some recent studies (Shor, 1962; Barber and Hahn 1962; Hilgard, 1967, 1969) have employed more sophisticated experimental designs, important areas of investigation have not been adequately explored. The central question of whether hypnosis does influence the tolerance of increasing amounts of stimulation has not been satisfactorily answered. Even though stimulus tolerance is the crux of clinical applications of hypnosis for pain control, and despite indications that psychological variables play a much more significant role in pain tolerance than in pain threshold (Sternbach, 1968), most researchers have overlooked questions concerning

tolerance in favor of threshold studies. A fixed-level stimulus of brief duration has typically been employed in the laboratory.

Increasing Analgesic Effects

In addition to the sparsity of sound data and the unresolved questions concerning hypnosis and pain tolerance, even less attention has been directed to experimental attempts to increase the analgesic effects obtained with hypnosis. Many specific hypnotic techniques to induce an analgesic state are reported in the literature (e. g. , Rosen, 1953; Erickson, 1959; Kroger, 1963; Hilgard, 1965, Reyher, 1968), but no systematic research has attempted to increase either threshold or tolerance levels above those obtained with the initial suggested analgesia. Reasons for this restriction of research are unclear. The direct modification of more than one variable effecting the experience of pain should be pragmatically feasible and can be empirically investigated.

Pain Stimulus Procedures

The few laboratory investigations that have employed increasingly intense stimuli leave many unresolved questions. Major limitations have been encountered in methods of producing a safe, controlled, and quantifiable pain stimulus.

Barber and Hahn (1962) and Hilgard (1967) used ice water in their research with hypnosis. This stimulus modality (called the "cold pressor test", Wolf and Hardy, 1941) does produce an increasingly painful experience but presents four problems which limit its utility in hypnosis research. 1. It is relatively uncontrolled (i. e. , stimulus intensity cannot be systematically varied). 2. Because numbness ensues rapidly, non-hypnotized Ss who are instructed to simulate hypnosis can show tolerance equal to that of hypnotized Ss. 3. The immediate shock of ice water does not allow time for the hypnotic subject to achieve a confident analgesic state (Hilgard, 1969). 4. The subjective reactions to ice water vary enormously from subject to subject and, for some Ss, this is not a sufficiently painful stimulus to serve as an effective test of analgesia (Hilgard, 1965). Thus, data from research with this stimulus are inconclusive.

A radiant heat technique has been described and employed by Hardy, Wolff and Goodell (1952) in an investigation of skin resistance. This study did not employ hypnosis. While the radiant heat technique does offer reasonable control of stimulus intensity, the fact that higher stimulus levels produce tissue damage limits its experimental utility in tolerance studies.

In a preliminary report, Hilgard (1967) described a tourniquet pain technique. Although this technique is still in

exploratory stages, it apparently does produce intense pain ("ischemic pain") which simulators will not endure. This method of producing painful stimulation also poses difficulties in attempts to define quantitatively and to control stimulus intensity. Further research limitations are imposed by the impracticality of immediate repeated applications. Additional data based on ischemic pain has recently been presented by Lenox (1970). This study found that most Ss (total N=8) would endure ischemic pain longer in a hypnotic state (Day 2) than in an awake state (Day 1). Physiological data and pain ratings were offered to support the validity of the analgesic state. However, since the order of test conditions was not varied and no control or comparison group was employed, Lenox's findings leave many unanswered questions.

Research with hypnosis (Sutcliffe, 1961; Shor, 1962) has utilized a brief, fixed-level electric shock as a pain stimulus. However, no previous hypnotic study reported in the available literature has used electric stimulation to provide an increasingly intense stimulus. This fact does not reflect disadvantages of this stimulus modality. Continuous electrical stimulation has been successfully used in sophisticated research of pain tolerance (e. g. , Collins and Stone, 1966a, 1966b; Nichols and Turskey, 1967; Wolff and Horland, 1967). Electric stimulation offers advantages of control, quantification, repeatability,

and the production of strong pain sensations in a delineated area without damaging tissue or involving more than sensory receptors.

Pain and Anxiety

There is no controversy over the proposition that the experience of pain is an extremely complex phenomenon involving many physiological and psychological factors (see Buytendijk, 1962; Sternbach, 1968). Many writers (e. g. , Hardy, 1940; Hill, Kornetsky, Flanary, and Wikler, 1952; Kornetsky, 1954; Beecher, 1959; Buytendijk, 1962) have concluded that anxiety is one psychological factor which plays a central role in the experience of pain. Further clinical observations (Taylor, 1949; Spear, 1966) and experiments (e. g. , Shalling and Levander, 1964; Hare, 1965) have reported positive correlations between measures of anxiety and increased pain sensitivity. Functionally, it is recognized that the analgesic effectiveness of opiates is due to the capacity of these drugs to nullify the anxiety reaction pattern to pain (Hill et al. , 1952). In theoretical formulations, Fisher (1968) has suggested that clinicians and researchers consider pain within the framework of Freud's later concepts of anxiety. It should be noted that, in the context of this paper, no distinction is made between "anxiety" and "fear". This position is held because the distinction between these concepts is

based on the source of the stimulus and does not relate to or differentiate the resultant reaction or experiential state (see Martin, 1961). In accord with our present orientation, the common reactive state of anxiety (or fear) is of central importance rather than the source of the evoking stimuli.

In a laboratory study, Shor (1962) attributed reduced physiological pain responses in waking subjects to test conditions designed to produce "minimal anxiety". Bowers (1968) also drew on anxiety reduction as a central concept to explain his findings of increased pain tolerance in subjects who perceived themselves in control of the stimulus.

Implications of the inverse relationship suggested in anxiety-pain formulations are summarized in Shor's hypothesis (1962) that anything which eliminates the anxiety component of the pain reaction is also likely to reduce or eliminate pain.

Tying the construct "anxiety" to a specific condition in order to define a dependent variable for exploration, we may draw from general psychodynamic theories (Freud, 1920, 1924; Sullivan, 1953) and contend that a state which is "pleasurable" to an individual denotes relief of anxiety and, conversely, a phenomenologically "unpleasant" condition is associated with higher anxiety. In accord with these views and additional interpretations by Basowitz et al.

(1955), Spielberger (1966) conceptualized the state of anxiety as containing 'unpleasant , consciously perceived feelings of tension and apprehension'. Spielberger's empirical work indicated that feelings of anxiety were highly correlated with the absence of feelings commonly used to describe pleasant experiential states ('calmness, security, contentedness, etc...'). Viewing pleasurable states as denoting a reduction of anxiety, one can interpret both the data published by Barber and Hahn (1962) which showed a reduced pain response when awake Ss were instructed to imagine 'it is a very hot day... the water feels pleasantly cool...', and also August's clinical technique (1961) of having patient's visualize past pleasant experiences as operating through a reduction of anxiety. It may be proposed that the implementation of any condition (e. g. , pleasure) that is a central component of a given state or psychological construct (e. g. , low anxiety) will facilitate the creation of that state.

In that the concept of anxiety is very important in conceptualizations of pain, an assessment of anxiety levels may shed light on individual differences in pain tolerance and differences in individual reactions to attempts to modify the perception of pain.

A two part perspective of anxiety has been proposed by Spielberger and colleagues (1968). This view suggests using the constructs of State Anxiety and Trait Anxiety.

State Anxiety (A-State) is conceptualized as a transitory emotional state or condition of the organism that varies in intensity and fluctuates over time. . . . Trait Anxiety (A-Trait) refers to relatively stable individual differences in anxiety proneness, that is to differences in the disposition or tendency to respond with elevations in A-State in situations that are perceived as threatening. (p. 1)

Data has been accumulated (Hodges, 1968; O'Neil, Spielberger, and Hansen, 1968) which supports this view that anxiety is not a unitary concept. Accordingly, it has been stressed (Spielberger, 1966; Spielberger et al. , 1969) that for a most meaningful consideration of anxiety, assessment should reflect the non-unitary nature of anxiety. Although researchers who differentiate State Anxiety and Trait Anxiety have not outlined any formal propositions regarding the differential relationship of these variables to the experience of pain, a tentative hypothesis may be offered: Individuals with highest levels of State Anxiety prior to tolerance tests will exhibit the largest changes in tolerance as a result of experimental procedures designed to increase tolerance. Indeed, Trait Anxiety may also be related to tolerance changes. However, since preliminary evidence has indicated that threat of pain does not induce different levels of A-State as a function of A-Trait (Hodges, 1968; Spielberger, 1968), it was expected that State Anxiety would be the most crucial of the two anxiety variables.

In addition to the exploration of the relationship between State Anxiety and tolerance changes, the present project attempts to clarify other unanswered questions by: (a) Providing a systematic investigation of the influence of hypnotically suggested analgesia on stimulus tolerance. Most research has investigated modifications of threshold and perceptions of brief stimuli. Laboratory studies have not provided adequate evidence that stimulus tolerance is significantly increased by hypnotically suggested analgesia. (b) Determining whether stimulus tolerance can be increased by hypnotic instructions to imagine a pleasant situation. This instruction is conceptualized as functioning to reduce anxiety. (c) Attempting to enhance the pain reducing potential of hypnosis by combining hypnotically suggested pleasant imagery with specific hypnotic analgesic suggestions.

The following hypotheses were tested:

1. Stimulus tolerance obtained with hypnotically suggested analgesia exceeds that exhibited in the waking state.
2. Stimulus tolerance obtained with hypnotic instructions to imagine a pleasant situation exceeds that exhibited in the waking state.
3. Stimulus tolerance obtained with (a) hypnotically suggested analgesia plus (b) concurrent hypnotically suggested visual imagery of a pleasant situation exceeds that exhibited in

conditions involving either of these variables independently.

In light of advantages in control, quantification, and the production of safe yet intense stimulus levels, an electrical stimulus was determined to be most appropriate for this study.

METHOD

Subjects

Thirty-six volunteer female college students served as subjects. All Ss had previously attained a score of 8 or higher on the Harvard Group Scale of Hypnotic Susceptibility (Shor and Orne, 1962) and had demonstrated, while hypnotized, the capacity to experience a directly suggested analgesic condition and to visualize pleasant imagery. Eighteen Ss were assigned to a simulator group and 18 to a hypnosis group. These groups were matched on the basis of Ss' hypnotic susceptibility.

Materials and Apparatus

Anxiety measure - Anxiety levels were measured with the State-Trait Anxiety Inventory (STAI) (Spielberger et al., 1968). This instrument (see Appendix B) was designed to assess levels of both State and Trait Anxiety on the basis of Ss' self reports. Twenty Trait Anxiety items require the S to report the frequency with which he feels anxious. Twenty State Anxiety items appraise the intensity of anxiety at the moment the S is responding.

Stimulus apparatus - The stimulus was delivered by a custom-built, automatic, current-limited, D.C. stimulator. This machine operates on a 2kv D.C. source with several output scales. The multiple scales allowed E to select an appropriate scale for each S, depending on waking tolerance level. A scale was chosen for each S which permitted a potentially large increase in the stimulus. On each scale the maximum current is internally limited by a series of current-limiting resistors. Maximum output is 5ma. Voltage (across Ss) varies to compensate for S's resistance, thus giving a constant current at any given point. Internal calibration circuits and separate read-out circuits made it possible to obtain an accurate read-out of the current level which was present at the moment of termination after S had been removed from the circuit. Current was increased automatically by a motor-driven drive. This was activated and stopped by a remote control button held by S. Upon release of the button, the drive stopped immediately and current returned to zero. Wires connected the stimulus unit to two small glass cups containing one ounce of a saturated saline solution. These served as simple fluid electrodes. Contact was made to the index and third finger of S's non-dominant hand.

Procedure

Screening - Trait Anxiety scores were obtained from an administration of the STAI just prior to the group hypnosis session which was conducted to obtain susceptibility data. Following the group hypnosis session, an individual screening was held for each S. During this session

the S was introduced to the electric stimulator apparatus. Voluntary tolerance instructions were given ("release the control button when you do not want the stimulus to continue"), and a series of trials were run until a consistent stop point (change $\leq .2$ ma) was established. Each S was then hypnotized and tested for the ability to experience a hypnotically suggested analgesic state (on the basis of S's self-report when her hand was pricked with a pin) and the ability to experience visual imagery of a "pleasant, enjoyable situation" upon suggestion. Eighty-five percent of the Ss screened were able to meet both criteria. Prior to termination of the hypnotic trance Ss were informed that they would receive an envelope at the end of the research hour containing instructions for the next hour. This information was followed by a repeated suggestion that:

Your role in this research is very important. . . you will find that you will have no difficulty in following the instructions given to you and will successfully do so.

After termination of hypnosis each S was given an envelope containing either hypnosis or simulator instructions (see Appendix C). Group assignment and the preparation of envelopes was done by an assistant. E was not informed of S's assignment until the end of the experimental session.

Experimental session - At the beginning of the experimental session each S completed form X-1 (State Anxiety) of the STAI. Seated in a comfortable chair, S was then given the stimulator remote control

button, her fingers were placed in the fluid electrodes, and a voluntary waking tolerance level was again established (with S's eyes closed). Next, a hypnotic induction procedure was employed using a combination of eye fixation, progressive relaxation, and suggestions of drowsy, comfortable feelings.

Following eye closure, the traditional arm-drop and finger-lock hypnotic tests were performed. Each S was subsequently tested for voluntary tolerance under three experimental conditions: Analgesia (A), Pleasant Imagery (PI), Analgesia plus Pleasant Imagery (A+PI). These conditions were induced with standardized instructions (see Appendix D). A complete counterbalanced design of six orders of presentation was constructed from the three experimental conditions. The sample size was sufficiently large to allow all orders of presentation to be repeated three times in both groups. The hypnotic trance state was terminated after the last experimental test condition and S was tested in the waking state. A brief post-test interview was conducted to determine S's perception of the electrical stimulus during waking and experimental tests. Stimulus ratings were obtained using a scale similar to that employed by Keele (1964). The inquiry also determined whether any simulator Ss had unsuccessfully resisted hypnosis (see Appendix E for interview forms). Four simulators were replaced on the basis of their having gone into a hypnotic state.

RESULTS

Changes in Stimulus Tolerance

Compared to the pre-test waking tolerance level the hypnosis subjects exhibited an average of a 45% increase in tolerance in the Analgesic condition, an 11% increase in the Pleasant Imagery condition and a 33% increase in the Analgesic plus Pleasant Imagery condition. T-test for dependent measures (Edwards, 1964) indicated that the increases in both conditions A ($t=+3.78$) and A+PI ($t=+3.98$) were significant above the .01 level. The increase in the PI condition was not significant ($t=+1.56$). Thus, hypothesis #1, which predicated that stimulus tolerance obtained with hypnotically suggested analgesia would exceed that exhibited in the waking state was confirmed. Hypotheses #2 and #3 were not supported by the data.

Although the changes exhibited by the simulator group were in a positive direction, there were no statistically significant changes in any of the experimental conditions. A graph of the mean increases for both groups is presented in Figure 1.

Insert Figure 1 About Here

An additional, unexpected finding appears in the data in Figure 1. An analysis of the Post-Test Wake (P-TW) tolerance measure revealed a significant increase in tolerance for hypnosis Ss ($t=+2.85$; $p < .05$) and a non-significant decrease in tolerance for simulator Ss.

Anxiety Measures

To test the hypothesis that individuals with highest levels of State Anxiety prior to tolerance tests would exhibit the largest changes in tolerance under the experimental conditions, product-moment correlations were computed between pre-test State Anxiety scores and tolerance changes in all experimental conditions. None of the correlations were statistically significant.

In accord with the exploratory nature of the investigation of anxiety in relation to stimulus tolerance, correlations were also calculated between all tolerance changes and post-test State Anxiety scores as well as Trait Anxiety scores. This was done for data of both hypnosis and simulator groups. All correlations are presented in Tables 1. and 2.

 Insert Table 1 About Here

 Insert Table 2 About Here

Only one anxiety measure showed significant correlations with tolerance changes. This was Trait Anxiety which was consistently negatively correlated with all test conditions in the simulator group only. Simulators with higher dispositions to be anxious showed less increases in stimulus tolerance.

Stimulus Rating

When asked to rate the sensation experienced at the stop point in waking and experimental conditions, 12 of the simulating Ss reported that the stimulus was stronger in one or more of the experimental conditions. Six simulator Ss reported no change in sensation. In contrast, although the actual group stimulus increase was much higher, only two hypnosis Ss reported an increase in the perceived stimulus during any experimental condition. One S reported a decrease in the felt sensation. Fifteen Ss reported that the intensity at the stop point during experimental trials was the same as in the pre-test waking state.

DISCUSSION

Results from the present study provide several important areas that warrant discussion. The first is the central finding of a significant increase in tolerance, for hypnosis Ss, in the Analgesic (A) experimental condition. This offers evidence that hypnosis can be employed in a controlled laboratory setting to create a valid analgesic state. Additional support for the validity of this contention is gained from the fact that almost all hypnotic Ss reported that they did not perceive the higher intensity levels in the experimental conditions to be more painful than the lower levels tolerated in the waking state. A comprehensive theoretical analysis of the mechanisms involved in this type of alteration in perception has been presented by Reyher (1964). This theory conceptualizes hypnotic phenomena as being mediated by the phylogenetically older and lower level integrating fields of the brain. Reyher has suggested that the cingulate gyrus may be one of the key structures in mediating hypnotic behavior:

The cingulate region and other structures in the limbic system do not mediate sensory stimuli; this is performed by the specific projection system. These structures respond associatively, via collaterals, from the reticular formation, with intrapsychic stimuli which provide the meaning to perception. . . . Under

hypnosis, the intimate connections that the cingulate region has with the structures associated with memory recording mechanisms can be instrumental in either depriving or enhancing associations to a sensory stimulus and in producing marked alterations in recall and perception. These alterations in perception are also responsible for hyperesthesias, analgesias, anesthetics, and hallucinations. (p. 113)

The results in the Analgesic plus Pleasant Imagery (A+PI) experimental condition also support the view that hypnotic states can function as effective analgesic agents. However, here a question is raised by the finding that the mean tolerance increase in the A+PI condition was lower than that in the A condition. Obviously, the hypothesized additive effects were not operating. Some light was thrown on the dynamics here by Ss' reports after the experimental session. Many noted that the creation of two concurrent hypnotically suggested conditions tended to detract from the intensity and realism of both. The most powerful analgesic condition was a single one that was not diluted by distracting additions.

This finding that hypnotic states do not combine in an additive fashion has not been previously reported in the body of hypnosis literature and will require consideration in subsequent theoretical and experimental work.

The fact that the Pleasant Imagery (PI) condition did not result in a significant increase in tolerance is also of interest. This is especially true in the light of August's report (1961) of considerable success in

employing hypnotically suggested pleasant imagery as an analgesic agent in clinical obstetrics. In part, the conflicting results may be contingent upon the circumstances of observation. In our laboratory, Ss had control of the stimulus and could terminate it at will. This is quite different from the relative lack of stimulus control experienced by a woman in labor. In fact, some Ss reported that they stopped the stimulus during the P_i condition, not because it had reached a maximum tolerance level, but simply because they did not want it to increase and possibly disrupt what was a very pleasant experience for them. Another factor that may have been an even more important variable in influencing the effectiveness of the P_i condition is the focus of the imagery. To make the most of idiosyncratic factors for the creation of very realistic imagery, the specific definition of the "pleasant enjoyable situation" was left to each S. Resultantly, many of the fantasied situations involved rather sensuous, body-oriented imagery. In accord with Szasz's contention (1957) that a prime requisite for a reduction in the experience of pain is an ego-orientation away from the body, it is quite possible that some types of imagery were less effective than others in modifying tolerance. To clarify this issue, an exploratory inspection of the P_i tolerance increase data in conjunction with the type of imagery was performed. Imagery reports were dichotomized on the basis of content. Images which were directly body-oriented or presented relatively clear sexual connotations (e.g., "laying on the beach...feeling the warmth of the sun"; "sitting in my boyfriend's arms") were assigned to the body-oriented group (N=10).

All other imagery (e.g., "tobogganing"; "attending my sister's marriage") was assigned to the neutral group (N=8). An analysis of the PI tolerance increases in each of these groups indicated that the neutral imagery group did show a significant increase in tolerance from that exhibited in the waking state (mean increase = 18%; $t=+1.95$; $p < .05$, one-tailed). The group with body-oriented imagery exhibited a 5% tolerance increase. This was not statistically significant. Although final conclusions are not justified on the basis of this post-hoc analysis in which the form of the data does not fulfill some of the study's design requirements (i.e., the dichotomized groups do not represent complete counterbalancing), the findings do suggest a potentially important pattern which requires further study.

The absence of the hypothesized relationship between State Anxiety scores and the changes in tolerance levels presents some interpretative problems. Since State Anxiety purports to measure anxiety specific to the situation, it logically should be related to a stimulus tolerance change produced, in part, by conditions which modify anxiety. A plausible reason for the present negative results may involve the Ss' experiences prior to the experimental session. In the previous session each S had been introduced to the electrical stimulator, had ample opportunity to explore its operation and to experience the fact that she controlled the stimulus intensity which in no way could go beyond the point at which she chose to stop it. Thus, at the experimental session State Anxiety regarding the situation or the potentially painful stimulus was probably minimal. As

such, State Anxiety was, perhaps, not a major variable to be modified by the experimental conditions.

Several findings from the performance of the simulator group are noteworthy. The post-test reports of increased pain even though the stimulus increase itself was relatively small is consistent with findings (e.g., Shor, 1962; Gardner, 1967) that while simulating instructions may affect Ss' behavior, they do not affect the subjective experience of the stimulus. The fact that the simulators did not duplicate the tolerance performance of hypnotic Ss is also important. This supports the preliminary data compiled by Hilgard (1969) using ischemic pain. Apparently when a very intense stimulus is employed simulators will not endure amounts equal to those endured by hypnotic Ss. The simulators' reports about the electrical stimulus (e.g., "it was becoming distressful;" "I was afraid it was going to get worse;" "I was trying to let it go further but it was uncomfortable") add support to this interpretation. The significant negative correlations of Trait Anxiety scores with all of the tolerance changes for the simulators indicate that simulating Ss who are typically more anxious were less able to tolerate increased amounts of the painful stimulus. The influence of this more stable disposition to be anxious was perhaps called into play during the actual experimental condition tests by the simulators' perception of the situation as one in which they were more vulnerable and were expected to endure pain to "succeed" in their role. In this context, it is noteworthy that Spielberger (1968) has reported that situations in which personal adequacy is evaluated

are particularly threatening to persons with high Trait Anxiety. Simulator Ss may indeed have been confronted with a double bind of either enduring more discomfort or failing to adequately fulfill their role requirements. Either option may have activated anxiety. In contrast, the hypnosis Ss were faced with a more protective situation. They were given means (hypnotic suggestions) which allowed them to endure higher stimulus levels without increasing discomfort beyond levels voluntarily endured in the waking state. Thus, anxiety dispositions, reflected by Trait Anxiety scores, were not transformed into active anxiety, and were not related to tolerance changes.

The interesting increase in tolerance shown by the hypnosis Ss in the Post-Test Wake (P-TW) trial warrants attention. Simulators showed no similar tendency for a post-test tolerance increase. The change exhibited by hypnosis Ss may be a result of the experimental conditions. It is possible that the change reflects the influence of a decay of suggestibility which has been reported by Hull (1933). According to Hull's formulation, hypnosis Ss are very suggestible for several minutes after trance termination. Although there were no explicit suggestions given by E for a post-test tolerance increase, it is possible that the demand characteristics of the situation were such that Ss provided autosuggestions to increase tolerance. The hypnosis Ss may have defined, for themselves, that they would experience an increase in tolerance following the completion of the specific experimental tests. The fact that the simulators did not exhibit a similar change does not refute this possibility. As noted by Reyher (1967), the demand characteristics of

hypnosis research are quite different for simulator and hypnosis Ss. The simulator operates in the context of attempting to fool the E. This requires an active interpretation of the situation and an intentional acting as a hypnotized S would behave. These factors provide a significantly different structure to the situation and thus modify the demand characteristics. A closely related alternative explanation of the P-TW change is that perhaps having experienced the capacity to endure higher levels of a stimulus without discomfort allowed Ss to generalize this ability beyond the specific experimental tests. A state of hypersuggestibility may have facilitated this generalization. Having already experienced hypnotic anesthesia states, perhaps the desire to avoid an unpleasant experience for a longer time may have created spontaneous thoughts which re-activated the anesthesia. Regardless of the specific dynamics, the P-TW change highlights a need for researchers to be cognizant of the possibility of a very high post-trance suggestibility. This concern has been emphasized by Reyher.¹ The fact of P-TW change itself calls for further research in determining possible tolerance changes over time after the experimental session and also calls for an exploration of possible spontaneous changes with other stimulus modalities.

In addition to a replication of the present study with male Ss, a number of varying lines of research are also suggested. Testing hypotheses regarding body orientation is relevant and feasible. Tests of tolerance

¹J. Reyher, personal communication, May 13, 1970.

levels while Ss are experiencing body-oriented imagery and tests while Ss are experiencing imagery focused away from the body would be useful in clarifying unanswered questions.

Having established that hypnosis can effectively modify the tolerance of an increasingly intense stimulus in the laboratory, a more detailed examination of the components of the hypnotic state is in order. Here, explorations of the effects of direct suggestion, relaxation, and definition of the situation as "hypnosis" are necessary. Studies of other possible methods of modifying tolerance such as distraction, problem-solving, and the creation of psychological conflicts are also appropriate to help more clearly define the yet ambiguous psychological processes that may be effective in reducing pain. In this same vein, a more detailed assessment of personality variables is in order.

SUMMARY AND CONCLUSION

The present study was designed to investigate the effectiveness of hypnotically suggested analgesia (A), pleasant imagery (PI), and both of these conditions concurrently (A+PI) in modifying the tolerance of an increasingly intense stimulus. It was hypothesized that conditions A and PI would create significant increases in tolerance (beyond that obtained in the waking state) and that the combination of conditions (A+PI) would be more effective in modifying tolerance than either condition independently. It was also tentatively hypothesized that Ss with highest State Anxiety scores on the State-Trait Anxiety Inventory (STAI) would show the largest changes in tolerance as a result of the experimental procedures.

Thirty-six female college students served as subjects. All Ss had exhibited, while hypnotized, the capacity to experience a directly suggested analgesic state and to visualize pleasant imagery. Eighteen Ss were assigned to a Simulator group and were instructed to act as if they were hypnotized. An equal number of Ss were assigned to the Hypnosis group. To avoid experimenter bias, group assignments were made by an assistant. E was not informed of S's group identity

until after the experimental session. Groups were matched on hypnotic susceptibility as assessed by the Harvard Group Scale of Hypnotic Susceptibility. An automatic, current-limited, D.C. stimulator was employed to present a controlled, increasingly intense stimulus.

During the experimental session all Ss completed the STAI, established a stable waking tolerance level, and then went through a hypnotic induction. Each S was then tested for stimulus tolerance under the three experimental conditions. A complete counterbalanced design with six orders of presentation was used. An analysis of the data indicated that, for Hypnosis Ss, the A condition was most effective in modifying stimulus tolerance. The A+PI condition was also effective but not to the degree of A alone. The results from these two conditions were interpreted as providing evidence of the creation of a valid analgesic state. The PI condition did not produce a statistically significant increase in tolerance. The fact that the A+PI condition was not most effective in modifying tolerance was discussed in light of Ss' reports that the concurrent suggestion of more than one condition produced a diluting rather than an additive effect. The absence of the hypothesized tolerance increase in the PI condition was discussed from the perspective of theories which propose that an ego-orientation away from the body is necessary for pain reduction. In that the present design called for Ss to define their own imagery, much of this was rather sensuous and oriented

toward the body. A more detailed exploratory inspection of the PI data indicated that Ss with imagery that was not body-oriented did exhibit significant tolerance increases in the PI condition.

The tentative hypothesis relating State Anxiety to tolerance change received no support. However, a consistent negative relationship between Trait Anxiety and all tolerance changes for Simulator Ss was found. This indicated that Simulator Ss who had higher dispositions toward Anxiety were less able to endure increased pain in their simulating role. The Simulator group showed no significant increases in tolerance in any test condition.

Suggestions for further research, including studies of the component variables of the hypnosis state, directed imagery, and other methods of tolerance modification were offered.

REFERENCES

REFERENCES

- August, R. V. Hypnosis in obstetrics. N. Y. : McGraw-Hill, 1961.
- Barber, T. X., and Hahn, K. W., Jr. Physiological and subjective responses to pain producing stimulation under hypnotically-suggested and waking-imagined "analgesia". Journal of Abnormal and Social Psychology, 1962, 65, 411-418.
- Basowitz, H., Persky, H., Korchin, S. J., and Grinker, R.R. Anxiety and stress. N. Y. : McGraw-Hill, 1955.
- Beecher, H. K. Measurements of subject responses. N. Y. : Oxford University Press, 1959.
- Bowers, K. S. Pain, anxiety, and perceived control. Journal of Consulting and Clinical Psychology, 1968, 32, 596-602.
- Brown, R. R., and Vogel, V. H. Psychophysiological reactions following painful stimuli under hypnotic analgesia with gas anesthesia and Novocain block. Journal of Applied Psychology, 1938, 22, 408-420.
- Buytendijk, F. J. Pain. Chicago: University of Chicago Press, 1962.
- Collins, L. G., and Stone, L. A. Pain sensitivity, age and activity level in chronic schizophrenics and in normals. British Journal of Psychiatry, 1966, 112, 33-35. (a)
- Collins, L. G., and Stone, L. A. Family structure and pain reactivity. Journal of Clinical Psychology, 1966, 22, 33. (b)
- Doupe, J., Miller, W. R., and Keller, W. K. Vasomotor reactions in the hypnotic state. Journal of Neurology and Psychiatry, 1939, 2, 97-106.
- Dynes, J. B. Hypnotic anesthesia. Journal of Abnormal and Social Psychology, 1932, 27, 79-88.

- Edwards, A. L. Statistical methods for the behavioral sciences. N. Y.: Holt, Rinehart and Winston, 1964.
- Erickson, M. H. Hypnosis in painful terminal illness. American Journal of Clinical Hypnosis, 1959, 1, 117-121.
- Esdaile, J. Hypnosis in medicine and surgery. N. Y.: Julian, 1957. (Originally titled Mesmerism in India, copyright 1850.)
- Fischer, K. H. The problem of pain from the psychiatrist's viewpoint. Psychosomatics, 1968, 9, 319-325.
- Freud, S. Beyond the pleasure principle. (1920) In Standard edition of the complete psychological works of Sigmund Freud. Vol. 18, London: Hogarth, 1958.
- Freud, S. A general introduction to psychoanalysis. N. Y.: Boni and Liveright, 1924.
- Hardy, J. D. Studies on pain. Journal of Clinical Investigation, 1940, 19, 659-680.
- Hardy, J. D., Wolff, H. G., and Goodell, H. Pain sensations and reactions. Baltimore: Williams and Wilkins, 1952.
- Hare, R. D. Psychopathy, fear arousal and anticipated pain. Psychological Reports, 1965, 16, 499-502.
- Hilgard, E. R. Hypnotic susceptibility. N. Y.: Harcourt, Brace and World, 1965.
- Hilgard, E. R. The psychophysiology of pain reduction through hypnosis. Unpublished manuscript, Stanford University, 1967.
- Hilgard, E. R. Pain as a puzzle for psychology and physiology. American Psychologist, 1969, 24, 103-113.
- Hill, H. E., Kornetsky, C. H., Flanary, H. G., and Wikler, A. The effect of anxiety and morphine on discrimination of intensities of painful stimuli. Journal of Clinical Investigation, 1952, 31, 473-480.
- Hodges, W. F. Effects of ego threat and threat of pain on state anxiety. Journal of Personality and Social Psychology, 1968, 8, 364-372.

- Hull, C. L. Hypnosis and suggestibility. N. Y.: Appleton-Century, 1933.
- Keele, C. A. Substances producing pain and itch. Baltimore: Williams and Wilkins, 1964.
- Kornetsky, C. Effects of anxiety and morphine on the anticipation and perception of painful radiant thermal stimuli. Journal of Comparative and Physiological Psychology, 1954, 47, 130-132.
- Kroger, W. S. Clinical and experimental hypnosis in medicine, dentistry and psychology. Philadelphia: J. B. Lippincott, 1963.
- Lenox, J. R. Effect of hypnotic analgesia on verbal report and cardiovascular responses to ischemic pain. Journal of Abnormal Psychology, 75, 199-206.
- Marmer, M. J. Hypnosis in anesthesiology. Springfield: Thomas, 1959.
- Martin, B. The assessment of anxiety by physiological behavioral measures. Psychological Bulletin, 1961, 58, 234-255.
- Nichols, D. C., and Tursky, B. Body image, anxiety, and tolerance for experimental pain. Psychosomatic Medicine, 1967, 29, 103-110.
- O'Neil, H. F., Spielberger, C. D., and Hansen, D. N. State anxiety and task difficulty using CAI media. Paper presented at the meeting of the American Educational Research Association, Chicago, 1968.
- Petrie, Asenath. Individuality in pain and suffering. Chicago: University of Chicago Press, 1967.
- Reyher, J. Brain mechanisms, intrapsychic processes and behavior: A theory of hypnosis and psychopathology. American Journal of Clinical Hypnosis, 1964, 7, 107-119.
- Reyher, J. Hypnosis in research on psychopathology. In J. D. Gordon (Ed.), Handbook of clinical and experimental hypnosis. N. Y.: Macmillan, 1967. Pp. 110-147.
- Reyher, J. Hypnosis. Dubuque, Iowa: Wm. C. Brown Co., 1968.

- Rosen, H. Hypnotherapy in clinical psychiatry. N. Y.: Julian, 1953.
- Schalling, D. , and Levander, S. Ratings of anxiety - proneness and responses to electrical pain stimulation. Scandinavian Journal of Psychology, 1964, 5, 1-9.
- Sears, R. R. Experimental study of hypnotic anesthesia. Journal of Experimental Psychology, 1932, 15, 1-22.
- Sherrington, C. The integrative action of the nervous system. Cambridge: Cambridge University Press, 1947.
- Shor, R. E. Physiological effects of painful stimulation during hypnotic analgesia under conditions designed to minimize anxiety. International Journal of Clinical and Experimental Hypnosis, 1962, 10, 183-202.
- Shor, R. E. , and Orne, Emily C. Harvard group scale of hypnotic susceptibility. Palo Alto: Consulting Psychologists Press, 1962.
- Spear, F. G. An examination of some psychological theories of pain. British Journal of Medical Psychology, 1966, 39, 349-355.
- Spielberger, C. D. Theory and research on anxiety. In C. D. Spielberger (Ed.), Anxiety and behavior. N. Y.: Academic, 1966. Pp. 3-20.
- Spielberger, C. D. , Gorsuch, R. L. , and Lushene, R. E. The State-Trait Anxiety Inventory: Preliminary Test Manual for Form X. Florida State University, 1968.
- Spielberger, C.D. , Lushene, R. E. , and McAdoo, W.G. Theory and measurement of anxiety states. In R. B. Cattell (Ed.), Handbook of modern personality theory. Chicago: Aldine, 1969, in press.
- Sternbach, R. A. Pain: A psychophysiological analysis. N. Y. : Academic, 1968.
- Sullivan, H. S. The interpersonal theory of psychiatry. N. Y. : Norton, 1953.
- Sutcliffe, J. P. "Credulous" and "skeptical" views of hypnotic phenomena: Experiments on esthesia, hallucination, and delusion. Journal of Abnormal and Social Psychology, 1961, 62, 189-200.

- Szasz, T. S. Pain and pleasure: A study of bodily feelings. N. Y. : Basic Books, 1957.
- Taylor, H. C. Vascular congestion and hyperaemia. II. The clinical aspects of the congestion-fibrosis syndrome. American Journal of Obstetrics and Gynecology, 1949, 57, 637-653.
- West, L. J., Neill, K. C. and Hardy, J. D. Effects of hypnotic suggestions on pain perception and galvanic skin response. Archives of Neurology and Psychiatry, 1952, 68, 549-560.
- Wolf, S., and Hardy, J.D. Studies on pain: Observations on pain due to local cooling and on factors involved in the "cold pressor" effect. Journal of Clinical Investigation, 1941, 20, 521-533.
- Wolff, B. B., and Horland, A. A. Effect of suggestion upon experimental pain: A validation study. Journal of Abnormal Psychology, 1967, 72, 402-407.
- Wolff, H. G., and Goodell, H. The relation of attitude and suggestion to the perception of and reaction to pain. Proceedings of the Association for Research in Nervous and Mental Disease, 1943, 23, 434-448.

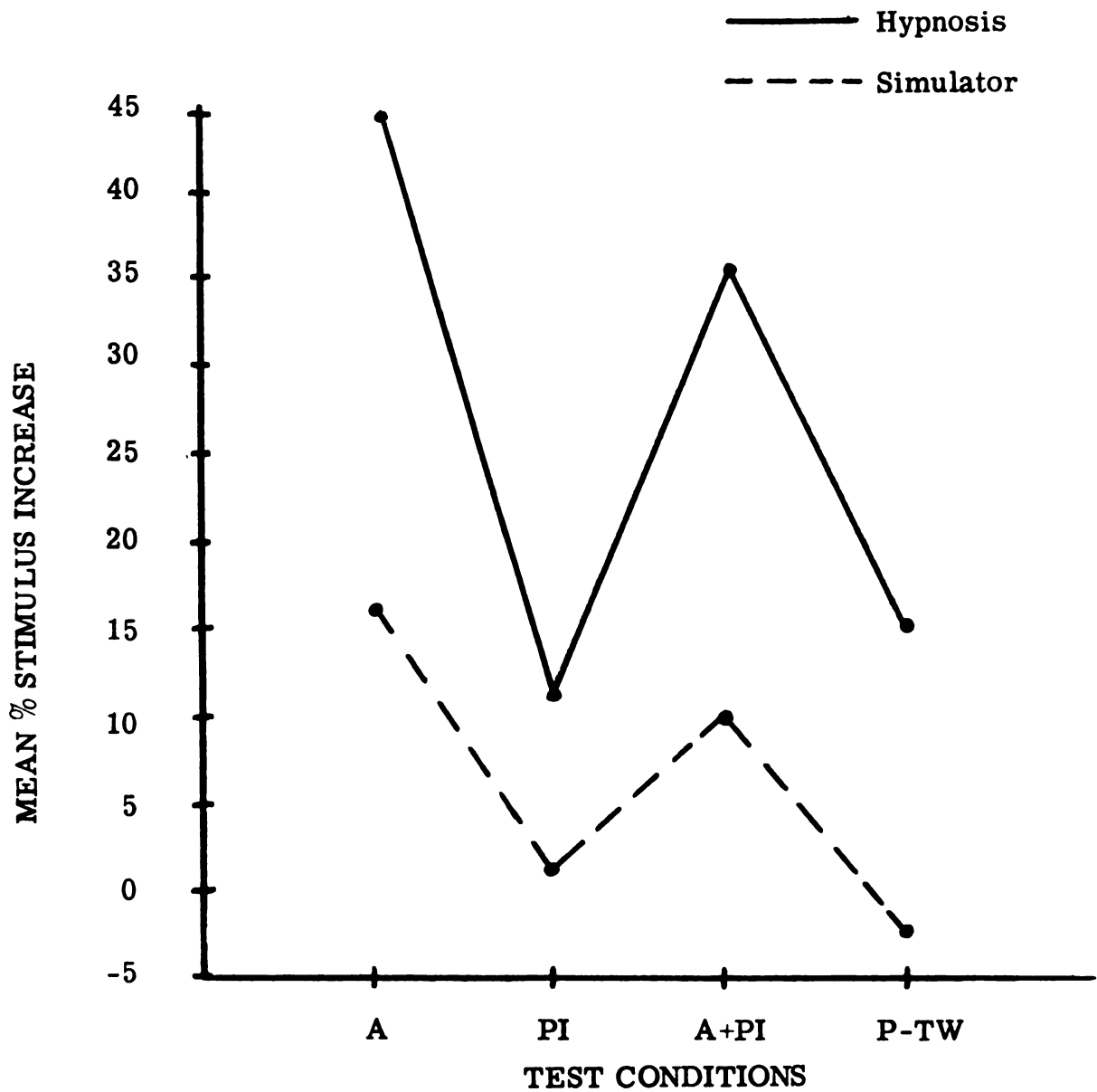


FIGURE 1. -- Mean Stimulus Tolerance Increases for Hypnosis and Simulator Groups under Analgesic (A), Pleasant Imagery (PI), Analgesic plus Pleasant Imagery (A+PI), and Post-Test Wake (P-TW) Test Conditions

TABLE 1

Product-Moment Correlations of Tolerance Change and
Anxiety Measures: Hypnosis Subjects

<u>Test Condition</u>	<u>Anxiety Measure</u>		
	Pre-test State Anxiety	Post-test State Anxiety	Trait Anxiety
A	-0.16	+0.11	+0.04
PI	+0.12	-0.21	-0.01
A+PI	-0.26	-0.08	+0.11
P-TW	+0.18	+0.31	+0.02

TABLE 2

Product-Moment Correlations of Tolerance Change and
Anxiety Measures: Simulator Subjects

<u>Test Condition</u>	<u>Anxiety Measure</u>		
	Pre-Test State Anxiety	Post-Test State Anxiety	Trait Anxiety
A	+0.05	-0.33	-0.60**
PI	+0.19	-0.00	-0.48*
A+PI	-0.07	-0.16	-0.63**
P-TW	+0.09	-0.33	-0.50*

* p < .05

** p < .01

APPENDIX A

Review of the Literature

REVIEW OF THE LITERATURE

"Pain is such a familiar phenomenon that it is surprising that we know so little about it."
(E. R. Hilgard, 1967, p. 1)

The Nature of Pain

Pain is a very complex phenomenon which can be subdivided into many types (Bartley, 1958). However, the present discussion will be limited to pain having its origin in the stimulation of peripheral tissue. No one has established a definitive outline of the processes and components involved in the experience of pain. Yet, a survey of major writers in this area provides important facts, theories, and opinions.

One generally accepted view is that, for conceptual purposes, pain should be dichotomized into physiological and psychological components. This view appears in Weitzenhoffer's (1953) statement that while physiological and psychological concomitants of pain are intimately related, they do constitute two separate aspects of the problem of pain. Subsequently, Forbes (1957) called for the recognition of the basic difference between pain as excitation of pain receptors and

pain as a psychologically unpleasant experience. Hebb (1958) concurred. Pain, according to Hebb, has two distinctive parts: a sensory event and a motivational state. Fischer (1962) defined the components as "two primary processes": a physiological threshold and a reaction component. The importance of this dichotomy was also emphasized by Buytendijk (1962).

Physiology of pain - Discussions of physiological analyses of pain are characterized by a high degree of uncertainty.

peripheral nervous system - The receptor mechanisms for pain (nocipetors) are not clearly defined (Buytendijk, 1962). The most generally accepted hypothesis (Woodworth, 1938; Altman, 1966) is that pain receptors are dendritic branches, or free nerve endings, of small-diameter nerve fibers. This assumption is based on the evidence of pain sensitivity in organs that contain such free nerve endings but are devoid of specialized receptors (e. g. , cornea and dental pulp). These nerve endings are unspecialized and non-specific. They can be stimulated by mechanical, thermal, electrical, and chemical stimuli. It has been established (Woodworth, 1938) that pain spots (free nerve endings) are the most numerous of cutaneous sensory spots.

central nervous system - Cognizant of the fact that it is not definitely known which central nervous system parts are responsible for registering pain, Buytendijk (1962) supported the widely accepted view that the thalamus performs a very important

function in the perception of pain (See also Sarbin, 1956). Buytendijk also noted that the total cortex, frontal lobes, and the post central and angular gyrus also function in the interpretation of painful stimuli.

Altman (1966) offered a more specific outline of the pain pathway through several central nervous system channels. However, the uncertainty of the importance of the various central loci was clearly illustrated by MacCarty and Drake (1956). These researchers detailed 16 surgical procedures, at different central nervous system locations, designed to eliminate pain. They noted that no operation on a single site has been found to be totally effective in stopping pain. There is agreement that, on the basis of present knowledge, no central locus can properly be called the "pain center" (White and Sweet, 1955; Noordenbos, 1959).

Psychology of pain - As one might expect, the psychological components and concomitants of pain are far from simple. Szasz (1957) stated that the experience of pain depends primarily on whether the ego-orientation is predominately to the body or is focused on other objects.

While others (e. g. , Erickson, 1959; Buytendijk, 1962) give partial support to this view, it is apparent that ego-orientation is not the only psychological variable effecting pain. Anxiety is a central factor. Buytendijk (1962) defined pain as the "sensation of

crisis and tension." He noted that the effectiveness of many pharmaceutical agents for relieving pain is in their ability to promote relaxation. The recognition that morphine and other opiates function by nullifying the anxiety-reaction pattern of pain (Hardy, 1940) has been substantiated in experimental work (Kornetsky, 1954; Hill et al. , 1952).

Bishop (1943) presented three thresholds that are discernible in the activation of pain endings. The third threshold, which Bishop sees as necessary for the experience of pain, has "emotional protest" as a defining characteristic. Forbes (1957) and Keele and Armstrong (1964) agree that the essential element of what most people understand as pain is the quality of unpleasantness.

Erickson (1962) broadened the consideration by stating that the manner in which we learn to react is also of central importance. In accord, Shor (1962) and Orne (1962) have noted that the total meaning, the interpretation, of a stimulus must be painful in order for the subjective experience of pain to occur.

Summary - Satisfactory evidence exists that peripheral pain receptors are non-specific free nerve endings. Central neural mechanisms are not clearly defined. The thalamus may play a primary role. No "pain center" has been determined.

Psychological factors of pain are also ambiguous. Yet there is consensus that anxiety, ego-focus, learning, and contextual

meaning are important in the interpretation and the experience of painful stimuli. Of these, most attention has been given to anxiety.

Hypnosis and Pain

The use of hypnosis to modify the perception of painful stimuli has had a long, irregular history. Early in the 19th century Faria recorded his observations that hypnotic subjects could be made insensitive to pain. After Faria's report, Bertrand, Sennevoy and Georget, all of Paris, individually made brief tests of the analgesic effects of hypnosis. Their reports are not available (see Pattie, 1967).

In terms of practical clinical usage, the most impressive record was established by Esdaile. Working in India, Esdaile (1846) performed more than one thousand minor operations and about three hundred major operations using "mesmerism" as the sole analgesic agent. In spite of the large numbers of patients treated, Esdaile's work has been the focus of considerable skepticism. One critic (Rosen, 1946) even suggested that all of Esdaile's patients actually only pretended they felt no pain. Perhaps more relevant is the question of whether Esdaile's mesmerismic trance state (often produced by hours of physical stroking) is comparable to modern hypnotic states.

Clinical literature - Clinicians generally agree that hypnosis can alter the experience of pain and that, in terms of its

side effects, hypnosis represents an ideal analgesic agent (Lee and Atkinson, 1964). The clinical usefulness of hypnosis in reducing physiologically based pain has been amply documented (see Wright, 1962; Kroger, 1963; Hilgard, 1965; Reyher, 1968). However, establishing the existence of this clinical phenomenon has clarified few of the theoretical issues or questions requiring controlled laboratory replications of hypnotic analgesic states. Clinical studies have also not resolved a number of practical problems associated with the use of hypnosis.

Kuehner (1965) stated that the two factors most prohibitory to the clinical use of hypnosis were: 1. The time and effort involved in training patients to enter a sufficiently deep trance. 2. The comparatively small number of total patients who will achieve the necessary trance depth. Lee and Atkinson (1964) endorsed a similar position. They estimated that 15 - 20% of patients, given sufficient time, could enter a deep trance. Similarly, Crasilneck (1958) expressed concern because many patients could not enter a trance of sufficient depth. However, Crasilneck found that, in his experience, patients manifesting extreme pain were usually excellent subjects.

Erickson, Hershman and Sector (1961) confirmed the time problem involved in inducing a sufficiently deep trance. Yet, on the positive side, these authors noted that significant parts of the pain experience can be removed in a relatively short time.

Kirkner (1956) focused on another thorny problem. Specifically, he noted that "it becomes increasingly difficult to control (pain) for longer periods of time when its origin is continuously generated by a physiological process."

In addition to outlining important problem areas, the clinical literature also presents many methods which have been successfully used to induce analgesic conditions. These range from the simplest and most widely employed method of directly suggesting insensitivity, to the creation of a "psychological lobotomy". Five specific methods have been outlined by Rosen (1953). Several more techniques have been described by Erickson (1959). Reyher (1968) has succinctly presented a procedure used with success in obstetrics.

Thus, while realistic problems presently limit the practical utility of hypnotic pain control, the picture is not without promise. Hypnosis has been effectively employed to reduce pain in a wide variety of conditions -- from accidental lacerations in children (Erickson, 1959 (b)) to intractable pain in adult cancer patients (Kroger, 1963). Empirical evidence is being accumulated which indicates that susceptibility to hypnosis can be increased (Sanders and Reyher, 1969). These facts, plus the advantages of hypnotically induced analgesia (patients can function at normal physiological levels and are in no danger of toxic side effects) certainly justify the expenditure

of resources in studies investigating pain and hypnosis.

Experimental literature - Relatively few empirical projects exploring variables of pain and hypnosis have been completed. Most published studies are inadequate in terms of experimental design and methodology. Typically, conclusions are not supported by the data. Yet, a review of these publications is worthwhile. They provide potential research directions, make contributions to design, offer some interesting and informative data, and highlight errors to be avoided.

Pattie (1967) credited a Frenchman, Recamier, with conducting the first experiment which employed hypnosis as an anesthesia to reduce intentionally induced pain. In 1821 Recamier burned moxas on the bodies of two hypnotized patients. Neither showed any sign of pain. Following this pioneering effort, the French General Council of Hospitals forbid work with hypnotism in the hospitals. While this did not stop research with hypnosis, the general attitude reflected by the Council members may have affected the type of subsequent research. Controlled clinical studies are rare. Also, the literature has few studies dealing with the tolerance of relatively severe pain stimuli. The bulk of published investigations have used pain stimuli of very brief durations and have focused on physiological reactions rather than subjective experiences.

Levine (1930) was an early researcher who did gather information on both physiological reactions and the subject's report of his experience. Working with just one subject, and employing a venipuncture needle as the stimulus, Levine reported that hypnosis with suggested anesthesia produced less subjective pain than hypnosis alone. GSR remained unchanged. Considering the sample size, caution must be used in the interpretation of Levine's findings.

In a later study which tested seven subjects' physiological reactions to a variety of stimuli (pinch, pin prick, pistol noise), Dynes (1932) found significant differences on several physiological variables when comparing reactions in a "waking" and a "hypnosis plus analgesia" condition. A major fault of this work was that all subjects were fully aware of the purpose of the experiment and the expected reactions. A valuable addition to research design was Dynes' introduction of "simulators". His two "role-playing" subjects showed lower differences on all variables.

Sears, also in 1932, studied seven subjects' reactions to a pin pressed against the skin for one second with a 20-ounce pressure. The stimulus was applied to both legs. Analgesic suggestions and instructions to voluntarily inhibit reactions in one leg were given. Differences in physiological reactions were noted as each leg was stimulated. The experimental conditions were: 1. Wake Control.

2. Hypnotic Analgesia. 3. Voluntary Inhibition. 4. Hypnosis Alone.

Order of conditions was not randomized or counterbalanced. Sears found few differences in reactions in the Waking Control, Hypnosis Alone, and Voluntary Inhibition states. Five of the six physiological measures were different in the Hypnotic Analgesia state. Some 17 years later Shor (1959) attempted to replicate Sears' experiment but abandoned the undertaking because "the pain stimulator device was inadequate for producing moderate pain under rigorously controlled conditions. "

In 1938 Brown and Vogel focused on six physiological indices abstracted from polygraphic tracings. They employed three pain stimuli (blood lancet, weighted thumb tack, water at 40 degrees centigrade). Test conditions included waking, imagined analgesia, and hyperalgesia as well as hypnosis plus suggested analgesia. Order of presentation was counterbalanced. The data obtained was too inconsistent to suspect the operation of other than chance factors. Again, no subjective reports were included.

Doupe, Miller and Keller (1939) also investigated physiological variables only (vasoconstriction of cutaneous blood vessels). Their eight subjects showed a slightly lower mean vasoconstriction when the pain stimulus (pin prick) was applied to the "hypnotically anesthetic arm". This may have been an artifact of increased reactions from the

normal arm. The results were not statistically significant.

Wolff and Goodell (1943) tested pain thresholds under several conditions (e. g. , reading, clanging bell, hypnosis). Only one subject was studied. The data showed little order of any kind. A relatively new apparatus (the dolorometer) provided a radiant heat stimulus. This apparatus can produce relatively high stimulus intensities. It does, however, pose ethical problems in that high intensity levels can produce tissue burns. Tissue changes also restrict repeated applications.

In a study with hospitalized patients, Dorcus and Kirkner (1948) investigated the use of hypnosis to suppress intractable pain in seven cases of spinal cord injury. The authors reported that patients decreased requests for chemical analgesics following treatment with hypnosis. No control group was used.

Back in the laboratory, West, Neil and Hardy (1952) reported decreases in GSR, pain thresholds, and subjective pain sensitivity in a state of hypnosis with suggestions of analgesia as compared to waking state tests. Seven subjects were tested. No control group was provided. The order of test states was not varied. Radiant heat was employed as the pain stimulus.

A study by Laux (1953) is distinguished by having used a relatively large sample of hospitalized patients (N=40). All were

experiencing post-operative pain. Subjects were randomly assigned to control and experimental groups. Three hypnotic sessions were held with each member of the experimental group. No comparable interaction was provided for controls. Results showed that the experimental group (this included good as well as poor hypnotic subjects) requested 34% less anodynes.

A complex laboratory study reported by Sutcliffe (1961) investigated "paresthetic" as well as "anesthetic" effects of hypnosis. Subjects were assigned to three conditions: 1. Control. 2. Hypnosis induction plus anesthetic suggestion. 3. Acting when awake. Subjects assigned to acting anesthetic test groups were instructed to recall a situation in which, although in pain, they had behaved as though they were not in pain. Only four subjects were in each test condition. A fixed-level electric shock was the stimulus. Ss' reports of pain and GSR were recorded. No GSR differences were found between hypnotic and control groups. Subjective reports did differ. The hypnotic anesthetic Ss did not report pain. Sutcliffe concluded: "... subjective experience is at variance with bodily reaction. "

Shor (1962) reviewed some of these early works and noted a number of common errors in methodology. Typical design inadequacies included: inadequate control of order effects, a lack of information about the effects of hypnosis alone, and uncontrolled

pain-producing stimuli. Shor's own study (1962) was focused on the effects of "incidental anxiety" on physiological responses. He used 14 college students as subjects. Seven were simulators. Electric shock was the stimulus. A number of steps were taken to reduce incidental anxiety. Each subject was allowed to set the shock himself at a point which he reported to be "really painful", but also which he agreed to tolerate for an extended series of trials (60 shocks; .5 second each). Subjects were also given a two-second warning before each shock and were fully acquainted with the purpose of the experiment. Shor found no significant differences in physiological effects between the two groups. This was attributed to the reduction of anxiety. It is of interest that any hypnotic subject who reported feeling pain was excluded from the sample. All simulators stated they did feel pain on all trials.

Approximately the same time, Barber and Hahn (1962) reported finding no significant differences in the degree of analgesia experienced among two groups of selected suggestible subjects. The pain stimulus was administered by having Ss keep one hand in ice water for three minutes. Subjects in one group were hypnotized and given analgesic instructions. The other group ("waking-imagined analgesia") was instructed to image that "it is a very hot day... the water feels pleasantly cool...".

Hilgard (1965) noted that Barber and Hahn's results were quite inconclusive. Especially serious was their selection of subjects on the basis of high responsiveness to waking suggestions. This confounds the findings because these are the types of subjects that show little differences in waking or hypnotic states. "The real question is whether or not, for highly susceptible subjects who can experience analgesia under hypnosis, the fact of hypnotic induction makes a difference" (Hilgard, 1965).

Although the ice water ("cold pressor") stimulus which Barber and Hahn used has been employed in several subsequent hypnosis projects, this stimulus does present a number of problems of which researchers should be cognizant: 1. It is relatively uncontrolled (i. e. , stimulus intensity cannot be systematically varied). 2. Because numbness ensues rapidly, non-hypnotized Ss who are instructed to simulate hypnosis can show tolerance equal to that of hypnotized Ss. 3. The immediate shock of ice water does not allow time for the hypnotic S to achieve a confident analgesic state (Hilgard, 1969). 4. The subjective reactions to ice water vary greatly from subject to subject and, for some Ss, this is not a sufficiently painful stimulus to serve as an effective test of analgesia (Hilgard, 1965). Thus, data from research with this stimulus are inconclusive.

Using the cold pressor test, Tart and Hilgard (reported in Hilgard, 1965) studied 11 subjects who represented relatively high hypnotic susceptibility. These subjects had a much wider range of responsiveness to waking suggestions than the Barber and Hahn subjects. Using the subjects as their own controls, Tart and Hilgard found that subjective pain reports with one hand in ice water were higher in the waking than in the hypnotic condition.

Gardner (1967) also employed ice water as the pain stimulus in his study which predicted that: 1. The affective intensity of words used to connote pain would be reduced subsequent to hypnotically suggested analgesia. 2. Ss receiving hypnotic suggestions for analgesia would maintain contact with the pain producing stimulus longer than non-hypnotized Ss (simulators and controls). Twelve Ss were assigned to each group. The experimenter was fully aware of the identity of simulators and hypnotic Ss during testing. Thus, adequate controls against experimenter bias were not incorporated. Hypothesis #1 received no support. The second hypothesis was confirmed. However, a significant, unexplained, interaction effect was present depending on whether the S was tested first with the preferred or the non-preferred hand.

Hilgard has recently (1967) presented data on individual differences. Employing ice water as the pain stimulus, he found:

1. Subjects more highly susceptible to hypnosis on measures

unrelated directly to pain relief are more able to reduce pain through hypnotic suggestion. 2. There are enough individual differences among highly susceptible hypnotic subjects that some of the most susceptible are not able to relieve pain under experimental conditions. 3. Amount of heart rate and breathing reduction is unrelated to amount of felt pain.

In an additional study reported in the same paper, Hilgard (1967) found that a group of five simulators did indeed feel pain and did show greater increases in blood pressure. A variable that makes these results more difficult to interpret was introduced by the use of simulators who were not susceptible to hypnosis. Differences between hypnotic and simulator Ss may have been a function of personality factors or factors related to susceptibility rather than the hypnotic procedure. Hilgard also presented some preliminary results from studies employing tourniquet pain (ischemic pain). This stimulus modality does produce an intensely painful experience. Hilgard reported that none of three Ss (all had low hypnotic susceptibility) could parallel the performance of hypnotic Ss. Again, in addition to differences in subjective reports of pain, large differences in blood pressure were found. The ischemic pain stimulus is, however, extremely difficult to control and quantify. In essence, the intensity of the stimulus is controlled by the amount of arm and hand muscle exertion produced

by the subject when the blood flow is restricted. This poses some almost insurmountable quantification problems and makes comparative findings difficult to evaluate.

The preceding studies by Hilgard are summarized in a more recent paper (1969). Additional data from Hilgard's laboratory (Sachs, 1969) claimed to present further confirmation of the validity of hypnotic analgesia with an ice water stimulus. Subjects (N=5) rated pain experienced in a hypnotic analgesia and a hypnotic relaxed state. There were no independent control groups. Results showed lower pain state reports and lower blood pressure scores in the analgesic condition.

A very recent study (Lenox, 1970), also from Hilgard's laboratory, has presented further data based on ischemic pain. This study found that most Ss (total N=8) would endure ischemic pain longer in a hypnotic state (Day 2) than in an awake state (Day 1). Physiological measures (systolic blood pressure and heart rate) and pain ratings were offered to support the validity of the analgesic state. However, some caution is necessary in interpreting this data. There was no comparison or control group employed. The order of test conditions was not varied. Thus, no information is provided about possible order effects. The use of very sophisticated research Ss (five had previously taken part in a hypnosis project using a different pain

stimulus; the remaining three had been given 12 hours of hypnotic training) may limit the generalizability of results. Lenox's work leaves many unresolved questions regarding the effectiveness of hypnosis in modifying pain tolerance.

Summary - There are many theoretical and pragmatic questions left unanswered in laboratory studies of the modification of pain tolerance with hypnotic procedures. Most experiments have focused on physiological reactions or pain thresholds rather than tolerance. Although a variety of stimulus modalities have been employed, generally the stimulus has been of brief duration and very difficult to quantify or control. Also, adequate comparison groups of subjects have seldom been incorporated into research designs. This is complicated by the fact that, with the possible exception of preliminary ischemic pain studies, the stimuli used produced limited intensity levels. Thus, simulators were able to duplicate the performance of hypnotic subjects. As a result of problematic designs and the general focus on issues other than the modification of pain tolerance, the basic question of whether hypnotic states are effective, in a controlled laboratory setting, in changing a person's tolerance of an increasingly intense stimulus remains unanswered.

REFERENCES

REFERENCES

- Altman, J. Organic foundations of animal behavior. New York: Holt, Rinehart and Winston, 1966.
- Barber, T. X., and Hahn, K. W., Jr. Physiological and subjective responses to pain producing stimulation under hypnotically-suggested and waking-imagined "analgesia." Journal of Abnormal and Social Psychology, 1962, 65, 411-418.
- Bartley, H. S. Principles of perception. New York: Harper and Brothers, 1958.
- Bishop, G. H. Responses to electrical stimulation of single sensory units of skin. Journal of Neurophysiology, 1943, 6, 361-382.
- Brown, R. R., and Vogel, V. H. Psychophysiological reactions following painful stimuli under hypnotic analgesia with gas anesthesia and Novocain block. Journal of Applied Psychology, 1938, 22, 408-420.
- Buytendijk, F. J. Pain. Chicago: University of Chicago Press, 1962.
- Crasilneck, H. B. The control of pain and symptom management. In Margaretta K. Bowers (Ed.), Introductory lectures in medical hypnosis. New York: Institute for Research in Hypnosis, 1958. Pp. 43-47.
- Dorcus, R. M., and Kirkner, F. J. The use of hypnosis in the suppression of intractable pain. Journal of Abnormal and Social Psychology, 1948, 43, 237-239.
- Doupe, J., Miller, W. R., and Keller, W. K. Vasomotor reactions in the hypnotic state. Journal of Neurology and Psychiatry, 1939, 2, 97-106.
- Dynes, J. B. Hypnotic anesthesia. Journal of Abnormal and Social Psychology, 1932, 27, 79-88.
- Erickson, M. H. Hypnosis in painful terminal illness. American Journal of Clinical Hypnosis, 1959, 1, 117-121.
- Erickson, M. H. Further techniques of hypnosis - utilization techniques. American Journal of Clinical Hypnosis, 1959 (b), 2, 3-21.
- Erickson, M. H. Basic psychological problems in hypnotic research. In G. H. Estabrooks (Ed.), Hypnosis: current problems. New York: Harper and Row, 1962. Pp. 207-223.

- Erickson, M. H., Hershman, S., and Senter, I. I. The practical application of medical and dental hypnosis. New York: Julian Press, 1961.
- Esdaile, J. Hypnosis in medicine and surgery. New York: Julian, 1957. (Originally titled Mesmerism in India, copyright 1850.)
- Fischer, K. H. The problem of pain from the psychiatrist's viewpoint. Psychosomatics, 1968, 9, 319-325.
- Forbes, A. quoted by Beecher, H. K. The measurement of pain. Pharmacology Review, 1957, 9, 59-209.
- Gardner, R. The effects of hypnosis on behavioral and cognitive responses to noxious stimulation. Unpublished M. A. thesis, University of Louisville, 1967.
- Hardy, J. D. Studies on pain. Journal of Clinical Investigation, 1940, 19, 659-680.
- Hebb, D. O. A textbook of psychology. Philadelphia: W. B. Saunders, 1958.
- Hilgard, E. R. Hypnotic susceptibility. New York: Harcourt, Brace and World, 1965.
- Hilgard, E. R. The psychophysiology of pain reduction through hypnosis. Unpublished manuscript, Stanford University, 1967.
- Hilgard, E. R. Pain as a puzzle for psychology and physiology. American Psychologist, 1969, 24, 103-113.
- Hill, H. E., Kornetsky, C. H., Flanary, H. G., and Wikler, A. The effect of anxiety and morphine on discrimination of intensities of painful stimuli. Journal of Clinical Investigation, 1952, 31, 473-480.
- Keele, C. A., and Armstrong, D. Substances producing pain and itch. Baltimore: Williams and Wilkins, 1964.
- Kirkner, F. J. Hypnosis in a general hospital service. In R. M. Dorcus (Ed.), Hypnosis and its therapeutic applications. New York: McGraw-Hill, 1956, Pp. 11/1-11/18.
- Kornetsky, C. Effects of anxiety and morphine on the anticipation and perception of painful radiant thermal stimuli. Journal of Comparative and Physiological Psychology, 1954, 47, 130-132.

- Kroger, W. S. Clinical and experimental hypnosis in medicine, dentistry and psychology. Philadelphia: J. B. Lippincott, 1963.
- Kuehner, G. F. Hypnosis in dentistry. In R. M. Dorcus (Ed.), Hypnosis and its therapeutic applications. New York: McGraw-Hill, 1956, Pp. 12/1-12/21.
- Laux, R. An investigation of the analgesic effects on postoperative pain resulting from urological surgery. Unpublished doctoral dissertation, University of Southern California, 1953.
- Lee, A. J., and Atkinson, R. S. A synopsis of anaesthesia. Bristol: John Wright and Sons, 1964.
- Levine, M. Psychogalvanic reaction to painful stimuli in hypnotic and hysterical anesthesia. Bulletin of Johns Hopkins Hospital, 1930, 46, 331-339.
- Lenox, J. R. Effect of hypnotic analgesia on verbal report and cardiovascular responses to ischemic pain. Journal of Abnormal Psychology, 75, 199-206.
- MacCarty, C. S., and Drake, R. L. Proceedings of Staff Meetings of the Mayo Clinic, 1956, 31, 208.
- Noordenbos, W. Pain: problems pertaining to the transmission of nerve impulses which give rise to pain. New York: Elsevier, 1959.
- Orne, M. T. Antisocial behavior and hypnosis. In G. E. Estabrooks (Ed.), Hypnosis: current problems. New York: Harper and Row, 1962. Pp. 137-192.
- Pattie, F. A. A brief history of hypnotism. In J. E. Gordon (Ed.), Handbook of clinical and experimental hypnosis. New York: Macmillan, 1967. Pp. 10-43.
- Reyher, J. Hypnosis. Dubuque, Iowa: Wm. C. Brown Co., 1968.
- Rosen, G. Mesmerism and surgery: a strange chapter in the history of anesthesia. Journal of the History of Medicine and Allied Sciences, 1946, 1, 527-550.
- Rosen, H. Hypnotherapy in clinical psychiatry. New York: Julian, 1953.

- Sachs, L. B. Comparison of hypnotic analgesia and hypnotic relaxation during a continuous pain source. Proceedings, 77th Annual Convention, APA, 1969, 907-908.
- Sanders, R. S., and Reyher, J. Sensory deprivation and the enhancement of hypnotic susceptibility. Journal of Abnormal Psychology, 1969, 74, 375-381.
- Sarbin, T. R. Physiological effects of hypnotic stimulation. In R. M. Dorcus (Ed.), Hypnosis and its therapeutic applications. New York: McGraw-Hill, 1956. Pp. 4/1-4/57.
- Sears, R. R. Experimental study of hypnotic anesthesia. Journal of Experimental Psychology, 1932, 15, 1-22.
- Shor, R. E. Explorations in hypnosis: a theoretical and experimental study. Unpublished doctoral dissertation, Brandeis University, 1959.
- Shor, R. E. Physiological effects of painful stimulation during hypnotic analgesia under conditions designed to minimize anxiety. International Journal of Clinical and Experimental Hypnosis, 1962, 10, 183-202.
- Sutcliffe, J. P. "Credulous" and "skeptical" views of hypnotic phenomena: experiments on esthesia, hallucination, and delusion. Journal of Abnormal and Social Psychology, 1961, 62, 189-200.
- Szasz, T. S. Pain and pleasure: a study of bodily feelings. New York: Basic Books, 1957.
- Weitzenhoffer, A. M. Hypnotism. New York: Wiley, 1953.
- West, L. J., Neill, K. C., and Hardy, J. D. Effects of hypnotic suggestions on pain perception and galvanic skin response. Archives of Neurology and Psychiatry, 1952, 68, 549-560.
- White, J. C., and Sweet, W. H. Pain. Its mechanisms and neurosurgical control. Springfield: Thomas, 1955.
- Wolff, H. G., and Goodell, H. The relation of attitude and suggestion to the perception of and reaction to pain. Proceedings of the Association for Research in Nervous and Mental Disease, 1943, 23, 434-448.

Woodworth, R. S. Experimental psychology. New York: Holt, 1938.

Wright, M. E. Hypnosis research and rehabilitation problems. In G. H. Estabrooks (Ed.), Hypnosis: current problems. New York: Harper and Row, 1962. Pp. 193-206.

APPENDIX B

The State-Trait Anxiety Inventory (STAI)

Self-Analysis Questionnaire
FORM X-1

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you feel right now, that is, at this moment.

There are no right or wrong answers.
Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

	Not at all	Somewhat	Moderately so	Very much so
1. I feel calm.....	1	2	3	4
2. I feel secure.....	1	2	3	4
3. I am tense.....	1	2	3	4
4. I feel regretful.....	1	2	3	4
5. I feel at ease.....	1	2	3	4
6. I feel upset.....	1	2	3	4
7. I am presently worrying over possible misfortunes..	1	2	3	4
8. I feel rested.....	1	2	3	4
9. I feel anxious.....	1	2	3	4
10. I feel comfortable.....	1	2	3	4
11. I feel self-confident.....	1	2	3	4
12. I feel nervous.....	1	2	3	4
13. I am jittery.....	1	2	3	4
14. I feel "high strung".....	1	2	3	4
15. I am relaxed.....	1	2	3	4
16. I feel content.....	1	2	3	4
17. I am worried.....	1	2	3	4

Self-Analysis Questionnaire
FORM X-1 (Continued)

	Not at all	Somewhat	Moderately so	Very much so
18. I feel over-excited and "rattled".....	1	2	3	4
19. I feel joyful.....	1	2	3	4
20. I feel pleasant.....	1	2	3	4

FORM X-2

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you generally feel.

There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

	Almost never	Sometimes	Often	Almost always
21. I feel pleasant.....	1	2	3	4
22. I tire quickly.....	1	2	3	4
23. I feel like crying.....	1	2	3	4
24. I wish I could be as happy as others seem to be....	1	2	3	4
25. I am losing out on things because I can't make up my mind soon enough.....	1	2	3	4
26. I feel rested.....	1	2	3	4
27. I am "calm, cool, and collected".....	1	2	3	4
28. I feel that difficulties are piling up so that I cannot overcome them.....	1	2	3	4
29. I worry too much over something that really doesn't matter.....	1	2	3	4
30. I am happy.....	1	2	3	4
31. I am inclined to take things hard.....	1	2	3	4
32. I lack self-confidence.....	1	2	3	4
33. I feel secure.....	1	2	3	4
34. I try to avoid facing a crisis or difficulty.....	1	2	3	4
35. I feel blue.....	1	2	3	4
36. I am content.....	1	2	3	4

APPENDIX C

Instructions for Hypnosis and Simulator Subjects

FORM X-2
(Continued)

	Almost never	Sometimes	Often	Almost always
37. Some unimportant thought runs through my mind and bothers me.....	1	2	3	4
38. I take disappointments so keenly that I can't put them out of my mind.....	1	2	3	4
39. I am a steady person.....	1	2	3	4
40. I get in a state of tension or turmoil as I think over my recent concerns and interests.....	1	2	3	4

Instructions for Ss Assigned to the
Hypnosis Group

INSTRUCTIONS

IN THE NEXT SESSION YOU
WILL AGAIN ALLOW YOURSELF
TO BE HYPNOTIZED

Your role in this research is very important.

During the next research session you will again let yourself be hypnotized. Mr. Greene will be using a hypnosis induction procedure similar to those you have already experienced. You will again experience the enjoyable, restful, relaxing feelings of entering a hypnotic state. Again, just let yourself drift into a hypnotic state.

When Mr. Greene says "THE EXPERIMENT IS OVER", the research session will be completed. Following this, you can, if you wish, discuss any questions you may have about the research with Mr. Greene.

Thank you for your cooperation.

Experiment Instruction Coordinator

Instructions for Ss Assigned to the
Simulator Group

INSTRUCTIONS

IN THE NEXT SESSION YOU
WILL NOT ALLOW YOURSELF
TO BE HYPNOTIZED

Your role is very important for this research.

At no time during the next research session will you allow yourself to become hypnotized. You will remain completely awake. Mr. Greene will attempt to hypnotize you, but you will not allow yourself to become hypnotized in the slightest. Under no circumstances during the next session will you become hypnotized by Mr. Greene. You will successfully resist hypnosis.

What you are to do during the next session is to pretend that you are hypnotized. Again, it is most important that you not, at any point, allow yourself to actually become hypnotized. In your role of pretending to be hypnotized, you should act as you think a hypnotized person would behave; but you will remain awake. Because Mr. Greene will not know the content of these instructions, he will not know whether you are really hypnotized or not. It has been demonstrated that even an expert hypnotist can be fooled by a person pretending to be hypnotized.

When Mr. Greene says "THE EXPERIMENT IS OVER", the research session will be completed. You should then stop pretending to be hypnotized. Following this, you can, if you wish, discuss any questions you may have about the research with Mr. Greene. Your successful resistance of hypnosis during this next session will not affect your ability to become hypnotized in the future.

Thank you for your cooperation.

Experiment Instruction Coordinator

Again, it is most important that you remain completely AWAKE during the next research hour. Use whatever methods you feel might assist you in staying awake (examples: not concentrating on tack on the wall, diverting attention away from Mr. Greene's voice, active thinking about other things, not relaxing, etc.) -- above all, say AWAKE -- just pretend to be hypnotized.

APPENDIX D

Experimental Test Conditions Instructions

Analgesia

(Trial 1)

During the last research session, you reported that you have had the experience of sleeping on your arm and having your hand and arm go numb, asleep. Also, during the last session you were able to experience a similar feeling here . . . through hypnosis. You will soon have that same experience again, you will be able to have that same experience again . . . the experience of your - - - - hand and arm losing sensitivity. (Refer to appropriate hand.)

* * * * *

(Trial 2)

Previously this hour and during the previous research hour you were able to experience a change in the sensations, in the feeling in your - - - - arm and hand. Kind of a numbing feeling, like your hand and arm were sort of "asleep." You will soon have that same experience again, you will be able to have that same experience again. The experience of your - - - - hand and arm losing sensitivity.

(Intersperse "AGAIN")

* * * * *

Again, I want you to pay close attention to and concentrate on your - - - - hand. If you do pay close attention and concentrate, you can again notice the beginning of a slight tingling feeling in the hand and arm. Again, your fingers may move slightly as the change begins to occur. In any case, a feeling of a slight tingling nature, perhaps a feeling of lightness, will creep into your hand and arm. Whatever you may be experiencing, it is quite similar to what happens when your arm is going to sleep. After only a few seconds you will begin to experience a change in the sensation, a change in the feeling in your - - - - hand. The change may be some sort of numbing feeling. This may begin with a tingling feeling similar to that which you may have experienced when your hand is going to sleep. Perhaps a feeling of coolness. Just let yourself experience whatever may be happening. A tingling, a coolness, the feeling that sensitivity is again being lost in the - - - - hand. Nerves are becoming numbed. A numb feeling increasing. Increasing more and more and more. A feeling of insensitivity. Perhaps a feeling like your hand is covered by a heavy leather glove. Feeling is decreasing; becoming deadened. Or perhaps the sensation that your hand is like a block of wood. A chunk of wood just sticking out at the end of your arm. Whatever experience you may be having, you will notice the feelings of numbness increasing more and more. More and more. Losing sensitivity. If you are noticing this feeling, a change in sensitivity in your - - - - hand and arm, nod your head so I will know you are experiencing this. Fine. You will notice that the feelings of numbing will increase more and more.

They will continue to increase. More and more numb. Sensations being lost more and more. Hand and arm more and more insensitive. Losing the feeling of sensitivity. The hand may be feeling as though covered with a leather glove. Or perhaps it is feeling like wood. Just an extension out on the end of your arm. Let yourself experience whatever the change may be.

* * * * *

In a moment I am going to put your fingers into the water and ask you to turn on the stimulator. Again, when the stimulation gets to the point where you do not want it to continue, release the button. Hand more and more numb.

(Fingers In)

When the stimulation gets to the point where you do not want it to continue, release the button.

(Test)

Now I am going to rub the back of your hand three times. When I do this, you will find normal feelings, your typical sensitivity returning to your hand. Numbness gone very shortly. Hand and arm returning to normal condition.

Pleasant Imagery

From our previous practice, we know that you are able to experience visual imagery while in the restful sleep-like state you are now in. You are able to see things, to get pictures, visual images in your mind's eye with little effort on your part.

Now I want you to use this capacity, this ability to see things in your mind's eye, to again get a picture of a very enjoyable situation or experience.

If second PI test: I want you to see the SAME pleasant, enjoyable experience or situation which you saw previously this hour. The SAME pleasant, enjoyable situation or experience which you saw previously this hour.

(If #2 intersperse "SAME")

Use your capacity for visualization to again get a picture in your mind's eye of a very enjoyable situation or experience. A very enjoyable situation or experience. Again, this may be something you have experienced or perhaps just an experience or situation you would like to be in, to enjoy. A pleasant, enjoyable situation or experience. If this is not in your mind's eye now, you will find this pleasant situation appearing on the count of

three. 1 . . . 2 . . . 3. A pleasant, enjoyable situation or experience. Nod your head if you are visualizing something pleasant and enjoyable. Very good. Now keep visualizing this pleasant, enjoyable situation until I say "O.K. . . . Stop."

In a moment I am going to put your fingers into the water and ask you to turn on the stimulator. Again, when the stimulation gets to the point where you do not want it to continue, release the button. Seeing a pleasant, enjoyable situation (fingers in). When the stimulation gets to the point where you do not want it to continue, release the button.

(Test)

Fine. O.K. . . . Stop. Stop imagining the pleasant scene . . . just let the image fade away.

Analgesia Plus Pleasant Imagery

1. Induce Analgesia (see Analgesia instructions)

2. Pleasant Imagery

(Your hand and arm will continue to lose sensitivity, more and more numb . . . and, as this continues, I want you to again use the other capacity you previously exhibited. The capacity to experience visual imagery while in the restful sleep-like state you are now in. You are able to see things, to get pictures, visual images in your mind's eye with little effort on your part.

Now I want you to use this capacity, this ability to see things in your mind's eye, to again get a picture of a very enjoyable situation or experience.

If second PI test: I want you to see the SAME pleasant, enjoyable experience or situation which you saw previously this hour. The same pleasant, enjoyable situation or experience which you saw previously this hour.

While you are enjoying this pleasant image, the numb feelings in your hand will continue . . . will increase.

(If #2 intersperse "SAME")

Use your capacity for visualization to again get a picture in your mind's eye of a very enjoyable situation or experience. A very enjoyable situation or experience. -- Hand numb. -- Again, this visualization may be something you have experienced, or perhaps just an experience or situation you would like to be in, to enjoy. A pleasant, enjoyable situation or experience. If this is not in your mind's eye now, you will find this pleasant situation appearing on the count of three.

1 . . . 2 . . . 3 . . . A pleasant, enjoyable situation or experience.

Nod your head if you are visualizing something pleasant and enjoyable.

Very good. Now keep visualizing this pleasant, enjoyable situation until I say "O.K. Stop."

Hand more and more numb.

In a moment I am going to put your fingers into the water and ask you to turn on the stimulator. Again, when the stimulation gets to the point where you do not want it to continue, release the button.

Hand more and more numb. Seeing a pleasant, enjoyable situation.

(Fingers In)

When the stimulation gets to the point where you do not want it to continue, release the button.

(Test)

APPENDIX E

Post-Test Interview Form and Stimulus Rating Scale

POST-TEST DATA: EXPERIMENTER RECORD

1. Simulator or Hypnotic Subject?

- a. If Simulator, did you successfully resist hypnosis?
- b. If Hypnotic, did you allow yourself to become hypnotized?

--

2. Stimulus Rating

- a. Describe experience at point where you turned the stimulus off.
- b. Fit into Stimulus Rating Scale (attached)
- c. Was the sensation (at the stop point) the same each time?
 - i. If "no", elaborate

$\bar{2}\bar{A}$ (alternate with #2)

Phenomonological view: Why didn't you want the stimulus to continue beyond the stop point?

--

3. What do you think this experiment was all about?

--

4. Guess what the results will be.

5. What was the pleasant imagery?

a. Realistic?

b. How do you feel about having experienced this imagery?

--

6. Rate how much numbness or change you felt occurred in your
_____ arm and hand. (ask for both tests)

- 1: None (not at all numb)
- 2: Slight (slightly changed, numb)
- 3: Moderate
- 4: Much
- 5: Very Much

--

7. How do you feel about the entire research experience?

--

8. Had any drugs in the past 24 hours?

STIMULUS RATING SCALE

At the point when you turned off the stimulus, were you feeling:

(circle one)

- A. a tingling sensation.**
- B. a picking sensation.**
- C. slight pain.**
- D. moderate pain.**
- E. severe pain.**
- F. very severe pain.**

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