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Physiological reactivity to mental imagery as a construct relating to somatization and hypnotizability

Jeffrey J. Borckardt

To the Graduate Council:

I am submitting herewith a dissertation written by Jeffrey J. Borckardt entitled "Physiological reactivity to mental imagery as a construct relating to somatization and hypnotizability." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Psychology.

Michael R. Nash, Major Professor

We have read this dissertation and recommend its acceptance:

Accepted for the Council:

Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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Acceptance for the Council:

Vice Provost and Dean of Graduate Studies

PHYSIOLOGICAL REACTIVITY TO MENTAL IMAGERY AS A CONSTRUCT RELATING TO SOMATIZATION AND HYPNOTIZABILITY.

A Dissertation

Presented for the

Doctor of Philosophy Degree

University of Tennessee, Knoxville

Jeffrey J. Borckardt

August, 2003

DEDICATION

I dedicate this work to the following people:

My wife, Deza. Without her continued love and support, none of my efforts at the University of Tennessee would have been possible. She has always encouraged all of my endeavors and keeps me organized and in good spirits.

My mentor, Dr. Michael Nash. His patience, guidance and wisdom have inspired me to continually strive to be a better researcher and psychologist.

My parents, Laura and Bob. Their support throughout the years has been essential in helping me accomplish my goals and live my dreams.

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I would also like to acknowledge the other members of my dissertation committee: Dr. Robert Wahler, Dr. Richard Saudargas and Dr. Larry James for their support and time spent thoughtfully reviewing this work as well as my clinical and academic specialty papers.

Finally, I would like to acknowledge Jarred Younger for his help and expertise with regard to psychophysiology, measurement and research design. His thoughtful contributions to this project have taught me a lot and helped to make this project possible.

ABSTRACT

Previous research has failed to find a consistent relationship between hypnotizability and imagery ability. Common means of assessing imagery ability involve self-report measures of visual imagery vividness. The present study implements a behavioral approach to capture a unique aspect of imagery ability. It was hypothesized that participants' ability to have physiological reactions to their mental images *as if* those images were real, may be related to hypnotizability. Additionally, previous research has explored links between hypnotizability and a tendency to have psychosomatic difficulties. The present study examines this relationship using a new measure of somatization (Somatization of Emotional Conflict Scale). 70 Undergraduates at the Univeristy of Tennessee (34 Males and 36 females, mean age = 19.59) completed several self-report questionnaires as well as the Waterloo-Stanford Group C scale of hypnotic susceptibility. Their physiological reactivity to imagery of having their hands immersed in an ice bath was also measured. Findings indicate that reactivity to mental imagery was not related to hypnotizability however, scores from the Somatization of Emotional Conflict scale significantly predicted hypnotizability over and above all other measures implemented in the study. Implications for further research on the relationship between somatization and hypnotizability are discussed.

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CHAPTER I

REVIEW OF THE LITERATURE

The study of hypnotic susceptibility (hypnotizability) as an individual difference trait seems to have raised many more questions than it has answered over the past century. Several behavioral scales have been developed to measure hypnotizability and consist of suggestions for behavioral responses varying in difficulty (Hilgard, 1965). Measures of hypnotizability as a trait seems to be psychometrically stable and consistent with high test-retest and internal consistency reliability. Additionally, hypnotizability as a trait seems to be normally distributed. However, investigations as to stable correlates of hypnotizability have had little yield (Bowers, 1976). Early investigations of the relationship between hypnotizability and various personality traits such as acquiescence, neuroticism and hysteria did not reveal reliable correlations (Bowers, 1976; Deckert & West, 1963; Barber, 1964; Dana & Cooper, 1964; Hilgard, 1965). Bowers (1976) proposes four possibilities for the historical lack of findings: 1) the personality traits in question may be more limited and specific in their impact on functioning than previously suspected; 2) hypnotic susceptibility may correlate with other personality characteristics but only in people pre-selected for certain other qualities; 3) hypnotic susceptibility *scores* may not accurately reflect *hypnotic susceptibility*. Instead, the scores may be affected by apprehension, concern for autonomy and/or lack of familiarity with hypnosis; and 4) Subtle complexities in hypnosis itself may account for low correlations with various personality traits.

Absorption as a related construct

While traditional methods of correlating known personality traits with hypnotizability did not yield positive results, some efforts were made to find collections of unique non-hypnotic experiences that did correlate with hypnotizability. Shor (1960) found that participants who reported experiencing non-volitional body movements, uncertainty regarding whether they had done something or not, and other similar experiences tended to be more hypnotizable than those who had not. A cluster of items that high-hypnotizable participants endorsed reflected an ability to become highly absorbed in something (e.g. nature, art or a particular role). Following from these findings, VanNuys (1973) asked undergraduates to focus attention on their own breathing for 15 minutes. Participants were asked to push a button whenever they were caught-up in a distracting thought that interfered with their concentration on breathing. The correlation between the number of button presses and hypnotizability (measured by the Harvard Group Scale of Hypnotic Susceptibility) was -.42 strengthening the notion that there exists a relationship between absorption ability and hypnotizability.

Tellegen and Atkinson (1974) developed a questionnaire to assess absorptive attention which they defined as "full commitment of available perceptual, motoric, imaginative and ideational resources to a unified representation of the attentional object" (p. 274). Research on the relationship between hypnotizability and absorption using the Tellegen Absorption Scale (TAS) has revealed modest relationships at best with correlations typically in the range of .12 to .21 (Council, Kirsch & Grant, 1996;

Bowers, 1976; Kupferberg, 1996; Angelini, 1999; Barnier & McConkey, 1999; Oakman, Woody & Bowers, 1996; King et al, 2000; Moore et al, 2000).

Dissociation as a possible correlate

Another trait investigated as a correlate with hypnotizability is proneness to dissociative experiences. Bowers (1976) suggested that highly hypnotizable people are better able than people with low-hypnotic ability to process and appraise information preattentively without being distracted from other involvement which he referred to as dissociative ability. Bernstein and Putnam (1986) developed a scale to measure dissociation in normal and clinical populations called the Dissociative Experiences Scale (DES). There is ample evidence suggesting that the DES is a reliable and valid instrument (Carlson-Bernstein & Putnam, 1993). However, there appears to be no discernable relationship between dissociation and hypnotizability (Angelini, Kumar and Chandler, 1999; Oakman, Woody & Bowers, 1996; Kupferberg, 1996; King et al, 2000; Moore et al, 2000).

Expectations and hypnotic behavior

Participants' expectations regarding their own hypnotizability seem to be predictors of their actual hypnotizability scores but usually only account for about 10% of the variance in hypnotizability (Council, Kirsch & Grant, 1996; Kirsch & Council, 1992). However, this relationship may be partially explained by Bowers' (1976) notion that, to a degree, hypnotizability scores may be affected by apprehension, concern for autonomy and/or lack of familiarity with hypnosis. It

seems reasonable that expectations of one's own hypnotizability would be driven by such apprehension, concern and lack of familiarity. It could be that expectations simply account for these factors without actually capturing much of the true construct of hypnotizability.

Hypnosis and imagery ability

J.R. Hilgard (1970) suggested that "those who have vivid imagery experiences outside hypnosis might be better prepared to meet the demands of the hypnotic situation." While there has been much interest in the relationship between mental-imagery-ability and hypnotizability, the relationship appears to be a complicated one. Sutcliffe, Perry & Sheehan, (1970) explored the relationship between self-reported vividness of imagery and hypnotizability. Their findings suggest that poor imagers tended to be low-hypnotizables but vivid-imagers were either high or low in terms of hypnotizability. J.R. Hilgard (1970) notes that while self-reported imagery ability may correlate modestly with hypnotizability, the relationship may be driven by the lack of people in the quadrant of the distribution representing low imagery ability and high hypnotizability. She also notes that imagery ability seems to be more strongly related to hypnotizability when only items aimed at *production of experiences* (e.g. taste hallucination, dream & mosquito hallucination) in hypnosis are considered. Finally, she comments that self-reported imagery vividness may not be an adequate way to measure imagery ability (J.R. Hilgard, 1970).

More recent research has yet to uncover a consistent and reliable link between imagery and hypnotizability. One of the problems with the study of imagery is that it

is a difficult construct to measure. Marks (1973, 1995) developed the Vividness of Visual Imagery Questionnaire (VVIQ) which is a self-report measure of imagery vividness. While the use of the VVIQ has been quite popular in research, a relationship between VVIQ scores and hypnotizability has not clearly emerged. Kogon et al (1998) examined the relationship between self-reported imagery vividness, behavioral indices of spatial imagery ability and hypnotizability. Using the VVIQ and a computerized task of spatial imagery ability, the authors found no relationship between hypnotizability and vividness of visual imagery nor between hypnotizability and the behavioral measure of imagery ability. Glisky, Tataryn & Kihlstrom (1995) also found no stable relationship between hypnotizability and vividness of visual imagery, control of visual imagery, vividness of motor imagery or control of motor imagery. Coe, St.Jean & Burger (1980) found no differences in vividness and control of imagery across high, medium and low-hypnotizable participants.

Bowers (1976) argues that if an imagined experience feels as if it is being evoked by an external agency and is experienced as effortless and unbidden, the relationship between imagery and hypnotizability is likely to be strong. In other words, it may not be the vividness of imagery itself that is related to hypnotizability but rather the effortlessness with which it is invoked. To address Bowers' (1976) assertion, Moore, King, Borckardt and Nash (1999) attempted to measure effortlessness of mental imagery and explore the relationship between it and hypnotizability. Participants completed a number of computerized imagery tasks. They were then given a different form (counterbalanced) of the same computerized

imagery tasks but were asked to perform an additional auditory detection task simultaneously. Effortlessness of mental imagery was determined by examining performance differences on imagery tasks between the imagery-only task and the dual-task such that no difference indicated high effortlessness and large differences indicated low effortless of imagery ability. However, despite Bowers' (1976) assertion regarding effortlessness as a key component of the relationship between imagery and hypnotizability, no significant relationship was found between effortlessness of imagery invocation and hypnotizability.

Imagery and physiological reactivity

While linking imagery ability to hypnotizability has not proven exceptionally fruitful, imagery ability seems to have some interesting relationships with physiological reactivity. Using Sheehan's (1967) revision of Betts' (1909) Questionnaire Upon Mental Imagery, Hirschman and Favaro (1980) found that participants with high imagery ability could voluntarily control heart rate better than low-imagers. Both high and low-imagers reported using imagery in the attempt to control heart rate, and the authors conclude that it is differences in vividness of imagery that accounted for the differences.

Ikeda and Hirai (1976) found a relationship between richness of imagery using the Sophian Scale of Imagery (SSI; Richardson, 1969) and ability to voluntarily alter electrodermal activity in 42 undergraduate students. Participants high on the SSI showed more voluntary control of electrodermal activity while using a biofeedback paradigm.

Kuzendorf (1981) introduced 4 tests of imagery that assess a participant's prevalence of visual, auditory, tactile and heat imagery (PVIT, PAIT, PTIT & PHIT). In addition to measuring imagery prevalence, he measured visual, auditory, tactile and heat imagery vividness with modified versions of the VVIQ. Kuzendorf (1981) found significant positive relationships between the prevalence measures and participants' ability to control, voluntarily and differentially, their hand temperatures. The overall correlation between prevalence of imagery and temperature control ability was .51, however none of the vividness measures were significantly related with ability to control hand temperature.

Carroll, Baker and Preston (1979) found individual differences in the voluntary control of heart rate. For participants who reported using mental imagery as a strategy for heart rate control, there was a relationship between vividness of visual imagery and degree of increase in heart rate ($r=.40$, $p<.10$).

Deschaumes-Molinaro, Ditmar and Vernet-Maury (1992) looked at 15 marksmen and 7 archers' autonomic nervous system (ANS) activity during a real competition, during an imaginary competition simulation and during imagery of a neutral situation. The authors found no differences in ANS activity between the actual and imagined shooting situations but ANS activity during both conditions was distinguishable from ANS activity during imagery of the neutral situation. This suggests that the ANS arousal associated with imagined emotional events might, under some circumstances, be similar to ANS arousal associated with the real event.

Hypnotizability and physiological reactivity

The aforementioned studies articulate a potential link between imagery and physiological reactivity. While this research demonstrates clear individual differences in ANS reactivity to mental imagery, none of the studies considered the possibility of hypnotizability as a correlate of ANS reactivity to imagery.

There have been some investigations as to the relationship between hypnotizability and physiological reactivity in general without the explication of imagery. Harris et al (1993) found a strong relationship between hypnotizability and heart rate reactivity. They found that participants with lower heart rate during baseline and greater heart rate increases during a mood induction were more susceptible to hypnosis. However, Crosson (1980) found no relationship between hypnotizability and ability of participants to raise finger temperature relative to forehead temperature.

Wickramasekera, Pope, & Kolm (1996) found that large increases in skin conductance levels during cognitive threat situations were significantly related to high hypnotizability in 118 adult patients with chronic pain symptoms. Additionally, he found that highly hypnotizable patients retained higher skin conductance levels than low-hypnotizables. These findings are consistent with Wickramasekera's (1993) high risk model of threat perception in which high hypnotizability is hypothesized to be a primary risk factor for ANS reactivity and somatization disorders. Wickramasekera (1993) articulates this relationship by suggesting that:

> Hypnosis can be defined as a mode of information processing in which a suspension of peripheral attention and critical

> analytic cognition can lead to major changes in perception, memory, and mood in people of high hypnotic ability, which can have major behavioral and biological consequences (p. 592).

In support of this notion, Wickramasekera (1994) found that sympathetic reactivity is higher under cognitive threat for highly hypnotizable participants than for moderately hypnotizable participants.

Despite the relationships found between hypnotizability and ANS reactivity as well as between imagery and ANS reactivity, there is little work examining the possible links between the three. However, in one study, Panagiotides (1997) found that dental surgery patients who were high in hypnotizability displayed higher fast EEG activity during both baseline and non-hypnotic "mental-reliving" of the procedure compared to low hypnotizables suggesting a some relationship between reactivity to mental imagery and hypnotizability.

Szechtman, Woody, Bowers & Nahmias (1998) found similar activation patterns of the right anterior cingulate (Brodmann area 32) for both hypnotically produced auditory hallucinations and actual auditory stimuli in highly-hypnotizable subjects using positron emission tomography (PET). This activation was not produced for low-hypnotizable, non-hallucinating subjects. The authors conclude that activation of Brodmann area 32 during auditory hallucinations may lead to the experience of self-generated thoughts being perceived as external. Following from the authors' ideas, it seems possible that physiological reactivity to mental imagery may result from a similar process of experiencing self-generated images as external. The

degree to which a person experiences an internally generated image as external or real may relate to the degree to which they respond physiologically. It may be the ability of a subject to make some degree of a false source attribution (internal or external) that relates to hypnotizability. Thus, the degree to which a subject responds physiologically to an image as if it were externally generated may correlate with hypnotizability which is consistent with the experiences of effortlessness and passive receptivity in hypnosis. Essentially, individual differences in the ability to experience internally generated stimuli as external (as reflected in activity of the right anterior cingulate; Szechtman, Woody, Bowers & Nahmias, 1998) may explain how physiological reactivity to mental imagery relates to hypnotizability.

Somatization and hypnotizability

Interestingly, Wickramasekera (1993, 1994, 1995) links high hypnotizability and high ANS reactivity with proneness to somatoform disorders. Somatoform disorders are defined by the presence of physical symptoms suggesting a general medical condition but are not fully explained by a medical condition or the direct effects of a substance (DSM-IV, 1994).

Somatization (tendency for physiological expression of psychological distress) is typically measured using a symptom checklist. Common measures include the Cohen-Hoberman Inventory of Physical Symptoms (CHIPS), the Somatization subscale of the Symptom Checklist-90 (SCL-90; Derogatis & Lazarus, 1994) and the Wahler Physical Symptoms Inventory (PSI; Wahler, 1968). While the symptom checklist method (broadly employed in each of the aforementioned

somatization scales) is useful, it does not directly capture the relationship between psychological events and somatic complaints. For example, if someone indicates that they have recently been troubled by shakiness, sweating, stomachaches and muscle weakness using a symptom checklist (e.g. CHIPS or SCL-90), they may be suffering from somatic distress stemming from anxiety, or they may have the flu. However, a measure that queries a respondents attribution of psychological contribution to somatic problems may help to distinguish people who suffer from chronic somatic problems associated with psychological distress from those who have recently been infected with a virus. The interaction of psychological states and somatic complaints seems more directly related to the relationships between imagery, hypnotizability and ANS reactivity (and by implication, somatization; Wickramasekera, 1993, 1994, 1995) insofar as imagery and many hypnotic phenomena are psychological and ANS reactivity is somatic.

Recently, Borckardt, Younger, Adams & Nash (2000) have developed a symptom checklist that attempts to capture the interaction between psychological phenomena and somatic complaints. The Somatization of Emotional Conflict Scale (SECS) is comprised of 40 somatic symptoms in checklist form. Participants are asked to indicate: 1) the frequency of symptom occurrence; 2) the severity (or intensity) of the symptom; and 3) which, if any, emotional state(s) (anxiety, depression or anger) tend(s) to be related to each symptom. This third construct can be thought of as *acknowledgement of emotional contribution* (AEC) to somatic problems. Preliminary analyses indicate the SECS to have acceptable levels of internal consistency reliability and external validity with coefficient alpha ranging

from .84 to .90 across various samples (Borckardt et al, 2000). Additionally, SECS frequency and severity scores correlate positively with the somatization sub-factor of the SCL-90 with coefficients ranging from .46 to .70 (Borckardt et al, 2000). The inclusion of the three components (frequency, severity, and emotional contribution) for each symptom allows for numerous pieces of information to be derived in addition to mere symptom endorsement. One construct of interest is *acknowledgment of emotional contribution* to somatic complaints (AEC). AEC is determined by adding the number of acknowledgements a participant makes to the contribution of affective conditions to somatization (possible range 0 to 120). AEC is simply the degree to which participants report relationships between emotional factors and somatic symptomology. This construct is not available using standard symptom check-list measures.

Conclusions and hypotheses

In sum, previous research has found hypnotizability to be linked with somatization and physiological reactivity. Additionally, previous research links physiological reactivity with imagery ability but there is no compelling evidence that hypnotizability and imagery ability are linked despite theoretical positions suggesting that there should exist a relationship between them. There have been no direct examinations of the relationship between physiological reactivity to mental imagery and hypnotizability.

In essence, I propose that it is not imagery ability per se that is related to hypnotizability but, rather it is a person's tendency toward physiological reactivity to

mental imagery that is key. The present study seeks to link the three components of somatization measured by the SECS (frequency, severity and AEC) with hypnotizability. Additionally, the present study seeks to account for variance in hypnotizability using individual differences in ANS reactivity to mental imagery (RMI). It is hypothesized that participants who are high in RMI will be high-hypnotizables thus bridging the gap between imagery and hypnotizability.

More specifically, the present study attempts to account for variance in hypnotizability using individual differences in expectations, absorption, dissociation, prevalence of mental imagery, somatization (frequency, severity and AEC), and reactivity to mental imagery (RMI). Finally, it is hypothesized that somatization and RMI will account for variance in hypnotizability over and above expectation, absorption, dissociation and imagery prevalence.

CHAPTER II

METHODS

Participants

Participants were 70 undergraduates at the University of Tennessee at Knoxville enrolled in an Introductory Psychology Classes. There were 34 males and 36 females with a mean age of 19.59.

Participants volunteered to participate in the study and received extra credit for their participation. Participants were administered the hypnotizability scale during their regular Introduction to Psychology class period and the imagery portions and questionnaire portions of the study were held separately. Of the 70 participants, a total of 47 participants attended both the hypnosis session and the imagery/ questionnaire portion. Problems with physiological measurement (participants coughing or moving too much and/or equipment failure) resulted in some incomplete physiological protocols (missing physiological data). Of the 70 participants, 7 had incomplete heart rate protocols and 10 had incomplete skin conductance protocols. When applying regression models which integrate numerous variables including questionnaire scores, physiological and hypnotizability measures, each participant missing even one element was eliminated thereby limiting the N-size for regression analyses (N=33) and resulting in variable N-sizes for post-hoc analyses following ANOVA procedures.

Materials

Hypnotizability measure

Hypnotizability was assessed using the Waterloo-Stanford Group C scale of hypnotic susceptibility (WSGC; Bowers, 1998; Bowers, 1993) in the classroom setting. The WSGC consists of a standard hypnotic induction followed by 12 suggestions for hypnotic behavior which vary in difficulty. The range of scores is normally 0 to 12. However, one item (hypnotic age regression) was removed due to its tendency to elicit negative affect from participants. For the purposes of this study, the range of possible scores was 0 to 11. The WSGC has demonstrated acceptable levels of internal consistency with alpha ranging from .77 to .80 and it correlates with the Harvard Group Scale of Hypnotic Susceptibility at about .70 (Bowers, 1998).

Expectation measure

Expectation was measured by asking participants to indicate the number of items they expected to pass on the hypnotizability scale. Participants read the following passage:

> People differ in the extent to which they respond to hypnosis. Some people are very hypnotizable and respond to many of the suggestions given during hypnosis. Others are not so hypnotizable. The only way to tell how hypnotizable someone is, is to actually do hypnosis, give a series of suggestions, and see how many of the suggestions

they respond to. The person's score is the number of suggestions they respond to. Most hypnosis scales have 12 suggestions. Thus a person could score anywhere from 0 to 12.

They were then asked "If you were hypnotized, how many of the 12 suggestions do you think you would respond to? In other words, how responsive to hypnosis do you expect you would be? What do you think your score would be on a scale from 0 to 12?" The expectations scores were recorded on the backs of the response forms prior to beginning the hypnosis scale.

Somatization of Emotional Conflict Scale

Somatization was measured using the Somatization of Emotional Conflict Scale (SECS; Borckardt et al, 2000). The SECS presents participants with 42 somatic complaints (2 are male-specific and 2 are female specific) resulting in 40 possible for each participant. Some examples of symptoms/items include "headache," "vomiting," "muscle tension," "fatigue or weakness," and "numbness or tingling." For each symptom, participants indicated on a 5-point Likert scale (0-4) the frequency of occurrence of each symptom (0 = I have never had this problem, to 4 = more than four times a month). Next, participants indicated the severity of each symptom on a 5-point Likert (0 = never a problem at all, to 4 = huge negative impact on my life). Finally, participants were asked to indicate (by checking appropriate columns) if they have each symptom when they feel "stressed, anxious, frightened or worried," "depressed lonely, empty or sad," and/or "angry, irritated, mad or agitated."

Acknowledgement of emotional contribution to symptomology (AEC) is the total number of check-marks for all of the symptoms on the list (total possible is 3 per symptom or 120). The SECS has demonstrated acceptable levels of internal-consistency reliability (coefficient alpha ranging from .84 to .90 across various samples). Additionally, SECS frequency and severity scores correlate positively with the somatization sub-factor of the SCL-90 with coefficients ranging from .46 to .70 (Borckardt et al, 2000).

Prevalence of imagery tasks

The Prevalence of Visual, Auditory, Tactile and Heat Imagery Tests (PVIT, PAIT, PTIT, and PHIT) consist of word lists (16 words each) that relate to each of the imagery modalities (visual, auditory, tactile and heat). Participants were instructed to think both of the first word association that each word brings to mind and of the first visual, auditory, tactile or heat image that it brings to mind. Participants then indicated with a check mark whether the word association or the visual image came to mind first. Imagery prevalence for each modality was indicated by the number of items that the participant marks as eliciting an image before the word association. As there is very little research available on this scale except for the original study, there is no reliability or validity information available.

Dissociative Experiences Scale

Dissociative ability was measured with the Dissociative Experiences Scale (DES; Bernstein and Putnam, 1986). There is ample evidence suggesting that the

DES is a reliable and valid instrument (Carlson-Bernstein & Putnam, 1993). The questionnaire consists of twenty-eight question about experiences that participants may have in their daily lives. Participants determine what percent of the time they have each experience described and circle a corresponding percentage (0% to 100%). Some of the items are: "Some people have the experience of driving a car and suddenly realizing that they don't remember what has happened during all or part of the trip" and "Some people find that sometimes they are listening to someone talk and they suddenly realize that they did not hear part or all of what was just said."

Tellegan Absorption Scale

Absorption was measured with the Telligan Absorption Scale (TAS; Tellegen and Atkinson, 1974). The scale was developed to assess absorptive attention which they defined as "full commitment of available perceptual, motoric, imaginative and ideational resources to a unified representation of the attentional object" (p. 274). The scale consists of 37 true/false items such as "Sometimes I feel and experience things as I did when I was a child" and "I can become deeply involved when reading or hearing about someone else's experiences."

Physiological measurement

Skin conductance level (SCL) was measured by a Coulbourn Instruments Lab Linc V Skin Conductance Coupler (Model V71-23). Bipolar placement was used with electrodes placed on the medial phalanx of the first and second fingers of each participant's non-dominant hand (Andreassi, 2000).

Heart rate (HR) was measured with a Coulbourn Instruments Lab Linc V Tachometer (model V77-26). Sternal leads were utilized with a positive electrode lead placed over each participant's manubrium and a negative electrode lead placed over the xyphoid process (Andreassi, 2000).

Systolic blood pressure (SBP) and diastolic blood pressure (DBP) was measured with a Diametrics arm cuff digital blood pressure monitor using a hospital grade Critikon Dinamap Vital Signs Monitor (model 1846 SX).

Procedure

Prior to beginning the WSGC, participants were asked to write down the number of items they expected to pass (0-11) on the back of the response booklet. Participants were administered the WSGC during Introduction to Psychology class as an experiential part of the section on "States of Consciousness." They received 5 points extra credit for participation.

Participants were then informed that they could participate in an imagery study in order to receive the remainder of possible extra credit points for the course. Interested participants signed up for time slots (1 week to 5 weeks following the hypnosis session) to complete the second half of the study. Twenty-three participants attended the second half of the study without completing the hypnotizability scale.

Upon arrival to complete the imagery study, participants completed the SECS, DES, TAS, PVIT, PAIT, PTIT and PHIT. They were then taken individually to a small room containing a comfortable chair and a television/VCR. Participants were seated in the chair and the physiological measurement leads for SCL, HR and BP

were attached to participants by trained lab-assistants. The leads were run through a small opening in the wall and were plugged in to the physiological measurement equipment contained in an adjacent room.

Participants were asked to relax for ten minutes while watching a video of underwater scenes and listening to relaxing music in order to establish physiological baseline (Andreassi, 2000; Younger & Borckardt, 2000).

Upon completion of the baseline measure, the participants placed their right hands in a circulating ice bath for 40 seconds. Changes in SCL, HR, and BP from baseline were recorded.

Participants were then given another 10 minute relaxation period (recovery baseline period) while watching the same video from baseline in order to re-establish baseline levels. The time taken to return to baseline was recorded but all participants were given a full 10 minutes (Andreassi, 2000; Younger & Borckardt, 2000).

Finally, Participants were asked to imagine as vividly as possible, placing their right hand in the ice water as they did earlier in the experiment. Changes in SCL, HR, and BP were recorded.[1]

Participants were thanked and debriefed.

CHAPTER III

RESULTS

Measures and summary scores

Measures for the non-physiological tasks were as follows: 1) Hypnotizability (WSGC) scores, 2) Hypnotizability expectation scores, 3) Prevalence of visual imagery test (PVIT) scores, 4) Prevalence of auditory imagery test (PAIT) scores, 5) Prevalence of tactile imagery test (PTIT) scores, 6) Prevalence of heat imagery (PHIT) scores, 7) Somatization of Emotional Conflict Scale Acknowledgment of Emotional Contribution (AEC) scores, 8) Somatization of Emotional Conflict Scale (SECS) Frequency of somatic symptoms scores, 9) SECS Severity of somatic symptoms scores, 10) Dissociative Experiences Scale (DES) scores and 11) Telligan Absorption Scale (TAS) scores.

For each physiological measure, reactivity to mental imagery (RMI) was assessed by dividing physiological levels *after stimulus* (imagined ice bath) by physiological levels *during the recovery baseline period* in order to correct for individual differences in baseline levels and physiological reactivity (Andreassi, 2000). There were therefore four separate RMI variables: 1) heart rate-RMI, 2) skin conductance-RMI, 3) systolic blood pressure-RMI, and 4) diastolic blood pressure-RMI.

The PVIT, PAIT, PTIT and PHIT scores were added together to create a single index of prevalence of imagery (Prevalence of Imagery Total, PIT) as per Kuzendorf (1981).

Frequency and Severity scores from the SECS were added together to make a single 'somatization' score as these two individual scores were statistically too similar to predict unique variance in a regression analysis ($r=.83$, $p<.0001$).

Assessment of experimental effects

Four within-subject ANOVA's were conducted, one for each of the physiological measures (SBP, DBP, HR, SCL). Each of the four ANOVA's had four within-subject conditions which were baseline, real ice bath, recovery, and imagined ice bath. The analyses were conducted to determine if the experimental conditions affected physiology. Participants' systolic blood pressure differed across conditions ($F(3,65)=3.94$, $p=.012$), as did their diastolic blood pressure ($F(3,65)=30.22$, $p<.0001$), heart rate ($F(3,39)=17.91$, $p<.0001$) and skin conductance level ($F(3,39)=6.30$, $p=.001$). Figures 1 through 4 show the means of each of the physiological measures across each of the four experimental conditions.

Post hoc analyses revealed a marginal increase in systolic blood pressure from baseline as a result of the implementation of the ice bath ($t(69)=1.91$, $p=.061$), a significant decrease from the ice bath to the recovery period ($t(69)=2.60$, $p=.011$) and a significant increase from the recovery period as a result of the imagined ice bath ($t(67)=2.90$, $p=.005$).

There was a significant increase in diastolic blood pressure from the baseline period to the ice bath condition ($t(69)=8.16$, $p<.0001$), a significant decrease from the ice bath to recovery period ($t(69)=8.76$, $p<.0001$) and a significant increase from the recovery period to the imagined ice bath condition ($t(67)=4.52$, $p<.0001$).

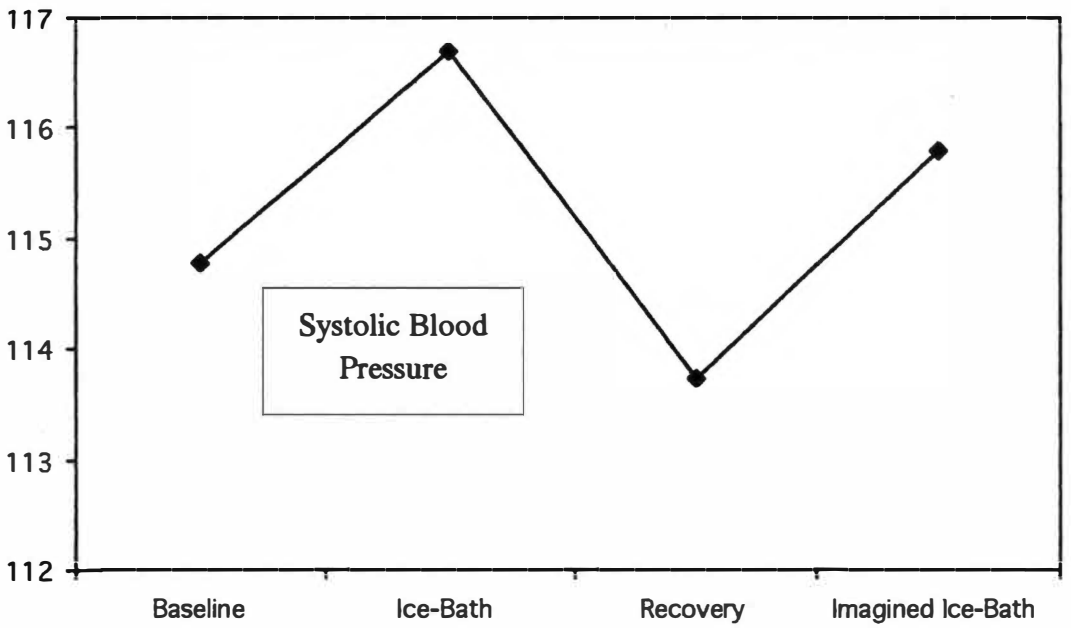

Figure 1. Changes in systolic blood pressure across all phases of experiment (baseline, ice bath, recovery, and imagined ice bath).

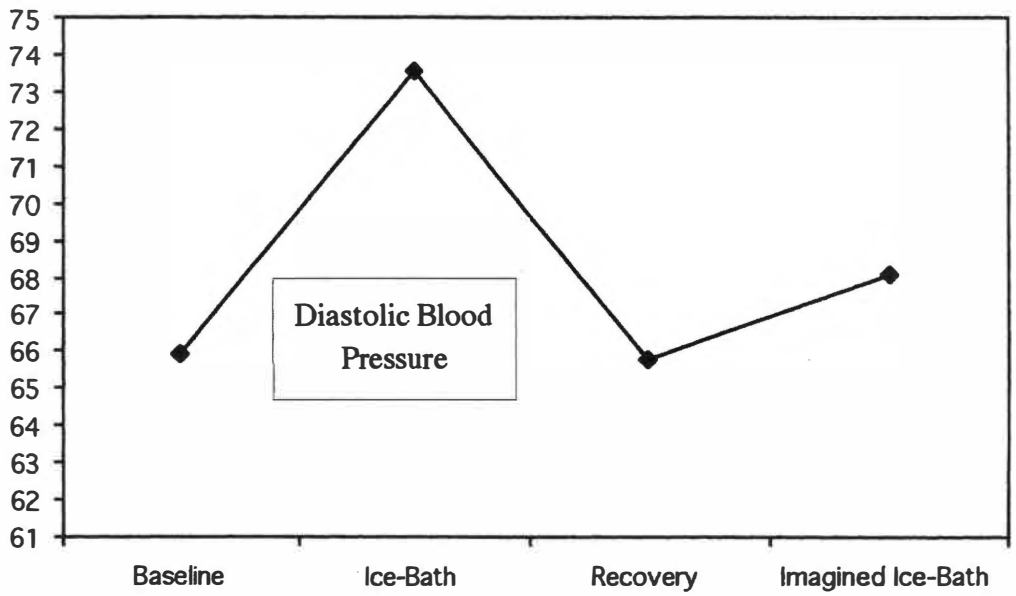

Figure 2. Changes in diastolic blood pressure across all phases of the experiment (baseline, ice-bath, recovery, imagined ice-bath).

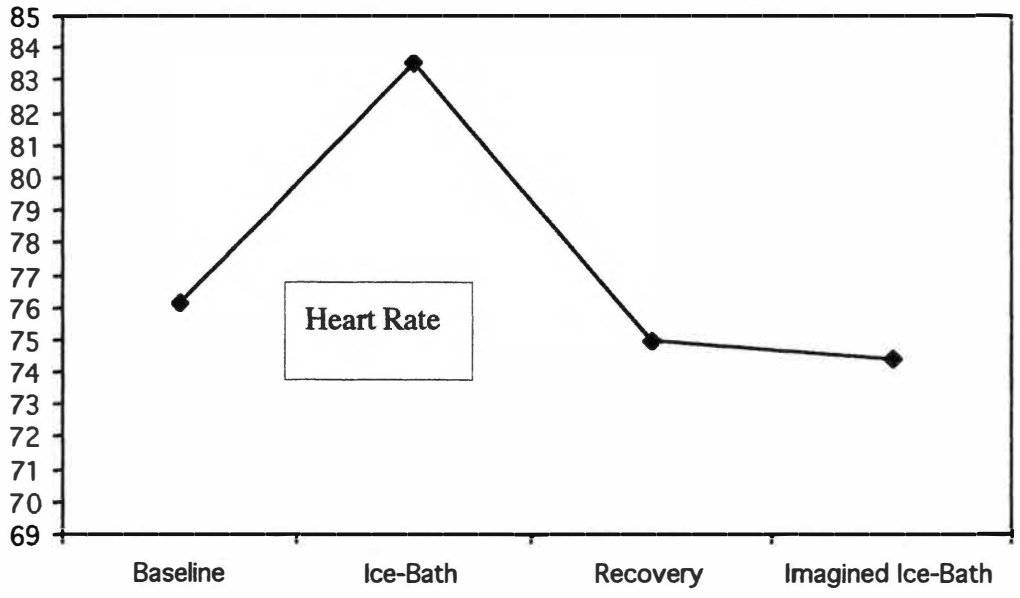

Figure 3. Changes in heart rate across all phases of the experiment (baseline, ice-bath, recovery, imagined ice-bath).

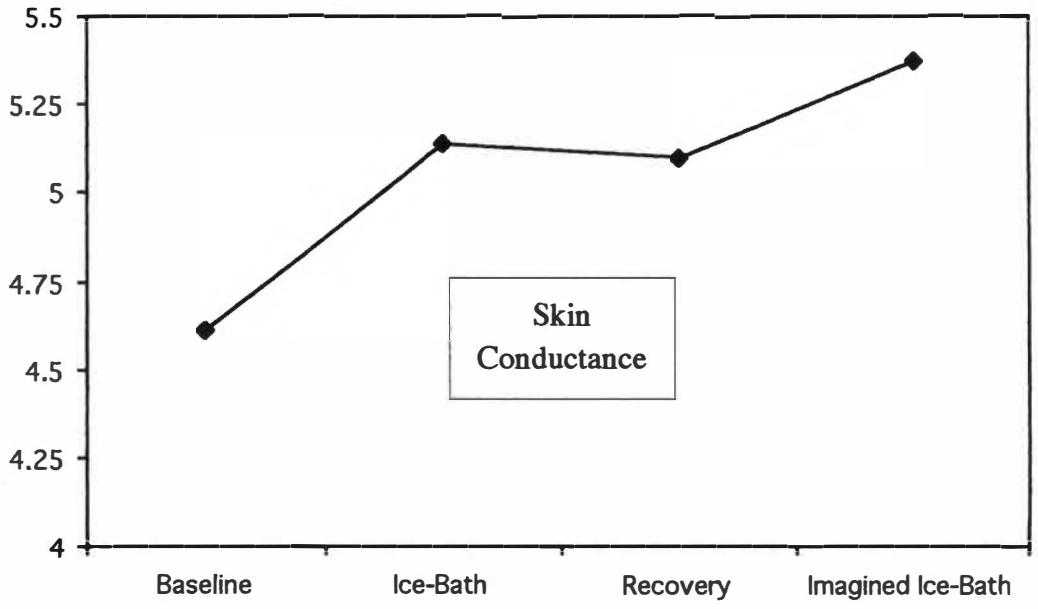

Figure 4. Changes in skin conductance level across all phases of the experiment (baseline, ice-bath, recovery, imagined ice-bath).

There was a significant increase in heart rate from the baseline period to the ice bath condition ($t(62)=7.53$, $p<.0001$), a significant decrease from the ice bath to recovery ($t(61)=8.04$, $p<.001$) but no significant change in heart rate from the recovery period to the imagined ice bath condition ($t(62)=1.09$, ns).

Finally, there was a significant increase in skin conductance from the baseline period to the ice bath condition ($t(59)=4.39$, $p<.0001$), but no decrease in skin conductance from the ice bath to the recovery period ($t(58)=.91$, ns). However, there was a marginal increase from the recovery period to the imagined ice bath condition ($t(56)=1.88$, $p=.065$).

Hence, there were significant changes in physiological levels from the recovery period to the imagined ice-bath on only two of the physiological measures (SBP and DBP).

Regression Analyses

A stepwise linear regression model was conducted. Hypnotizability was the dependent variable with the following predictor variables: expectation, absorption, dissociation, prevalence of mental imagery, somatization, AEC, heart rate-RMI, skin conductance-RMI, systolic BP-RMI and diastolic BP-RMI. Residual plots for each of the independent measures against hypnotizability were analyzed for each regression model and residuals were found to be normally distributed. No transformations were applied.

The overall model was not significant ($F(10,32) = 1.48$, ns). The R^2 value was .40 but the adjusted R^2 value was .13 suggesting that the model might be a better fit if some extraneous predictors were removed.

A backward stepwise regression was performed with the removal criterion set to .20 in order to remove a few extraneous variables but allow the model to remain generally true to the hypotheses by keeping even marginal predictors. The best model was determined to include the following predictors: Absoroption, systolic blood pressure RMI, heart rate-RMI and somatization as measured by the SECS. The adjusted R^2 value was .26 and the model was significant ($F(4,32)=3.86$, $p=.013$). Table 1 shows the model parameters and coefficients. Despite the significance of the model and the backward stepwise fitting, only somatization was a significant predictor.

Finally, in order to better understand the relationships between predictor variables from the regression analyses, a correlation matrix including all relevant variables was examined. A few interesting correlations were present and will be addressed in Chapter IV. Table 2 shows all of the correlation coefficients between the variables examined in this study.

Table 1. Regression model parameters and coefficients for model predicting hypnotizability after backward removal was applied.

R^2= .36, Adjusted R^2=.26
F(4,32)=3.86, p=.013

Model	Beta	t-value	Significance
(constant)	-	.24	.82
TAS	-.221	1.41	.17
SBP-RMI	.221	1.41	.17
HR-RMI	-.245	1.56	.13
SECS	.458	2.90	.007

Table 2. Correlation matrix showing all significant correlation coefficients and p-values between all variables measured in the study.

	Hyp	Exp	AEC	TAS	DES	PIT	SYS	DIA	HR	SCL	SEC
Hyp	---	.33*	.	.	.	.	.	.32*	.	.	.42**
Exp	p=.03	---	.	.	.	.40**	.35*	.	.	.	.
AEC	.	.	---	.	.	.	.38**	.24	.	.	.34**
TAS	.	.	.	---	.	.	.	.	.	.	.
DES	.	.	.	.	---	.24*	.	.	.	.	.40**
PIT	.	p<.01	.	.	p=.05	---	.29*	.	.	.28*	.
SYS	.	p=.01	.	.	.	p=.02	---	.30*	.	.	.
DIA	.	.	p<.01	.	.	.	p=.01	---	.	.	.
HR	p=.04	.	p=.06	.	.	.	.	.	---	.	.
SCL	.	.	.	.	.	p=.03	.	.	.	---	.
SEC	p<.01	.	p<.01	.	p<.01	.	.	.	.	.	---

CHAPTER IV

DISCUSSION

Hypnotizability and reactivity to mental imagery

With regard to the effectiveness of the experimental conditions, it appears that on average, blood pressure (systolic and diastolic) are reactive to mental imagery in much the same way that they are reactive to actual environmental stimuli. There were significant changes in systolic and diastolic blood pressure in response to participants' imagination of the ice-bath task. In some sense then, the measures of SBP and DBP reactivity to mental imagery (RMI) might be the best means of representing the construct rather than heart rate and skin conductance reactivity. Though heart rate increased following ice-bath immersion, it did not following mental imagery. The same can be said for skin-conductance.

If DBP and SBP reactivity are indeed good measures of RMI then we might expect a strong relationship between them and hypnotizability. While SBP-RMI was kept in the regression following the backward stepwise procedure, it was only marginally related to hypnotizability. It is therefore reasonable to conclude that reactivity to mental imagery (as it was operationalized in this study) is not significantly related to hypnotizability.

While hypnotizability was related to heart-rate RMI ($r(40)=.32$, $p=.04$), heart-rate RMI did not explain any unique variance in hypnotizability over and above absorption, systolic blood pressure RMI and somatization. Additionally, systolic

blood pressure RMI, diastolic blood pressure RMI and skin conductance RMI were unrelated to hypnotizability. It appears that the relationship between imagery and hypnotizability remains a complicated one and perhaps reactivity to mental imagery is not the key link between them.

Hypnotizability, expectation, absorption and dissociation

Consistent with previous research (Council, Kirsch & Grant, 1996; Kirsch & Council, 1992), hypnotizability was significantly related to participants expectations regarding their hypnotic abilities ($r(46)=.33$, $p=.026$). However, when evaluated against other possible predictors in the regression analyses, this relationship does not hold. In other words, expectation does not appear to be a unique predictor of hypnotizability.

No significant relationship emerged between hypnotizability and absorption or dissociative experiences. These findings are generally consistent with previous research which suggests that the relationships are modest at best (Council, Kirsch & Grant, 1996; Bowers, 1976; Kupferberg, 1996; Angelini, 1999; Barnier & McConkey, 1999; Oakman, Woody & Bowers, 1996; King et al, 2000; Moore et al, 2000; Angelini, Kumar and Chandler, 1999; Oakman, Woody & Bowers, 1996; Kupferberg, 1996; King et al, 2000; Moore et al, 2000).

Hypnotizability, imagery and somatization

As predicted, the relationship between somatization and hypnotizability was positive and significant ($r(40)=.42$, $p=.006$). There appeared to be about 18% of

shared variance between the two constructs. Additionally, somatization predicted unique variance in hypnotizability over and above other variables in the regression models. While it is still somewhat unclear exactly how somatization is involved in a persons hypnotic ability, at the very least, somatization seems to be part of the bigger picture of hypnotizability. In this respect, the future is wide open in terms of research aimed at better understanding links and mechanisms.

Unfortunately, the construct of acknowledgement of emotional contribution to somatic symptoms was unrelated to hypnotizability. However, this may be due to the fact that hypnotizability is a behavioral scale while AEC is self-report. While somatization was measured using a self-report modality as well, on the SECS scale, participants were asked to report frequency and severity of symptoms. This is somewhat objective and this method approaches the behavioral checklist method more so than asking the participants to report their approximation of the impact of psychological factors on somatization. Participants' self-reports of emotional contribution to somatic problems can be heavily influenced by beliefs systems (e.g. mind and body are separate, emotional influence of somatic problems means the physical complaints aren't "real") and demand characteristics (e.g. over-reporting a relationship between mind and body because the context is a psychology experiment). These factors may have compromised the validity of the AEC construct resulting in no discernable relationship with hypnotizability.

While this study (and many others before it) fails to articulate the relationship between self-reported imagery and hypnotizability, prevalence of imagery was related to systolic blood pressure RMI ($r(67)=.29$, $p=.016$) and to skin conductance RMI

($r(59)=.28$, $p=.029$). These findings suggest that participants who rely heavily on imagery in terms of daily functioning are also more reactive physically to it (in terms of systolic BP and skin conductance). Despite this relationship (which somewhat strengthens the validity of the RMI measures) prevalence of imagery was unrelated to hypnotizability. Future research may be able to find other physiological or even behavioral measures of imagery in order to bridge the gap with hypnotizability

Limitations

There are a few limitations of this study that must be considered. One key consideration is the possibility of non-representativeness of the sample. There were a number of participants that only completed half of the study. Some completed only the hypnosis-portion while some only completed the physiology/imagery portion. There is a possibility that the group of participants that completed both portions represented a group possessing a common characteristic such as consciousness. There is a possibility that this unmeasured trait influenced the findings.

Additionally, problems with participant follow-through and physiological monitoring error resulted in a limited sample-size for regression analyses. The resulting lack of power may have precluded discovery of subtle yet important and significant relationships between measured variables.

Finally, since all of the self-report imagery scales, symptom checklists and imagery tasks were administered in a single session, context effects may have influenced some correlations between predictor variables. Participants were, in effect, primed to think about and reflect upon their own psychological and

physiological conditions as well as their imagery abilities prior to engaging in the imagery/physiology task. This may have had an impact on their imagery and physiological responses thereby resulting in unusual imagery/physiological behavior which did not represent normal functioning in these areas.

Conclusions and future research

In all, hypnotizability appears to be a complicated construct which consists of numerous diverse components. While this study identifies a few of these components, much is left unanswered with regard to our understanding of the constructs. If various imagined and suggested stimuli in the hypnotizability scale were in fact real, we would expect some physiological consequences. People who are hypnotizable appear to report more physical complications which are perhaps rooted psychologically (regardless of their acknowledgement of psychological contribution). It may be that highly hypnotizable people experience regular physiological consequences to meaningful and stressful thoughts, images, expectations and fantasies which take the form of somatic symptoms *as if* the thoughts, images, expectations and fantasies were real. While reactivity to mental imagery measures failed to capture any unique variance in hypnotizability, the stimulus (ice water) may not have been appropriately meaningful to elicit physiological responses unique to people who are highly somatic. Rather, there may be a normal degree of reactivity to imagery experienced by most people, but for some, reactivity may be even greater when the stimulus is personally meaningful.

While this study provides more information about what hypnosis *is not* than what *it is*, the findings and methodology employed are somewhat useful in articulating potential pathways linking imagery and hypnotizability. At the very least, future research may focus on ways to operationalize reactivity to mental imagery in personally meaningful ways for participants as a way to better understand imagery's contribution to hypnotizability. Insofar as somatization is considered pathological, there may also be some interesting links between hypnotizability and psychopathology. Since hypnotizability seems related to somatization, future research in psychopathology might examine how somatization, psychopathology and hypnotizability interact.

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FOOTNOTES

[1] Younger & Borckardt (2000) used a similar paradigm to measure physiological reactivity to mental imagery. However, Younger & Borckardt (2000) asked participants to *imagine a time in which they were angry* as the imagined stimulus thus failing to control for recency and strength of the memory trace driving the imagery. The current procedural design better controls for recency and strength of the memory trace driving the imagined stimulus by providing a uniform stimulus for participants to imagine.

APPENDIX A
INFORMED CONSENT

Correlates of Autonomic Reactivity to Mental Imagery

You are invited to participate in a research study. This study aims to better understand heart-rate, blood pressure and skin conductance reactions to mental imagery. Additionally, it aims to determine if patterns of physiological reactions to imagery are related to other personality factors.

This study will take about 60 to 80 minutes to complete. You will first fill-out a number of questionnaires that assess certain aspects of your personality. You will be hooked-up to instruments that measure your heart-rate, blood pressure and skin-conductance levels. You will then sit quietly for ten minutes in order to establish baseline physiological levels. Next, you will place your hand in a small container of cold water for about 40 seconds. You may experience mild discomfort when doing so, and you may remove your hand from the water at any time. You will be given a towel to dry your hand immediately after you remove it from the water. You will then sit quietly for another 10-minute baseline period. Finally, you will be asked to imagine as vividly as possible that you are placing your hand in the cold water once again.

Risks: Minimal

Benefits: Participants may learn more about psychological research methods.

Confidentiality: Information in the study will be kept confidential. Data will be stored securely and will be made available only to persons conducting this study. No reference will be made in oral or written reports which could link participants to the study.

Compensation: Documentation of participation will be provided to your course instructor who will give you extra credit for your participation.

Contact Information: If you have any questions at any time about the study or the procedures, you may contact the researcher, Jeff Borckardt at 974-2161. If you have any questions about your rights as a participant, contact the Compliance Section of the Office of Research at 974-3466.

Participation: Your participation in this study is voluntary; you may decline to participate without penalty. If you decide to participate, you may withdraw from the study at any time without penalty and without loss of benefits to which you are otherwise entitled. If you withdraw from the study before data collection is completed, your data will be destroyed.

Consent

I have read the above information and I agree to participate in this study. I affirm that I am at least 18 years of age.

Participant's Signature_____ Date_____

APPENDIX B
PREVALENCE OF VISUAL IMAGERY TEST

For each of the following words, please: a) think of both the first **word association** that the word brings to mind and the first **visual image**, then b) indicate (***with a checkmark***) whether the word association or the visual image came to mind first.

PLACE ONLY A CHECKMARK IN THE SPACES BELOW...DO NOT WRITE YOUR ASSOCIATIONS OR IMAGES!

		CHECK ONE:	
#	**WORD**	**ASSOCIATION Came first**	**IMAGE Came first**
1	Girl		
2	Army		
3	Bottle		
4	Socialist		
5	Golf		
6	Table		
7	Duty		
8	Elephant		
9	Valley		
10	King		
11	Skillet		
12	Slipper		
13	Chance		
14	Lobster		
15	Priest		
16	Garden		

APPENDIX C
PREVALENCE OF AUDITORY IMAGERY TEST

For each of the following words, please: a) think of both the first **word association** that the word brings to mind and the first **auditory image**, then b) indicate (with a checkmark) whether the word association or the visual image came to mind first.

PLACE ONLY A CHECKMARK IN THE SPACES BELOW...DO NOT WRITE YOUR ASSOCIATIONS OR IMAGES!

		CHECK ONE:	
#	WORD	ASSOCIATION Came first	IMAGE Came first
1	Hammer		
2	Baby		
3	Satire		
4	Trumpet		
5	Ocean		
6	Street		
7	Bird		
8	Honor		
9	Insect		
10	Ambulance		
11	Harp		
12	Magnitude		
13	Shotgun		
14	Christmas		
15	Engine		
16	Lawn		

APPENDIX D
PREVALENCE OF TACTILE IMAGERY TEST

For each of the following words, please: a) think of both the first **word association** that the word brings to mind and the first **tactile/muscular image**, then b) indicate (with a checkmark) whether the word association or the visual image came to mind first.

PLACE ONLY A CHECKMARK IN THE SPACES BELOW...DO NOT WRITE YOUR ASSOCIATIONS OR IMAGES!

		CHECK ONE:	
#	WORD	ASSOCIATION Came first	IMAGE Came first
1	Pillow		
2	Somersault		
3	Steam		
4	Sandpaper		
5	Energy		
6	Gloves		
7	Razor		
8	Sinus		
9	Vaccination		
10	Density		
11	Toothbrush		
12	Stairway		
13	Sponge		
14	Resistance		
15	Hopscotch		
16	Burlap		

APPENDIX E
PREVALENCE OF HEAT IMAGERY TEST

For each of the following words, please: a) think of both the first **word association** that the word brings to mind and the first **heat image**, then b) indicate (with a checkmark) whether the word association or the visual image came to mind first.

PLACE ONLY A CHECKMARK IN THE SPACES BELOW...DO NOT WRITE YOUR ASSOCIATIONS OR IMAGES!

		CHECK ONE:	
#	WORD	ASSOCIATION Came first	IMAGE Came first
1	Soup		
2	Blizzard		
3	Fever		
4	Milkshake		
5	Autumn		
6	Blanket		
7	Friction		
8	Shower		
9	Death		
10	Snowball		
11	Peppers		
12	Oven		
13	Handshake		
14	Desert		
15	Frostbite		
16	Wool		

APPENDIX F
TELLIGAN ABSORPTION SCALE

S.S. Number: _____ - ____ - _____.

Directions. This questionnaire consists of twenty-eight question about experiences that you may have in your daily life. It is important that your answers show how often these experiences happen to you when you are not under the influence of alcohol or drugs. To answer the question, please determine to what percent of the time you have each experience described and circle the number that is most correct.

1. Some people have the experience of driving a car and suddenly realizing that they don't remember what has happened during all or part of the trip.
0% 20% 30% 40% 50% 60% 70% 80% 90% 100%

2. Some people find that sometimes they are listening to someone talk and they suddenly realize that they did not hear part or all of what was just said.
0% 20% 30% 40% 50% 60% 70% 80% 90% 100%

3. Some people have the experience of finding themselves in a place and having no idea how they got there.
0% 20% 30% 40% 50% 60% 70% 80% 90% 100%

4. Some people have the experience of finding themselves dressed in clothes that they don't remember putting on.
0% 20% 30% 40% 50% 60% 70% 80% 90% 100%

5. Some people have the experience of finding new things among their belongings that they do not remember buying.
0% 20% 30% 40% 50% 60% 70% 80% 90% 100%

6. Some people sometimes find that they are approached by people they do not know who call them by another name or insist that they have met them before.
0% 20% 30% 40% 50% 60% 70% 80% 90% 100%

7. Some people sometimes have the experience of feeling as though they are standing next to themselves or watching themselves do something and they actually see themselves as if they were looking at another person.
0% 20% 30% 40% 50% 60% 70% 80% 90% 100%

8. Some people are told that they sometimes do not recognize friends or family members.
0% 20% 30% 40% 50% 60% 70% 80% 90% 100%

9. Some people find that they have no memory for some important events in their lives (for example, a wedding or graduation).
0% 20% 30% 40% 50% 60% 70% 80% 90% 100%

10. Some people have the experience of being accused of lying when they do not think that they have lied.
0% 20% 30% 40% 50% 60% 70% 80% 90% 100%

11. Some people have the experience of looking in a mirror and not recognizing themselves.
0% 20% 30% 40% 50% 60% 70% 80% 90% 100%

12. Some people have the experience that other people, objects, and the world around them are not real.
0% 20% 30% 40% 50% 60% 70% 80% 90% 100%

13. Some people have the experience of feeling that their body does not seem to belong to them.
0% 20% 30% 40% 50% 60% 70% 80% 90% 100%

14. Some people sometimes have the experience of sometimes remembering an event so vividly that they feel as if they were reliving that event.
0% 20% 30% 40% 50% 60% 70% 80% 90% 100%

15. Some people have the experience of not being sure whether things that they remember happening really did happen or whether they just dreamed them.
0% 20% 30% 40% 50% 60% 70% 80% 90% 100%

16. Some people have the experience of being in a familiar place but finding it strange and unfamiliar.
0% 20% 30% 40% 50% 60% 70% 80% 90% 100%

17. Some people find that when they are watching television or a movie they become so absorbed in the story that they are unaware of other events happening around them.
0% 20% 30% 40% 50% 60% 70% 80% 90% 100%

18. Some people find that they become so involved in a fantasy or daydream that it feels as though it were really happening to them.
0% 20% 30% 40% 50% 60% 70% 80% 90% 100%

19. Some people find that they sometimes are able to ignore pain.
0% 20% 30% 40% 50% 60% 70% 80% 90% 100%

20. Some people find that they sometimes sit staring off into space, thinking of nothing, and are not aware of the passing of time.
0% 20% 30% 40% 50% 60% 70% 80% 90% 100%

21. Some people sometimes find that when they are alone they talk aloud to themselves.
0% 20% 30% 40% 50% 60% 70% 80% 90% 100%

22. Some people find that in one situation they may act so differently compared with another situation that they feel almost as if they were two different people.
0% 20% 30% 40% 50% 60% 70% 80% 90% 100%

23. Some people sometimes find that in certain situations they are able to do things with amazing ease and spontaneity that would usually be difficult for them (for example, sports, work, social situations, etc.).
0% 20% 30% 40% 50% 60% 70% 80% 90% 100%

24. Some people sometimes find that they cannot remember whether they have done something or have just thought about doing that thing (for example, not knowing they have just mailed a letter or whether have just thought about mailing it).
0% 20% 30% 40% 50% 60% 70% 80% 90% 100%

25. Some people find evidence that they have done things that they do not remember doing.
0% 20% 30% 40% 50% 60% 70% 80% 90% 100%

26. Some people sometimes find writings, drawings, or notes among their belongings that they must have done but cannot remember doing.

0% 20% 30% 40% 50% 60% 70% 80% 90% 100%

27. Some people sometimes find that they hear voices inside their head that tell them to do things or comment on things that they are doing.

0% 20% 30% 40% 50% 60% 70% 80% 90% 100%

28. Some people sometimes feel as if they are looking at the world through a fog so that people and objects appear far away or unclear.

0% 20% 30% 40% 50% 60% 70% 80% 90% 100%

APPENDIX G

DISSOCIATIVE EXPERIENCES SCALE

S. S. Number: ____ - ___ - _____.

Please read each statement and decide whether it is mostly true or mostly false as applied to you. If you decide that a statement is true or mostly true, circle "T". If the statement is false or mostly false as applied to you, circle "F". There are no right and wrong answers.

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

T F 2. I can become deeply involved when reading or hearing about someone else's experiences.

T F 3. When I watch a boat on the lake, I can almost feel what it would be like to be on it.

T F 4. I can be greatly moved by eloquent or poetic language.

T F 5. While watching a movie, a T.V. show, or a play, I may become so involved that I forget about myself and my surroundings and experience the story as if it were real and as if I were taking part in it.

T F 6. If I stare at a picture and then look away from it, I can sometimes "see" an image of the picture, almost as if I were still looking at it.

T F 7. Sometimes I feel as if my mind could envelop the whole world.

T F 8. I like to watch the cloud shapes change in the sky.

T F 9. If I wish, I can imagine (or daydream) some things so vividly that they hold my attention in the way a good movie or story does.

T F 10. I sometimes "step outside" my usual self and experience an entirely different state of being.

T F 11. I think I really know what some people mean when they talk about mystical experiences.

T F 12. Textures--such as wool, sand, wood--sometimes remind me of colors or music.

T F 13. Sometimes I experience things as if they were doubly real.

T F 14. When I listen to music, I can get so caught up in it that I don't notice anything else.

T F 15. If I wish, I can imagine that my body is so heavy that I could not move it if I wanted to.

T F 16. Often I can somehow sense the presence of another person before I actually see or hear him (her).

T F 17. The crackle and flames of a wood fire stimulate my imagination.

T F 18. It is sometimes possible for me to be completely immersed in nature or art and to feel as if my whole state of consciousness has somehow been temporarily altered.

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

T F 20. I am able to wander off into my thoughts while doing a routine task and actually forget that I am doing the task, then find a few minutes later that I have completed it.

T F 21. I have attempted to write poetry or fiction.

T F 22. Different colors have distinctive and special meanings for me.

T F 23. Things that might seem meaningless to others often make sense to me.

T F 24. While acting in a play, I think I could really feel the emotions of the character and "become" him (her) for the time being, forgetting both myself and the audience.

T F 25. My thoughts often don't occur as words but as visual images.

T F 26. I often delight in small things (like the five-pointed star shape that appears when you cut an apple across the core or the colors in soap bubbles).

T F 27. When listening to organ music or other powerful music, I sometimes feel like I am being lifted into the air.

T F 28. Sometimes I can change noise into music by the way I listen to it.

T F 29. Some of my most vivid memories are called up by scents and smells.

T F 30. Certain pieces of music remind me of pictures or moving patterns of color.

T F 31. I often know what someone is going to say before he or she says it.

T F 32. I often have "physical memories"; for example, after I've been swimming I may still feel like I'm in the water.

T F 33. The sound of a voice can be so fascinating to me that I can just go on listening to it.

T F 34. At times I somehow feel the presence of someone who is not physically there.

T F 35. Sometimes thoughts and images come to me without the slightest effort on my part.

T F 36. I find that different odors have different colors.

T F 37. I can be deeply moved by a sunset.

APPENDIX I
IMAGERY LAB FORM

Subject ID# _____

SECTION ONE

1) Water Temperature _____ ° F
2) Time (seconds) until hand removal _____ (max = 40 secs)

3) ON A SCALE FROM ZERO TO 10, I WANT YOU TO ESTIMATE THE AMOUNT OF DISCOMFORT YOU EXPERIENCED. FOR EXAMPLE, ZERO WOULD MEAN "NO DISCOMFORT WHATSOEVER" AND 10 WOULD MEAN "EXCRUCIATING PAIN."
Pain Rating # 1 : _____

AFTER 2nd BASELINE

4) ON A SCALE FROM ZERO TO 10, HOW MUCH TIME DID YOU SPEND THINKING ABOUT THE COLD WATER TASK OVER THE PAST TEN MINUTES. ZERO WOULD MEAN "NOT AT ALL" AND 10 WOULD MEAN "THE ENTIRE TIME, NONSTOP."
Rumination: _____

5) ON A SCALE FROM ZERO TO 10, HOW MUCH WERE YOU DISTRESSED ABOUT THE COLD WATER TASK OVER THE PAST TEN MINUTES. ZERO WOULD MEAN "NOT AT ALL DISTRESSED" AND 10 WOULD MEAN "EXTREMELY DISTRESSED AND BOTHERED."
Distress: _____

SECTION TWO

6) Time (seconds) until "hand removal" _____ (max = 40 secs)

7) ON A SCALE FROM ZERO TO 10, I WANT YOU TO ESTIMATE THE AMOUNT OF DISCOMFORT YOU EXPERIENCED. FOR EXAMPLE, ZERO WOULD MEAN "NO DISCOMFORT WHATSOEVER" AND 10 WOULD MEAN "EXCRUCIATING PAIN."
Pain Rating # 2 : _____

8) ON A SCALE FROM ZERO TO 10, HOW VIVID WOULD YOU SAY YOUR IMAGINED EXPERIENCE OF THE COLD WATER TASK WAS. ZERO WOULD MEAN, "NOT VIVID AT ALL" AND 10 WOULD MEAN "EXTREMELY VIVID"
Vividness : _____

9) ON A SCALE FROM ZERO TO 10, HOW REALISTIC WOULD YOU SAY YOUR IMAGINED EXPERIENCE OF THE COLD WATER TASK WAS. ZERO WOULD MEAN, "NOT REALISTIC AT ALL" AND 10 WOULD MEAN "EXTREMELY REALISTIC"
Realistic : _____

APPENDIX H
SOMATIZATION OF EMOTIONAL CONFLICT SCALE

DO NOT PUT YOUR NAME ON THESE SHEETS! Last 4 digits of SS#_____

Sex (circle): Male Female Age:_____ Height:_____ Weight: _____ Race: _____

Do you smoke cigarettes? Yes No

If yes, how many cigarettes per day? _____

How often do you get sick with the cold, flu, or similar common illness? (circle the number of the most accurate response):

1 - less than once a year 2 - once or twice a year 3 - three or four times a year 4 - more than four times a year

Have you ever been diagnosed with the following (circle the appropriate response):

Chronic fatigue syndrome	Yes	No	Sarcoidosis	Yes	No
Irritable bowel syndrome	Yes	No	Fibromyalgia	Yes	No
Asthma	Yes	No	Conversion Disorder	Yes	No
Anemia	Yes	No	Somatization Disorder	Yes	No
High blood pressure	Yes	No	Anxiety disorder	Yes	No

Please list medications you are currently taking (including oral contraceptives):

_____ _____ _____ _____

_____ _____ _____ _____

On the next page, you will be presented with several common physical difficulties that people experience followed by three columns. Column A is concerned with how frequently you experience these difficulties. You are to circle a number to indicate how frequently you experience the difficulties. Column B is concerned with how much of an impact the difficulties have on your life. You are to circle a number to indicate the impact of the physical problems. Column C is concerned with what kinds of moods or emotions contribute to the physical difficulties. You are to place a check-mark in as many of the boxes as necessary to represent the emotional states that seem to lead to the physical problems. See the example below.

EXAMPLE:

	Column - A: How frequently do you have the following problem? (CIRCLE ONE)					Column - B: How much does the problem affect you? (CIRCLE ONE)					Column - C: I have these problems when I feel... (CHECK ALL THAT APPLY)		
	I have NEVER had this problem	Less than once a month	Once or twice a month	Three or four times a month	More than four times a month	Never a problem AT ALL!	Rarely a problem, not a problem	A minor problem, small discomfort	A problem, but can be dealt with	Huge impact on my life	Stressed, anxious, frightened or worried	Depressed, lonely, empty or sad	Angry, irritated, mad or aggravated
Migraine headache	0	1	2	(3)	4	0	1	2	(3)	4	✓		✓
Headache	0	1	2	3	(4)	0	1	(2)	3	4	✓		
Nausea or upset stomach	0	1	(2)	3	4	0	1	2	3	(4)		✓	
Numbness or tingling	(0)	1	2	3	4	(0)	1	2	3	4			

Please turn the page and proceed with the actual test items.

For EACH of the common difficulties below, circle ONE number in column A, circle ONE number in column B, and check as many boxes in column C that apply to you.

	Column - A: How frequently do you have the following problem? (CIRCLE ONE)					Column - B: How much does this problem affect you? (CIRCLE ONE)					Column - C: Those above problems when I feel... (CHECK ALL THAT APPLY)		
	I have NEVER had this problem	Less than once a month	Once a week a month	Three or four times a month	More than four times a month	None problem AT ALL!	Barely noticeable, not a problem	A minor problem, small discomfort	A problem, but can be dealt with	Huge concern, impacts on my life	Stressed, anxious frightened or worried	Depressed, lonely, empty or sad	ANGRY, irritated, mad or aggravated
Migraine headache	0	1	2	3	4	0	1	2	3	4			
Headache	0	1	2	3	4	0	1	2	3	4			
Nausea or upset stomach	0	1	2	3	4	0	1	2	3	4			
Numbness or tingling	0	1	2	3	4	0	1	2	3	4			
Trouble breathing or short of breath	0	1	2	3	4	0	1	2	3	4			
Stomach aches or pains	0	1	2	3	4	0	1	2	3	4			
Shakiness or trembling	0	1	2	3	4	0	1	2	3	4			
Difficulty sleeping	0	1	2	3	4	0	1	2	3	4			
Vomiting	0	1	2	3	4	0	1	2	3	4			
Heart pounding or racing	0	1	2	3	4	0	1	2	3	4			
Dizziness	0	1	2	3	4	0	1	2	3	4			
Blackouts or fainting	0	1	2	3	4	0	1	2	3	4			
Cramps	0	1	2	3	4	0	1	2	3	4			
Backaches	0	1	2	3	4	0	1	2	3	4			
Appetite problems	0	1	2	3	4	0	1	2	3	4			
Leg or foot pain	0	1	2	3	4	0	1	2	3	4			
Diarrhea	0	1	2	3	4	0	1	2	3	4			
Fatigue or weakness	0	1	2	3	4	0	1	2	3	4			
Indigestion	0	1	2	3	4	0	1	2	3	4			
Impotence (males)	0	1	2	3	4	0	1	2	3	4			
Chest pain	0	1	2	3	4	0	1	2	3	4			
Blurred vision	0	1	2	3	4	0	1	2	3	4			
Nose bleeds	0	1	2	3	4	0	1	2	3	4			
Difficult body odors and gases	0	1	2	3	4	0	1	2	3	4			
Constipation	0	1	2	3	4	0	1	2	3	4			
Hot or cold spells	0	1	2	3	4	0	1	2	3	4			
Sore throat	0	1	2	3	4	0	1	2	3	4			
Pain or aches in arms or hands	0	1	2	3	4	0	1	2	3	4			
Genital/Sexual Pain	0	1	2	3	4	0	1	2	3	4			
Cold sores or fever blisters	0	1	2	3	4	0	1	2	3	4			
Twitching of eyelid	0	1	2	3	4	0	1	2	3	4			
Premature ejaculation (males)	0	1	2	3	4	0	1	2	3	4			
Heartburn	0	1	2	3	4	0	1	2	3	4			
Ulcer	0	1	2	3	4	0	1	2	3	4			
Ringing in ears	0	1	2	3	4	0	1	2	3	4			
Dry or red eyes	0	1	2	3	4	0	1	2	3	4			
Absence of sexual urges (females)	0	1	2			0	1	2	3	4			
Acne	0	1	2	3	4	0	1	2	3	4			
Muscle tension	0	1	2	3	4	0	1	2	3	4			
Severe PMS (females)	0	1	2			0	1	2	3	4			
Inability to achieve orgasm	0	1	2	3	4	0	1	2	3	4			
Excessive sweat	0	1	2	3	4	0	1	2	3	4			

APPENDIX J
HYPNOTIC EXPECTATION QUESTION

PLEASE ANSWER THE TWO QUESTIONS BELOW

HOW HARD WILL YOU TRY TO BECOME HYPNOTIZED?
(Circle the number that fits you best)

0	1	2	3	4	5
To be honest, I'm not going to try at all.					I'm going to try extremely hard.

HOW MUCH DO YOU WANT TO BECOME HYPNOTIZED?
(Circle the number that fits you best)

0	1	2	3	4	5
Not at all					Very, very much

One way to tell how hypnotized a person is, is to actually do hypnosis, give a series of suggestions, and see how many of the suggestions the person responds to. The more suggestions they respond to, the more responsive to hypnosis they are said to be. The person's score is the number of suggestions which they respond to.

The hypnosis scale we will use today has 11 suggestions. Thus a person could score anywhere from 0 to 11.

Just to repeat, a way to tell how hypnotized a person is, is to do hypnosis with them and see how many of the 11 suggestions they respond to. Their score is the number of suggestions they pass. People can score as low as 0 and as high as 11, and anywhere in between.

NOW, KNOWING THE ABOVE, PLEASE READ AND ANSWER THE QUESTION BELOW

During the hypnosis, how many of the 11 suggestions do you think you will respond to? In the box below put the number from 0 to 11 that represents how many of the 11 suggestions you think you will respond to.

HOW CONFIDENT ARE YOU THAT THE ABOVE NUM BER IS REALLY THE NUMBER OF SUGGESTIONS YOU WILL ACTUALLY RESPOND TO DURING TO DURING HYPNOSIS?
(Circle the number that fits you best)

0	1	2	3	4	5
I have no confidence whatsoever					I am 100% certain

APPENDIX K
WATERLOO-STANFORD SCALE OF HYPNOTIC SUSCEPTIBILITY, GROUP C

(WSGC-11 POINT VERSION)

DO NOT **OPEN THIS BOOKLET** UNTIL THE EXAMINER SPECIFICALLY INSTRUCTS YOU TO DO SO.

Please supply the information requested below:

Name:_____ Student #:_____-___-_____

Phone #:_____

Age: ____

Sex: ____

GPA: ____

Today's Date: ___/____/____

DO NOT **OPEN THIS BOOKLET** UNTIL YOU ARE SPECIFICALLY INSTRUCTED TO DO SO.

Hypnotist Code ___ Score ___+___ = ___

PAGE 6

Please write down now briefly in your own words a list of things that happened since you began looking at the target. Do not go into detail.
Spend three minutes, no longer, on writing your reply.

Please DO NOT TURN THIS PAGE until the experimenter specifically instructs you to do so.

PLEASE DO NOT RETURN PAGE 6

On this page write down a list of anything else that you now remember that you did not remember previously. Please do not go into detail. Spend two minutes, no longer, in writing out your reply.

Please DO NOT TURN THIS PAGE until the experimenter specifically instructs you to do so.

PLEASE DO NOT RETURN TO EARLIER PAGES

ITEM SCORING SECTION

Listed below in chronological order are the specific happenings which were suggested to you during the standard hypnotic procedure. We want you to estimate whether or not you objectively responded to these twelve suggestions, that is, whether or not an onlooker would have observed that you did or did not make certain definite responses by certain specific criteria.

It is understood that your estimates may in some cases not be as accurate as you might wish them to be and that you might even have to guess. But we want you to make whatever you feel to be your best estimate regardless.

Beneath a description of most of the suggestions are sets of two responses, labeled A and B. Please circle either A or B for these questions, whichever you judge to be more accurate. Please answer every question. Failure to give a definite answer to every question may lead to disqualification of your record. For a few of the suggestions, a specific scale has been devised. Select the response that is the best estimate of your experience.

0. EYE CLOSURE

You were told to rest your hands in your lap and pick out a spot on either hand as a target and concentrate on it. You were then told that your eyelids were becoming tired and heavy. Would you estimate that an onlooker would have observed that your eyelids had closed (before the time you were told to close them deliberately)?

Circle one: A. My eyelids had closed by then.

B. My eyelids had not closed by then.

1. HAND LOWERING (RIGHT HAND)

You were told to extend your right arm straight out and feel it becoming heavy as though a weight were pulling the hand and arm down. Would you estimate that an onlooker would have observed that your hand lowered at least six inches (before the time you were told to let your hand down deliberately)?

Circle one: A. My hand had lowered at least six inches by then.

B. My hand had lowered less than six inches by then.

2. MOVING HANDS TOGETHER

You were next told to hold your hands out in front of you about a foot apart and then told to imagine a force pulling your hands together. Would you estimate that an onlooker would have observed that your hands were not over six inches apart (before you were told to return your hands to their resting position)?

Circle one: A. My hands were less than six inches apart by then.

B. My hands were more than six inches apart by then.

Please turn to the next page

6. DREAM

You were next told to have a dream. In the following space describe your dream in detail.

We have found that people have various sorts of experiences in response to this.

How real would you say your dream was?

Not real/or No dream 1 2 3 4 5 Very real

Which of the following categories do you think best describes your experience?

Circle one letter:

A. Nothing went through my mind.
B. Passing thoughts, no dreamlike imagery.
C. Fleeting, vague, dreamlike imagery, play of colors, etc.
D. Dreamlike imagery, but no clear theme or sequence of events.
E. Dreamlike imagery, plus sequence of events.
F. Something other than these. (Describe)

7. ARM IMMOBILIZATION (LEFT ARM)

You were next told how heavy your left hand and arm felt and then told to try to lift your hand up. Would you estimate that an onlooker would have observed that you did not lift your hand and arm up at least one inch (before you were told to stop trying)?

Circle one: A. I did not lift my hand and arm one inch by then.

B. I did lift my hand and arm at least one inch by then.

Please turn to the next page

8. MUSIC HALLUCINATION

Next you were asked to hold your right hand up when you could satisfactorily hear the recording of Jingle Bells.

Circle one: A. I raised my right hand.

B. I did not raise my right hand.

Please indicate how the music sounded by checking the most appropriate statement.

____ 1. I did not hear any music.

____ 2. I heard the music only vaguely and briefly.

____ 3. The music was sustained even though faint.

____ 4. The music was very clear.

9. NEGATIVE VISUAL HALLUCINATION

You were next asked to open your eyes and to see two paper circles that had been placed on the board. What did you actually see on the board in front of you?

No circles at all	One circle	Two circles	Three circles	Four circles
___	___	___	___	___

Write the color of any paper circles that you saw on the board:

_____, _____, _____, _____.

10. POST-HYPNOTIC AUTOMATIC WRITING

Next you were given the suggestion to draw a tree on Page 2.

1. Did you draw a tree? Yes ___. No ___.

2. Did you feel a tendency or compulsion to draw?

I felt no compulsion	1	2	3	4	5	I felt a strong compulsion

11. AMNESIA

Next you were told to forget what happened while you were hypnotized.

1. Did you feel that this suggestion affected your memory in any way?

1	2	3	4	5
Not at all		Somewhat		A Great Deal

2. Please circle the answer which best describes your experience in trying to remember the things that happened:

1. I felt like I had no control over remembering the things that happened.

2. I felt like I had very little control over remembering the things that happened.

3. I felt like I had very much control over remembering the things that happened.

4. I felt like I had complete control over remembering the things that happened.

PLEASE ANSWER THE FINAL QUESTION BELOW

DO NOT RETURN TO PREVIOUS PAGES

HOW HARD DID YOU TRY TO BECOME HYPNOTIZED?
(Circle the number that fits you best)

0	1	2	3	4	5
To be honest, I did not try at all.					I tried extremely hard.

VITA

Jeff Borckardt was born on December 12th, 1973 in Cleveland Ohio. He attended high school at Medina High School and received his Bachelor of Arts degree in Psychology from the University of Akron in May of 1997. While enrolled in the Ph.D. program in clinical psychology at the University of Tennessee, he received his Master of Arts degree in psychology in December of 1998. He received his license as a Psychological Examiner in November of 2000.

He remains involved in numerous technology-based clinical and research projects and will be attending the Medical University of South Carolina for his clinical internship in the summer of 2002. He is enrolled in the Behavioral Medicine Track.