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# Self-Hypnosis and Volitional Control of Finger Temperature Among Adults

Joseph Swope  
*Walden University*

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# Walden University

COLLEGE OF SOCIAL AND BEHAVIORAL SCIENCES

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Joseph Swope

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Dr. Susan Kaz, Committee Member, Psychology Faculty

Dr. Elisha Galaif, University Reviewer, Psychology Faculty

Chief Academic Officer

Eric Riedel, Ph.D.

Walden University

2013

Abstract

Self-Hypnosis and Volitional Control of Finger Temperature Among Adults

by

Joseph Swope

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Psychology

Walden University

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## Abstract

Raynaud's disease is a condition in which circulation to the hands becomes restricted, causing an uncomfortable sense of cold and occasionally injury. The cause of Raynaud's disease is unknown. Earlier studies have shown that hetero-hypnosis is effective in the treatment of Raynaud's disease. Cost and access to providers limit such a treatment's availability. Theories of hypnosis suggest that self-hypnosis underlies all hypnotic processes. This study examined the utility of self-hypnosis and focused attention on the volitional control of hand temperature. Forty-three adult participants ranging in age from 19 to 77 years with no hypnosis experience were randomly divided into 2 groups; 20 completed the study. Eleven participants listened to a self-hypnosis recording and 9 listened to a mostly blank recording containing periodic instructions to concentrate on controlling finger temperature. A paired samples *t* test showed a significant difference in means between pre- and post-treatment ability. A second *t* test did not show a significant difference in means between the groups' ability. Analysis of survey data did not show a significant relationship between participant demographic data and ability to control finger temperature. However, analysis of participant survey responses did show that self-hypnosis was significantly more enjoyable than conscious concentration, which suggests that self-hypnosis has greater potential for adoption if used in the treatment of Raynaud's disease. Because self-hypnosis was found to be enjoyable and effective it may be superior to other treatments that are unpleasant or have pharmacological side effects. These findings will inform sufferers of Raynaud's disease and researchers in their efforts to treat the disease. The positive social change implications of this study are to expand treatment options for a disease that affects 4% of the world's population.



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## Table of Contents

Table of Contents .....	i
List of Figures .....	viii
Chapter 1: Introduction to the Study.....	1
Background .....	1
Background of This Study.....	2
Problem Statement .....	2
Purpose of the Study .....	3
Rationale.....	5
Nature of the Study .....	5
Research Questions .....	6
Hypothesis.....	9
Definition of Terms.....	10
Assumptions .....	12
Limitations .....	12
Delimitations .....	13
Significance of the Study .....	14
Summary and Transition .....	14



Chapter 2: Literature Review .....	17
Research Strategy .....	18
Criteria for Inclusion .....	19
Primary Raynaud’s Disease .....	21
Treatment of Raynaud’s Disease.....	23
Hypnosis.....	25
Altered State Debate.....	26
Neurological Correlates in Hypnotic States .....	27
Types of Hypnosis.....	28
The Importance of Suggestion .....	29
Self-Hypnosis .....	32
Conscious Concentration Versus Hypnosis .....	37
Stress, Mental States, and Circulation.....	39
Biofeedback and Circulation.....	41
Concerns With Biofeedback as a Treatment .....	42
Hypnosis and Other CAM Treatments for Increasing Blood Flow .....	44
Hypnosis and Extremity Cooling .....	47
Hypnosis and Difference of Participant Variables .....	49

Gender of Participants .....	49
Individuality of Participants .....	50
Age of Participants .....	51
Motivation of Participants .....	52
Hypnosis for Circulation and Other Diseases .....	54
Hypnosis and Aversive Symptoms .....	56
Negative Effects of Hypnosis.....	57
Use of Hypnosis Recordings in Previous Research .....	58
Finger Temperature and Classical Conditioning.....	60
Studies That Offer Contradictory Findings.....	61
Summary and Transition .....	68
Chapter 3: Research Method.....	70
Introduction .....	70
Sample.....	73
Research Design.....	74
Online Resources.....	77
Communication with Participants .....	77
Setting.....	78

Treatment .....	79
Instrumentation.....	80
Surveys .....	80
Recordings .....	82
Thermometer .....	83
Protocol for Measuring Finger Temperature.....	84
Protection of Participants .....	85
Discontinuation.....	85
Record Keeping.....	85
Personal information.....	85
Survey Information.....	86
Initial and Post Treatment Finger Temperature Measurement.....	86
Variables.....	86
Data Analysis .....	87
Chapter 4: Research Method.....	88
Introduction .....	88
Research Question.....	88
Hypothesis .....	89

Demographic Characteristics of Participants .....	90
Control Group Versus. Experimental Group Post-treatment Results .....	94
Pre-Treatment Versus. Post Treatment Results.....	95
Duration of Participation.....	97
Results from Surveys .....	98
When participants listened.....	99
Position when listening to recordings.....	100
Participation.....	101
Enjoyment.....	103
Enjoyment and group assignment.....	104
Enjoyment and participation.....	105
Expectation .....	106
Summary .....	108
Transition Statement .....	108
Chapter 5: Discussion .....	110
Introduction .....	110
Discussion of an Unexpected Result.....	111
Treatment Effect of the Control Recording.....	111

Discussion of Participation.....	112
Listening and Testing Environments.....	113
Authenticity Versus. Control.....	114
Self-Hypnosis as a Treatment for Raynaud’s Disease .....	114
Limitations .....	115
Social Change Implications.....	117
Future Research.....	119
Summary .....	120
Appendix A: Copy of Solicitation Flyer.....	142
Appendix B: Screen Shot of Supporting Website.....	143
Appendix C: Screen Shot of Post Exercise Survey .....	144
Appendix D: Screen Shot of Survey After All Trials .....	145
Appendix E: Description of FeverWatch Thermometer.....	146
Appendix F: Transcript of Hypnosis Recording.....	147
Appendix G: Transcript of Conscious Concentration Recording .....	153
Appendix H: Curriculum Vitae.....	158
Appendix I: Permission To Publish Hypnotic Scripts .....	161

List of Tables

Table 1. Questions for the Set of 12 Surveys.....	69
Table 2. Questions From the Survey After the Training Regimen.....	70
Table 3. Ethnicity and Gender of Participants.....	77
Table 4. Ethnicity and Gender of Participants by Group Finishers.....	78
Table 5. Comparison of Control Group and Experimental Group.....	81
Table 6. Participant Ability Before Recordings and After	81
Table 7. Raw Finger Temperature by Group.....	81
Table 8. Correlation Between Participation in the Study and the Ability to Create a Difference in Finger Temperature.....	86
Table 9. Correlation between Participant Enjoyment of the Recordings and the Ability to Create a Difference in Finger Temperature.....	87
Table 10: Summary of Survey Responses by Group.....	88
Table 11: Summary of Survey Responses by Group.....	89

## List of Figures

Figure 1. When Participants Began and Finished the Study .....	78
Figure 2. When Participants Listened.....	82
Figure 3. Position While Listening.....	83

## Chapter 1: Introduction to the Study

### **Background**

Primary Raynaud's disease is a condition in which the blood flow to the hands, feet, fingers, and toes often becomes restricted. This restriction causes discomfort and may lead to more serious injury. The main symptom of primary Raynaud's disease is uncomfortably cold hands, feet, fingers and toes (Harvard Health Publications, 2009). Harvard Health Publications (2009) reported that, though Raynaud's disease is more "bothersome than disabling" (p. 4), it can not only cause discomfort, it can lead to secondary injury. Treatment, according to Harvard Health Publications (2009), is limited to prevention, lifestyle changes, and powerful medications that can carry severe side effects. The prevention and lifestyle changes have a limited effect in mediating the discomfort of Raynaud's disease. The side effects of the common prescribed medications can be lower blood pressure, dizziness, and headache (García-Carrasco et al., 2008).

Hypnosis administered by a professional hypnotist has been shown to increase blood flow and hand temperature, the two main symptoms of Raynaud's disease (Bregman & McAllister, 1981). Obtaining hypnotic treatment might not be feasible for many people due to cost, location, or other factors. This study investigated whether self-hypnosis can allow participants volitional control of their finger temperature, and thus provide support for development of an alternative form of treatment.



### **Background of This Study**

Hypnosis has been shown to increase hand temperature and finger temperature by increasing blood flow to peoples' extremities (Bregman & McAllister, 1981). While encouraging, studies focusing on hypnosis and blood flow have been limited by their methodologies to laboratory conditions and use of a professional hypnotist, and they are usually limited to highly susceptible subjects (Yee, 1988). While there have been many studies on hypnosis and blood flow to the hands, there appears to be no study that directly measures self-hypnosis (auto-hypnosis) and finger temperature.

However, hypnosis provides several advantages that biofeedback does not. Hypnosis is not dependent upon expensive equipment. Recordings of hypnosis programs can be heard via CD players, MP3 players, and home computers. Self-hypnosis does not require travel to a therapist's office. Rather, with the popularity of personal MP3 players, self-hypnosis can be practiced nearly anywhere.

### **Problem Statement**

Despite its prevalence, primary Raynaud's disease does not have an agreed upon, safe, and effective treatment. Millions of people use pharmacological treatments and risk side effects, change their lifestyle, or simply suffer with the symptoms. By introducing the variable of participation in a self-hypnosis program, this study evaluated whether participants gain the ability to volitionally control their finger temperature. Primary Raynaud's disease affects millions of people and there is evidence that hypnosis administered by a professional can positively affect hand temperature (Jambrick et al.,

2005). However, little research has been conducted to determine if hypnosis administered by oneself can positively affect finger temperature.

### **Purpose of the Study**

The purpose of this study was to investigate whether a regimen of listening to self-hypnosis recordings allowed participants to control finger temperature. Self-hypnosis, as defined by listening to recordings without the direct supervision of a professional, has been shown to provide empirical clinical benefits for a variety of maladies (Horowitz, 2006). This study only used participants who have not had experience with hypnosis. By using subjects with no hypnotic experience, a powerful confounding variable, participants' hypnotic ability, was excluded. This study examined the efficacy of inexpensive, commonly available hypnosis recordings on finger temperature. Participants listened to self-hypnosis recordings in their homes. The recordings were produced by Uncommon Knowledge, a British corporation that produces downloadable self-hypnosis recordings. The recordings contain suggestions that encourage participants to attempt to control the finger temperature.

Despite being approved by the American Medical Association over 50 years ago, hypnosis is still considered a complementary and alternative medicine (CAM; Mottern, 2010). Complementary and alternative therapies are broad categories that are defined by what they are not (National Institutes of Health, 2010). CAM includes acupuncture, yoga, lifestyle changes, and mind body therapies such as hypnosis. Hypnosis is gaining in popularity as a treatment option for a variety of ailments (Lynn & Kirsh, 2006). Nearly

40% of all American adults used CAM in 2007 (Barnes, Bloom, & Nahin, 2008). In 2009, it was reported that only 16% of Americans use mind body therapies such as hypnosis, which is listed as among the most used categories of CAM treatment (Galper, Gill Taylor, & Cox, 2003).

While many scholars have investigated CAM (Barnes et al., 2008), CAM treatments are not often accepted in mainstream medical circles (Eisenberg, 2005). The lack of acceptance of CAM treatments is connected to the lack of scientific data on such treatments (Ernst, 2008). Further, there are often methodological flaws in studies of CAM treatments of Raynaud's disease (Malenfant, Catton, & Pope, 2009). Malenfant, Catton, and Pope (2009) suggested the need for more studies that uphold high methodological standards, specifically in terms of the number of subjects. In a meta-analysis of studies investigating CAM treatments for Raynaud's disease, Malenfant et al. found that many studies did not have a large enough sample to support a significant effect size. Because of the increased interest in CAM and because of the large number of people who suffer from primary Raynaud's disease, I conducted this quantitative study to investigate whether self-hypnosis can control finger temperature.

Primary Raynaud's disease is not the only malady that causes poor circulation to the extremities. Diabetes, for example, can cause decreased circulation to the hands and feet (Xu & Cardeña, 2008). Xu and Cardeña (2008) wrote that there is substantial reason to believe that hypnosis can improve symptoms of diabetes including the circulatory component. In their review of the literature Xu and Cardeña cited how behavioral

treatments such as hypnosis can improve and have been shown to improve circulation to the lower extremities in sufferers of diabetes. While this study used subjects who do not have vascular dysfunction, the results could be applied to the large number of people suffering from primary Raynaud's disease and conditions with similar symptoms.

There are numerous studies that have investigated hypnosis and its ability to offer practitioners control of a variety of involuntary physiological functions. These studies also reveal a knowledge gap in that such studies are confined to a laboratory and are usually limited to a small group of highly suggestible subjects.

### **Rationale**

This study, while investigating self-hypnosis as a possible treatment for Raynaud's Disease, did not include participants who had Raynaud's symptoms. The rationale for doing so was to establish a baseline of whether self-hypnosis could be shown to be effective without including a possible confounding variable of participant symptoms. By including only people who have healthy circulation to their extremities, this study determined if self-hypnosis was effective in people with no blood flow resistance. With that effectiveness established, future research will be able to apply self-hypnosis directly to people who suffer from Raynaud's Disease.

### **Nature of the Study**

The nature of this study is empirical. This study used an experimental design employing a test/retest design between two groups, an experimental group and a control

group. Self-hypnosis was the primary independent variable and volitional control of finger temperature was the primary dependent variable.

Due to its subjective, personal nature, hypnosis has been difficult to measure (Rosen, 1991). However, hypnosis is also intertwined with empirical physiological functions (Barber, 1984). The physiological element that was this study's dependent variable is finger temperature. Thus, efficacy of self-hypnosis was a function of a demonstrable, objective measurement such as easily measurable finger temperature.

### **Research Questions**

The research question for this study was, Does listening to self-hypnosis recordings for 6-weeks allow participants that ability to control their finger temperature to the extent they can raise the temperature of fingers of one hand while lowering the temperature of fingers of the other? This study employed an empirical method by comparing the participants' control of their finger temperature before treatment to their control of their finger temperature after treatment. The dependent variable was the difference in temperature between each subject's left fingers and his or her right fingers. It was hypothesized that participants did, at the beginning of the study, have little or no control over their finger temperature. Volitional control of finger temperature is operationalized as the ability of participants to raise the temperature of the fingers of one hand while lowering the temperature of fingers of the other hand.

The independent variable or treatment consisted of two levels, both of which consist of listening to a recording that contains suggestions pertaining to finger

temperature control. The first level used self-hypnosis to assist in differential control of finger temperature, and the second level encouraged control of finger-temperature without self-hypnotic suggestion. Having participants bi-directionally control their finger temperatures offered strength to the research by reducing the possibility of confounding variables. Some confounding variables that have occurred in past research have been effect of ambient room temperature, circulation response due to nervousness, and different resting hand temperature between subjects.

During the first measurement, which took place before treatment was given, it was expected that there would not be a significant difference between the finger temperatures of subjects. Before that first measurement, participants were told to attempt to make the fingers of one hand warmer by increasing blood flow and to make the fingers of the other hand cooler by decreasing blood flow.

The self-hypnosis regimen required participants to listen to a self-hypnosis recording two times a day for 6-weeks. The self-hypnosis recording had a typical hypnotic induction that contains suggestions for relaxation. It also contained specific suggestions for increasing and decreasing finger temperature. It was expected that listening to a hypnosis recording 12 times would allow participants to warm the fingers of one hand while cooling the other.

Their control regimen consisted of listening to a recording that was identical in length, sound quality, introduction, and ending to the self-hypnotic recording. After the introductory music and greeting, the recording contained instructions for the participants

to sit quietly and consciously concentrate on changing their finger temperature. Such instructions lasted approximately two minutes. After that two-minute instructional time, the recording was mostly blank. The control group recording had no sound except for periodic reminders that prompt the participant to continue to concentrate.

The experimental group recording also had a two-minute instructional time where the speaker introduced himself and give a brief overview of the contents of the recording. After that, the speaker began a hypnotic induction that lasted approximately eight minutes. During that induction period, the speaker used imagery language that is common to hypnotic inductions. The induction instructed participants to imagine a relaxing scene, breathe deeply, and listen to the speaker's words. The experimental group recording then offered participants suggestions that one of their hands was becoming warmer while the other was cooler. The suggestion period lasted approximately 10 minutes. The experimental group recording ended in a similar manner to the control group recording.

Because the goal of this study was to show that easily obtainable self-hypnosis recordings are a method by which a person can improve his or her health, the recordings were produced by a company whose primary business is producing hypnosis MP3s and selling them via the Internet. A hypnosis recording obtained from the Internet offers the advantage of convenience and affordability over hypnosis treatment obtained from professionals. Because a significant effect was found, such evidence can help many people benefit from the healing power of hypnosis by offering them an avenue to treatment that might otherwise be blocked by cost, location, or other factors.

The details of this study's research design and implementation are discussed in detail in Chapter 3. Specifically, the sampling and selection of subjects is described. Additionally, a thorough listing of the equipment used is found in Chapter 3.

### **Hypothesis**

This study was an independent samples experiment. There were two groups, one that listens to a hypnosis recording and one that listens to a neutral recording. Both groups were measured after they listened to the recordings 12 times. The dependent variable, measured after participants listened to the recordings, was their degree of control over their finger temperature. The primary hypothesis was that the experimental group would have greater control than the control group.

Finger temperature control was measured before treatment by asking participants to make one hand warmer than the other. That measurement ( $M_1$ ) was compared with a measurement ( $M_2$ ) of each participant's finger temperature control after treatment. Thus, this study investigated whether the second measurement of finger temperature control was greater than the first measurement of finger temperature control.

A  $t$  test was used to test the hypotheses. The null hypothesis was that listening to a self-hypnosis recording would not demonstrate a significant difference between the before treatment measurement of finger temperature control and the after treatment measurement of finger temperature control. Similarly, the null hypothesis predicted that there would not be a significant difference between the control group's ability to control



their finger temperature and the experimental group's ability to control their finger temperature.

The hypothesis of this study was that the results of experimental group of this study would allow for a rejection of the null hypothesis. The null hypothesis was that listening to a regimen of a self-hypnosis recording would not allow participants to gain volitional control of their finger temperature. A second hypothesis of this study was that there would be a significant difference in ability to control finger temperature between the two groups.

### **Definition of Terms**

*Atenolol*: A type of beta blocking drug. It is used to relax blood vessels to promote blood flow. Side effects of this drug include dizziness, tiredness, depression and nausea (National Institute of Health, 2010).

*Beta Blocking drugs*: Drugs that are used to treat high blood pressure. While they have been reported to make symptoms of Raynaud's disease worse, they have been prescribed to treat primary Raynaud's disease (Shepherd, 2008).

*Calcium blocking drugs*: Drugs that allow for increased blood flow through the small blood vessels of the hands and feet (Thompson & Pope, 2005).

*Cognitive inhibition*: Processes and events by which certain mental activities are stopped or slowed significantly (MacLeod, 2007).

*Complementary and alternative medicine (CAM)*: Sets of procedures, ideas, and concepts that are used to replace or to support conventional medical treatment that is

given by established medical professionals. Complementary medicine is used with conventional medicine and alternative medicine is used instead of conventional medicine. CAM includes acupuncture, yoga, qi-gong, lifestyle changes, and mind body therapies such as hypnosis (National Institutes of Health, 2010).

*Electromyograph (EMG) biofeedback:* A technique to teach individuals about their own muscle tension. EMG biofeedback is often used to combat headaches that arise from pathological contractions of scalp muscles (Rokicki et al., 2003).

*Endothelial response:* The reaction of the lining of blood vessels to bodily signals to increase or decrease blood volume through the vessels (Ten & Pinsky, 2002).

*Endothelial dysfunction:* The maladaptive response of the lining of blood vessels that allows for an incorrect volume of blood to flow (Ten & Pinsky, 2002).

*Induction or Hypnotic Induction:* The process of changing the state of one's consciousness. While it can take many forms, it typically involves suggestions to relax, focus on one stimulus to the exclusion of others and use one's imagination (Lynn & Kirsh, Introduction: Definitions and Early History, 2006).

*Ischemic response:* A reduced blood supply to a part of the body (Easton et al., 2009).

*Nifedipine:* A calcium channel blocking drug (National Institute of Health, 2011).

*Primary Raynaud's disease:* Also known as primary Raynaud's syndrome. A condition that reduces blood flow to various parts of the body, usually the hands and feet

(Shepherd, 2008). It is termed *idiopathic* because the cause of it is not known (Pope, 2008).

*Secondary Raynaud's disease:* A disease similar in symptoms to primary Raynaud's disease but has an underlying medical problem (Wrigley, 2002).

*Stanford Hypnotic Susceptibility Scale:* A rating scale that assigns a numerical value to a person's ability to respond to hypnotic suggestion (Woody, Barnier, & McConkey, 2005).

### **Assumptions**

It was assumed that the participants' hypnotic ability falls in an even distribution where some participants are highly hypnotizable and some participants are lowly hypnotizable. Thus, the majority of participants should have fallen within the normal range of hypnotic ability. It was assumed that participant responses on the surveys were honest and accurate to the best of their ability. It was assumed that measurement of finger temperature is directly related to hand temperature. It was further assumed that the normal temperature of the fingers of each participant's left hand is similar to the temperature of the fingers of his or her right hand or varies randomly.

### **Limitations**

Participants in this study were not tested for hypnotic susceptibility. Testing participants for hypnotic susceptibility directly before such participants engage in a blind study might introduce the bias of expectation (Middaugh, et al., 2001). One limitation of this study is the possibility that the method of solicitation and selection of participants

might not ensure true representation of the U.S. populace. Another limitation might be attrition of the participants. Due to the 6-week length of the study, it is possible that a large number of participants simply stopped engaging in the mental exercises. Logistical aspects such as scheduling a time and date for the final measurement for each participant could have been a limitation.

### **Delimitations**

This study investigated volitional control of finger temperature by healthy adults with no history of circulatory disease or primary Raynaud's disease. As such, it is important to note that this study and its findings should not be considered directly applicable to people suffering with the medical condition of Raynaud's.

Although this study used participants from a specific geographic region, that region is ethnically and socially diverse. It was noted in the Limitations section that there was a possibility the participants might not be representative of a larger population. However, due to the diversity of this study's participants, the findings of this study should be generalizable to a larger population.

Alternative therapies effective for managing poor circulation (Taylor, Goehler, Galper, Innes, & Bourguignon, 2010) are not within the scope of the present study. Researchers reported that alternative therapies are on the rise (Malenfant et al., 2009). Alternative therapies for poor periphery circulation are not limited to Raynaud's disease. They have been recommended for sufferers of diabetes who might have reduced blood flow to the feet (Rice, 2007). The inclusion of subjects who do not have Raynaud's

disease might offer a potential barrier to the application of this study's results to a population that would benefit.

### **Significance of the Study**

It has been reported that 2.2% of women and 1.6% of men suffer from Raynaud's disease (Suter, Murabito, Felson, & Fraenkel, 2005). Thus, positive results from this study can be examined for their possible benefit for nearly 4% of the population. Once positive effects for mind-body therapies are realized by practitioners, such benefits can be maintained for years (Galper et al., 2003).

If it is found that self-hypnosis offers a demonstrable and significant effect on volitional control of finger temperature, then such results can be of benefit to millions of people. The direct beneficiaries are sufferers of primary Raynaud's Disease because the relationship between increased blood flows to the fingers and increased finger temperature is so strong (Fiero, Galper, Cox, Phillips, & Fryburg, 2003; Freedman, 1989). By increasing finger temperature, participants increase blood flow to the fingers. While this study focused on increasing warmth and blood flow to the fingers connected to Raynaud's Disease, the findings of this study may be applied to other instances of circulatory distress.

### **Summary and Transition**

The larger goal of this study was to offer evidence that obtaining healing benefit from hypnosis need not be dependent upon a professional hypnotherapist in certain cases. Due to cost, location, and lifestyle constraints, using the skills of a hypnotherapist might

not be possible. Self-hypnosis is, by its nature, not reliant upon the presence of a second person. Due to the Internet, hypnosis recordings are easily obtainable and inexpensive. This study aimed to demonstrate the efficacy of self-hypnosis recordings so that self-hypnosis can be seen as an effective treatment.

The specific malady that this study's efforts addressed is primary Raynaud's disease. Primary Raynaud's disease is a common disease that causes discomfort and pain and affects the quality of life of its sufferers. By investigating whether self-hypnosis can allow people to volitionally control finger temperature, I hope that this study's results may immediately offer a treatment for sufferers of Raynaud's disease. Because hand temperature and circulation are nearly synonymous, this study's results might prompt further research into volitional control of other circulatory diseases.

While there are some treatments for primary Raynaud's disease, this study offers an alternative to treatments that carry with them side effects and curtailment of life's activities. This study investigated whether self-hypnosis is a safe, effective alternative to such treatments.

There is considerable previous research on hypnosis, circulation, and Raynaud's disease (Shenefelt, 2002). This study contains a thorough review of past investigations and is based on the many instances where hypnosis administered by another has shown significant effect on blood flow and extremity temperature. Chapter 2 presents such previous research in detail and presents a rationale as to why this study should produce significant results.

This study used a quantitative method to compare the efficacy of a regimen of listening to a self-hypnosis recording containing suggestions pertaining to finger temperature in an experimental group to a control group. The control regimen consisted of having participants listening to a recording that contains instructions for them to consciously concentrate on controlling their finger temperature. Details of the research method are provided in Chapter 3.

## Chapter 2: Literature Review

The purpose of this study was to determine if listening to a self-hypnosis recording allowed subjects to control the temperature of their fingers. In order for this study to be grounded in methodologically appropriate research, the extent of previous research must be established. The literature is reviewed in this chapter.

The review of the literature provided evidence that hypnosis as well as other CAM treatments can allow people to control blood flow to their extremities and control temperature of their extremities. Additionally, the review of the literature provided evidence that self-hypnosis is a common form of CAM and of an effective way of delivering effective treatment. The evidence that previous CAM treatments including self-hypnosis have shown significant results on volitional control of autonomic processes is the rationale for this study.

The ability of hypnosis to promote health by giving practitioners of hypnosis control over autonomic functions has been researched (Jambrick, Sebastiani, Picano, & Gherlarduccie, 2005; Stetter & Kupper, 2002)(Jambrick, Sebastiani, Picano, & Gherlarduccie, 2005) (Stetter & Kupper, 2002). While there have been investigations into the area of hypnotically learned control of hand temperature, there are research gaps. A large research gap is that it is not known if the benefits of controlling finger temperature through hypnosis can be learned by people without the presence of a professional. To date, research in hypnosis and temperature control of the fingers has been limited to academic and specialized medical situations. Information that can fill such gaps can



prove advantageous to the many people who could benefit from learning to control autonomic physiological functions.

Hypnosis has existed in one form or another since antiquity (Gauld, 1995). However, hypnosis takes several forms. Many of those forms involve different terminology. Thus, in order to locate previous studies, one must include in the literature search different labels and terms.

Similarly, previous research that is relevant to this study's purpose shows that temperature control and blood flow to the extremities is a topic that has been investigated by different disciplines. Accordingly, it has been labeled and described in a variety of ways. In order to find and acquire the most relevant research for inclusion in this study's literature review, a broad search strategy that was inclusive of different terms and synonyms was used.

### **Research Strategy**

The process for identifying and obtaining background literature for this study was multiphasic. The first step was to use the PsycINFO database to identify research on self-hypnosis, hand warming, and finger warming.

Alternate search terms were needed. The synonyms for hypnosis that were employed were *self-hypnosis*, *autogenic training*, *guided imagery*, *alternative therapy*, *trance*, *meditation*, and *biofeedback*. The synonyms used for temperature were *circulation*, *hand temperature*, *finger temperature*, *blood flow*, *Raynaud's phenomenon*,

*Raynaud's disease, blushing, galvanic skin response, vasodilation, vasoconstriction, endothelial response, ischemia, and sympathetic response.*

Once these search terms were identified, the PsycINFO database was used. One hundred and seventy five instances of past research were found. After reading the abstracts, articles that were deemed valuable were divided into two categories: articles that were obtainable through the Walden University library and articles that were not attainable through the Walden University library.

Once a list of valuable research that was not obtainable via the Walden University library was created from Zotero, different databases were used. Zotero is online software that organizes the data from library searches so that data become more easily used by other library searches. Research that was done by the National Institutes of Health was freely available via Google Scholar. CINAHL, which is a health and nursing database, was searched using the search criteria mentioned above. MEDLINE, which is a database that incorporates medicine, healthcare, dentistry and veterinary research, was also searched. Several articles that were on the Zotero list were obtained from these databases via Walden University's library using the document delivery service.

### **Criteria for Inclusion**

While over 200 articles were read for possible inclusion into this study's literature review, 99 scholarly sources were included. The main criteria for inclusion into this study were closeness to the study's research goal and procedure. Closeness included methods of hypnosis, measurement of blood flow, and measurement of finger

temperature. An additional requirement for inclusion into this study was that sources be peer reviewed. There are many examples of studies that share key words of research that is directly relevant to this study. The determination of relevancy can only be made after the abstract or even the whole study is examined.

Another consideration for inclusion into this study's literature review was a previous study's adherence to proper research methodology. Examples of proper research methodology include sampling techniques, number of subjects, description of procedure, and presentation of results. While the literature review contains a majority of articles with several subjects and multiple controls, case studies with large effect sizes were included.

Proper use of the scientific method was a dominant criterion. As such, this study's literature review includes several studies that offer powerful evidence against this study's hypothesis. However, as solid as the contradictory conclusions might seem, the research design of the supposedly contradictory studies do not put them at direct odds with this study's anticipated results.

The authors of the contradictory studies did not examine this study's variables in the same manner this study. Specifically, the studies that offer contradictory evidence did not use participation in a self-hypnosis regimen as their primary independent variable. Equally important, many of the studies that offer contradictory evidence used a small group of participants.

An example of previous research that claimed hypnosis is not effective in increasing finger blood flow was a study by Freedman (1989). As discussed later in this literature review, Freedman's application of hypnosis had the subjects listen to only 3 minutes of recorded instructions. The subjects in this study listened to 23-minute recordings, two times per week for 6-weeks.

With comprehensiveness as a guiding principle, the chronological depth of this study's literature review is not limited to a specific time span. The majority of the previous researched examined in this study's literature review is recent. However, there are many older studies that were performed using solid methodologies and procedures. Moreover, several studies are considered seminal works in the area and were included to provide a basis for this study.

### **Primary Raynaud's Disease**

Primary Raynaud's disease is a painful condition in which blood flow is reduced to different parts of the body (Keefe, Surwit, & Pilon, 1980). The reduction in blood flow volume to the hands and fingers can be measured directly with medical equipment and be related to symptoms such as color and temperature. While this disease has been known to manifest in the ears, nose, feet, and other body parts, it is most often identified by restricted blood flow to the hands and fingers (Shepherd, 2008). For some, Raynaud's disease is not considered to be a serious malady in terms of the degree of discomfort experienced or impairment of activities of daily living life's activities (Karavidas, Tsai, Yucha, McGrady, & Lehrer, 2006). However, it has been reported that the disease is

painful (Conn & Mott, 1984). Additionally, a meta-analysis of 18 studies of primary Raynaud's disease showed that this disease interferes with life activities such as outdoor activities during cold weather (Malenfant et al., 2009).

Approximately 30% to 60% of all people seeking treatment for Raynaud's symptoms have primary Raynaud's disease (Shepherd, 2008). A second division of Raynaud's phenomenon is termed secondary Raynaud's disease. The same symptoms occur in secondary and primary Raynaud's; the term *secondary* in this context refers to an underlying medical condition to which cause of the reduced blood flow is attributed (Wrigley, 2002). While hypnosis and other mind body treatments have been shown to be effective in mitigating reduced blood flow to the extremities, such treatments do not address the underlying medical conditions. For that reason, this study is most applicable to primary Raynaud's phenomenon.

Sufferers are diagnosed with primary Raynaud's phenomenon when no underlying cause can be identified for the reduced blood flow (García-Carrasco et al., 2008). Primary Raynaud's phenomenon is often termed an *idiopathic disease*, meaning that no cause is known (Kayslerl, Uchôa Corrêa, & Coelho Andrade, 2009). Furthermore, the cellular and physiological mechanisms of primary Raynaud's phenomenon are not known even after more than 140 years of investigation (Levien, 2010).

It must be noted that, in their meta-analysis, Stetter and Kupper (2002) examined stress-induced restriction of blood flow to the extremities. While stress has been identified as a trigger for Raynaud's symptoms (Shenefelt, 2003), Raynaud's disease has

as its primary trigger an overactive response to cold temperature (Tagliarino, Purdon, & Jamieson, 2005). Stress-induced reduction of blood flow to the hands and fingers is not limited to sufferers of Raynaud's disease. A reduction of blood flow to the upper extremities and a corresponding drop in temperature is a normal reaction when humans feel threatened (Rimm-Kaufman & Kagan, 1996).

Symptoms of Raynaud's include a triphasic discoloration (Desai & Headley, 2006). The discoloration begins as a whiteness of the afflicted area. If left untreated for a period of time, the white discoloration can turn to a bluish discoloration (Desai & Headley, 2006). The third phase of the triphasic cycle is redness as blood returns to the affected area (Levien, 2010). Other symptoms of Raynaud's disease are numbness and a drop in skin temperature (Herrick, 2005). It is the lowering of skin temperature that is the common complaint of Raynaud's sufferers.

Raynaud's symptoms can occur in matching fingers in both hands at the same time, several fingers on one hand at the same time, or one finger at a time (Wrigley, 2002). It was found that neither handedness nor subjects' body awareness of one side of their body versus another side is significantly related to symptoms of Raynaud's disease (Surwit, Bradner, Fenton, & Pilon, 1978).

### **Treatment of Raynaud's Disease**

The most recommended treatment for Raynaud's is lifestyle change such as the elimination of smoking, wearing gloves, and avoidance of cold weather. (Levien, 2010). However, lifestyle changes might prove impractical or not be available for many

sufferers of Raynaud's disease. Further, such changes can be negative as the changes might interfere with pleasurable and necessary activities.

The conventional medical treatment is a calcium channel blocker, nifedipine (Harvard Health Publications, 2009). Such a pharmacological treatment can carry with it side effects such as headache, lowered blood pressure, and dizziness (García-Carrasco, et al., 2008; Wrigley, 2000). Such side effects are reported as common in people who take the calcium channel blocker (Thompson & Pope, 2005). Furthermore, the effectiveness of the pharmacological treatments of nifedipine varies (Tagliarino et al., 2005). Such side effects occur due to the inherent inability to target the drug to only the affected area (Freedman, 1987)

Another pharmacological treatment for primary Raynaud's disease is a regimen of a beta blocking drug (Shepherd, 2008), the most common of which is atenolol. However, it has been reported that symptoms of Raynaud's can continue in patients who subscribe to a treatment of beta blockers (Shepherd, 2008).

Aside from the side effects of calcium channel drugs and beta blocking drugs, there is a monetary cost of using such methods. An average cost of 60 mg of nifedipine can be \$72 per month (Consumer Reports, 2009). An average cost of a month's supply of atenolol at 25 mg is \$67 (Consumer Reports, 2009).

Another method for treating symptoms of Raynaud's disease is the wearing of special gloves. The gloves are ceramic-impregnated gloves and have been shown to significantly improve the symptoms of primary Raynaud's disease (Ko & Berbrayer,

2002). However, there are drawbacks to using gloves as a treatment for Raynaud's. The first is cost, as the gloves cost \$49 (Far Infrared Health, 2011). The second is that the effectiveness of the gloves is dependent on wearing them for hours per day (Ko & Berbrayer, 2002). This requirement can be seen as intrusive on a person's daily activities and lifestyle because the gloves often must be worn indoors and at public places.

While there has not been an investigation into the effects of acupuncture on Raynaud's disease, there has been one investigation of acupuncture and endothelial dysfunction. It was found that neither real acupuncture nor placebo acupuncture had a significant effect on stress induced endothelia function in brachial arterial flow (Jambrik, et al., 2004). However, it was found that highly hypnotizable subjects ( $n = 5$ ) did not exhibit symptoms of endothelial distress in the first place. Given the small number of subjects, caution must be used when inferring generalizability.

### **Hypnosis**

Hypnosis is described as a procedure involving relaxation, suggestion and altered cognitive processes (American Psychological Association, 2010). Additionally an important process for hypnosis is cognitive inhibition, the willful inability to think as one normally does (Dienes et al., 2009). This aspect of cognitive inhibition is important for this study because the independent variable for the experimental group used cognitive inhibition while the independent variable for the control group did not.

Despite the various definitions of hypnosis (APA, 2010; Green, Barabasz, Barrett, & Montgomery, 2005) Hasegawa and Jamieson (2002) claimed that competing



schools of thought within the realm of hypnosis need not subscribe to an “either/or” situation.

That this study does not offer defining semantic labeling should not be considered a weakness of this study. Based on previous empirical research using hypnosis, it has been shown that having a universally agreed upon definition of hypnosis is not necessary to studying it empirically nor does it diminish the results of previous research (Lynn & Kirsh, 2006).

### **Altered State Debate**

A central debate in the academic realm of hypnosis that has existed for decades is the state versus non-state question. That debate asks whether hypnosis is an altered state (AS) that is qualitatively different from other states of consciousness or if it is not an altered state (NAS) and is a product of social and cultural influences (Hasegawa & Jamieson, 2002). That debate rests on the central question of what is hypnosis (Pekela, 2011). However, in order to understand the nature of hypnosis, researchers must inquire about the nature of consciousness (Kallio & Revonsuo, 2005).

In this study, I attempted to test self- hypnosis as a method for teaching volitional control. As such, this was not intended to address the nature of consciousness or to add to the longstanding debate, as my goal was the function of self-hypnosis and not the structure of self-hypnosis. Indeed, while there is ample evidence that hypnosis can allow people to learn to control autonomic processes, there is also evidence that the same processes can be learned by other methods (Jobe, Roberts, & Sampson, 1986).

It should be mentioned that this study's results, while based on the empirical measurement of a physiological occurrence, should not be taken as evidence for either side in the altered state/non-altered state debate. An argument using the results of this study could be made to support both sides.

### **Neurological Correlates in Hypnotic States**

I measured the connection of a physiological with a mental process. While there have been other studies that have examined hand temperature, finger temperature, and blood flow in relation to cognitive occurrences, it is important to note that physiological correlates to hypnosis are not limited to extremity temperature and extremity blood flow.

There is strong physiological evidence as measured by brain imaging techniques that hypnosis is a fundamentally different state than an awake state and the state of relaxation (Gruzelier, 2005). That evidence is the product of research that used magnetic resonance imaging (MRI) technology to compare activity in the left dorsolateral prefrontal cortex and activity in the anterior cingulate cortex in people who had undergone hypnosis versus people who had undergone meditation (Halsband, Mueller, Hinterberger, & Strickner, 2009).

MRI technology is not the only tool that has been used in investigating the relationship between cognitive activity and brain activity (Wobst, 2007). Wobst (2007) reported that electroencephalograph (EEG) machines can show that subjects practicing hypnosis for pain management show decreased amplitude in their somatosensory cortex without decreases in other parts of the brain.

In addition to MRI technology and EEG technology, positron emission tomography (PET) technology has also been used to record brain activity under hypnosis. PET scans offer a window into the activity of the brain by locating even small areas of the brain that are processing a certain level of blood glucose. The implication is that areas of the brain that are most metabolically active are the areas that are involved with the cognitive phenomenon that is occurring simultaneously. Regional cerebral blood flow increases (rCBF) have been shown in the anterior cingulate cortex of the corpus callosum during hypnosis (Rainville, 2002).

Evidence from brain imaging technologies offers support for the theoretical underpinning of this study's hypothesis, that cognitive process can have a significant effect on physiological events.

### **Types of Hypnosis**

Because the definition of hypnosis has permeable boundaries, there are questions as to whether the label of hypnosis should be applied to other cognitive phenomena (Nash, 2005). Nash (2005) argued that though hypnosis is broad and subjective meaning, if a cognitive exercise contains the concepts of focusing and relaxation it is hypnotic. This concept makes hypnosis a broad umbrella that allows many cognitive exercises and processes to be under it. Some examples of such concepts are self-hypnosis, autogenic training, progressive relaxation, meditation, and guided imagery (Barber, 1984). Hypnosis is a way of thinking differently (Araoz, 2006). This description of hypnosis is not exclusionary and can support many cognitive phenomena.

While the American Psychological Association included in its definition the idea that hypnosis usually involves one person guiding another, its definition also includes the idea of self-hypnosis (American Psychological Association, 2010). Self-hypnosis is the practice of a person going into a hypnotic trance using the instructions on a recording (Barušs, 2003).

Hypnosis is dependent on the internal cognitive processes and is not dependent on external stimuli or situations (Araoz, 2006). From that comes the idea that the identity or voice of the hypnotist is not the deciding factor in whether a person becomes hypnotized. It is the subject who ultimately decides the depth of the trance state. (Erickson, 1958).

Further, a dominant paradigm of hypnosis holds that hypnosis is not a distinct cognitive state, but rather an extension of natural cognitive abilities (Lynn & Kirsh, 2006). This paradigm is antithetical to the traditional idea of hypnosis that holds that an authority figure puts a person under hypnosis and that the person loses cognitive control. Hypnosis is a function of the participants' mental abilities and not a function of the hypnotist (Lynn & Kirsh, 2006). There are large amounts of evidence that the internal processes of a person in hypnosis can be related to physiological occurrences within the brain (Gruzelier, 2005).

### **The Importance of Suggestion**

While the power of suggestion is not unique to hypnosis, suggestion is seen as a central component of hypnosis (Lynn & Kirsh, 2006). Though there have been many studies that have investigated different mechanisms to grant people volitional

control of blood flow to the hands and control of hand temperature, this study investigated whether suggestion of the ability to control finger temperature given while the participant is in a hypnotic trance allowed that participant to gain volitional control of finger temperature. As such, it is important to discuss the role of suggestion in earlier research.

The power of the suggestion was demonstrated in a study that compared two groups. It was shown that the type of the instructions given to subjects had a significant effect on the type of physiological response given (Braud & Masters, 1980). Subjects ( $n = 15$ ) in a group that were given recorded autogenic instructions for warmth and relaxation showed the expected physiological results that are associated with relaxation. Subjects in a group ( $n = 15$ ) that received opposite instructions showed higher physiological arousal.

An earlier study showed that hypnotic suggestion for increased blood flow to the hands was more effective than biofeedback (Barabasz & McGeorge, 1978). That study divided subjects ( $n = 78$ ) into four groups. The first group received audio biofeedback, the second group received “sham” feedback, the third group received relaxation instructions, and the fourth group received hypnosis with specific suggestions for increased hand warmth. The fourth group showed a significant increase in hand temperature from the end of the baseline period as compared with a temperature reading taken after the hypnotic treatment was given. It is interesting to note for the purposes of this study that subjects in that study were not screened for hypnotic susceptibility. This is

supported by recent research in hypnosis that has found that hypnosis without the suggestion to warm one's hands does not yield an increase of blood flow to one's hands (Casiglia, et al., 2006).

In a study that compared biofeedback to hypnotic suggestion, it was demonstrated that hypnotic suggestions separate from biofeedback training can allow participants ( $n = 10$ ) to control their hand temperature (Keefe, 1978).

In a study that did not use hypnotic suggestion, an experimental group that received relaxation therapy did not yield a significant effect over a control group in long term circulatory problems. (Van Montfrans, Karemaker, Wieling, & Dunning, 1990). Relaxation therapy was defined as yoga and breathing exercises. Part of that therapy included listening to relaxation recordings once a week. The control group was instructed to engage in a regimen of sitting quietly. While that study did not show results that support the idea that cognitive process can have an effect on circulatory mechanisms or that listening to recordings can have an effect, it did not use specific suggestion. Further the dependent variable was long term reduction in blood pressure. The purpose of that study was not to measure blood pressure immediately after relaxation treatments.

Wallace and Kokoszka (1992) investigated whether hypnosis without suggestion would cause cooling of skin temperature as a function of hypnotic analgesia. It was hypothesized that because people who undergo hypnotic analgesia for their hands report a cooling sensation, hypnotic analgesia causes cooling of the extremity. No significant

effect for skin temperature cooling was found to be connected to hypnosis that did not contain suggestion for skin cooling.

Meisner (2011) demonstrated that suggestion alone in the form of placebo can not only affect subject responses such as pain, but also objective physiological responses such as blood pressure. That study investigated the physiological mechanisms that allow the mind to directly affect bodily organs and processes.

### **Self-Hypnosis**

Because access to and cost of a professional hypnotist might act as barriers to sufferers of Raynaud's disease seeking hypnosis as a treatment, this study investigated whether self-hypnosis can allow people to learn to warm their hands, thereby gaining relief from the major symptom of Raynaud's. Leading hypnosis researchers have stated that all hypnosis is self-hypnosis (Jensen, 2010). The idea that all hypnosis is self-hypnosis resounds in the literature of hypnosis (Gauld, 1995) and is not contradicted by hypnosis being performed by a professional on a client. Spiegel said that all hypnosis is focused attention as cited in (Jensen, 2010)(Jensen, 2010). Spiegel went on to say that self-hypnosis is dissociation from everything but the point of focus; it fosters unusual associations and openness to new ideas. Even with the presence of a professional, it is the subject who directs and controls his or her attention.

Self-hypnosis is a skill that is learned with differing degrees of ease (Jensen & Patterson, 2006). Jensen and Patterson (2006) claimed that the ongoing use of and practice with hypnosis recordings is important to maintaining the benefit of hypnosis.

Such practice usually includes listening to hypnosis recordings (Jensen & Patterson, 2006). In self-hypnosis, a person listens to a recording of a hypnotic induction and suggestions (Barušs, 2003). The suggestions need not be logical and often work best when incorporating the subject's imagination (Jensen, 2010). There is agreement among leading hypnosis scholars that people are more receptive to suggestions in a hypnotic state than in a normal state, even if the hypnotic state is created by the participant or client (Green et al., 2005).

While there has not been a study of self-hypnosis on finger temperature control, there have been recent studies of self-hypnosis and insomnia (Farrell-Carnahan, et al., 2010). Despite that study's emphasis on insomnia instead of hand temperature, it is of particular relevance because it used hypnosis recordings downloaded from the Internet as the treatment. Further, that study asked participants to listen to the recording for several weeks and to record data via electronic logs. It was found in that study that self-hypnosis did yield a significant improvement in insomnia symptoms.

According to the recent redefinition of meditation by the U.S. National Center for Complementary and Alternative Medicine, meditation and hypnosis overlap each other in form and function (Manocha, Black, Spiro, Ryan, & Stough, 2010). In fact, Manocha et al. (2010) reported that it is difficult to delineate hypnosis from other relaxation methods. Thus, this study included research that investigated the effect of meditation on blood flow to the hands and finger.



The idea that hypnosis and meditation overlap each other in structure, content, and purpose has been supported by other recent research (Horowitz, 2006). Dowd (2004) offered the idea of mindfulness as the dominant construct and hypnosis, meditation and relaxation therapy as methods of reaching the goal of mindfulness. While the semantics of mindfulness, hypnosis, and meditation might be debatable, the commonalities far outweigh the differences (Dowd, 2004).

Autogenic training has been called a type of hypnosis (Kemper & Breuner, 2010). Autogenic training has been investigated in several studies as a possible mechanism to gain control over the temperature of extremities. This training is a relaxation procedure that encourages practitioners to return to a state of physiological homeostasis (Wright, Courtney, & Crowther, 2002). Developed in Germany in 1932, autogenic training is more common in German speaking areas than in English speaking areas (Stetter & Kupper, 2002). It contains six exercises as its core treatment mechanism (Kanji, White, & Ernst, 2006). The core imagination-based and focus-based exercises are for the subject to concentrate on the feeling of heaviness in the limbs, warmth in the limbs, a slow and steady heartbeat, a slow and steady breathing pattern, warmth in the chest region and coolness on the forehead (Wright et al., 2002). Autogenic treatment is like hypnosis (Moore & Wiesner, 1996). However, it has been reported that, though autogenic training has its roots in hypnosis, it is considered to be distinct from hypnosis (Yurdakul, Hottum, & Bowden, 2009). Evidence for this is found in this study's review of the literature

where autogenic training has been less successful than hypnosis in influencing blood flow to the upper extremities.

It has been claimed that a hypnotic induction is merely a version of guided imagery (Barušs, 2003). Guided imagery is a category of mental exercises that includes focusing, visual imagination, and interaction between the mind and body (Ahsen, 1996). These criteria offer nothing that suggests guided imagery is exclusive from hypnosis. Further, guided imagery has been described in terms that are nearly identical to accepted descriptions of hypnosis (Trakhtenberg, 2008). There have been several studies that have examined guided imagery as a method to learn control over blood flow to the hands and hand temperature.

Self-hypnosis has been investigated and applied to diseases as serious as multiple sclerosis, diabetes, and cancer (Jensen et al., 2009). Jensen et al. (2009) performed a quasi experiment comparing the efficacy of self-hypnosis versus progressive muscle relaxation in modifying the pain felt by sufferers of multiple sclerosis. It was found that self-hypnosis is a viable treatment option for pain. Jensen et al. listed several possible biases to their study and to self-hypnosis studies in general. They wrote that self-hypnosis does not lend itself to empirical study because of the subjective nature of hypnosis. Furthermore, not only was the independent variable of self-hypnosis based solely on participants' perceptions, but so too was the dependent variable, the participants' perception of pain. The authors mentioned that hypnosis and self-hypnosis are broad concepts and that different approaches to self-hypnosis might yield different

results. Therefore, it is not hypnosis itself that is studied in other research but the approach to hypnosis. The authors claimed that self-hypnosis was an effective treatment for the pain associated with multiple sclerosis. Participants were placed into either the progressive muscle relaxation group or into the self-hypnosis group. There was no control group. The group receiving the self-hypnosis treatment showed significant reductions in pain.

More importantly for this study, it was found that suggestions imbedded into hypnotic recordings can alter the blood flow of the forearms (McGuirk, Fitzgerald, Friedman, Oakley, & Salmon, 1998). In a within-subjects design, subjects ( $n = 28$ ) were given contrasting hypnotic suggestions for warm and for cold sensations on their forearms. In the first session, half of the subjects were given the recording that contained the suggestion for a feeling of warmth in one of their forearms. The suggestion was specific for one arm, thus the opposite arm served as a control. Half of the subjects were given the recording that contained the suggestion for a feeling of cold on their forearms. In a second session, those who received the suggestion for warmth were then given suggestion for cold while maintaining one of their arms as a control. Likewise, the subjects who were given the suggestion of cold first were given the suggestion of warmth in a second session while maintaining one of their arms as a control. There were significant results for reduction of blood flow when the subjects received the cold suggestion and an increase in blood flow for the subjects who received the warm

suggestion. While McGuirk et al. (1998) used forearm blood flow as a dependent variable, their findings can be used to support the rationale of this study.

While the phrase “all hypnosis is self-hypnosis” is a mainstay of many books and articles on the subject, the idea is not universally held (Zeig, 2008). Zeig (2008) wrote that certain hypnotic processes cannot be done to oneself by oneself. As an example, Zeig wrote about the concept of dissociation, which is a mental process by which one does not concentrate on the here and now. Zeig (2008) suggested that a person cannot instruct him or herself through hypnosis to dissociate in the same way that a person cannot instruct him or herself to be spontaneous. Thus, listening to hypnotic recordings is a method for obtaining the benefits from suggestions of dissociation.

### **Conscious Concentration Versus Hypnosis**

Because listening to a recording that instructs participants to consciously concentrate on controlling their hand temperature served as the treatment for the control group, it is important to discuss conscious concentration. Concentration is a label that applies to a broad array of mental phenomena and is often used to describe a mechanism of achieving an altered state of concentration (Holroyd, 2003). However, concentration usually falls within the normal state of consciousness (Rosenthal, 2000). Hypnosis is an altered state of consciousness (APA, 2010; Gruzelier, 2005; Halsband et al., 2009).

Findings in neuroscience imaging support the concept that hypnosis is qualitatively different than normal conscious states (Heap, 2011). This difference is supported by studies that have shown, via brain imaging, that hypnotized people have

different neurological activity than non hypnotized people (Field, 2009). Further, it has been reported that participants who score higher on standardized hypnotic susceptibility scales than the norm, also score differently on other psychometric tools (Heap, 2011).

Focused concentration is, by definition, an active state of cognition where the practitioner is employing much of that person's cognitive ability (Wegner & Erskine, 2003). This activity directly contradicts one of the recognized hallmarks of hypnosis, cognitive inhibition (Dienes, et al., 2009). Cognitive inhibition is a function of a hypnotized person not engaging in proactive thinking (Dienes, et al., 2009).

In a comparison of cognitive methods of control over circulatory processes, it was found that hypnosis was superior to waking imagination (Tebecis & Provins, 1976). In that study, highly suggestible subjects ( $n = 14$ ) underwent three experimental sessions. The first two sessions had the subjects go into a trance via recorded suggestions. The recordings prompted the subjects to believe they were in very cold settings and in very warm settings. Biometric readings from the subjects' palms showed a decrease in hand temperature when the subjects were told via hypnotic instruction that they were on the top of a snowy mountain. Similarly, subjects' hand temperature increased when they were instructed via hypnosis that they were in a very warm environment. Significant changes in hand temperature were found for both of the hypnotic treatment sessions. There was not a significant change in hand temperature for the subjects when they were in an awake state and told to imagine that they were in an extreme environment. The fact that significant results were found due to recorded hypnotic instruction offers strong

support for this proposed study. Because concentration without the use of cognitive devices such as imagery, other people, and recordings is a normal occurrence and is qualitatively different from the state hypnosis, it is a good construct for the control group.

### **Stress, Mental States, and Circulation**

There is ample research that hypnosis and other mental activities significantly alter physiological functions such as blood flow and stress response (Fingelkurts, 2007; Rainville, 2002). How the variables of Raynaud's disease, blood flow, and hypnosis are operationalized is critical to validity and reliability of much of the research in this area. Many researchers have assumed that the temperature of the hands and fingers are strongly correlated to blood flow (Fiero et al., 2003). In a quantitative study that used several biometric devices, a direct relationship between finger temperature and blood flow to the fingers was significantly demonstrated (Freedman, 1989).

Stress causes vasoconstriction in extremities (Dusek & Benson, 2009). It has been widely reported that hypnosis by its very nature is relaxing (Jambrick et al., 2005). Thus the very act of relaxing could discourage the sympathetic nervous system response and encourage the parasympathetic response (Becker, Hildenbrand, Whitcomb, & Sanders, 2009). The sympathetic response has as one of its facets a restriction of blood flow to the extremities. Conversely, the parasympathetic response has as one of its facets an increase of blood flow to the extremities.

The findings of Becker et al. (2009) are supported by a study done by Wickramesekera, Kolm, Pope, and Turner (1988) in that the latter study reported that one

of the common symptoms of stress is reduced blood flow to the extremities which manifests as cold hands and fingers. In earlier research it was reported that while blood flow to the periphery and peripheral hand temperature are correlated, there might be other factors involved in both temperature and blood flow (King & Montgomery, 1980). Such factors might be tissue hydration, position of the extremity, and ingestion of food (King & Montgomery, 1980).

In a study done by Jambrick, Sebatianie, Picano, and Gherlarduccie (2005) it was shown that hypnosis can significantly reduce the sympathetic nervous system response. Specifically, hypnosis can lessen the reduction of brachial arterial flow that occurs under stress. The subjects ( $N = 20$ ) were divided into groups of highly susceptible and non-susceptible according to the Stanford Hypnotic Susceptibility Scale (SHSS). The subjects who were highly hypnotizable resisted stress as defined by reduced brachial blood flow significantly more than those subjects who scored low on the SHSS.

The idea that mental events can influence blood flow to the upper extremities was supported by the findings of a study that used hand temperature as a mechanism to explore statistical anomalies (Jamieson, 1987). In that study, subjects ( $n = 65$ ) were exposed to cognitive stressors in an effort to produce a change in hand temperature. While the goal of the study was not to explore willful control of hand temperature, that study did find that mental discomfort which is antithetical to hypnosis restricted blood flow to the hands.

Blood flow to the hands is likewise reduced when the stressor is physical (Wickramesekera, Kolm, Pope, & Turner, 1998). According Wickramesekera et al. (1998), sufferers of chronic pain without an identifiable condition that affected the subjects' circulatory system had colder hands than people without chronic pain. However, in that study when sufferers of chronic pain with cold hands were subjected to more stress, their hand temperature rose.

### **Biofeedback and Circulation**

While this study did not use biofeedback in this investigation of voluntary control of hand temperature, it is important to discuss the contributions of biofeedback to the arena of learned control of finger temperature. It is also important to discuss the limitations of biofeedback. After 40 years of use and many reported cases of success, the exact mechanisms of biofeedback's effect on physiological processes are unclear (Galper et al., 2003).

Biofeedback is the most studied treatment for Raynaud's disease, aside from traditional pharmacological treatments (Middaugh et al., 2001) (Middaugh, et al., 2001). Biofeedback is not only claimed to be effective for warming one's hands, it has been shown to be effective at giving subjects volitional control of the temperature of their feet (Fiero et al., 2003). However, Fiero et al. (2003) reported that biofeedback has been shown to lack the ability to foster consistent results for increasing blood flow to the sufferers' hands.



Middaugh et al. (2001) found that biofeedback can allow randomly selected adults to have a large degree of control over what was previously thought to be an autonomic function, circulation. However, Middaugh et al. found that only 30% of subjects assigned to thermal biofeedback and only 50% of subjects assigned to EMG biofeedback showed significant improvement in their symptoms of Raynaud's disease. Middaugh et al. found that age, gender, attitude and even the site at which the biofeedback training was administered had significant effect on whether biofeedback skills were learned and retained.

In one study that used biofeedback for control of circulation it was reported that effects for increasing blood flow were small, while effects for decreasing blood flow were larger (Violani & Lombardo, 2003). The long history of biofeedback's success in allowing people to gain volitional control over the temperature of their extremities supports the rationale of this study because biofeedback has some significant results, but because biofeedback has several limitations, self-hypnosis should be investigated.

### **Concerns With Biofeedback as a Treatment**

There are concerns about using biofeedback as a long term strategy to offer relief from primary Raynaud's disease. The first concern regarding biofeedback as a long term strategy for the relief of primary Raynaud's symptoms centers on the practical aspects of obtaining, owning, and using such machines. Biofeedback is thought to be most effective when applied by a trained technician (Moss, 2002). Scheduling appointments and paying for professional treatments of biofeedback therapy can be impediments to wide swaths of

society (Middaugh et al., 2001) (Middaugh, et al., 2001). The cost of biofeedback varies and is dependent upon the market price of a professional's hourly rate (Muller, 2009). Most studies that have offered strong evidence of the efficacy of biofeedback have used treatment periods of 8-12 weeks (Scharff & Etherage, 2000). It is estimated that the fee for one session of biofeedback treatment is \$50-\$200 with a high likelihood the fee will be higher if customization is necessary (Lofthouse, McBurnette, Arnold, & Hurt, 2001). The next sessions range between \$50 - \$80 (Global Quantum Quest, 2005). Further, reimbursement by insurance companies is not consistent (Rosenthal, 2008). A second concern is the training needed to use such machines successfully. It has been reported in a Meta-analysis of the efficacy of biofeedback training on circulatory concerns that a good deal of biofeedback users was not well trained (Karavidas et al., 2006).

While there are home kits available, such kits are not as comprehensive or as effective as those used by professionals (Association for Applied Psychophysiology and Biofeedback, 2008)(Association for Applied Psychophysiology and Biofeedback, 2008). An Internet search using both Google and Bing search engines for home biofeedback equipment showed that \$150 was the lowest price for an entry level biofeedback machine. Owning a biofeedback machine, might not be advantageous to a sufferer of primary Raynaud's disease due to the aforementioned necessity of proper training.

The third concern is the dependency on the equipment. By definition, biofeedback therapy requires equipment. Even with the declining cost of electronics, the cost of a sophisticated biofeedback device can be several thousand dollars

(Ratanasiripong, Sverduk, Hayashino, & Prince, 2010). It has been shown by meta-analysis of the efficacy of biofeedback that home practice increases the effectiveness of treatment (Nestoriuc & Martin, 2007), provided that home practices are within proper treatment guidelines. The concerns and limitations of biofeedback as a long term strategy offer evidence for that rationale of this study, that self-hypnosis should be investigated as a treatment for Raynaud's disease.

### **Hypnosis and Other CAM Treatments for Increasing Blood Flow**

Roberts, Kewman and MacDonald (1973) examined a small group of hypnotically talented subjects ( $n = 6$ ). The subjects were examined for their ability to learn to control their hand temperature; it was found that most of the subjects could demonstrate significant and reliable differences between the temperatures of their two hands. Instead of attempting to raise or lower their hands, subjects' hand temperature was artificially manipulated by placing one hand on a cold pad and one hand on a warm pad. Once the temperature of the hands had stabilized, the warm and chilled pads were removed and subjects were measured for their ability to maintain the temperature difference between their hands. Over several trials, each subject had the left hand placed on the cold and the hot pad. Correspondingly, a subject's right hand was placed on the hot pad, and the left hand was placed on the cold pad. Subjects demonstrated the ability to maintain a large difference in their hand temperature in nearly every trial. However, it must be mentioned that though some subjects showed remarkable ability to maintain significantly different hand temperatures, not all of the subjects could do so. Further, those that were

studied scored very high on the Stanford Hypnotic Susceptibility Scale. Hypnosis was fostered by a laboratory setting and by a professional hypnotherapist. Thus, there is a question of that study's generalizability.

While some studies have compared the effectiveness of hypnosis and biofeedback and found hypnosis to be a more effective treatment, other studies have studied the two treatments in conjunction with each other. Hypnosis in conjunction with biofeedback has been successful in raising skin temperature and can be used as a treatment in Raynaud's disease (Shenefelt, 2003).

However, in a study done by Crosson (1979) it was reported that biofeedback could produce significant hand warming results while groups that received suggestion did not show a significant difference from the control group.

Though this study used the finger as focus of the dependent variable, it is appropriate to discuss previous findings that have investigated temperature control of other body parts. In a study that was designed to eliminate the possible confounding variable of muscle activity as a cause for increased blood flow, it was shown that after four training sessions of biofeedback, subjects ( $n = 8$ ) could show significant temperature differences between their two earlobes (Steptoe, Mathews, & Johnston, 1974). However, the authors admitted that a baseline differential between the earlobes of each subject was not taken. It is possible that the differences between earlobe temperatures shown in the fourth session was present and persisted through the session for each subject.

Autogenic training has been shown to be a type of hypnosis (Barber, 1984; Horowitz, 2006). However, in a comparison between autogenic training and biofeedback mechanisms, it was shown that biofeedback produced significant increases in hand temperature and hand blood flow while subjects using autogenic techniques showed no significant increases (Freedman, 1989). Though, Freedman (1989) cited several previous studies where autogenic training did produce significant increases in hand temperature, in his own research he did not show a significant effect. However, subjects ( $n = 8$ ) listened to recorded instructions for only three minutes per session and were then instructed to repeat the phrase, “My hands are warm and heavy” (p. 438). A study done 9 years before the study done by Freedman (1989) reported nearly the exact opposite finding. Keefe, Surwit, and Pilon (1980) claimed that the addition of biofeedback did not enhance the successful effects of autogenic training on peripheral skin temperature.

Despite the similarities between relaxation and hypnosis, the two techniques are different because hypnosis involves the use of suggestion during a trance state. Still, for the purposes of this study, it is important to discuss research where relaxation training and biofeedback were used to examine volitional control of finger temperature. Kluger, Jamner, and Bernard (1985) divided 29 subjects into three groups, finger temperature biofeedback, finger pulse volume biofeedback and relaxation training. None of the subjects had previous experience with such training. After a three-week training period where each subject participated in two sessions per week, it was shown that all three treatments allowed subjects to control their finger temperature, but that there was not a

significant difference between the training groups. The findings by Kluger et al. (1985) are quite similar to the findings of Surwit, Shapiro, and Field (1976) who showed that relaxation with biofeedback did allow participants ( $n = 8$ ) were able to warm their hands.

Similar to relaxation training, meditation, and hypnosis share many similar aspects. However, meditation does not include suggestion during a trance state (Lynn, Das, Hallquist, & Williams, 2006). Despite that difference between hypnosis and meditation there have been studies on meditation and control of physiological processes (Emani & Binkley, 2010; Wang & Widlansky, 2009). In a study comparing biofeedback and meditation, it was found that meditation yielded significant physiological changes while biofeedback did not (Credidio, 1981). The physiological changes included increased blood flow to the upper extremities.

Manocha et al. (2010) also examined mediation and volitional control of hand temperature. They reported that subjects ( $n = 10$ ) who were in a group that was instructed to relax increased their hand temperature while subjects ( $n = 16$ ) who were in the meditation group showed an unexplained and significant drop in hand temperature. Those authors concluded that different types of meditation might yield different types of physiological responses.

### **Hypnosis and Extremity Cooling**

Though Raynaud's disease is associated with uncomfortably cold hands, such symptoms are related to a lack of regulation of one's circulatory processes. Because this study's primary dependent variable was finger temperature, it is important to look at

research that includes volitional lowering of hand temperature. Previous research supports the possibility that self-hypnosis allowed participants volitional control of their finger temperature to the extent that participants can simultaneously raise the temperature of the fingers of one hand while lowering the temperature of the fingers of the other hand.

Vasodilation has been shown to be more difficult to achieve than vasoconstriction (Surwit, Shapiro, & Feld, 1976). This might be due to the idea that there is a ceiling effect; hand temperature cannot be raised beyond that of the body temperature (King & Montgomery, 1980; Violani & Lombardo, 2003). However, hand temperature can drop far below body temperature as blood flow volume required to maintain the health of the tissues of the fingers is far less than the volume of blood flow required to maintain a comfortable temperature (Stohecker & Parulski, 1997).

Van Quekelberghe (1995) showed that not only can hypnosis allow for warming of one's fingers and for cooling of one's fingers, but that participants were able to raise and lower finger temperature at the same time. Van Quekelberghe did this by comparing the control group ( $n = 10$ ) with an experimental group ( $n = 10$ ). The experimental group showed significant results and reported a mean temperature difference between the index finger and the little finger of the same hand of  $2.1^{\circ}\text{C}$  ( $3.78^{\circ}\text{F}$ ). These results are supported by a study done 10 years previously (Kojo, 1985). In the study done by Kojo (1985) that showed volitional control of hand temperature, hypnosis via listening to recording was used.

Similar findings have been reported by Maslach, Marshall, and Zimbardo (1972), who also showed an impressive degree of precision and control over the blood flow to the extremities. It was not two separate hands that showed a significant difference in blood flow drive temperature. It was differing fingers of the same hand. Maslach et al. (1972) reported significant results but did not offer mean difference for their subjects. The highest reported difference was 4°C (7.2°F). However, only six subjects were used ( $n = 6$ ). Also, the subjects were examined and found to be highly susceptible by the Stanford Hypnotic Susceptibility Scale. Thus, a researcher must use caution in any attempt to apply these findings to a larger population that has not been screened for hypnotic susceptibility.

### **Hypnosis and Difference of Participant Variables**

#### **Gender of Participants**

Such differences might be based on the sex of the subject in addition to the subjects' personality measurements (Surwit et al., 1976). In the study done by Surwit, Shapiro, and Field (1976), it was found that both men and women can learn to increase the temperature of their hands through relaxation with the aid of biofeedback. However, men learned to warm their hands as their heart rate decreased. Women learned to warm their hands while increasing their heart rate. Increasing or lowering the heart rate was not part of the instructions nor was it part of the feedback. It is hypothesized by those authors that there might be more than one mechanism for achieving voluntary control of blood flow to the fingers.



In another study that compared the ability of men and women to learn to control their hand temperature it was found that only women could learn to warm their hands while both sexes could learn to cool their hands (Violani & Lombardo, 2003). That study used biofeedback instead of hypnosis. It was discussed by the authors of that study that men have a higher baseline peripheral temperature and thus had less of a margin to improve. The idea of the possible existence of different mechanisms or of different methods of voluntarily controlling the temperature of one's fingers was brought up in an earlier study of hypnosis and blood flow to the extremities (Roberts, Kewman, & MacDonald, 1973).

### **Individuality of Participants**

A study done by Surwit, Bradner, Fenton, and Pilon (1979) examined individual differences in subjects. Some correlational evidence was found between subjects' scores on the Psychological Screening Inventory (PSI). A significant relationship was found between those who scored low on the alienation part of the PSI and those who had a large increase in finger temperature (Surwit et al., 1979). The authors hypothesized that there might be several individual and personality factors that could influence successes in volitional control. This idea was supported in similar research that used biofeedback instead of autogenic training (Roberts, Bacon, & Joanne, 1975; Violani & Lombardo, 2003). The possible effect of personality traits has implications for this study because hypnosis is a complex skill. Gaining control of aspects of one's circulatory system might not be a binary phenomenon. Indeed, it has been reported that there are emotional

considerations and self-fulfilling prophecies involved Middaugh et al., 2001). (Middaugh, et al., 2001).

Shaffer (2009) found that subjects ( $n = 39$ ) did not present a uniform pattern of cooling of fingers or of the whole hand. That study introduces demonstrable evidence that blood flow to the periphery is not only influenced by cognitive processes, it is variable across subjects. In a literature review of biofeedback and peripheral temperature, it was found that there were significant variances in peripheral temperature control between subjects who received the same treatments (King & Montgomery, 1980). That finding of variances across subjects was supported by recent research (Violani & Lombardo, 2003).

### **Age of Participants**

Most of the studies on hypnosis and blood flow to the extremities have been limited to adult participants. It has been shown that children, through hypnosis, can learn to warm one part of their body while maintaining or reducing the skin temperature of another part of their bodies (Dikel & Olness, 1980). The Dikel and Olness (1980) study had a large sample size ( $n = 48$ ). The age ranges of the children were from 5 to 15. Such a 10 year difference in age range suggests that learning the hypnotic skill of controlling blood flow is not limited to those of a certain level of cognitive development. Dikel and Olness used an experimental design that contained an experimental group and a control group. It was found that the group that received the hypnotic instruction showed a

significant difference skin temperature change from the control group (Dikel & Olness, 1980).

In another study that examined children's ability to learn to control their hand temperature, it was found that not only could children warm their hands, three of the subjects ( $n = 4$ ) could warm one hand relative to the other hand (Lynch, Hama, Kohn, & Miller, 1976). In the first six training sessions, the children were told to cool their dominant hand and to warm their non dominant hand. In the last six sessions, subjects were given opposite directions. Both sets of directions yielded significant results. To combat the possibility, that there could have been other variables, aside from the purported learned skill, a second experiment was done by those authors. Two of the subjects from the first experiment were chosen to learn to warm one finger of their dominant hand while cooling a finger of their non-dominant side. Only one of the children could yield significant results after 8 training sessions.

### **Motivation of Participants**

Differing motivation of the subjects might play a role in their ability to learn to control their hand temperature via voluntary influence of blood flow to the extremities. In a study where subjects displayed a large effect in their ability to learn to control their hand temperature it was noted by the authors of the study that subjects were eager and very cooperative (Roberts et al., 1973). In a study where motivation to learn to control hand temperature was a monetary reward, subjects were successful in demonstrating significant increases and significant decreases in hand temperature when instructed to do

so (Surwit et al., 1976). In that study, subjects were paid \$.25 for every .1°C (1.8°F) increase in hand temperature they could demonstrate.

Lynch, Hama, Kohn, and Miller (1976) also paid their subjects ( $n = 4$ ) who were children and found a significant effect in the ability to control hand temperature.

Monetary motivation has been shown to be effective in a case study where a young woman who suffered from chronically cold hands and occasional blanching learned to increase her hand temperature with biofeedback (Kaplan & Crawford, 1979). The subject agreed to deposit a significant amount of money into an account that was presumably controlled by the therapist. As she reached her targets of increased hand temperature, she earned back her money. It must be noted that no specifics were given regarding the legal and ethical considerations that would arise if the subject could not reach her goals. This study, however, did not offer monetary compensation to participants.

A second question of motivation was raised by Kaplan and Crawford (1979). Those authors posited the idea that subjects might be unwilling to learn to demonstrate true bidirectional control of hand temperature. The authors suggest that many earlier studies were flawed because there was lingering doubt that increasing hand temperature might be a result of ambient temperature, stress reduction, or other factors. Similarly, in studies that claimed that subjects learned to lower hand temperature, might simply be showing that subjects were nervous about having to perform their learned skill and any decreases were a result of stress.

Kaplan and Crawford (1979) suggested that subjects who suffer from Raynaud's disease or from chronically cold hands might be unwilling or unmotivated to learn to make their hands even colder. However, without true bidirectional control, certain biases cannot be ruled out.

### **Hypnosis for Circulation and Other Diseases**

Increasing blood flow to the extremities via hypnosis is not limited to treatment of Raynaud's. It has been claimed that that hypnosis can be used as a lifestyle improvement to reduce the risk of peripheral artery disease (Wang & Widlansky, 2009). Peripheral artery disease shares many of the symptoms of Raynaud's disease (Karavidas et al., 2006).

It was found that hypnosis can increase blood flow to participants' hands as a treatment for repetitive strain injury (Moore & Wiesner, 1996). In that study, 30 participants were divided into near equal groups of 15 subjects with 14 women and one man each. The experimental group was given one 45 minute hypnosis session per week for 6-weeks. A statistically significant increase of an average of 6.71 degrees F (3.71°C) was found for the experimental group. It was mentioned in the article that the experimental group served as its own control, but it was not explained how that was achieved. Additionally, it is questionable whether the results of a small group ( $n = 15$ ) can be generalized. Still, the results of the study done by Moore and Wiesner (1996) are encouraging in their support of the proposed study especially because their training period is similar to the training period of this study.

The heart is, of course, the central organ in the circulatory system. Emani and Binkley (2010), suggest that meditation can significantly improve heart functioning. That finding is supported by earlier research that suggests that practicing yoga can reduce endothelial dysfunction (Sivasankaran et al., 2006). The study done by Sivasankaran et al. (2006) compared a group ( $n = 10$ ) with coronary artery disease with a group ( $n = 33$ ) without coronary artery disease. While both groups practiced yoga for 6-weeks, only the group who had coronary heart disease showed a significant improvement in endothelial functioning while the group who did not have coronary heart disease only showed a non significant trend towards improvement. While heart functioning and finger temperature are two different physiological processes, it is important, for the rationale of this study, to note that mental processes have been shown to alter the autonomic processes of the heart.

In a more recent study, it was found that listening to a self-hypnosis recording for 30 minutes allowed participants to significantly reduce several unhealthy measures of cardiac and circulatory activity (VandeVusse, Hanson, Berner, & White Winters, 2010). While the research by VandeVusse et al. (2010) does not investigate finger temperature, it is important to note that those authors used self-hypnosis recordings in their study.

It is widely known that embarrassment can cause blushing, which is an autonomic process. In a study that investigated subjects' cognitive appraisal of an embarrassing situation it was found that blood flow and temperature of the cheeks can rise asymmetrically in response to experimental conditions (Drummond & Mirco, 2004). In that study subjects ( $n = 28$ ) were asked to sing a nursery rhyme while being stared at

from the side. When subjects were stared at by researchers from one side, that side of the subjects face showed a greater increase in temperature than the side of the face that was not being stared at. While hypnosis was not used in the study, the study offers evidence that mental processes can influence specific pattern of blood flow.

In another study that examined blushing, it was found that participants can learn to control autonomic processes (Welsh, 1978). Over a 4-week period, the subject, a woman age 27 years who had a chronic case of inappropriate blushing learned to control her blushing to an extent that the baseline measure of 6.4 blushing attacks per day was reduced to near zero. With only one subject, generalizability is difficult. However, if the study is valid, it offers strong support for the volitional control of circulatory responses.

### **Hypnosis and Aversive Symptoms**

Mental activity such as concentration can not only lead to positive benefits to a person's cardiovascular activity; it can also lead to negative functioning (Feldman, Cohen, Hamrick, & Lepore, 2004). The authors of that study had a control group ( $n = 20$ ) and a group that was exposed to cognitive stress ( $n = 21$ ). The authors were careful to operationalize the stressor as purely cognitive. They did this by having the subjects in the treatment group mentally create rhetorical arguments and silently rehearse the arguments for a public speaking task. Subjects reported that preparing for the public speaking task was stressful to them. More importantly, there was a significant change in cardiovascular activity in the treatment group from their baseline cardiovascular

measurements to their measurements during and after the cognitively stressful task. The authors also reported a significant difference between the cardiovascular readings of the control group and the experimental group. The controls and the research design of that study offer strong evidence that mental events can alter cardiovascular processes.

In a study that seems to be an opposite of many of the treatment-based studies, hypnosis was found to have a significant result in causing a stressful reaction (Casiglia et al., 1997). The authors of that study gathered data of the participants' ( $n = 22$ ) forearm blood flow during a phlebotomy. The next stage of the study required that the authors induce a hypnotic trance in the subjects and suggest that the subjects were undergoing a phlebotomy. All of the subjects showed statistically similar circulatory data leading the authors to claim that events of the circulatory system are partially responsive to hypnotic suggestions. However, all of the subjects were accepted based on their status as highly susceptible as determined by the Stanford Hypnotic Susceptibility Scale.

In another study that used hypnosis to cause stress and discomfort to subjects, it was found that the suggestion of pain can affect the skin temperature of the area where the subject was instructed to feel pain (Hájek, Jakoubek, Kýhos, & Radil, 1992). A significant increase in skin temperature in the skin of subject's back and on subjects' palms was found as a result of hypnotic suggestion that those areas of the body felt pain. The mean increase in skin temperature for both groups was .6 (1.8°F) degrees Celsius. Hájek et al. (1992) did not include tests for significance in their study.

### **Negative Effects of Hypnosis**



While hypnosis has been treated as almost completely benign by much of the literature (Mottorn, 2010) some investigations have been conducted of the negative side effects of hypnosis (Gruzelier, 2000). The cause for such investigations make intuitive sense, for if hypnosis is a powerful construct that can bring about positive mental and physical changes, then it is more than possible it can bring about negative changes. In a review of the literature regarding unwanted effects of hypnosis, Gruzelier (2000) offers a series of case studies, surveys, and anecdotal evidence. As such Gruzelier (2000) leads the reader to draw a causal relationship between the hypnosis in which the subject participated and the negative effects the subject reported. Gruzelier reported that negative effects of hypnosis are generally minor such as headaches and are generally short lived.

### **Use of Hypnosis Recordings in Previous Research**

In this study, listening to hypnosis recordings is the independent variable. Thus, it is important to examine previous research that investigated self-hypnosis recordings on circulatory processes. There is evidence that not only can listening to guided imagery recordings with suggestions prompt subjects to raise their hand temperature, but such recordings can also allow subjects to lower their hand temperature (Kojo, 1985). While Kojo studied only five participants ( $n = 5$ ), there were six experimental sessions for each of the subjects. The repetitive nature of the method generated data from which the author claimed significant results. What offers a bit of insight into the mind body mechanism at work is that the correlation the authors found between the instances when the hand

temperature changed and the instances when the subjects reported successful mental imagery of hand immersion in either cold water or hot water. The author offered theories as to the exact mechanism of cognitive and imaginative efforts on hand temperature.

In a study done by McGuirk et al. (1998) it was found that listening to hypnotic recordings with suggestions for altering one's bloodflow of the forearms did show a significant alteration in the blood flow. One year before, it was found that listening to a hypnosis recording coincided with a reduction in frequency of vasoconstriction response of the capillaries of the hands due to cold ambient temperature (Mück-Weymann, Joraschky, & Hornstein, 1997). As previously mentioned, blood flow to the hands and hand temperature are strongly correlated (Freedman, 1989). A 6-week regimen of listening to hypnosis recordings was used as treatment which offers strong support for this study. The authors of that study used a before-after, test-retest model, however there were not many subjects ( $n = 10$ ). The focus of their study was the neurological underpinnings of vasoconstriction in response to cold ambient temperature.

In a case study of hypnosis to treat Raynaud's disease, it was found that a highly hypnotizable subject could dramatically recover from an induced Raynaud's attack through a hypnosis session (Conn & Mott, 1984). Moreover, the subject was able to maintain the benefits of hypnosis by practicing via listening to self-hypnosis recordings. Due to the nature of a single subject case study, the reported dramatic results might not be able to be generalized.

In another study that used recordings as part of the independent variable and that examined three different types of behavioral therapy on Raynaud's disease, it was reported that subjects in the experimental group ( $n = 30$ ) showed significantly higher finger temperatures after cold stressor test than did their counterparts in a control group. The cold stressor test consisted of having the participants sit in a room that was initially set at 26°C and then lowered to 20°C. to (Surwit et al., 1979). Subjects in the control group ( $n = 15$ ) did not show increased finger temperature. The treatment was a three week regimen of listening to recorded autogenic instructions. As per standard autogenic protocols, the first phase of treatment which lasted a week consisted of focusing on heaviness of the limbs. The second stage, which lasted another week, consisted of subjects listening to recorded instructions focusing on warmth. The third stage, which also lasted a week, consisted of recorded instructions focusing on generalizability.

There are two studies that use recordings to alter cardiac physiological processes instead of altering extremity temperature. Van Montfrans, Karemaker, Wieling, and Dunning, (1990) did not use hypnotic suggestion to demonstrate a change in physiological processes in their subjects, however, they did instruct their participants to listen to relaxation recordings once a week. Their results were significant. In a more recent study, VandeVusse et al. (2010) found that listening to a self-hypnosis recording for 30 minutes significantly reduced several unhealthy measures of cardiac and circulatory activity.

### **Finger Temperature and Classical Conditioning**

Hypnosis and autogenic training are not the only forms of non-conscious learning. Classical conditioning has been shown to retrain vascular responses for positive benefit (Jobe et al., 1986). Subjects ( $n = 8$ ) were trained by pairing the stimulus of sitting in a cold ( $1^{\circ}\text{C}$ ) room with the stimulus of having both hands enclosed in a box that provided warmth. Treatment was given three times a week for 6-weeks. Before the treatment, subjects were asked to complete a questionnaire regarding the frequency and severity of Raynaud's symptoms. After treatment subjects completed a similar questionnaire. A significant difference was found between the baseline questionnaire and the post treatment questionnaire.

### **Studies That Offer Contradictory Findings**

Despite the many studies on non conscious yet volitional control of the circulatory system, as late as 2006 there was doubt as to the strength of the previous findings (Casiglia et al., 2006)(Casiglia, et al., 2006). Casiglia et al. (2006), using previous research determined that a minimum of 15 subjects was needed to avoid a  $\beta$  (Type II) error. Those authors used more than that in their study ( $n = 18$ ). All of the subjects were deemed to be highly hypnotizable by the Stanford Hypnotic Susceptibility Scale. Before the experimental sessions, the subjects were hypnotized by an expert hypnotist to establish a rapport between hypnotist and subjects. The subjects were taken through three experimental sessions involving hypnosis. The first experimental session included hypnotic suggestions for each of the subjects to imagine their dominant forearm was immersed in warm water. The second experimental session included hypnotic

suggestions for subjects to imagine their whole body was immersed in warm water. The third experimental session included hypnosis without specific suggestions pertaining to body temperature or blood flow. While the subjects forearm temperature did not significantly rise, it was found that there was a significant decrease in hemodynamic resistance and a corresponding increase in blood flow through the forearm. The second experimental session showed a significant change in several circulatory measures. The third experimental sessions did not show any significant change in blood flow. That study offers strong evidence that even though hypnosis did not cause a temperature change, it can affect autonomic processes such as blood flow, if appropriate suggestions are used. Regarding the lack of significant increase in forearm temperature, the authors claim that thermal readings from the skin are not accurate measurements of the temperature of the tissues underneath the skin. Those authors agree with the claim that hypnosis can facilitate the alteration of circulatory dynamics. Casiglia et al. suggested the possible application of hypnosis to Raynaud's disease. It must be noted that, all of the subjects in the study by Casiglia et al. (2006) were highly hypnotizable. This poses a question of generalizability to a larger population.

A study in Hong Kong indicated that guided imagery did not significantly alter blood flow in subjects (Crosson, 1979). That study compared the efficacy of guided imagery as a treatment for Chronic Obstructive Pulmonary Disease (COPD). While it was found that the control group ( $n = 13$ ), by listening to recorded relaxation instructions, did improve lung functioning, the control group did not show a significant change in

hand temperature. Though the study measured hand temperature, hand temperature was not a focus of the study, nor were there instructions regarding hand temperature embedded in the recording. This is supported by the work of Casiglia et al. (2006) that suggested that relaxation alone was not enough to effect a change in hand temperature. There must be a specific suggestion.

There is some doubt as to the efficacy and the methodological strength that support positive claims of the efficacy of hypnosis's ability to foster control over extremity blood flow (Stetter & Kupper, 2002). It has been claimed that, in aggregate, a small to medium effect size was found for studies of hypnosis and circulation published before 1999 (Stetter & Kupper, 2002). It must be noted that in the meta-analysis of such articles the qualifier of hypnosis was not used. Rather, the term autogenic training was used. Hypnosis and autogenic training operate on similar principals of focus, dissociation, and relaxation (Moore & Wiesner, 1996). Still, it must be mentioned that the methods of applying the autogenic treatment in the studies that Stetter and Kupper (2002) investigated varied in their methodological soundness.

Autogenic training was found not to yield a significant effect on blood flow to the hands or on the temperature of the hands (Freedman, 1989). Of the 16 subjects in the study done by Freedman (1989), half were assigned to the autogenic training group ( $n = 8$ ). This small sample size might call into question the results of the study. Additionally, the autogenic training was operationalized as listening to a three minute recording and then repeating a mantra of "my hands are warm and heavy" for 13 minutes.

In an additional study that compared biofeedback with a technique that did not rely upon equipment, it was found that biofeedback did not show an effect that was superior to autogenic relaxation training (Kluger, Jamner, & Bernard, 1985). That study offered directed contradictory evidence from the study done by Freedman (1989).

Ten years earlier, in a study that investigated the efficacy of autogenic training as a treatment for migraines, it was found that autogenic training did not give subjects ( $n = 12$ ) voluntary control of their hand temperature (Jessup, 1979). Subjects in the group that received autogenic instructions were given 15-minute recordings of the instructions and told to practice at home. The study lasted 12 weeks. While some scholars include autogenic instruction as another type of hypnosis (Horowitz, 2006), other scholars distinguish it from hypnosis in its theoretical base and in its application (Yurdakul et al., 2009).

A meta-analysis of Mind Body Therapies revealed a trend towards a reduction of endothelial dysfunction as a result of non-pharmacological treatment. However that trend was not significant (Prasad, Reriani, Murad, Sood, & Prasad, 2011). That article evaluated several hundred studies for inclusion into its meta-analysis. Some of those studies used hypnosis as a treatment. In the end, only three were selected. Neither of the studies used hypnosis as a treatment.

In a study that compared hypnosis, biofeedback training, hypnosis with biofeedback training and a control group, it was found that subjects ( $n = 9$ ) who were hypnotized with suggestions for warming their hands could not show significant results

while subjects ( $n = 9$ ) who received biofeedback training were able to demonstrate a significant difference between their hand temperatures (Crosson, 1979). It must be mentioned that subjects in the hypnosis group did show an increase in temperature during the hypnotic induction, but not during or after the suggestion phase of the hypnotic treatment. That increase in temperature was hypothesized to be the result of the relaxation effect of the induction.

In that study, four groups of nine subjects each were given different treatments, biofeedback training, hypnosis with suggestion, biofeedback with suggestion and a control group that received a false suggestion and pseudo feedback. Only the group that received biofeedback could show a significant difference in hand temperature. It is interesting to note that subjects who received biofeedback with suggestion did not show a significant effect but biofeedback without suggestion did show a significant effect. Crosson (1979) did not offer an explanation for how a hypnotic suggestion of hand warmth in the treatment group that received both hypnosis and biofeedback cancelled the effect of the biofeedback treatment that had shown a significant effect in another group. One problem with Crosson's method was his use of a distracter task that was to prevent subjects from getting a head start on influencing their peripheral blood flow. The distracter was a cognitive task that was similar to the ones that have been shown to be stressful enough to reduce blood flow to the hands (Jamieson, 1987). It could be that the anomalous hand warming during the induction was due to the subjects recovering from the stress of the cognitive distracter.



Further, questions of his design can be raised. In particular, Crosson's treatment of hypnosis as a method for learning to control hand warmth was done only once with that group's nine subjects. Crosson (1979) merely showed that one session of hypnosis was not sufficient for a group of nine subjects to learn to control their hands.

In an early case study of a single subject ( $n = 1$ ) who suffered from Raynaud's it was reported that self-hypnosis alone did not allow the subject to raise his hand temperature (Jacobson, Hackett, Surman, & Silverberg, 1973). However, it must be noted that the subject was a poor respondent to traditional hypnotic inductions. Moreover, success was measured only after three sessions of self-hypnosis. Due to the methodological weaknesses and the fact there was only one subject, caution must be used in accepting the results.

Similar results were found in a study that was done 18 years later (Freedman, Keegan, Migaly, Galloway, & Mayes, 1991). In a study that placed subjects into a group that received biofeedback training ( $n = 16$ ) and a group that received autogenic training ( $n = 15$ ), it was found that autogenic training did not allow for significant increases in finger temperature or finger blood flow. However, no details were given regarding the autogenic training. Thus, caution must be used when applying the findings of Freedman, Keegan, Migaly, Galloway, and Mayes (1991).

Those findings are very close to the findings of an earlier study that claimed autogenic training did not show a significant effect in finger temperature while biofeedback did show a significant effect (Freedman & Ianni, 1983). It must be noted

that the autogenic training was limited to having subjects listen to three minutes of a recording that was used in an earlier study (Surwit, Pilon, & Fenton, 1978) and then repeating the phrase “my hands are warm and heavy” for 21 minutes.

In a later study that points out the lack of longitudinal data on behavioral therapies and Raynaud’s disease, it was claimed that biofeedback was more effective than autogenic training (Freedman, 1987).

However, in a study by some of the same authors as the studies listed above, autogenic training was found to have a significant effect (Keefe et al., 1980). The researchers compared autogenic training, biofeedback training, and progressive relaxation. The subjects ( $n = 21$ ) were divided into three experimental groups. It was determined by the authors that a control group was not necessary for the validity of the experimental design. All of the subjects showed an improvement in maintaining a warm hand temperature during a cold stressor during all sessions after the baseline session; the final session was found to be statistically significant. However, only the subjects in the autogenic training and in the progressive relaxation group showed significant improvements in the management of their symptoms. The subjects in the biofeedback group did not show significant improvement. That claim directly contradicts the work of Freedman (1987).

In an even earlier study it was found that a 6-week regimen of autogenic training did allow subjects ( $n = 30$ ) to show significant improvement in maintaining hand temperature in a post test cold stressor (Surwit et al., 1978). In a design that used two

groups, one that used only autogenic instructions and one that used autogenic instruction with biofeedback, subjects sat in a room that was lowered to 17°C. Biometric readings of their hand temperatures were recorded. After a period of 6-weeks subjects showed a significant difference in ability to maintain a comfortable hand temperature over their pretest. It is important to note that in addition to laboratory instructions, subjects were told to practice the autogenic instructions by listening to a recording of it.

### **Summary and Transition**

Over a nearly 40-year period, there have been numerous studies on gaining control of blood flow to the hands and fingers as well as gaining control of the temperature of the hands and fingers. None of the studies were identical to this study's research design.

Specifically, none of the studies that have been done in this area investigated self-hypnosis as a primary variable. Very few of the studies investigated subject's ability to warm only one hand or one finger of one hand while keeping the other fingers at a baseline temperature. Those studies that did investigate such control of hand temperature used small samples that were selected for their high degree of hypnotizability.

While the previous research reviewed in this chapter is certainly encouraging and suggestive in terms of the possibility learning control of hand temperature via self-hypnosis, there is still a knowledge gap. That knowledge gap is the

question of whether a person with no training in hypnosis can download an inexpensive hypnosis recording and benefit from it by reducing the effects of Raynaud's disease.

## Chapter 3: Research Method

### **Introduction**

The third chapter includes details about how this study was done and is divided into sections that address the major components of the data collection of this study. This chapter begins with a description of the design of the research. The research design consisted of both a comparison of groups that receive different treatments and of a comparison between before treatment data and after treatment data.

The resources that this study used, including electronic methods of communicating with participants, are discussed in this chapter after the research design. This study used a website as a collection point for the survey data and as a distribution point for the recordings. Participants entered their survey responses into the website and downloaded or streamed the recordings from the website.

The method of interacting with participants is also discussed in this chapter. Specifically, this chapter discusses how participants were solicited. Similarly, the section that describes in interaction with participants lists the important aspects of meetings where the author measured participants' ability to control their finger temperature.

The recordings that were listened to as treatment are discussed in detail in this chapter. This discussion of recordings includes a description of each of the recordings, the one the experimental group listened to and the one to which the control group listened. Finally, treatment of participants including protection of data is discussed in

this chapter. The discussion of participant protection details the multiple layers oversight to ensure that not only were participants safe, but their data were protected as well.

This study compared the ability to control finger temperature by an experimental group and a control group after a treatment regimen of recorded self-hypnosis versus recorded instruction exercises.

The research question of this study was, Would listening to a self-hypnosis recording allow listeners to learn to influence their finger temperature? Previous studies (Casiglia et al., 2006; Jambrick et al., 2005) have shown a significant correlation between hypnosis and hand temperature control. This study is different because it focuses on self-hypnosis. The independent variable is participation in a mental training regimen that offers participants the opportunity to learn to control their finger temperature. The dependent variable is the control of the temperature of their fingers.

At the beginning of the study, participants were instructed to attempt to raise the temperature of the fingers of one hand while lowering the temperature of the fingers of the other. The temperature of the fingers of each hand was measured. An experimental group listened to a self-hypnosis recording two times per week for 6-weeks. A control group listened to a neutral recording tape under the same regimen. At the end of the study, participants were again instructed to attempt to raise the temperature of the fingers of one hand while lowering the temperature of the fingers of the other, and finger temperature was again measured.

In addition to the data collected from the meetings, participation in the regimen was measured. After each engagement of the 12 exercises, participants were to answer a survey that qualified and quantified their efforts. There were 12 sets of survey responses for each participant because each participant was to engage in the cognitive exercises two times per week for 6. A copy of the survey is included in Appendix C.

Third, a posttreatment survey was taken after participants had completed the 6-week training period. This post treatment survey contained six questions. The questions gathered data on participants' perceptions of the regimen's effectiveness as well as their expectation of success during the final measurement.

Both the experimental group and the control group were encouraged to create a difference in left and right finger temperature during the 6-week regimen, but no finger temperature measures were taken during that period. All participants were allowed to choose the time of day and the day of the week to listen to the recording. Participants were given instructions for creating an optimal experience.

The experimental group underwent a self-hypnosis regime consisting of listening to a recording. A different treatment was given to the control group consisting of a recording that is mostly silent but included periodic instruction to consciously concentrate on raising the temperature of the fingers of one hand while lowering the temperature of the fingers of the other hand.

This study's literature review examined previous works that spanned a time period of nearly 40 years. A total of 155 articles were cited in this study. While not all

of those sources were investigations into volitional control of body temperature, of those that were, the number of participants averaged 20. Though the range was a study that used 1 participant to a study that used 78, the vast majority of the studies use less than 30 participants and over half used less than 20 participants. Because of the results of the reviewed literature, this study used 20 participants randomly divided into two groups.

### **Sample**

Participants were solicited by methods of convenience. The participants were adults over age 18 without symptoms of circulatory health problems. Participants did not have experience with hypnosis. Participants were required to have reliable access to the Internet to complete the surveys.

There were several methods for soliciting participants. One method was to use an elementary school that was close to the author's residence as distribution point for flyers advertising the need for participants. The flyers contained information about the nature, duration, and requirements of the study. An e-mail address and a URL of a website were listed at the bottom of the flyer. The website held detailed information about the study, its goals, its requirements and other information for potential participants.

A second method was to use social media. By setting up a Facebook page for this study and soliciting participants through such an online venue, this study attracted a larger potential participant pool than not using social media.



Yet another method was to advertise through a youth sports league that is in the same zip code of the author's residence. Hundreds of flyers were distributed to adults at children's athletic events.

Those who responded to either of the methods of solicitation were told in detail about the time commitment required for the study. Once respondents had agreed to participate in the study and had signed the informed consent document, they were randomly placed into groups.

Demographic data of the participants are provided in Chapter 4. Demographic information includes age, gender and ethnicity. Only participants who did not have symptoms of circulatory conditions were used. Limiting the participant pool to only people without circulatory health problems reduced confounding variables and improved methodological strength.

Expected effect size was determined by looking at three studies that are of particular relevance to this study. Quekelberghe (1995) showed a mean increase of 2.10 C in participants' hand temperature. Similarly, a study done by Moore and Wiesner (1996) showed that a mean increase of 6.71 F after a hypnotic treatment. A study done by Violani and Lombardo (2001) demonstrated that participants could increase the temperature differences between their two hands by 2.03 C.

### **Research Design**

This study was an independent sample experiment with a control group and an experimental group. The independent variable was a listening regimen. Participants

listened to either a hypnosis recording or a neutral recording with instructions for participants to consciously concentrate on their finger temperature. Both groups were asked to listen to the recordings two times per week for 6-weeks.

This design is supported by multiple studies that made up the foundation for this study as discussed in the Chapter Two. Specifically, recent studies done by Horowitz (2006) and Manocha et al. (2010) set a precedent that multiple methods of engendering body temperature control are appropriate. This study, to reduce possible confounding variables, had participants attempt to alter the temperature of two body parts simultaneously. This feature was done in previous studies and offered solid evidence that any changes were not due to ambient air temperature (Stephoe, Mathews, & Johnston, 1974; Van Quekelberghe, 1995) This study's comparison between pretreatment and post treatment data was based on studies done by Kluger, Jamner and Bernard (1985) and by Freedman (1987).

The participation surveys were administered online. Participants were instructed to complete a survey after each one of the 12 instances of listening to a recording. The surveys were used to collect information on how thoroughly the participants kept to the regimen of two practice sessions two times per week. Additionally, the survey contained questions that collected information about the participants' thoughts on the effectiveness of their method of training.

At the end of the instructional meeting, participants' finger temperature was measured twice. Because measurements were taken with a noncontact infrared

thermometer, obtaining measurements of finger temperature only required seconds. Thus, finger temperature measurements were taken quickly and accurately for each participant at the instructional meeting and at the meeting for final measurement. I obtained the finger temperature measurements using a Fever Watch Thermometer (Model RC802i). This thermometer is approved by the Food and Drug Administration and sold over the counter for use by the public. No special training to use the thermometer is required.

The readings were taken from the back of the participants' fingers. Participants were instructed to put their fingers together. This ensured that the thermometer is not gathering data from the open space between fingers. The focus of the thermometer was the first knuckle of the index or the middle finger. This focus point ensured that the thermometer did not gather data from the fingers' surrounding area.

The series of surveys that each participant completed provided data that was analyzed in conjunction with the initial finger temperature measurement and post-treatment finger temperature measurement. The series of surveys yielded data on the perceived effectiveness of the cognitive exercises. Results from those surveys was used to evaluate biases such as a self-fulfilling prophecy and, conversely, whether belief in the training mechanism was necessary for the mechanism's success. Accordingly, though participants were asked to practice at home, they were directed not to measure their finger temperature at home. Asking them not to measure their fingers was done to eliminate the possible variable of expectancy.

The final finger temperature measurement was scheduled and performed for each participant on an individual basis after he or she had completed the 6-week regimen.

### **Online Resources**

There was a website that supported this study. The web address was [www.handtemperaturecontrol.com](http://www.handtemperaturecontrol.com). The site had information for potential participants as well as information for participants who had agreed to the study's requirements. The site contained the link that enabled participants to access the online survey after each of the exercises. The site also contained my contact information. The website contained only one webpage. A copy of the screenshot of the website's page is included in Appendix B.

The surveys were created and were hosted on an online survey software called Survey Monkey. The software was hosted on a site of the same name, [www.surveymonkey.com](http://www.surveymonkey.com). [Surveymonkey.com](http://www.surveymonkey.com) is a popular, easy to use, and effective site that allowed for efficient and thorough data collection (survey-reviews.net, 2009).

The site [www.handtemperaturecontrol.com](http://www.handtemperaturecontrol.com) contained a reminder that participants could discontinue their participation at any time for any reason. It also contained my contact information.

### **Communication with Participants**

Participants had contact information of this study's author. Contact information was an e-mail address and a mobile phone number. Participants were instructed that they are welcome to contact me for information about this study, their participation, withdrawing from the study and other reasons.

Email communication was initiated by me of this study to the participants in an effort to prevent attrition. I contacted the participants en masse with reminders and encouragement to continue with their efforts. The e-mail was to all of the participants to maintain the integrity of the double blind nature of the study.

### **Setting**

Each participant met me in an individual, informational meeting. The meeting took place in a conference room in a medical office building. I thoroughly reviewed the informed consent document. Participant consent was obtained.

The meeting place was central to the area from which participants were drawn. During the informational meeting, participants were asked to attempt to demonstrate their ability to control their finger temperature by creating a difference between the temperatures of the fingers of their two hands. During this meeting participants were told they were welcome to take as long as 20 minutes. Twenty minutes was the length of the recording to which they would listen.

After the informational meeting, the treatment was self-administered by the participants in their home. The requirements of this study were that participants must attempt the 20-minute training sessions two times per week for 6-weeks. The participants had the flexibility to decide when to do the 25-minute sessions. The flexibility extended to time of day in addition to day of the week. Further, participants had the flexibility to listen to the recordings on a personal music player, a computer, a CD player, or other

such format that was convenient for them. As such, participants had the choice to listen to the recordings using headphones or using conventional speakers.

The participants were instructed to refrain from more than one alcoholic beverage for the day on which they planned to listen to a recording. Participants were instructed to refrain from listening if they were sick or injured. Likewise, participants were instructed to not attempt to participate if they experienced a mood or an emotional set that was significantly different than their normal condition.

Participants were instructed on factors that are conducive to successful completion of the mental exercises of either group. Some factors are a comfortable position and a setting that would remain quiet for 25 minutes.

### **Treatment**

The treatment in this study was participation in a regimen of listening to self-hypnosis recordings two times per week for 6-weeks. Other studies have used this length of training (Credito, 1981; Mück-Weymann et al., 1997; Kaplan & Crawford, 1979). The treatment for the control group was a neutral treatment of having participants listen to a recording that only offered instructions to consciously concentrate on the temperature of their fingers.

The recordings were made available through a download link on this study's website. Participants were instructed to download the MP3 recording that corresponded with the group to which they were assigned. At the instructional meeting, participants were informed that an alternate method of obtaining the recordings was available. A CD

containing the recording could be provided, at no expense, if they were unable to download the recording.

## **Instrumentation**

### **Surveys**

Each participant took two types of surveys. The surveys were created using SurveyMonkey.com. The first survey was a participation survey that was administered after every instance when a participant attempted to listen to a recording. The maximum number of times a participant was to take this survey was 12 because each participant was instructed to listen to the recording two times per week for 6-weeks. The surveys were to be completed soon after participants from both groups attempted the mental exercises. The 12 surveys were identical and contained nine questions about the participants' efforts during the exercises. Participants took each survey by going to this study's website and clicking on the link that corresponded to the number of times they had listened to the recording. Thus, this study produced 12 surveys for each participant.

Each of the nine questions of the twelve identical surveys was close ended and objective. The questions limited the participants' responses to options that categorize the participant's responses. The responses from the survey were analyzed along with the measurement of finger temperature differences. The final finger temperature measurement was scheduled and performed for each participant on an individual basis after the participant had completed the 6-week regimen.

Table 1

*Questions For The Set of 12 Surveys*

## Question number

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1	Please enter your participant ID
2	What time of day did you engage in the exercise?
3	Was this most recent exercise performed at approximately the same time as the last time you engaged in the exercise? Please check "first time" if this is the first of your 12 attempts at the exercise.
4	In what location/position did you engage in the exercise?
5	Is this the same location as your last engagement? Please check "first time" if this is the first of your 12 attempts at the exercise.
6	Were you able to listen to the entire recording?
7	If the answer was 'No' to question 6, please select why.
8	How well were you able to maintain focus for the exercise?
9	Did you enjoy the exercise?

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The questions on the 12 identical surveys are listed in Table 1. A copy of the survey can be found in the appendix of this study. The second survey was taken after participants attempted the mental exercises 12 times and before they meet with this study's author to have their finger temperature measured. The second survey contained six questions. The questions were designed to elicit data regarding participants' perceptions of the exercise and of the forthcoming measurement of their ability to control their finger temperature. The questions are listed in Table 2.



Table 2

*Questions From the Survey After the Training Regimen*

Question number	Question text
1	Please enter your participant ID number.
2	Overall, how would you rank your participation in this study. 5 being that you gave each exercise your best effort and 1 being that you did not give your best effort to a majority of the exercises.
3	Do you think that the mental exercises in which you engaged will allow you to demonstrate different finger temperatures in the upcoming measurement session?
4	Do you think the mental exercises will allow you to alter the temperature of your fingers?
5	Do you think the mental exercises will allow you to alter the blood flow of your fingers?
6	Do you think nervousness might affect your ability to demonstrate a difference in finger temperature during the measurement session?

**Recordings**

The hypnosis recoding was created by a British company, Uncommon Knowledge. That company offered self-hypnosis recordings for sale via download in an MP3 format. An Internet search revealed several websites and companies that offer hypnosis recordings. Uncommon Knowledge was selected for this study because the

company offers more self-hypnosis recordings than other sites. Uncommon Knowledge has been offering self-hypnosis recordings since 1995. At the time this study was initially devised, Uncommon Knowledge's site [hypnosisdownloads.com](http://hypnosisdownloads.com) was the top result returned by Internet searches.

After being contacted and told of the needs of this study, the owners of Uncommon Knowledge were willing to support this study by providing both the treatment recording and the control recording.

Both recordings were 18-minutes long. Both recordings began with a light classical music and the narrator introducing himself. The control recording then had long periods of silence with periodic interruptions by the narrator as he encouraged listeners to continue to concentrate on their finger temperature. The hypnosis recording then offered a brief introduction of the nature of hypnosis. That was followed by the appropriate use of hypnosis. The recording offered a standard induction to assist the participants in the treatment group achieve a hypnotic state. After the induction phase, the recording offered the participants suggestions that supported the idea that mental activity can alter finger temperature. The recording concluded with a segment that encouraged a gradual transition to a normal state of consciousness. A transcript of both the self-hypnosis recording for the experimental group and a neutral recording for the control group is included in the appendix.

### **Thermometer**

The thermometer that was used was a Fever Watch Thermometer (Model RC802i). That thermometer is a non-contact, infrared thermometer that was easily available in most health related retail outlets. It is approved by the Food and Drug administration for medical use. The thermometer is accurate to tenths of degrees Fahrenheit. It is sold over the counter. No special training was needed to operate it.

It was assumed that the thermometer would yield consistent and valid results. It was calibrated with Craftsman Infrared industrial thermometer with laser guidance (model Model# 50466). Though the Craftsman thermometer was meant for measuring inanimate objects, it is an accurate gauge of temperature from -58F to 100F.

### **Protocol for Measuring Finger Temperature**

A standardized protocol for measuring finger temperature was followed for the initial measurement and for the final measurement. The standardized protocol was applied to every participant. For the convenience of the participants, I met the participants individually.

At the initial meeting, participants were encouraged to raise the temperature of the fingers of one hand while lowering the temperature of the fingers of the other hand. Participants were told they would have up to twenty minutes to attempt the temperature change. When participants indicated they were ready, their finger temperature was measured. The back of the middle phalanx of the middle finger was measured. The measurement that was displayed on the infra red thermometer was immediately recorded into a laptop.

The final meetings occurred after participants had listened to the recordings 12 times, participants were again instructed to attempt to raise the temperature of the fingers of one hand while lowering the temperature of the fingers of the other hand. They were told they had 20 minutes to produce the change. They had the option to listen to the recording during that 20 minute time. After the 20 minute time period which coincided with the end of the recording, participants had their finger temperature measured and recorded. The measurement was immediately recorded into a laptop computer.

### **Protection of Participants**

#### **Discontinuation**

The solicitation flyers made it clear that participants were not bound to participate or continue participation. All participants were told in the instructional meeting that their participation was completely voluntary and that they had the right to discontinue participation for any reason.

At the end of the treatment, participants were asked to take a survey about their perceptions of their exercises, either hypnotic or concentration. That survey included reminders about participants' ability to discontinue participation for any reason without obligation.

### **Record Keeping**

#### **Personal information**

The personal information of names of participants, contact info of participants and other information was maintained in a password protected computer file. I did not share such information with anyone save the appropriate faculty at his university. At the instructional meeting, participants were assigned an identification number when they were randomly placed into groups. Participants did not enter any personal data into surveymonkey.com or into any of the surveys.

### **Survey Information**

In order to take the online surveys, participants were required to enter the identification number given to them at the instructional meeting. Thus, specific data on perception and data on performance after the treatment was not directly linked with participant names. Surveymonkey.com was an established Internet corporation that uses SSL (Secure Sockets Layer) technology.

### **Initial and Post Treatment Finger Temperature Measurement.**

After the first part of the initial meeting when participants were given information about the study, the temperature of the fingers of both hands were measured. I recorded the data from the thermometer only by the identification number given to the participant at the instructional meeting.

### **Variables**

The primary independent variable was participation in a regimen of mental exercises. There were two groups participating in a regimen. The first was the experimental group who participated in a regimen of listening to a self-hypnosis

recording. The second group was the control group that participated in a regimen of listening to a recording that instructed them to consciously concentrate on changing their finger temperatures. Participants in this group were instructed to consciously concentrate on warming the fingers of one hand while simultaneously cooling the fingers of the other. To measure the extent of their participation, participants responded to survey questions after each attempt of the mental exercises.

The first dependent variable was difference between pretreatment ability to control finger temperature and the post treatment ability to control finger temperature. The other set of dependent variables were provided by the participants' response to the survey questions. Participants were asked to answer the survey questions after each instance of engagement in the exercise. There were nine survey questions. Those nine questions were answered by the number of participants ( $n = 20$ ). This occurred two times per week for 6-weeks. Thus, there were 20 participants, answering nine questions on 12 different occasions.

### **Data Analysis**

A standard independent samples t-test was performed to evaluate the difference in ability to control finger temperature after the study between the two groups. The independent variables were the two different recordings. The dependent variable was the difference between the finger temperatures on the participants' different hands.

A repeated measures t-test was performed to investigate the relationship between the pre-listening recording and the post listening recording was done.

The degree of subject participation was a major factor in this study. As such it was measured by the survey that was taken after each instance of listening. Participation was defined as whether participants listened to the entire recording and whether participants maintained focus.

Bivariate Correlations were done to evaluate the relationship between survey responses and the ability to control hand finger temperature as measured at the final meeting. The outcome of the analysis is presented in detail in Chapter 4.

## Chapter 4: Research Method

### **Introduction**

This study investigated whether self-hypnosis could afford healthy adults control over finger temperature. It has been shown in previous research that hetero hypnosis and biofeedback not only can allow people control over their extremity temperature, it has been used clinically as treatment for some diseases. Self-hypnosis has not been used as a treatment for such diseases.

Thus, this study was designed as an exploration of whether self-hypnosis could grant control over finger temperature in those without circulatory problems. The rationale behind this research design is that if healthy people could control their finger temperature, then future research might use the results of this study as a reason to use self-hypnosis clinically.

### **Research Question**

The research question this study attempted to answer is, will listening to self-hypnosis recording for 6-weeks allow participants the ability to control their finger temperature to the extent they can raise the temperature of fingers of one hand while lowering the temperature of fingers of the other? This question is important to investigate because current treatments for Raynaud's Disease have drawbacks such as cost, pharmacological side effects, and lack of accessibility. Previous investigations into hypnosis and autonomic control have focused on hetero-hypnosis where a professional was necessary.

### **Hypothesis**

This experimental study used a test/retest design between two groups, an experimental and a control group. Listening to a recording with instructions to control finger temperature was the primary independent variable and volitional control of finger temperature was the dependent variable.

In addition to the main variables of ability to control finger temperature, there were several other categories of data that were collected. The categories of data were demographic data such as age, ethnicity and gender. Treatment application data such as what time of day did the participant listen and in what position did the participant listen were collected by surveys that were completed after each instance of listening. A category of thoroughness of participation was comprised of questions asking about duration of listening, mental focus during listening and enjoyment was also collected by surveys completed after each instance of listening. There was also a survey that was



completed after a participant listened to the recording 12 times, but before he or she met with me.

### **Demographic Characteristics of Participants**

Noninvasive demographic data was collected on 43 participants. As discussed in the Delimitations section of Chapter 1, the demographic characteristics of the participants were quite diverse. The demographic data collected were age, gender, and ethnicity (see Table 3). Over a span of months from February 2012 to May 2012, 43 participants started the study.

Table 3

*Ethnicity and gender of participants*

Demographic Characteristic	Finishers	Percentage	Non-Finishers	Percentage
Male	6	14	8	19
Female	14	33	15	35
Caucasian American	5	12	8	19
Male				
Caucasian American	12	28	12	28
Female				
African American	1	<1	0	0
Male				
Asian American	1	<1	2	<1
Female				
Hispanic American	0	0	1	<1
Male				
Hispanic American	1	<1	0	0
Female				
Average age	49.2		37.5	

Note.  $N = 43$

Table 4

*Ethnicity and gender of participants by group finishers*

Demographic Characteristic	Experimental Group Finishers	Percentage	Control Group Finishers	Percentage
Male	4	20	2	10
Female	7	35	7	35
Caucasian American Male	4	20	1	5
Caucasian American Female	7	35	5	.25
African American Male	0	0	1	5
Asian American Female	0	0	1	5
Hispanic American Male	0	0	0	0
Hispanic American Female	0	0	1	5
Average age	53		43	

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Note.  $n = 20$

In order for a participant to be classified as started the study, he or she had to have met me at the study location and have his or her ability to control his or her finger

temperature measured. At that meeting, participants were shown the study requirements and the informed consent form. At that meeting participants were randomly placed into groups. One group of participants was assigned the experimental recording which contained self-hypnosis instructions. The other group of participants was assigned the control recording which was mostly blank but had periodic instructions for participants to consciously concentrate on creating a difference in their hand temperature.

More than half of those who started the study did not finish. Not finishing is defined as not meeting with the researcher to have one's ability to control finger temperature measured after listening to a recording. As mentioned above, 43 participants met with the researcher to have their ability to control finger temperature measured. Of those 43, 20 participants met with the researcher to finish the study. Eleven participants were assigned to the experimental group. Nine participants were assigned to the control group.

Forty of the participants started the study within 6-weeks of each other. Three other participants began the study in the months of April 2012 and May 2012 as their awareness of the study and their ability to meet with me allowed for their embarking on the study.

The 20 participants who finished the study did so in a more spread out manner. The average number of days between meeting with me to initiate the study and meeting with me the second time to test the effect of the recording was 71 days (see Figure 1). The study was designed to have participants listen to the recording over a six week time

period and meet with me shortly after listening to the recording for the 12<sup>th</sup> time. The shortest number of days between the initial meeting and the final meeting was 47 days.

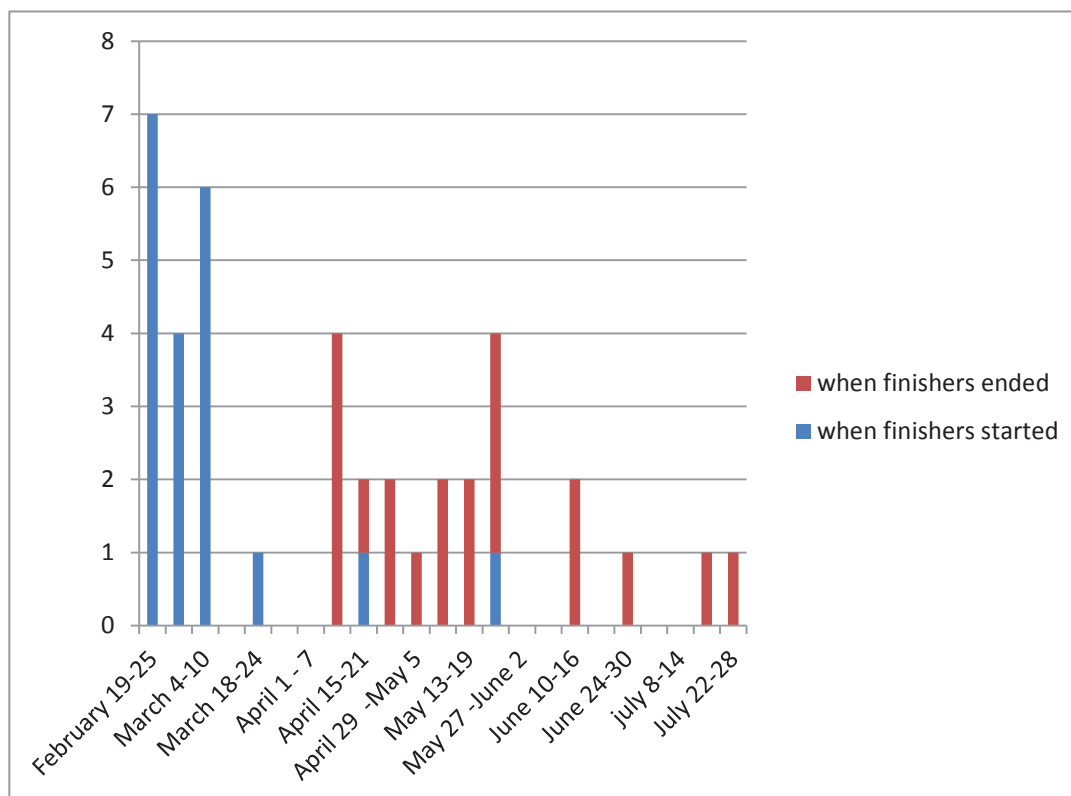


Figure 1. Date range of when participants began and finished the study.

There was a 53% attrition rate from the 43 participants who had started the study. Attrition is defined as not meeting with me to have their hand temperature measured a second time.

### **Control Group Versus. Experimental Group Post-treatment Results**

Of the 11 participants in the experimental group who completed the training, nine were able to demonstrate more than a .5 difference between the finger temperatures of their two hands. Of the nine participants in the control group who completed the training,

eight were able to demonstrate more than a .5 difference between the finger temperatures of their two hands. There was not a significant difference ( $p < .05$ ) between the ability to control hand temperature between the control group and the experimental group (see Table 5).

Table 5

*Comparison of Control Group and Experimental Group*

	Group label	Mean Difference in Hand Temperature	Std. Deviation	Std. Error Mean	Sig. (2 tailed)
Post treatment difference in hand temperature	experimental	1.327	.8150	.2457	.390
	control	1.700	1.0782	.3594	

**Pre-Treatment Versus. Post Treatment Results**

In comparing the ability of the participants to control their hand temperature before undergoing the treatment of listening to a recording two times per week for 6-weeks, a matched pairs  $t$  test was performed. There was a significant difference ( $p < .05$ )

Table 6

Participant ability before recordings and after

	Mean	N	Std. Deviation	Std. Error Mean	Sig. (1-tailed)
pre_difference	.380	20	1.0294	.2302	.05
Post_difference	1.495	19	.9355	.2092	

for both groups between the demonstrated ability to control finger temperature in Fahrenheit before the treatment and the demonstrated ability to control finger temperature in Fahrenheit after the treatment ( $p = .002$ ; see Table 6 and Table 7).

Table 7

*Raw finger temperature by group* **Duration of Participation**

Participants by Group	Difference in Finger Temperature Before Treatment	Difference in Finger Temperature After Treatment
Experimental	1.10	2.20
Experimental	0.40	0.4
Experimental	0.20	0.30
Experimental	1.10	0
Experimental	2.70	2.10
Experimental	0.70	2.40
Experimental	0.40	1.5
Experimental	0.40	1.1
Experimental	-1.20	1.5
Experimental	-0.10	1.90
Experimental	-0.30	1.2
Mean for Experimental		<b>1.33</b>
Control	0.60	0.1
Control	-1.90	2.4
Control	1.70	4.00
Control	0.20	1.3
Control	-0.80	2
Control	0.70	1.10
Control	1.30	1.40
Control	1.00	1.80
Control	0.2	1.20
Mean for Control		<b>1.7</b>



Because participants met with the researcher on different dates and began listening to their recording when they chose, most participants had different start dates than other participants. Further, because participants listened to the recordings when they could fit it into their normal weekly routine and because participants and the researcher author had to find a mutually agreeable time to meet, participants finished on different dates and in differing lengths of time. a rolling basis.

The study was designed so that each participant would listen to his or her assigned recording two times per week for 6-weeks. With seven days in a week, the earliest a participant could have finished was 42 days. The participant who finished closest to that time span met with the researcher, listened to the recording 12 times, and met with the researcher again in 47 days. That participant created a 2.0° F difference in her hand temperature. The longest span of participation was 120 days. That participant created a 1.8° difference in his hand temperature. The average time participants spent participating in this study was 70 days. A significant relationship between duration participation and ability to control finger temperature was not found.

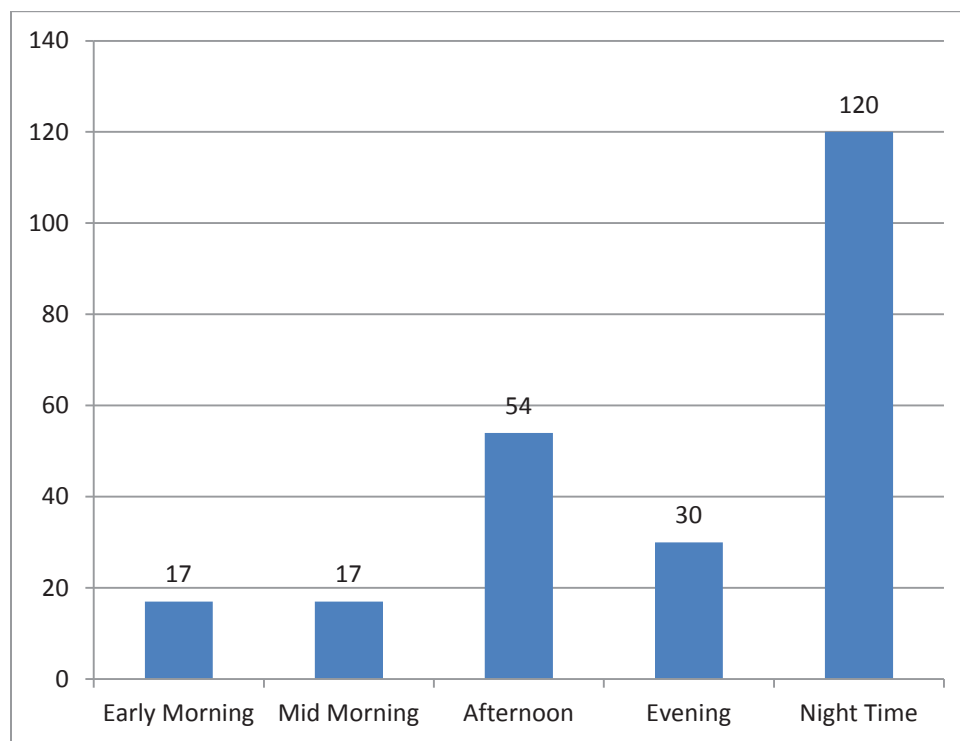
### **Results from Surveys**

After each time participant's listened to their assigned recording, they were to answer a survey about their listening experience. Responses pertaining to time of the day during which participants listened, position in which participants listened, degree of listening, and enjoyment were analyzed. Accordingly, relationships between survey

responses were analyzed. The remaining three questions of the survey were examined but did not appear to provide meaningful data, so they were not analyzed further.

### **When participants listened**

Because this study was designed as an investigation of self-hypnosis, participants were allowed to choose the time of day. After each instance of listening, participants were to answer one of the survey questions that asked when they listened to the recording. Of the 238 responses of the 20 participants who met with the researcher after listening to the recording 86% of the responses indicated that participants chose to listen to the recording at any time other than the evening. The evening is defined as 4:30 to 6:30 pm and is also the time during which 86% of the final measurement meetings took place (see Figure 2). This finding is important because none of the post treatment meetings when participants attempted to control their finger temperature happened during this time.



*Figure 2.* When participants listened

### **Position when listening to recordings**

Participants could choose to listen to the recording in any position that was most comfortable for them. After each time they listened to the recording, each participant was to take a survey which included a question about their position while they listened. That survey question had six choices: couch lying down, couch sitting up, straight chair, reclining chair, bed sitting up, and bed lying down. As Figure 3 shows, the straight chair response was the one most often indicated at 25%. This response means that 75% of the

time, participants were in a position that was not a straight back chair. The importance of position of listening is discussed in Chapter 5.

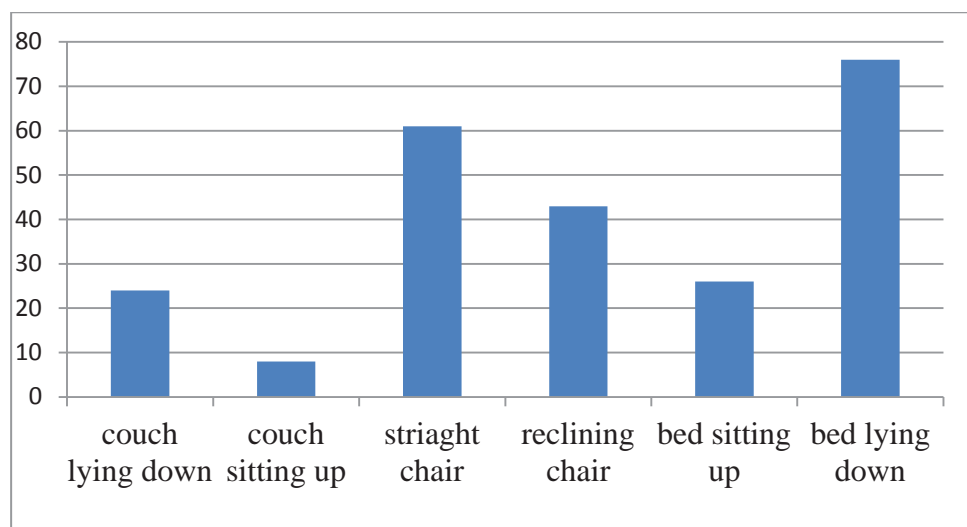


Figure 3. Position while listening

### **Participation.**

A participation score was derived from each participant's responses to question six and question eight of the survey participants took after listening to each instance of the recording. Question 6 asked participants if they had listened to the entire recording. Because participants were to listen to their assigned recording 12 times, they should have answered Question 6 12 times. For each "yes" answer that participants gave for question 6, they were given one point towards their participation score. Thus, there would be a maximum of 12 points for question six.

Question eight asked participants how well they had maintained focus for the recording. There were five choices that participants could choose when answering the

question. The response choices were *very distracted*, *somewhat distracted*, equal, mostly focused, and *completely focused*. A zero was assigned to very distracted responses. A .3 was assigned to somewhat distracted responses. A .5 was assigned to equal responses. A .8 was assigned to mostly focused responses. A 1 was assigned to completely focused. Thus, there would be a maximum of 12 points for question six if a participant reported that he or she was completely focused for every recording. Not one of the finishers reported the he or she was completely focused for every recording. When each participant's combined score out of 12 for the question six and question eight were added, participants had a participation score on a 24-point scale.

A bivariate correlation was performed (see Table 8). A significant relationship ( $p < .05$ ) for both groups combined was found between subject participation and the ability to create a difference in temperature between the fingers of their two hands. ( $p = .018$ ). For the experimental group a significant relationship was found between post treatment ability to control hand temperature and participation ( $p = .023$ ). For the control group a significant relationship was not found ( $p = .092$ ), which means that for the experimental group there was a positive relationship between whether participants listen to the whole recording each time and maintained focus each time and whether they were able to demonstrate a significant hand temperature difference at the final meeting with me.

Table 8

Correlation between participation and the ability to create a difference in finger temperature

		Post_difference and participation both groups	Post_difference and experimental group	Post_difference and control group
Post_ difference	Pearson Correlation	.525	.674	.594
	Sig. (2-tailed)	.018	.023	.092
	<i>N</i>	20	11	9

### Enjoyment.

Question nine of the survey asked participants if they enjoyed the mental exercise of listening to the recording. Yes responses were given a one and no responses were given a zero. Thus each participant would have an enjoyment score out of 12 points.

A Bivariate Correlation test showed that there was not a significant relationship ( $p < .05$ ) between whether participants enjoyed the exercises and whether they were able to create a difference in their hand temperature ( $p = .758$ ). A non-significant relationship was found when the experimental group's ability was compared with whether that group enjoyed the exercises ( $p = .119$ ). Similarly, a non significant relationship was found when the control group's ability was compared with whether members of that group enjoyed that exercise ( $p = .491$ ). These results are presented in Table 8. Because both groups were able to demonstrate control over their finger temperature, it can be

concluded that enjoyment of the exercises was not necessary for the exercises to be effective.

Even those who did not show a significant ability to control hand temperature reported that they enjoyed the exercises. In fact, the participant whose difference in hand temperature at the final meeting was zero had a very high enjoyment score. She had a 10 out of possible twelve.

Table 9

*Correlation between participant enjoyment of the recordings and the ability to create a difference in finger temperature*

		Post_ difference	Enjoy both groups	Enjoy experimental group	Enjoy Control Group
Post_ difference	Pearson Correlation	1	.074	.498	.265
	Sig. (2-tailed)		.758	.119	.491
	N	20	20	11	9

### **Enjoyment and group assignment.**

An independent samples t test was done to evaluate the relationship between the interval variable of how much a participant enjoyed the recordings and his or her group assignment. A correlational analysis revealed that there was a significant ( $p < .05$ ) relationship between group membership and whether the participants enjoyed the exercises ( $p = .001$ ). Participants in the hypnosis recording group reported that they

enjoyed the exercises significantly more than the participants in the control group. This relationship is explored further in Chapter 5.

### **Enjoyment and participation**

While enjoyment did not have a significant relationship with the post training ability to control hand temperature, enjoyment and participation were significantly correlated with each other ( $p = .011$ ) for both groups combined. For the control group, the relationship between enjoyment and participation was not significant ( $p = .132$ ) and for the experimental group, the relationship was not significant ( $p = .077$ ; see Table 10). This relationship is discussed further in Chapter 5 as enjoyment of a possible home based treatment has important implications as to whether a patient will willingly engage in such recording based treatment.

Table 10

*Correlation between participants' enjoyment and their participation in the study*

	Enjoy and participation both groups	Enjoy and participation control group	Enjoy and participation experimental group
Pearson Correlation	.556	.542	.554
Sig. (2-tailed)	.011	.132	.077
<i>N</i>	20	9	11



**Expectation**

On the survey that participants took after they listened to the recording 12 times and before they met with me, there was the question: Do you think the mental exercises will allow you to alter the temperature of your fingers? An independent samples t-test was done and a significant correlation was not found ( $p = .2$ ). These results are presented in Table 9. This matched with several interesting comments by participants who, at the final meeting, stated that they didn't think they could control their hand temperature, yet did demonstrate control. A few participants were quite surprised when they learned that they had created more than a one half degree difference in their hand temperature.

Table 11

Summary of survey responses by group

	Control Group ( <i>n</i> = 9)	Experimental Group ( <i>n</i> = 11)
Mean Enjoyment Score (out of 12)	4.4	10.6
Mean Listen to Entire recording (out of 12)	8.9	8.7
Mean Maintain Focus (out of 12)	4.3	7.7
Mean Participation Score (combined listen to Entire Score and Maintain Focus Score)	13.2	16.4
Number Expecting to be Able to Control Their Finger Temperature at Final Meeting	5	3
Number not expecting to be able to control Their Finger Temperature at Final Meeting	4	7

### **Summary**

Of the twenty participants who met with me after having listened to at least one instance of the recording, 16 were able to show more than half of a degree Fahrenheit difference between the finger temperatures their two hands. Nine (82%) of those were in the experimental group that listened to the self-hypnosis recording. Seven (78%) of the participants who demonstrate more than half of a degree Fahrenheit difference between the finger temperatures of their two hands were in the control group.

Of the demographic data collected, there was not a significant relationship between age, ethnicity or gender and the dependent variable of post treatment difference in hand temperature. Of the survey data collected, a significant relationship ( $p < .05$ ) was found between the degree of participation and the ability to demonstrate a difference in finger temperature. Similarly, there was a significant relationship between participation in and enjoyment of the recordings. Along those lines, there was a significant relationship between whether participants enjoyed the recording and whether they were assigned the hypnosis recording or the non-hypnosis recording.

### **Transition Statement**

In analyzing the data gathered by this study, several significant findings were found. The finding that mental techniques can engender volitional control of finger temperature is a continuation of several previous studies. The finding that there is not a significant difference between the types of mental techniques is both supported and contested in previous studies.

It is important to connect current research with previous studies so that the results can be seen in context and can be compared for validity. Similarly, it is important to look forward, through current research to see how that research can be expanded and applied. Chapter 5 of this research will discuss the findings of this research. Specifically, while some results can be seen as encouraging for those who suffer from Raynaud's disease and other circulatory maladies, there are boundaries to this research's reach and cautions that must be considered before this research is applied. The implications for gaining volitional control of finger temperature and other autonomic functions and the possible wide ranging benefits outcomes are discussed in Chapter 5.

## Chapter 5: Discussion

### **Introduction**

This study's purpose was to investigate whether listening to a recording with instructions for mental processes could allow the listener to gain volitional control over finger temperature. Such ability could be a complementary or alternative treatment to existing treatments for Raynaud's Disease. Existing treatments for Raynaud's disease are pharmacological in nature and have drawbacks such as cost and aversive side effects.

This study included 20 participants who attended an informational meeting where their ability to control finger temperature was measured. Then the participants listened to a recording two times per week for 6-weeks. After the participants listened to the recording for the prescribed number of times, they attended a meeting where their ability to control their finger temperature was measured.

It is important to note that this study did not include participants who had Raynaud's disease or other circulatory problem. The rationale for this exclusion was to establish the effectiveness of self-hypnosis without the confounding variable of the unpredictable symptoms of Raynaud's Disease. Because this study shows that mental control over somatic bodily functions is possible, this study can be used in future research that will include those with Raynaud's disease.

It was found that control of finger temperature could be acquired after listening to 12 instances of a recording that contained instructions regarding controlling hand temperature. The self-hypnosis recording was not more effective than the control

recording which required participants to consciously concentrate on controlling finger temperature.

### **Discussion of an Unexpected Result**

It is commonly accepted in experimental research that the control group will not be able to reject the null hypothesis. As described in Chapter 4, the control group showed results that do allow for a rejection of the null hypothesis. Based on the previous research cited in this study, it was anticipated that listening to a self-hypnosis recording would be able to impart the ability to control one's finger temperature. However, in a review of the literature, there was not a substantial reason to anticipate listening to a recording that contains only periodic directions to concentrate on one's finger temperature would impart such control.

### **Treatment Effect of the Control Recording**

Though the control group's recording was largely blank and did not contain hypnotic content, the recording had the effect of a treatment. The recording had instructions for the participants to consciously concentrate on their hand temperature. As reported in Chapter 4, listening to such a recording for 12 instances does allow people to control their hand temperature.

While the difference in hand temperature control does not appear significant between groups, the enjoyment of the recording was significantly different between groups. The control group recording asked participants to simply sit still and do nothing

but focus on their hand temperature for 18 minutes. Many participants found doing so extremely tedious and quite unpleasant.

Because control of one's finger temperature can be achieved by more than one method, future studies that incorporate participants with Raynaud's disease will have a wider variety of options. That learning control is not limited to a certain condition should be seen as evidence that the results of this study should not be considered limited to those without Raynaud's Disease. If volitional control of finger temperature can be achieved in the unfavorable condition of an unpleasant recording, then it is possible that such control could be extrapolated a group with Raynaud's Disease.

### **Discussion of Participation**

While the results of the participants' degree of participation in listening to recordings are analyzed in Chapter 4, there is an additional component to the participants' participation. That additional component is their effort at creating a difference in hand temperature during the final meeting. Measuring participants' effort at the final meeting was not built into this study's design. I noted that some participants chose not to listen to the recording. Some of the participants listened to only a few minutes' worth of the 18 minute recording. Other chose to listen to the whole recording.

Participation during the final meeting might be a confounding variable for duration of participation. As an example, one participant who had a relatively short duration of 61 days admitted she was very tense from a tough day of work and did not give the final meeting her best effort.

One participant who determined he was in the control group and agreed to have his ability to control his hand temperature measured again after listening to the recording only once did not exert much effort at the second measuring session. One participant stated that she didn't believe it was going to work and that she didn't think preparing herself for more than a minute would be of use. Interestingly, she was able to achieve a 1.1 degree Fahrenheit difference between her hands.

### **Listening and Testing Environments**

The setting in which the participants met the researcher author to have their ability to control their finger temperature measured was a conference room that was furnished as a lecture facility. The only lighting was bright fluorescent, overhead lights. The only chairs that were available were straight back chairs. Most participants preferred to listen to the recording as they reclined down or reclined. The testing environment did not allow for participants' preferred listening position.

As mentioned in Chapter 4, participants listened to the recording during the evening only 14% of the time. Reciprocally, 86% of the final meetings occurred in the evening which is defined as 4:30pm to 7:30 pm. The disconnect between the customary listening time and the final measurement time can be hypothesized to be a potential bias.

Further it can be hypothesized that there could be a greater control of hand temperature had participants been able to choose the position in which they listened during the final meeting as they did during the 12 times they listened to the recording previously. It can be hypothesized that a greater difference in finger temperature might have been



achieved, had the participants been able to listen to the recording during the final meeting in a position of their choosing.

### **Authenticity Versus. Control**

As mentioned in Chapter 3, participants listened to the recordings in their homes, on a day, at a time, and in a position of their choosing. While participants took surveys which were designed to measure their study-based behavior, the survey's accuracy was dependent on 20 different participants' perceptions. Similarly, participants reported that when they listened to the recording at bedtime and fell asleep during it, they completed the survey the next day.

Despite the lack of control and standardization such as the fact that 20 participants listened to the recordings under conditions of their choosing, it was shown that the recording did allow participants to control their finger temperature. Thus, the lack of control that existed as participants listened to the recordings is a testament to the durability of the ability to control finger temperature. For if participants can learn to control their hand temperature in heterogeneous circumstances, then it can reasonably be hypothesized that similar participants could achieve greater differences in their hand temperature if each listening environment was optimized and controlled.

Implications for Social Change should really head your section.

### **Self-Hypnosis as a Treatment for Raynaud's Disease**

If listening to a self-hypnosis recording is offered as a treatment for Raynaud's disease, such a treatment would occur outside of the control of a medical health

professional. As quite a few participants mentioned, interruptions to one's daily domestic activities occur. Dogs bark, phones ring and disturbances happen. Still, participants were able to listen sufficiently well to control their hand temperature. Thus, listening to an enjoyable recording at one's home might allow sufferers of Raynaud's disease an effective treatment.

It was shown in Chapter 4 that the enjoyableness of a recording was significantly correlated with which recording was listened to and was significantly correlated with participation. Because the self-hypnosis recording was more pleasant than the conscious concentration recording, a treatment of self-hypnosis has the benefit of being more enjoyable which might increase the likelihood of patients using it.

Thus, if recordings to treat circulatory disease such as Raynaud's Disease are used and if more than one type of recording is effective, one should then realize that the enjoyability of the recording should be included in a decision to use recordings to enhance compliance.

### **Limitations**

This study had several limitations that must be held in mind when evaluating this study's results. The first limitation is the high attrition rate. More than half of the participants who started discontinued. While data about participants' reasons for discontinuing are not available, it must be noted that participants did not receive compensation for completing the study. Perhaps more importantly, unlike sufferers of a disease, the participants of this study did not have an overt goal to work towards.

Another limitation that is tied with the attrition rate is the small sample size. Twenty participants completed the study. While this number has an impact on this study's effect size, the diversity of this study offers some evidence to this study's generalizability. While it was this study's intentions to have more than 30 finishers, as mentioned in Chapter 3, the average number of participants in earlier studies of volitional control of somatic function is 20 participants.

Other limitations fall into a category of flaws in the testing procedure. When participants met for the post treatment measurement, they were not in their own home where they had practiced. Related to that, they could not choose their body position, ambient lighting or air temperature. This lack of control is antithetical to self-hypnosis that holds at its very core the premise that the practitioner should engage in hypnosis when and how he or she prefers.

The time of the post treatment testing appointment can also be seen as a limitation. Due to the structure of many of the participants' work schedules and life commitments, late afternoon and early evening were the times when the post treatment testing took place. While the time difference itself might be a confounding variable, the emotional state of participants during that time of after work commuting is not the emotional state that many participants were in when they listened to the recording at or near bedtime.

### **Social Change Implications**

The goal of this research was to establish a baseline of efficacy for self-hypnosis's ability to allow people to control their finger temperature. As mentioned in Chapter Two, hetero-hypnosis has been shown to be an effective treatment for Raynaud's Disease. Thus, this study allows for the possibility that self-hypnosis might be useful as a treatment for Raynaud's Disease.

Though this study was not treatment based, its results are such that this study can be seen as a reason to begin to explore incorporating hypnosis into established medical treatment channels. The reason for this is twofold. The first and obvious is that there are millions of people who suffer from symptoms caused by poor circulation. Though this study did not include participants with Raynaud's Disease, this study's results are an encouraging step further for those who suffer from Raynaud's Disease. The second is that by incorporating self-hypnosis into medical channels, more people will try it and their results can be evaluated and measured. Thus, by prescribing self-hypnosis as a treatment for a multitude of maladies, health care practitioners can further data collection and research.

This study investigated whether practicing mental techniques for a six week period would allow participants to control finger temperature. Finger temperature as discussed by Freedman (1989) is strongly correlated with blood flow. As such, the findings of this study have implications beyond merely controlling one's finger

temperature with regards to Raynaud's Disease. It is possible that self-hypnosis is not simply allowing people to control finger temperature, but also to control blood flow. Blood flow and other autonomic functions are often the source of physical maladies because they are usually beyond the reach of volitional control. If self-hypnosis can allow a person some control over such functions, then that person will gain a greater measure of control over his or her own physiological functions and, by extension, gain greater control over his or her well-being.

Xu and Cardeña (2008) reported the diabetes can cause reduced blood flow to the extremities. This study corroborates the findings of Xu and Cardeña (2008) and McGuirk, Fitzgerald, Friedman, Oakley, and Salmon (1998) in its results that show mental techniques can alter the blood flow to the body's extremities. While this study did not incorporate participants who had Raynaud's disease, diabetes, or other circulatory disease, its results might be able to be applied to a wide group of people who suffer from reduced circulation to the extremities.

The advantages of using hypnosis are many. The first is that hypnosis very rarely offers aversive side effects. The second, as this study has shown, is that hypnosis is considered very pleasant. As such and in conjunction with the lack of side effects, hypnosis can be seen as a therapy in which sufferers will willingly engage. Self-hypnosis recordings are inexpensive. The company Uncommon Knowledge, LLC, which provided the recording, offers similar recordings for less than \$13.00. The recordings can be copied and transferred to mobile devices such as phones and personal music players. The

benefits of self-hypnosis for Raynaud's Disease and many other maladies are not competitive with the results of other treatment options. Self-hypnosis is not an either/or proposition with regards to pharmacological treatments. In fact due to the nature of self-hypnosis, it can be an easy to use complement to other treatments. While this study used subjects who do not have vascular dysfunction, the results could be applied to the large number of people suffering from primary Raynaud's disease.

### **Future Research**

As mentioned above, this study did not directly apply self-hypnosis to people with Raynaud's disease. This study worked to establish the effectiveness of self-hypnosis in acquiring volitional control of finger temperature in people without circulatory problems. Because such control is possible with self-hypnosis and since hetero-hypnosis has been shown to be effective in Raynaud's disease, then this study is a strong foundation for future research that will apply this study's findings to those who have Raynaud's Disease.

Because the possible benefits of volitional control of autonomic processes are far reaching, the findings of this study should serve as encouragement and as a stepping stone for further research. Future research in this area can and should take many forms. Whether it is replication of earlier studies, replication of this study, changing earlier studies, or using a complete new design, the possible benefits need to be investigated.

Because self-hypnosis has so many benefits and so few drawbacks, future research should concentrate on examining what type of listening regimen will yield the strongest result. Perhaps 3 times per week for 4 weeks would yield a larger effect.

Perhaps the duration of the recording should be changed. While, a significant effect was found, one should not assume that is the maximum effect that can be found. Additionally, future studies should investigate whether effects from self-hypnosis on finger temperature control are long lasting.

As mentioned in Chapter 2, hypnosis and self-hypnosis are considered complementary or alternative treatments by medical doctors. While there is nearly 40 years of research into the area of mental processes altering extremity blood flow, the research can be classified as academic in nature. The research does not seem to come from nor extend to medical practice. Thus, future research should be content with a goal of demonstrating that self-hypnosis can engender volitional control of autonomic process.

### **Summary**

Several significant relationships were found between the many variables of this study. The most striking is that 17 of 20 participants were able to demonstrate an ability to volitionally control their finger temperature. One of the three who could not listened to only one of the recordings before the final meeting.

That there was not a significant difference in the ability to control finger temperature between the control group and the experimental group should not be an indictment of self-hypnosis as a treatment for Raynaud's. The control group received a treatment in that members of that group repeatedly engaged in an activity that encouraged them to mentally alter their finger temperature. That the control group's recording was largely blank should be taken as strong evidence that the mind can be trained to

volitionally control autonomic functions. This study as with the many others that have investigated volitional control of autonomic functions should be built upon so that a safe, side-effect free treatment for Raynaud's Disease is made widely available.

Self-hypnosis for warming a person's fingers might not be the only application of this concept. Future research should not confine itself to fingers, toes, or any extremity. Indeed, if a person can control his or her blood flow to various parts of the body, he or she can take purposeful control of some bodily systems that might be acting incorrectly. Because so much of people's health depends on proper blood flow, anything, such as self-hypnosis, that can improve control of that critical process, should be examined and pursued so that many can benefit.



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## Appendix A: Copy of Solicitation Flyer

**What:** This study will investigate the ability to voluntarily control hand temperature through influencing blood flow. It is easy to see that thought processes and emotions direct and redirect blood flow to various parts of the body. Just think of the blushing of embarrassment, the white face of fear and the red face of anger. Participants will participate in six week period of mental exercises where they will engage in the exercise two times per week. Each exercise requires, listening to 25 minute recording and is akin to relaxation. During the six week period, participants will be asked to answer survey questions. It is expected that answering such questions will take less than 5 minutes.

**Who:** Any healthy adult who is curious about the relationship between the mind and body. Participants are gladly accepted on a rolling basis. Lots of people are needed so, please, send an e-mail.

**When:** This study is expected to begin in October of 2011. This is not a deadline. Interested people are encouraged to e-mail after that date.

**Why:** In short, people should have more control over their bodies and their health. This study will focus on a common annoyance of many people, cold hands. While there are medications for chronically cold hands, such medications can be expensive and carry the risk of side effects. Mental processes to increase hand temperature and blood flow do not have side effects, are free, and can be used indefinitely. If this study shows significant results, such results might be built on and applied to other instances of healthy living.

**Requirements:** This study can accept only healthy adults with no history of circulatory problems or experience in meditation, hypnosis, or other such mental activities.

## Mental Influence of Hand Temperature

A study by Joseph Swope

of Walden University

**Who:** Any healthy adult who does not have circulatory problems or experience with hypnosis, meditation or relaxation training are welcome. Participants are gladly accepted on a rolling basis. Lots of people are needed so, please, send an e-mail.

**What:** This study will investigate the ability of voluntary mental process to control hand temperature through influencing blood flow. It is easy to see that thought processes and emotions direct and redirect blood flow to various parts of the body. Just think of the blushing of embarrassment, the white face of fear and the red face of anger. This study will examine two different mental techniques and the effectiveness of each technique on learning to voluntarily control blood flow to the hands. During the initial measurement, the temperature of each participant's hands will be measured. It is expected that there will be no difference between participants' hand temperature at initial measurement phase. Participants will then engage in six week period of mental exercises where they will engage in the exercise two times per week.

## Appendix C: Screen Shot of Post Exercise Survey

**\*Please enter your participant ID number.**

Please enter your participant ID number.

**What time of day did you engage in the exercise?**

Early Morning (6:00 am - 8:30 am)

Mid Morning (8:30 am - 11:30 am)

Afternoon (11:30 am - 4:00 pm)

Evening (4:30 am - 6:30 pm)

Night time (6:30 pm - 11:59 pm)

Other (please specify) \_\_\_\_\_

**Was this most recent exercise performed at approximately the same time as the last time you engaged in the exercise? Please check "first time" if this is the first of your 12 attempts at the exercise.**

Yes

No

First time

**In what location/position did you engage in the exercise?**

Couch lying down

Couch sitting up

Straight chair

Reclining chair

Bed sitting up

Bed lying down

**Is this the same location as your last engagement? Please check "first time" if this is the first of your 12 attempts at the exercise.**

Yes

No

First Time

**Were you able to listen to the entire recording?**

Yes

No

Done

## Appendix D: Screen Shot of Survey After All Trials

1. Please enter your participant ID number.

Please enter your participant ID number.

**2. Overall, how would you rank your participation in this study. 5 being that you gave each exercise your best effort and 1 being that you did not give your best effort to a majority of the exercises.**

- 5
- 4
- 3
- 2
- 1

**3. Do you think that the mental exercises in which you engaged will allow you to demonstrate different finger temperatures in the upcoming measurement session?**

- 3. Yes, I expect to demonstrate a large difference between the finger temperatures of my two hands
- 2. Yes, I expect to demonstrate least some difference between the finger temperature of my two hands



## Appendix E: Description of FeverWatch Thermometer

**The FeverWatch™ Professional infrared digital thermometer has obtained FDA and CE approval for use in medical facilities as well as home health care.** Accuracy, water-resistant design, guidance system, adjustable alarm, readings memory, and back-lit LCD digital readout are all standard features in this powerful Infrared medical thermometer.

### Features

1. Recommended by physicians and premier hospitals
2. Convenient one-handed one-click operation
3. **Clinically proven accuracy (+- 0.3C)**
4. Quick reading (less than 1 second)
5. Non-contact infrared technology eliminates contamination risk
6. No probe covers required
7. Bright back-lit LCD screen ensures day and night readings
8. Adjustable audio alarm for high temperature
9. Dual scale: Easily switch between Fahrenheit or Celsius
10. Low energy consumption: Over 100,000 on a single set of 2 AA batteries (included)
11. long lifespan: Over 3 million measurements
12. Memory of the last 32 temperature recordings
13. Auto power off in 5 seconds

## Appendix F: Transcript of Hypnosis Recording

Hello my name is Mark Tyrrell and I'm going to be speaking for the next twenty minutes or so and as I do you might notice that you feel increasingly relaxed and comfortable. The purpose of this recording is to help you experience the extent to which your mind can influence the workings of your body in a very specific way. It's well known that blood can rush to the face in a flush of embarrassing ideas. Nervous thoughts are signals for the body to restrict blood flow to the stomach and can make your stomach feel as though there are butterflies in it. How nice would it be to control some of the body's reactions? The influence of the mind and thoughts on the body can be developed and used to promote health and comfort whenever you feel you need it ... Now some people find they begin to visualize almost instantly whilst others... take their time to relax deeply...and it really doesn't matter...you don't have to try to rest and relax...because you tend to find you....really start to...breathe in a very sleepy way when you are not really thinking about it...and that can begin to happen either very soon or a bit later on...

And you can just let my voice go with you...sometimes you can be more consciously aware of it and sometimes it can just...sort of drift into the background a bit...and that's absolutely fine...because your mind is so powerful...now it's good if you can be sitting or even lying down some place comfortable, some where you can relax and just drift in your mind for a while...and you can also, if you haven't already, let your eyes close so you can give those hard working eyelids a nice rest...

That's it so with eyes closed you can now just focus your mind on my words...or perhaps the spaces between my words as you...really begin to notice the muscles of your jaw relax...and you can direct your attention to the skin of your forehead as you notice it start to feel more relaxed, like you can just imagine it smoothing over right now....and you can also just notice your breathing...like the in and out of the water at the shoreline....and you can think about the kind of breathing that starts to happen when someone, perhaps you, begins to drift into a very sleepy state...often, before we begin to drift to sleep at night we begin to breath in that sleepy way....before you've even actually drifted into a nice relaxing sleep....

And so many people think they don't visualize...and yet they dream at night and see what they dream about very well...and yet what are dreams other than rich tapestries of intricate visualisations produced by and conducted through your powerful imagination? As if your imagination were a wonderful-ininitely creative movie director and movie theatre all rolled into one.

And, as you notice the toes of your right foot resting and relaxing...the big toe...and all the others as the your left foot relaxes-the instep and heel and now it's right you have awareness now of your right foot relaxing-with its toes resting deeply....and we so often assign colours to sensations, for example we often think of red as a hot colour...and right now I want you to think of the colour of rest or relaxation...it might be cooling blue, warming red or some other colour and you can notice now you can, in your mind's eye just watch your colour of relaxation soothing up your legs....soothing and

calming all your muscles...drifting throughout your torso...filtering through your neck....completely soothing and resting your back...

And within your imagination, just like how...in a cosy, comfortable and soothing dream your real body can be still and resting so deeply...now you can begin to imagine walking...in your mind to a restful calming and comfortable room...some place...maybe some room you'd like to be...the kind of room that is just so comfortable...the sort of place you can relax even deeper with each passing second...and as I count from ten to one you can find you can relax more completely with each count...almost as if the air around you can become...more still...as if the particles of air...and even surrounding objects can all...be increasingly relaxed as I count from 10....and 9...and 8....and you can begin to imagine a beautiful fireplace...

..like a open fireplace....with such a comfortable chair...like the most restful chair ever...right next to that warming and comfortable open fireplace....crackling away...warming and relaxing....and 7 and 6 and 5 and 4, down to 3 and 2 and in a few moments you can, in your mind sink into this almost magically relaxing chair in your mind and feel twice as relaxed....and one.....that's it....almost feeling the comfort and rest from this chair, almost feeling what it's like to sit and rest in such a comfortable setting and I want you to enjoy the sense of a (reasonably) near by open fire...the kind of open fire people sometimes read by...in a cosy way before bed time....

And I want you to be aware of the flickering red and orange flames...perhaps burning through logs...flickering flames warming the air around them...and within your

mind it can almost be as though you can...hear the sound of crackling from this fire...the heat rising....and warming this space....in this place and, just enough to warm it....I want you to notice how you can bring your left hand...closer than the rest of you to the fire....that's it just in the air near enough to really start to feel the warm air from around the crackling fire warming your left hand...that's it...perhaps your left palm nearer the fire....just a little at first....really beginning to feel it warm up....like it's becoming, like its becoming the warmest part of you.... that's it, the warming sensation opening up your fingers to the flow of relaxation. feeling the movement and presence of warm red flow in your left hand...the way people gaze into a crackling fire and drift into daydreams seeing shapes, swirling images in the flames, feeling the energy and heat from the fire.

That left hand getting warmer and warmer now.....and in a few moments it's going to get to the point where it...just starts to feel as hot as it can comfortably be.

And your mind can notice, when it wishes, the right hand.. so comfortable in its own way. The right hand, at the same time, far away and protected from the fire feels a refreshing breeze. Your creative mind can easily find the comforting source of soft, cooling air. That's right... Cool air slowly caressing the skin, whispering over the back of the hand. The refreshing coolness allows your hand to slow down and block any stress that wants to reach the fingers. The icy calm drifts down to the fingers, slowing down the hot stress that wants to rush away relaxation. That's it, a refreshing chilliness sliding between the fingers, slowing down the rushed flow of stress.

You might even imagine, when you're ready that your hands are wearing gloves, comfortable gloves made just for your hands. So soft. A red glove for your left hand, allowing the warmth to reach the tips of your fingers. That's right... heating energy flowing through the glove

At the same time you might notice a blue glove with smooth, cool lining. The glove allows your right hand to slow down and remain still. The glove helps keep the relaxing chill in place allows the fingers to rest.

You might notice how comfortable your hands are. They are the right temperature because they follow the healthy thoughts of your mind. Your unconscious mind knows that it is right to give the body instructions

Okay and now you can just let that left hand breath again....cool down away from the fire... at the same time you can feel the right hand warming up, returning to the normal flow of activity, no longer still. Your creative mind still in control, deciding what's right

That's it...how you can get a sense that the fire is receding, maybe even flickering out as coolness beings to replace warmth on your left side...and reassuring warm spreads through your right side.

And your mind might choose to notice how the body will follow healthy instructions.

And for now you can just start to get a sense of stretching your body....of coming back from 1 to 2, becoming more aware of your environment and 3, 4 and 5....noticing

your hands and the way breathing can rest you so deeply sometimes and 6 and 7 and 8 and 9 and 10....

Just focusing on your eyelids again or the thought of a spontaneous smile that spreads across your face before you knew it was going to...making you feel nice and open and relaxed yet alert and you can just open your eyes right now feeling nice and rested but wide awake and alert.

Please feel welcome to listen to this recording many times... as often as you like. You might notice that each time you listen you will feel more relaxed and you might notice that your hand enjoy listening to your mind's instructions. and thank you very much for listening.

### Appendix G: Transcript of Conscious Concentration Recording

Hello my name is Mark Tyrrell and I'm going to be speaking for the next twenty minutes or so and as I do you might notice that you feel increasingly relaxed and comfortable. The purpose of this recording is to help you experience the extent to which your mind can influence the workings of your body in a very specific way. Now some people find they begin to visualize almost instantly whilst others... take their time to relax deeply...and it really doesn't matter...you don't have to try to rest and relax...because you tend to find you...really start to...breathe in a very sleepy way when you are not really thinking about it...and that can begin to happen either very soon or a bit later on...

And you can just let my voice go with you...sometimes you can be more consciously aware of it and sometimes it can just...sort of drift into the background a bit...and that's absolutely fine...because your mind is so powerful...now it's good if you can be sitting or even lying down some place comfortable, some where you can relax and just drift in your mind for a while...and you can also, if you haven't already, let your eyes close so you can give those hard working eyelids a nice rest...

That's it so with eyes closed you can now just focus your mind on my words...or perhaps the spaces between my words as you...really begin to notice the muscles of your jaw relax...and you can direct your attention to the skin of your forehead as you notice it start to feel more relaxed, like you can just imagine it smoothing over right now...and you can also just notice your breathing...like the in and out of the water at the



shoreline....and you can think about the kind of breathing that starts to happen when someone, perhaps you, begins to drift into a very sleepy state...often, before we begin to drift to sleep at night we begin to breath in that sleepy way....before you've even actually drifted into a nice relaxing sleep....

And so many people think they don't visualize...and yet they dream at night and see what they dream about very well...and yet what are dreams other than rich tapestries of intricate visualisations produced by and conducted through your powerful imagination? As if you imagination were a wonderful-ininitely creative movie director and movie theatre all rolled into one.

And, as you notice the toes of your right foot resting and relaxing...the big toe...and all the others as the your left foot relaxes-the instep and heel and now it's right you have awareness now of your right foot relaxing-with it's toes resting deeply....and we so often assign colours to sensations, for example we often think of red as a hot colour...and right now I want you to think of the colour of rest or relaxation...it might be blue or some other colour and you can notice now you can, in your mind's eye just watch your colour of relaxation soothing up your legs....soothing and calming all your muscles...drifting throughout your torso...filtering through your neck....completely soothing and resting your back...

And within your imagination, just like how...in a cosy, comfortable and soothing dream your real body can be still and resting so deeply...now you can begin to imagine walking...in your mind to a restful calming and comfortable room...some place...maybe

some room you'd like to be...the kind of room that is just so comfortable...the sort of place you can relax even deeper with each passing second...and as I count from ten to one you can find you can relax more completely with each count...almost as if the air around you can become...more still...as if the particles of air...and even surrounding objects can all...be increasingly relaxed as I count from 10...and 9...and 8...and you can begin to imagine a beautiful fireplace...

..like a open fireplace....with such a comfortable chair...like the most restful chair ever...right next to that warming and comfortable open fireplace....crackling away...warming and relaxing....and 7 and 6 and 5 and 4, down to 3 and 2 and in a few moments you can, in your mind sink into this almost magically relaxing chair in your mind and feel twice and relaxed....and one.....that's it....almost feeling the comfort and rest from this chair, almost feeling what it's like to sit and rest in such a comfortable setting and I want you to enjoy the sense of a (reasonably) near by open fire...the kind of open fire people sometimes read by...in a cosy way before bed time....

And I want you to be aware of the flickering red and orange flames...perhaps burning through logs...flickering flames warming the air around them...and within your mind it can almost be as though you can...hear the sound of crackling from this fire...the heat rising....and warming this space....in this place and, just enough to warm it....I want you to notice how you can bring your left hand...closer than the rest of you to the fire....that's it just in the air near enough to really start to feel the warm air from around the crackling fire warming your left hand...that's it...perhaps your left palm nearer the

fire...just a little at first...really beginning to feel it warm up...like it's becoming, like its becoming the warmest part of you...feeling the movement and presence of this fire with your right hand...the way people gaze into a crackling fire and drift into daydreams seeing shapes, swirling images in the flames, feeling the energy and heat from the fire...and in a few moments it's going to feel as if that left hand is about to sweat even...and you can notice how, in comparison the right hand can feel so much cooler...and you can just keep the right hand there a little longer...really noticing now how it's become the warmest part of you by far...the temperature rising in that hand...as if you can really feel it warmed and heated by the flickering flames...notice how real that can start to feel...

That left hand getting warmer and warmer now.....and in a few moments it's going to get to the point where it...just starts to feel a little uncomfortably hot...just starting to feel red hot...like it's getting so hot you are going to need to pull it away in just a moment or so.....

And you can pull that away right now and really get the sense of the heat in your left hand...in the palm...even the back of your hand can feel very warm....

And you could now imagine that....even though it's a warmish place....your left hand can be wrapped in a glove or so kind of material just keeping that heightened warmth a little longer....feeling that material very close and tight on your left hand...that hand feeling much warmer than the left...now

Okay and now you can just let that left hand breath again....cool down away from the fire...

That's it...how you can get a sense that the fire is receding, maybe even flickering out as coolness beings to replace warmth...

And for now you can just start to get a sense of stretching your body....of coming back from 1 to 2, becoming more aware of your environment and 3, 4 and 5....noticing your hands and the way breathing can rest you so deeply sometimes and 6 and 7 and 8 and 9 and 10....

Just focusing on your eyelids again or the thought of a spontaneous smile that spreads across your face before you knew it was going to...making you feel nice and open and relaxed yet alert and you can just open your eyes right now feeling nice and rested but wide awake and alert and thank you very much for listening.

## Appendix H: Curriculum Vitae

JOSEPH M. SWOPE

*PROFESSIONAL EXPERIENCE*

## MONTGOMERY COUNTY COMMUNITY COLLEGE

Germantown, MD

***Adjunct Psychology Professor***2011- *present*

## HOWARD COUNTY COMMUNITY COLLEGE

Columbia, MD

***Adjunct Psychology Professor****Summer 2012*

## MONTGOMERY COUNTY PUBLIC SCHOOLS

Germantown, MD

***A.P. Psychology and Philosophy Teacher****1999 - present*

- Tailored instruction to diverse learning needs
- Developed online instructional methods and assessments
- Sponsored students in the publication of their research

ACADEMIC CONSULTANT –[www.ideaworks.com](http://www.ideaworks.com)

Shorewood, WI

***Guided development of automatic grading software for psychology essays****2010 - present*

- Generated essays and rubrics for national use
- Tested online feedback software with real time classroom interaction
- Used online instruction to provide instant feedback for student writing

## EDUCATION TESTING SERVICE

Princeton, NJ

***Advanced Placement Reader****2010-present*

- Trained in reliable and valid assessment of student writing
- Collaborated on best practices for psychology instruction

## EDUCATIONAL WEBSITE DEVELOPMENT

*2011-present*

### **www.homerpsych.com**

- Developed a system for using multimedia for psychology instructional
- Developed and implemented secure online assessment software

## *EDUCATION*

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### **Walden University**

Minneapolis, MN

Ph.D. - General Psychology- concentration on teaching

*3/2009 – 6/2013*

### **Trinity College**

Washington, DC

M.A. - Teaching Methods & Educational Theory

*1996*

### **The Catholic University of America**

Washington, DC

B.A. - Double Major, Psychology & Sociology

*1993*

## PROFESSIONAL CERTIFICATIONS

### **Psychology Teacher**

State of Maryland

Maryland State Department of Education

*1999 - present*

### **Member of Psi Chi – Psychology Honor Society**

Chattanooga, TN

*2010 - present*

### **National Teacher Board Certification**

Arlington, VA

*2011 - 2021*

*PERSONAL*

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**5th Degree Black Belt in Tae Kwon Do**

Washington, DC

- Simba Dojang, Washington, D.C. *1994 – present*
- Taught a diverse groups of students using mixed methods

**Published Author, Need for Magic, A Psychology Novel***December 2009*

- Developed supplemental materials to integrate the book into instruction
- Assisted teachers in implementing Need for Magic in their teaching

**Patent Holder, U.S. Patent No. 7,878,994***2011 – present*

- First Aid Appliance, “Cold Cast”
- Designed and modified design to comply U.S. patent criteria

## Appendix I: Permission To Publish Hypnotic Scripts

Mark Tyrrell

Jan 2 2013

to me

Hello Joe

Great to hear from you and Happy New Year! Yes it's amazing how expensive Santa's visits seem to be. Yes you have my absolute permission to use the transcript of the recording in any way you see fit.

I'd love to publicize this once it's all complete so keep me updated please.

It would be wonderful to do further research into hypnotic influence of somatic experience.

All best wishes

Mark