

The Impact of Selective Attention on Energy and its Implications for Health

Hanseung Simon Choi

Submitted in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy
under the Executive Committee
of the Graduate School of Arts and Sciences

COLUMBIA UNIVERSITY

2022

© 2022

Hanseung Simon Choi

All Rights Reserved

Abstract

The Impact of Selective Attention on Energy and its Implications for Health

Hanseung Simon Choi

The aims of the current investigation are to (1) examine the directive mechanism of selective attention on energy as measured by body temperature and to (2) assess the clinical impact of a meditation practice that uses this directive mechanism of selective attention. Despite the recent surge of interest in Eastern contemplative and medicinal practices, there exists a large gap between teachings of such Eastern traditions and empirical research findings of psychology in the West. Specifically, Eastern thought has for millennia emphasized the role of attention or intent in directing energy within the body, and importantly, the role that this phenomenon has on mental and physical health. Conversely, Western psychology has largely conceptualized attention as an unidirectional information-processing mechanism, not as an agent through which energy is directed. The present study contains two experiments that respectively incorporate a basic science approach to identify an alternative function of selective attention and an applied science approach to explore the clinical efficacy of a focused attention *dantian* (area in the lower abdomen) meditation practice compared to that of a standard Mindfulness-based Stress Reduction (MBSR) practice. Experiment 1 ($N = 12$) tested through an experimental design whether selective attention can function as a directive mechanism for energy by measuring bilateral hand temperatures. Experiment 2 ($N = 16$) measured various health and psychological indices before and after a six-week meditation practice in either a dantian-focused method or an MBSR practice. Findings suggest that selective attention does in fact function as a directive

mechanism for energy within the body and that the use of this method within the context of a dantian meditation practice improves aspects of mental health more efficaciously than an MBSR practice. This study ultimately seeks to interpret a traditional Eastern understanding of attention and its implications for health through the lens of empirical Western psychology.

Table of Contents

Lists of Charts, Graphs, Illustrations.....	iii
Acknowledgements.....	iv
Dedication.....	v
Chapter 1: Introduction.....	1
1.1 Theories of Selective Attention.....	1
1.2 Eastern Conceptualization of Selective Attention and Qi.....	3
1.3 Clinical Mechanism and Impact of Meditation.....	5
1.4 Theory of Qi and Attention.....	7
1.5 Post-materialism.....	8
1.6 Volitional Body Temperature Control.....	12
1.7 Current Study and Study Aim.....	13
1.8 Hypotheses.....	15
Chapter 2: Method.....	17
2.1 Participants.....	17
2.2 Materials.....	18
2.3 Procedure.....	20
Chapter 3: Results.....	27
3.1 Experiment 1.....	27
3.2 Experiment 2.....	31
Chapter 4: Discussion.....	41
4.1 Summary of Findings.....	41

4.2 Experiment 1 Implications and Future Directions.....	42
4.3 Experiment 2 Implications and Future Directions.....	54
4.4 Limitations.....	63
Conclusion.....	68
References.....	69
Appendices: Study Instruments	
Appendix A: Patient Health Questionnaire (PHQ-9)	111
Appendix B: Generalized Anxiety Disorder Scale (GAD-7)	112
Appendix C: PTSD Checklist—Civilian Version (PCL-C)	113
Appendix D: Five-Facet Mindfulness Questionnaire.....	114
Appendix E: Spiritual Transcendence Scale (STS)	116
Appendix F: Spirituality Scale (SS)	117
Appendix G: Physical Health Questionnaire (PHQ)	118
Appendix H: Medical Outcomes Study (MOS) 36-item Short Form Survey (SF-36)...	119
Appendix I: Psychological Well-being Scale.....	125
Appendix J: Experiment 1 Flyer.....	126
Appendix K: Experiment 2 Flyer.....	127
Appendix L: Experiment 1 Script.....	128
Appendix M: Experiment 2 Script.....	130

List of Charts, Graphs, Illustrations

Tables:

Table 1: Demographics of participants (exp 1).....	27
Table 2: One-sample t-test of correct net change for each time point (exp 1).....	28
Table 3: Paired samples t-tests for focus hand (exp 1).....	29
Table 4: Paired samples t-tests of non-focus hand (exp 1).....	29
Table 5: Regression of contemplative practice experience and correct net change (exp 1).....	30
Table 6: Demographics of participants (exp 2).....	32
Table 7: ANCOVA analyses (exp 2).....	35
Table 8: Mediation analyses (exp 2).....	37
Table 9: Paired samples t-tests for control group (exp 2).....	40
Table 10: Paired samples t-tests for experiment group (exp 2).....	40

Figures:

Figure 1: Attention cue (exp 1).....	22
Figure 2: Timeline for experiment (exp 1).....	23
Figure 3: Diagram for temperature sensors (exp 1).....	24

Acknowledgements

This dissertation would not have been possible without the exceptional mentorship and guidance by my doctoral advisor, Dr. Lisa Miller. Thank you for your unparalleled mentorship over the years and for imparting your wisdom, skills, and knowledge to me always with warmth and kindness. I feel incredibly blessed to have learned from you and to have grown as a person, scholar, and clinician under your guidance and leadership.

I would also like to thank the members of my dissertation committee, Dr. Cindy Huang, Dr. Daniel Tomasulo, Dr. Julia Mossbridge, and Dr. Prerna Arora for generously sharing your empirical insights, expertise, and enthusiasm.

Lastly, I would like to thank my dearest colleagues in the Spirituality and Psychology lab and members of my cohort for your support and empirical expertise.

Dedication

This dissertation is dedicated to my loving family.

To my loving wife, Rachel, my mom, Soo Hyung, and my dad, Sung Sup, my sister, Elaine, and our pup, Harper. Thank you for always being there for me, loving me unconditionally, and supporting me through thick and thin. My joy and success in life are only possible because of your endless love and support.

Introduction

Theories of Selective Attention

Extant theories of selective and volitional attention have conceptualized attention as an information-processing mechanism, whereby salient stimuli are processed and non-integral stimuli are ignored or attenuated (Deutsch & Deutsch, 1963). This process has been explained by numerous theories of attention including Broadbent's filter theory of attention, Treisman's filter-attenuation theory, the Deutsch-Norman theory of the influence of semantic characteristics, Neisser and Hochbergs' constructivist theories of attention, and Kahneman's capacity theory of attention with its emphasis on deliberate, conscious allocation of attention (Broadbent, 2013; Deutsch & Deutsch, 1963; Driver, 2001; Hochberg, 2007; Kahneman, 1973; Neisser, 1967; Norman, 1968; Treisman & Gelade, 1980). Both Broadbent's and Treisman's theories conceptualize attention as a bottleneck—as numerous sensory stimuli become available for processing, only a select few inputs are attended to consciously; through this bottleneck mechanism, most stimuli are not processed and attended to. Selective attention in these theories have been analogized to a bottleneck because of the limited capacity of attention—humans are unable to pay attention to all stimuli at once. While both Broadbent's and Treisman's models emphasize an early filter model, Treisman's filter-attenuation theory asserts that the unattended stimuli is attenuated rather than ignored entirely. Thereafter, Deutsch & Deutsch (1963) and Norman (1968) offered an alternative to the filter-attenuation theory—all stimuli are processed, but only the pertinent and semantically relevant stimuli will be paid attention to (e.g., one's own name). Neisser (1967) and Hochberg (2007) offered another alternative to the filter model that emphasizes a constructivist view of attention—perception consists of an active process of

analysis by synthesis, whereby attention is a functional mechanism that selects the stimuli to be synthesized. Hochberg further contributed to the constructivist conceptualization the potential role of confirmed expectations in perception and the dependence of awareness on what has been stored in memory. More recently, Kahneman's capacity theory of attention conceptualized attention through a framework of a "general limit on man's capacity to perform mental work;" within the confines of this limit, people allocate such resources through selective attention (Kahneman, 1973). Kahneman along with other interpretations of his theory have equated attention to energy (i.e., effort or metabolic expenditure in the nerve cells of the brain) (Bruya & Tang, 2018).

While these theories have addressed many aspects of human attention and its roles in information processing, energy expenditure, and resource allocation, none to date have explored the role of attention as a directive mechanism for energy. In other words, previous theories of attention do not suggest that selective attention influences the object of attention in any way. The object(s) of attention—endogenous or external stimuli—is understood as information that the spotlight of selective attention helps to process. In this sense, all previous theories of attention posit a unidirectional relationship of influence between selective attention and the object(s) of attention—selective attention functions solely as a mechanism to acquire or process information and does not influence, through the mere act of attending to, the object(s) (i.e., stimuli) of attention itself. Let us assume, for instance, that one is attending to the palm of one's right hand. According to previous theories of attention, we are allocating energy and resources to attend to this physical area, and as a result, we are able to process information about this area (e.g., color, location, texture, temperature, sensations, etc. of right hand palm). The theories do not hypothesize that attending to the hand, visually, tactilely, or by means of mental representations,

will influence the hand itself. According to the theories, the hand, in this case an external stimulus, provides information to our nervous system through the mechanism of our attention but the attention itself does not influence the hand—no measurable changes of energy will be found in the object of attention. The same mechanistic hypothesis would apply if the external stimulus would have been an object outside of the body (e.g., if I direct our selective attention to a table in front of us, this would not impact the table in any way). This unidirectional information-processing mechanism has been widely examined and supported by past research (Allport, 1987; Broadbent, 2013; Cherry, 1953; Driver, 2001; Eriksen & Rohrbaugh, 1970; Eriksen & Spencer, 1969; Francolini & Egeth, 19980; Gray & Idderburn, 1960; Kahneman, 1973; Lavie, 2001; Moray 1959; Neumann, 1987; Ninio & Kahneman, 1974; Peters, 1954; Treisman & Riley, 1969).

Eastern Conceptualization of selective attention and Qi

The unidirectional nature of extant theories of selective attention, however, fail to address one of the core principles of attention that are taught in numerous Eastern contemplative and meditative practices—selective attention reliably impacts the object(s) of attention. In other words, energy, in its varied forms, is believed to be directed toward the object(s) of selective, top-down attention when it is deliberately focused on. While people from many cultures, lineages, and religions have in one way or another “found that certain deliberate uses of attention...can transform their perception of the world,” several contemplative practices from the East (e.g., forms of Qigong, forms of Daoist meditation, Kriya yoga, Kouksundo, Tummo meditation, Kundalini yoga, etc.) have primarily emphasized the use of the aforementioned principle of attention to cumulate and direct energy in the body in order to transform the mind

and attain mental and physical health (Benson, et al., 1982; Harris, 2014; Johari, 2000; Kouk Sun Do, 2008; Sancier, 1996). This form of energy has been called Qi, Ki, Chi, Prana, or life force in various Eastern cultures and traditions. This vital form of energy is the foundation of Traditional Chinese Medicine (TCM), and Eastern medicine and contemplative practices alike posit the blockages of Qi as the source of mental and physical ailments (Chen, 2004).

While the existence of Qi has been difficult to examine empirically, there have been numerous attempts to measure the effects of Qi using a variety of techniques. For instance, an analytic review of Chinese studies measuring external qi, qi that is directed outwards by experienced practitioners, found external qi to be reliably measured in many studies using five different categories of detection—physical signal detectors, chemical dynamics methods, detectors using biological materials, detectors using life sensors, and detectors using the human body (Chen, 2004). Using non-practitioners as a control group, studies found expert practitioners of Qi-based practices were able to produce significantly higher levels of light, electricity, heat, sound, and magnetism outside of their body (Gu & Cheng, 1980; Gu & Lin, 1978; Gu & Zhao, 1979; Hou et al., 1993; Wang, Tian, & Li, 1995; Wu et al., 1991). These changes were attributed to Qi, as it is hypothesized that these detectable modalities of energy flow with Qi. External Qi emissions have also been shown to impact biological and chemical mechanisms—growth inhibition of liver carcinoma cells, acceleration of glucose oxidase reaction speed, increase in intracellular free calcium concentrations, inhibition of hepatitis b viral growth, stimulation in osteoblastic cells, and inhibition in the formation of osteoclast-like cells amongst others (Kiang, Ives, & Jonas, 2005; Ohnishi et al., 2005; Ren, 1990; Tsuyoshi Ohnishi et al., 2007; Yin, Huang, & Sun, 1998). Internally, Bonghan Kim, a North Korean medical surgeon, discovered the Bonghan system, a circulatory primo-vascular system in the body that corresponds with the

traditional meridian system of TCM and Eastern medicine through which Qi has been believed to circulate (Kim, 1963). These results and methodology used were later confirmed by Soh (2009) when a specific staining dye, trypan blue, was shown to selectively stain only the hypothesized meridians instead of blood vessels, lymph vessels, nerves, muscles, or adipose tissues. While the empirical examination of Qi is still in its emerging stages, these past studies indicate qi or bioenergy may play an important role in the mind-matter connection along with human health.

Clinical Mechanism and Impact of Meditation

Broadly speaking, the practice of meditation has widely been associated with reduced symptoms of depression, anxiety, stress, substance abuse, and pain as well as increased quality of relationships, attentional capacity, mindfulness capacity, self-realization, sense of personal spirituality, and sense of well-being (Bowen et al., 2006; Eberth & Sedlmeier, 2012; Goyal et al., 2014; Lim & Hong, 2010; Scalora et al., 2020; Sedlmeier et al., 2012; Zgierska et al., 2013). Various forms of meditation and yogic practices have also been linked with numerous physiological benefits such as improved respiration, cardiovascular health, body mass index, blood pressure, diabetes, and metabolism (Balaji et al., 2012; Ospina et al., 2007; Wallace & Benson, 1972). Contemplative practices have been purported to reduce arousal in the hypothalamic-pituitary-adrenal axis (HPA) and the sympathetic nervous system (SNS), structures whose hyperactivity has been closely associated with mental illness (Benson, 1997; Benson et al., 1974; Curiati et al., 2005; John et al., 2011; Krygier et al., 2013; Pariante & Lightman, 2008; Phongsuphap et al., 2008; Tang et al., 2009; Thayer & Lane, 2007; Veith et al., 1994; Wu & Lo, 2008). This reduction in the HPA axis and SNS may be the mechanism through which psychological and physiological benefits are exhibited. While there are many similar

effects of different meditative and contemplative practices, other studies have examined potential differences between differing meditative techniques (Burke, 2012; Goyal et al., 2014; Shannahoff-Khalsa et al., 1999; Shapiro, 2017; Tomasino et al., 2013; Wolf & Abell, 2003). There is, however, scant examination in the literature of the differential mental and physiological health effects of a qi-based focused attention meditation and a standard mindfulness meditation.

In the present study, I specifically focus on the following outcomes—depression, anxiety, subjective trauma, mindfulness, psychological well-being, transcendence, spirituality, and physical health—and how a qi-based meditation practice might influence these outcomes compared to a standard Mindfulness-based Stress Reduction (MBSR) program. I focus on these outcome measures for different reasons in this study. First, depression, anxiety, mindfulness, well-being, and physical health are outcomes that have been widely studied as indices for the benefits of meditation (Goyal et al., 2014; Sedlmeier et al., 2012). As such, these measures were selected as suitable indices of comparison in mental health outcomes between different modalities of meditation practice. The impact of meditation on trauma, conversely, has not been widely reviewed. Certain meditation practices have been found to be a feasible alternative to conventional effective treatments for trauma such as prolonged exposure therapy and have presented the possibility of PTSD treatment without direct exposure to traumatic memories (Nidich et al., 2016; Nidich et al., 2018). In the present study, I am interested in examining whether these findings are replicated in a six-week MBSR and qi-based meditation technique practices and whether there might be differences between the two types of practices. Lastly, meditation and the concepts of transcendence and spirituality have been historically linked (Goldberg, 2013; Plante, 2010). With the introduction of Eastern meditation practices to the West, however, spiritual and religious concepts were largely removed, a movement which

presented a Western audience with secular meditation for clinical and therapeutic purposes (Kabat-Zinn, 2003). More recently, in the past decade, there has been an increasing number of research that suggests that spirituality and transcendence may play a key role in the overall improvement of psychological health (Azhar et al., 1994; Barton et al., 2013; Bonelli & Koenig, 2013; Cloninger, 2006; Coward, 1996; Harden, 2010; Koenig, 2009; Miller et al., 2012). While the meditation and mindfulness practices in the present study are secular in nature, they originate from and were cultivated within religious and spiritual contexts. As a result, I am interested in examining if the deliberate use of one's selective attention impacts one's levels of spirituality and transcendence. A relationship between these two areas in the present study may suggest that an important aspect of solving modern society's pandemic of feeling alienated, isolated, and disconnected may be found in the deliberate use of attention.

Theory of Qi and Attention:

In many Eastern traditions, it is believed that Qi is directly influenced by human attention, consciousness, thought, or intent (*yi*). In essence, Qi is posited to move directly toward the object(s) of attention. Reconsidering the earlier example of focusing on one's right hand, the deliberate orienting of one's selective attention to the physical location of one's right hand should move Qi towards this exact spatial location. In the practice of Qigong or Kouksundo, for instance, the practitioner is trained to focus her selective attention on the *dantian* (*i.e.*, *danjeon*), a physical location in the lower abdomen where Qi is stored and easily accumulated. Once enough Qi is accumulated in the dantian, the practitioner will begin to experience significant improvements in mental and physical well-being. Doing so effectively, however, requires a significant amount of practice and skill—principles that align with Kahneman's

conceptualization of attention as a skill that can be developed with practice (Kahneman, 1973; Kahneman, 2011). Despite these similarities, modern theories of attention and empirical inquiry do not address the possibility that attention may act as a directive mechanism for energy. This potential phenomenon—energy being directed toward the object(s) of selective attention—has not yet been examined in the empirical literature to our knowledge. According to Eastern contemplative traditions, this phenomenon should be observed both when attention is focused within one’s own body as well as outside of one’s own body (External Qi, EQ). EQ, however, is alleged to be reliably produced only for expert practitioners who have dedicated themselves to an attentional practice for a long time (Chen, 2004).

Post-materialism:

While the phenomenon of energy concentrating on the object(s) of selective attention has not yet been empirically examined, evidence for attention as a directive mechanism for energy (and not simply a mechanism for energy expenditure) will contribute not only to the field of attention research but also to the ongoing efforts to understand the mind-body problem (i.e., what is the relationship between mind and matter?). The modern scientific worldview has been principally built on the assumption of materialism—matter is the fundamental reality and consciousness is a byproduct of it—and reductionism—reality can be explained by its smaller constituents (Beauregard et al., 2014). Under the assumption of scientific materialism, the mind arises from the brain and cannot influence the physical world. As a result of this materialist worldview, science has progressed rapidly and extensively since the 1600s. Since the 19th century, however, there have been an increasing number of empirically validated phenomena that the materialist view fails to explain. In the field of quantum mechanics, for instance, several replicable

phenomena such as nonlocality and entanglement, wave-particle duality, the observer effect, and Heisenberg's uncertainty principle among others challenge the constancy of scientific materialism. Moreover, several studies using a number of physical systems including the random event generators (REGs), double-slit optical systems, far-infrared detectors, and magnetic field detectors have documented the influence of mental intentions on tangible, physical events (Chen, 2004; Jahn & Dunne, 1986; Jahn & Dunne, 2001; Kokubo et al., 1999; Radin et al., 2012; Radin & Nelson, 1989; Schwartz et al., 1997).

Other fields such as biology, neuroscience, chemistry, and psychology have observed empirical data that suggest the influence of mind on body not accounted for by scientific materialism. For example, the placebo effect—the belief in the benefit of treatment leading to physiological improvement despite the ineffectuality of the treatment itself—has been well-documented across disciplines and is controlled for in experimental studies (via the double-blind procedure) due to its significant effect size (Beecher, 1955; Benedetti, 2014; Evans, 2004; Shapiro & Shapiro, 2000). Under the assumption of scientific materialism, the placebo effect should not exist, as the efficacy of a treatment should be determined solely by its physical properties. One's mindset, intentions, beliefs, thoughts, and emotions have been shown to reliably impact various other physiological outcomes such as immune function, cardiovascular disease, certain cancers, inflammation, and surgical recovery among others (Jamieson, Nock, & Mendes, 2012; Kiecolt-Glaser, 2002; Kiecolt-Glaser, 1998; Spiegel, 2001). One related study found that participants who were told they were consuming an “indulgent” milkshake of 620 calories produced a significantly larger decrease in ghrelin (i.e., the hunger hormone) compared with those who were told they were consuming a “sensible” 380-calorie milkshake when in fact the two milkshakes were identical (Crum et al., 2011). One's beliefs and intentions, similarly to

external qi emissions, have also been shown to impact natural elements external to the body such as the light intensity and crystallization of water as well as germination rates and light intensity of plants (Creath & Schwartz, 2004; Haid & Huprikar, 2001; Korotkov et al., 2009; Radin et al., 2006).

At the intersection of psychology and physiology, several different phenomena additionally support the post-materialist assumption. Regular practice of meditation or maintaining a high level of lived experience of spirituality over a long period of time, for instance, may lead to structural changes in the brain, changes in genetic expression, and altered electroencephalogram patterns (Bhasin et al., 2013; Davidson & Lutz, 2008; Fox et al., 2014; Hölzel et al., 2011; Jang et al., 2011; Kaliman et al., 2014; Lazar et al., 2005; Lutz et al., 2004; Miller et al., 2014; Miller et al., 2012). Such instances can also be found in various forms of psychopathology and psychosomatic disorders. Those with Dissociative Identity Disorder, for instance, have shown distinct physiological changes such as visual functioning, posture, handwriting style, vocal patterns, handedness, sensitivity to pain, and even allergic response for different identities or personalities (Braun, 1983; Coons, 1988; Huber & den Camp, 1997; Lewis et al., 1997; Miller, 1989; Savitz et al., 2004). Alternatively, Conversion Disorder—symptoms of the nervous system such as blindness or paralysis with no physical basis—has been improved via mind-focused treatment such as hypnosis and psychotherapy (Hinson et al., 2006; Moene et al., 2003; Turgay, 1990). While not forms of psychopathology, the nocebo phenomenon and psychogenic death, which refer to the negation of the positive impact of an efficacious treatment and death brought about solely by a strong negative emotional response (often triggered by a violation of social rules), respectively, have revealed inconsistencies in the materialistic assumption (Benedetti et al., 2007; Colloca & Miller, 2011; Dein, 2003; Meador, 1992; Richter,

1957). These well-documented phenomena further support the potentially powerful influence of mental processes on the physical world.

Additionally, while under the materialist assumption and neuron doctrine, we should observe an increase in brain activity corresponding with an increase in conscious activity, numerous studies indicate that this is not always the case. While most examinations of the brain emphasize an increase in brain activity using functional magnetic resonance imaging (fMRI), magnetoencephalography (MEG), electroencephalography (EEG), or positron emission tomography (PET), there have been several studies citing a decrease in brain activity corresponding to an increase or sustained rate in a mental activity (Friston et al., 1991; Goodyear & Douglas, 2009; Haxby et al., 1994; Raichle et al., 2001; Shulman et al., 1997). Further yet, a recent fMRI study on the effects of psilocybin found that psilocybin intake produced profound increases in conscious activity accompanied by decreases in blood flow across all brain regions examined including the hub regions of the thalamus and anterior and posterior cingulate cortex (Carhart-Harris et al., 2012). Perhaps the most extreme instances of this mismatch are found in the study of near death experiences (NDEs). Those who claim to have had a NDE report having had vivid conscious experiences while their bodies were deemed clinically dead, which means oxygen and blood intake to the brain are gradually halted. While there is often a severe reduction in brain activity and blood flow to the brain in these cases, studies have found a significant portion of survivors report a drastic increase in vivid, rich conscious experience (Agrillo, 2011; Moody, 1975; Van Lommel, 2006; Van Lommel et al., 2001).

With the advent of the empirical examination of the mind-matter interaction, an alternate scientific worldview—post-materialism—has emerged as an assumption that better accounts for the myriad observed phenomena found in the study of the mind-matter relationship. Post-

materialism posits that mind is as primary a component of reality as matter. Some post-materialist scholars have proposed an alternative model to that of unidirectional causality (e.g., matter gives rise to mind)—a latent reality gives rise to both mind and matter (Brabant, 2016). Physicist David Bohm stated “mind and matter are not separate substances [but rather,] different aspects of one whole and unbroken movement” (Bohm, 2002). Similarly, physicist Erwin Schrödinger affirmed, “consciousness cannot be accounted for in physical terms. For consciousness is absolutely fundamental” (Schrödinger, 1931). With the increasing body of evidence confirming the centrality of mind and consciousness in the mechanics of nature, these earlier insights seem more relevant now than at the advent of modern science.

Volitional Body Temperature Control:

One such relevant area of inquiry has been the impact of volitional mental processes on body temperature in the extant literature. Most of these studies used biofeedback or hypnosis to induce peripheral body temperature control and found that some individuals either possessed sufficient ability to control peripheral body temperature without any training or could be trained to do so over a period of time, with a wide between-subjects variation in ability (King & Montgomery, 1980; Lynch et al., 1976; Maslach, Marshall, & Zimbardo, 1972; Peper & Gibney, 2003; Roberts, Kewman, & MacDonald, 1973; Suter & Loughry-Macado, 1981; Tahsini et al., 2017). The training methods and instructions provided in these studies included auditory feedback, visual feedback, tactile thermal stimuli, mental imagery and visualizations, and hypnotic induction. Benson et al. (1982) specifically investigated body temperature changes of expert practitioners during advanced Tibetan Buddhist meditation practice called g Tum-mo and found they could increase their peripheral body temperature by up to 8.3 degrees Celsius. The

practitioners are said to utilize both a somatic component (i.e., deep breathing) and a neurocognitive component (i.e., visualization of flames in the body) during Tum-mo meditation. Each component has been shown to contribute to body temperature increases (Kozhevnikov et al., 2013). In several other studies, the illusion of the ownership of a virtual body or rubber hand, elicited via immersive virtual reality or the rubber hand illusion, decreased the temperature of the real hand or body part, suggesting one's endogenous body representation may impact body temperature (Kammers, Rose, & Haggard, 2011; Llobera, Sanchez-Vives, & Slater, 2013; Moseley et al., 2008). While it is clear from these studies that humans have the capacity to regulate and control peripheral body temperature, the mechanism behind how and why I observe this phenomenon is unclear. When visual or audio biofeedback, for instance, leads to an enhanced ability for the participant to control her peripheral body temperature, what is occurring endogenously in her state of consciousness? What might be the object of her selective attention? In the present study, I hope to answer these mechanistic questions regarding the relationship between attention and matter.

Current Study and Study Aim:

Through two separate experiments, I hope to contribute to the fields of selective attention, post-materialism, and clinical psychology by clarifying the mechanism of the attention-body relationship and what the implications of this mechanism might be on human health and well-being. While there have been many studies examining the mind-body relationship, none to our knowledge has explored selective attention as a directive mechanism for energy in the physical world, specifically within the body. I hypothesized that energy, as measured by temperature, would be directed towards the object of selective attention—the

spatial location that is focused on will observe a significantly greater increase in temperature compared with the location that is not focused on in the body. Temperature is defined as a measure of the average kinetic energy amongst particles within an object (Allain, 2017). While temperature does not measure total energy (i.e., kinetic or thermal energy) of an object, if two systems have equal temperature and quantity of matter (i.e., mass), we can assume they also have an equal amount of total energy. In the present study, a change in temperature represents a change in the average energy of the dantian. Given this technical definition, however, we can make the assumption that an increase in temperature in this study suggests an increase in total energy (Qi) because there is no change in the mass of the measured area. Theoretical implications for Qi and Eastern medicine and practices are reviewed in the discussion section. Evidence for this hypothesis may suggest that the content of attention and consciousness have a corresponding influence on the body. In other words, if one selectively attends to one's left foot, energy flows discerningly towards one's left foot and not towards one's right foot or left hand. Given corroborative findings, I argue that selective attention can be a directive mechanism for energy in addition to a mechanism for information processing. Once I have examined this mechanism, I tested the impact of focusing one's selective attention on one's dantian area (i.e., an area below the umbilicus) on mental and physical health. According to the teachings of Eastern contemplative practices, the accumulation of energy in this area using selective attention will improve overall health. I hope to empirically examine this hypothesis, as the implications of such findings on the fields of clinical psychology and medicine are far-reaching. Overall, the present study seeks to unify an Eastern contemplative understanding of consciousness and matter with a Western psychological perspective of attention through empirical findings.

Hypotheses

Experiment 1 (hand):

Hypothesis 1a:

I hypothesized that the correct net change in hand temperatures (i.e., change in focus hand - change in non-focus hand) will be significantly greater than 0 for each time point after baseline.

Hypothesis 1b:

I hypothesized that the temperature at each time point after baseline will be significantly higher than the temperature at baseline for the focus hand. I also hypothesize that there will be no significant difference between each time point after baseline and temperature at baseline for the non-focus hand.

Hypothesis 1c:

I hypothesized that contemplative practice experience will be positively associated with correct net temperature change at each time point after baseline.

Experiment 2 (meditation experiment):

Hypothesis 2a:

I hypothesized that the experimental (focus) group will exhibit significantly greater levels of increase from pretest to posttest scores in mindfulness, psychological well-being, spiritual transcendence, spirituality and physical health and significantly greater levels of decrease from

pretest to posttest scores in depression, anxiety, and subjective trauma symptoms than the control group.

Hypothesis 2b:

I further hypothesized that the change in depression and anxiety for the experimental group from pretest to posttest will be mediated by change in physical health but not for the control group.

Hypothesis 2c:

I hypothesized that both groups will exhibit significant increases in mindfulness, psychological well-being, spiritual transcendence, spirituality, and physical health and decreases in depression, anxiety, and subjective trauma symptoms from pretest to posttest.

Methods

Participants

I recruited 12 participants for experiment 1 and 16 participants for experiment 2 by posting flyers throughout Columbia University and New York City bulletin boards, inquiring religious and spiritual institutions such as monasteries, and word of mouth. The inclusion criteria involved any person at least 18 years of age with no restrictions on gender, socioeconomic class, race, religion, country of origin, or occupation. Additionally, I gathered participants from a wide-range of contemplative practice experience. Participants who have experience in contemplative practice were recruited from a variety of spiritual and contemplative practice traditions. Each participant received \$10 upon completion of each experiment. Thus, those that participated in experiment 1 received a total of \$10. In experiment 2, 16 participants were recruited in the same way. All participants recruited in experiment 2 had little to no experience in any form of contemplative practice. Each participant received \$10 upon completion of the pre-test survey and \$10 upon completion of the post-test survey, totaling \$20. Experiments 1 and 2 were approved by the Institutional Review Board of Teachers College, Columbia University, and informed consent was obtained from all participants before inclusion in the study.

Materials

The temperature sensor devices used was the Mindfield eSense Temperature sensor. One sensor was taped on the center of the palm of each hand using Nexcare Sensitive Skin tape that allows for a pain-free removal process. The Mindfield sensor was connected to a smart phone device (Apple iPhone 8 128 GB version), where the Mindfield eSense app (version 4.5.91)

tracked and saved the real-time temperature of each palm throughout the experiment. The device recorded the given temperature (in Fahrenheit) every $2/10^{\text{th}}$ of a second for the entirety of the temperature experiment. Once recorded, the temperature data for each participant was exported to Microsoft Excel and SPSS 26.0 for data analysis. The questionnaire completed after the temperature measurement consisted of demographic questions, handedness, questions examining experience in contemplative practice and content of practice, and clinical measures.

Specifically, the participant was asked whether they have engaged in a form of contemplative practice, whether they have an ongoing practice, for how long they have practiced, how frequently they have practiced, what type of contemplative practice they have practiced, and what the practice involves. Psychiatric symptoms—depression and anxiety—were measured using the Patient Health Questionnaire (PHQ-9) and the Generalized Anxiety Disorder Scale (GAD-7) respectively (Kroenke et al., 2001; Kroenke, Williams, & Lowe, 2006). These measures have been validated cross-culturally and may therefore be considered a reliable estimate of clinical depression and anxiety in the United States as well as Eastern countries (Patel et al., 2008; Wang et al., 2014; Lowe et al., 2008; Wild et al., 2014; Delgadillo et al., 2012). Based on standard scoring for the scale for the PHQ-9, mild levels of depression are scores ranging from 5-9, moderate to moderately severe levels of depression are scores ranging from 10-14, and scores of 15 and above constitute severe forms of depressive symptoms (Kroenke, et al., 2001; Kroenke, Williams, & Lowe, 2006). For the GAD-7, scores in the mild level of anxiety are represented by scores ranging from 5-9, moderate level of anxiety are scores ranging from 10-14, and severe levels of anxiety are scores 15 and above (Spitzer et al., 2006).

In addition to these measures used in experiments 1, experiment 2 used further clinical and psychological measures. Additional measures used in experiment 2 included the Five-Facet

Mindfulness Questionnaire, the Life Events Checklist (LEC), the PTSD Checklist—Civilian Version (PCL-C), the Psychological well-being Scale, the Spiritual Transcendence Scale (STS), the Spirituality Scale (SS), the Physical Health Questionnaire (PHQ), and the Medical Outcomes Study (MOS) 36-item Short Form Survey (SF-36). The Five-Facet Mindfulness Questionnaire contains 39 items that produces a total mindfulness score as well as scores for each of the five facets of mindfulness—observing, describing, acting with awareness, non-judging of inner experience, and non-reactivity to inner experience (Baer et al., 2006). The Life Events Checklist (LEC) is a 17-item self-report measure examining potentially traumatic events that have occurred in one’s lifetime. For each event, the LEC provides multi-choice options including “happened to me,” “witnessed it,” “learned about it,” “not sure,” and “doesn’t apply” (Gray et al., 2004). The PTSD Checklist—Civilian Version (PCL-C) is a 17-item inventory that measures traumatic symptoms in the last month. The Psychological well-being Scale is a 42-item scale measuring psychological well-being with a total score as well as scores for each of the six dimensions of well-being including autonomy, environmental mastery, personal growth, positive relations, purpose in life, and self-acceptance (Ryff, 2014). The Spiritual Transcendence Scale (STS) measures self-transcendence through a more holistic and interconnected lens to include self-transcendence beyond a theistic frame. This scale consists of three subscales including prayer fulfillment, universality, and connectedness (Piedmont, 1999). The Spirituality Scale (SS) contains 23 items that measure spirituality through a holistic lens as well, focusing on the beliefs, intuitions, lifestyle choices, practices, and rituals of spirituality (Delaney, 2005). The Physical Health Questionnaire (PHQ) is a 14-item scale measuring somatic symptoms including gastrointestinal problems, headaches, sleep disturbances, and respiratory illness (Schat, Kelloway, & Desmarais, 2005). Lastly, the Medical Outcomes Study (MOS) 36-item Short Form

Survey (SF-36) is a 36-item survey that measures general health that contains domains of limitations in physical activities because of health status, limitations in social activities because of physical or emotional problems, limitations in usual role activities because of physical health problems, bodily pain, general mental health, limitations in usual role activities because of emotional problems, vitality, and general health perceptions (Ware Jr. & Sherbourne, 1992).

Procedure

The present study consisted of two separate experiments examining the underlying mechanistic hypothesis that attention is not only an information-processing system but also a directive mechanism whereby energy, as measured by temperature, is increased at the spatial object of attention in the body. Temperature is being measured in this study because this measure of average kinetic energy has been shown to be influenced by human consciousness (Benson et al., 1982; Chen, 2004). In experiment 1, participants focused on a specific location in their own body. In experiment 1, there was a total of five time points (T = 0 min (baseline), 5 min, 10min, 15 min, 20 min), when I collected temperature and distraction levels. In experiment 2, participants practiced focusing their attention on a specific point on their lower abdomen (i.e., dantian), as taught in many Eastern contemplative practices, over the course of six weeks. After testing the hypothesis that attention is a directive mechanism for energy in the body with experiment 1, experiment 2 tested the hypothesis that the utilization of this mechanism to focus on one's "danjeon," "dantian," or energy center (i.e., chakra), would enhance health and reduce symptoms of psychopathology. Experiment 2 was conducted given the significant findings found in experiment 1. Each participant was given specific instructions on how to focus on the object

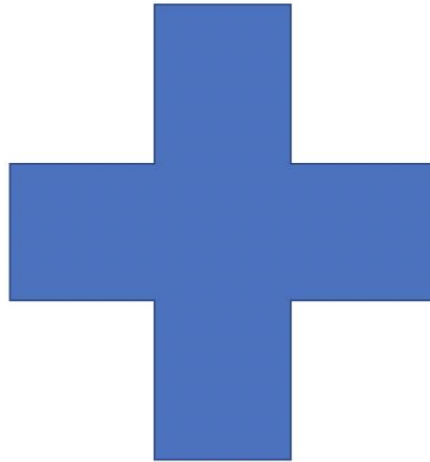
of attention. This method of concentration is taught in various Eastern meditation traditions. Each participant was instructed to focus her attention on a small point, a size of a dime, on the spatial location that was measured (i.e., where the sensor was placed). This method involves top-down attention by means of intently visualizing on a small point. By doing so, it aims to reduce the frequency and duration of unrelated thoughts as well as direct available attentional resources to a singular object of attention. The participant was asked to breathe normally while continuing to maintain focus on this point throughout the experiment. She was also instructed to gently return her attention to the point of concentration if she became distracted by thoughts.

Experiment 1

In experiment 1, each participant was asked to sit on a chair and pay attention to the instructions. Instructions on the overall set up of the study were given to the participant by a researcher in the beginning of the experiment. Instructions once the experiment began were played through the audio recording. Audio instructions were recorded prior to the experiment and were played on the iPhone 8 Voice Memos app to ensure standardization of instructions and minimization of experimenter bias. Once initial instructions were provided, the participant had a temperature sensor attached to each palm with tape by the researcher. There was also a third temperature sensor placed under the table in the room in order to measure the room temperature throughout the experiment. Once the sensors were placed in the correct positions and any further questions were answered, the researcher left the room. The participant was then asked, through the audio recording, to focus their attention on a small point (figure 1), shaped like a cross on a

piece of paper in front of them, which oriented their attention outside of her body and allowed for the hand temperatures to calibrate and settle.

Figure 1

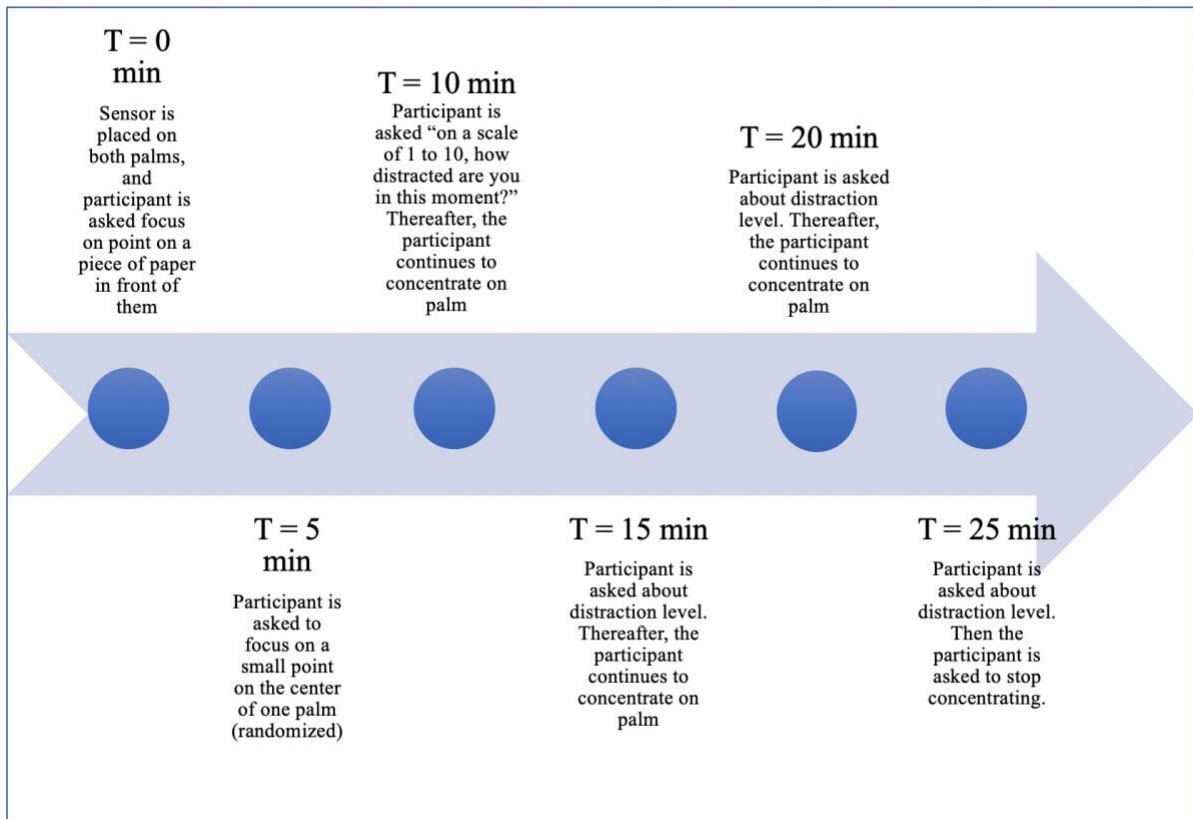


After five minutes, the participant was asked to focus on the center of one of her palms. Which hand she was asked to focus on was randomized. Once the participant started concentrating, every five minutes thereafter, the participant was asked, “on a scale of 1 to 10, how distracted are you in this moment?” through an audio recording. The participant answered vocally, and the audio of the answers was recorded. Once 20 minutes of concentration on one hand passed, the participant was asked to stop concentrating, the researcher returned to the room, and the temperature sensors were removed. The sensors continuously detected and recorded the room temperature and participant’s hand temperatures throughout the 25 minutes since the sensors were attached. Figure 2 depicts the timeline for temperature measurement and instructions, and figure 3 illustrates where each participant focused on. After this portion was completed, the participant was asked whether they have practiced a form of contemplative practice, which type they have practiced, how long they have practiced, how often they have

practiced, and what the duration of each practice session has been on average. The participant was also asked demographic questions such as their gender, race and ethnicity, religion, and handedness. Afterwards, they were asked to complete several measures on a computer including the Patient Health Questionnaire-9 (PHQ-9) identifying level of depression, and the Generalized Anxiety Disorder (GAD-7) identifying level of anxiety.

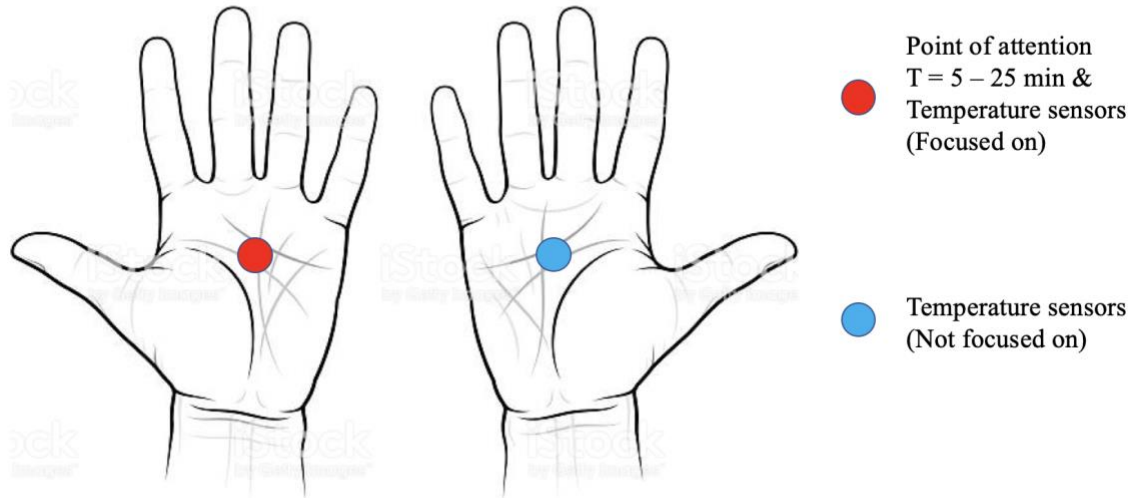
Figure 2

Timeline



Experiment 1 Diagram

Figure 3



Experiment 2

Experiment 2 used a pretest-posttest control group experimental design to examine the impact of focusing one's attention on one's "dantian," an area of the body in the lower abdomen, during meditation on mental and physical health. Participants in the control group were taught a breathing-based (MBSR) meditation while those in the experimental group were taught the same breathing meditation in addition to the focusing technique. 16 recruited participants were randomly assigned to one of the groups; each group therefore consisted of 8 participants. Once the participants were randomly assigned to each group, each participant was asked to complete a battery of measures that took approximately 30 minutes to complete (i.e., pretest). Thereafter, each participant was individually taught the meditation practice of his or her respective group by a researcher. For the control breathing-only group, each participant was taught a standard breathing meditation exercise. In addition to the same method of breathing, each participant in

the experimental group was taught to focus on a small, dime-sized point approximately two inches inside the body from the point approximately two inches below the umbilicus (i.e., dantian). The participant was further taught to visualize this point to be a bright, sun-like white and yellowish white color. Once the technique was taught, the breathing exercise was practiced for 20 minutes with an audio recording of the instructions and a meditation music with the researcher standing by to help with any questions. The meditation music was a repetitive, calming music with a pause every 10 seconds that helps the practitioner time her breathing. The practitioner was asked to inhale and exhale in accordance with this music, inhaling for 10 seconds and exhaling for 10 seconds. Once the initial 20-minute practice session was concluded, participants in both groups were asked to practice the respective meditation practice for 20 minutes every day for the subsequent six weeks. Once every two weeks, each participant met individually with the researcher to practice 20 minutes of the meditation and was offered an opportunity to ask any questions regarding the technique. Once the six-week training period was complete, all participants were asked to complete the same battery of measures that were completed before (i.e., posttest).

Statistical Analyses:

The raw data from the measures and sensors was analyzed using SPSS 22.0 (IBM Corp., 2013). In experiment 1, paired samples t-tests were used to measure individual hand temperature (i.e., focused hand and non-focused hand) change by increments of 5 minutes (e.g., 5 minute temperature vs. 0 minute temperature; 10 minute temperature vs. 0 minute temperature), one-sample t-tests were used to measure correct net change (i.e., absolute value of difference in increase in focused hand and decrease in non-focused hand), and linear regression analyses were

used to examine the relationship between experience in contemplative practice and correct net temperature change as well as the relationships between net temperature change and outcome measures. In experiment 2, paired samples t-tests were used to examine differences between posttest scores and pretest scores for both the control group and the experimental group. These tests were conducted for all of the aforementioned clinical and psychological measures in experiment 2. ANCOVAs were used to examine whether the experimental group exhibits larger levels of increase in mental health and other psychological variables over the course of 6 weeks with assigned group as the independent variable, pretest scores as the covariate, and posttest scores as the dependent variable. Multiple regression analyses (PROCESS macro) also examined whether change in physical health mediated the relationship between baseline (pretest) mental health outcome measure scores and posttest mental health outcome measure scores.

Results

Experiment 1

Sample Characteristics

The included sample was racially diverse given the small sample size ($N = 12$) (see Table 1). The average age was relatively young ($M = 29.67$, $SD = 5.37$), and the sample consisted of five female participants and seven male participants. Other sample characteristics were not attainable, as the data being used was derived from a pilot study previously conducted.

Table 1

Demographic Characteristics of Sample

Characteristic	<i>M</i>	<i>SD</i>
Age	29.67	5.37
	N	%
Sex		
Female	5	41.67
Male	7	58.33
Race		
Asian	4	33.33
Black or African American	1	8.33
Hispanic or Latino	3	25.00
White	4	33.33

Hypothesis 1a

I first hypothesized that the correct net change in hand temperatures (i.e., change in focus hand - change in non-focus hand) would be significantly greater than 0 for each time point after baseline. Using a One Samples t-test, the results suggested that the correct net change in hand temperatures (5 min: $M = 0.38$, $SD = 0.69$; 10 min: $M = 0.62$, $SD = 0.95$; 15 min: $M = 1.33$, $SD = 1.01$; 20 min: $M = 1.30$, $SD = 1.28$) was indeed significantly greater than 0 for each time point (Table 2), 5 min: $t(11) = 1.89$, $p = 0.043$; 10 min: $t(11) = 2.27$, $p = 0.023$; 15 min: $t(11) = 4.54$, $p = 0.001$; 20 min: $t(11) = 3.54$, $p = 0.003$.

Table 2

One-Sample t-tests of Correct Net Change for Each Timepoint

	Test Value = 0	df	<i>p</i>	Mean Difference	90% Confidence Interval		Cohen's <i>d</i>
	<i>t</i>				Lower	Upper	
5 min	1.89	11	0.043	0.38	0.02	0.73	0.55
10min	2.27	11	0.023	0.62	0.13	1.11	0.65
15 min	4.54	11	0.001	1.33	0.80	1.85	1.31
20 min	3.54	11	0.003	1.30	0.64	1.96	1.05

Hypothesis 1b

Secondly, I hypothesized that the temperature at each time point after baseline would be significantly higher than the temperature at baseline for the focus hand. I also hypothesized that there would be no significant difference between each time point after baseline and temperature at baseline for the non-focus hand. Using Paired Samples t-tests for the focus hand (Table 3), results indicated that the temperature at time points 10 min ($M = 89.00$, $SD = 3.76$), 15 min ($M = 89.61$, $SD = 3.42$), and 20 min ($M = 89.15$, $SD = 3.76$) were significantly higher than the temperature at baseline ($M = 87.94$, $SD = 4.64$), 10 min: $t(11) = -2.27$, $p = 0.022$; 15 min: $t(11) =$

-3.54, $p = 0.003$; 20 min: $t(11) = -2.30$, $p = 0.021$. The temperature at time point 5 min ($M = 88.57$, $SD = 3.97$) was greater than the temperature at baseline at a trend level, $t(11) = -1.45$, $p = 0.087$. Using Paired Samples t-tests for the non-focus hand, results suggested that the temperature at all time points 5 min ($M = 89.48$, $SD = 4.07$), 10 min ($M = 89.66$, $SD = 3.41$), 15 min ($M = 89.57$, $SD = 3.42$), and 20 min ($M = 89.13$, $SD = 3.78$) were not significantly different from the temperature at baseline ($M = 89.22$, $SD = 4.40$), 5 min: $t(11) = -0.77$, $p = 0.460$; 10 min: $t(11) = -0.97$, $p = 0.36$; 15 min: $t(11) = -0.59$, $p = 0.57$; 20 min: $t(11) = 0.14$, $p = 0.890$.

Table 3

Paired Samples t-tests of Focus Hand

Pair	Paired Differences		t	df	p	Cohen's d
	Mean	Std. Deviation				
Temp_focus_0min - Temp_focus_5min	-0.63	1.50	-1.45	11	0.087	0.42
Temp_focus_0min - Temp_focus_10min	-1.06	1.62	-2.27	11	0.022	0.66
Temp_focus_0min - Temp_focus_15min	-1.67	1.64	-3.54	11	0.003	1.02
Temp_focus_0min - Temp_focus_20min	-1.21	1.83	-2.30	11	0.021	0.68

Table 4

Paired Samples t-test Non-Focus Hand

Pair	Paired Differences		t	df	p	Cohen's d
	Mean	Std. Deviation				
Temp_nonfocus_0min - Temp_nonfocus_5min	-0.26	1.16	-0.77	11	0.460	0.22
Temp_nonfocus_0min - Temp_nonfocus_10min	-0.44	1.59	-0.97	11	0.355	0.28
Temp_nonfocus_0min - Temp_nonfocus_15min	-0.35	2.02	-0.59	11	0.566	0.17
Temp_nonfocus_0min - Temp_nonfocus_20min	0.09	2.12	0.14	11	0.890	0.17

Hypothesis 1c

Lastly for experiment 1, I hypothesized that contemplative practice experience would be positively associated with correct net temperature change at each time point after baseline. The

results partially confirmed this hypothesis. For time points 10 min and 15 min, there were significant positive associations between contemplative practice experience and correct net temperature change, 10 min: $F(1, 10) = 10.91, p = 0.008, R^2 = 0.52$; 15 min: $F(1, 10) = 16.44, p = 0.002, R^2 = 0.62$. For time points 5 min and 20 min, no significant associations were found between contemplative practice experience and correct net temperature change, 5 min: $F(1, 10) = 1.95, p = 0.193, R^2 = 0.16$; 20 min: $F(1, 10) = 1.67, p = 0.225, R^2 = 0.14$.

Table 5

Linear Regression of Contemplative Practice Experience and Correct Net Change (5 min)

Effect	B	SE	β	t	p
Hours	0.40	0.29	0.40	1.39	0.193

Linear Regression of Contemplative Practice Experience and Correct Net Change (10 min)

Effect	B	SE B	β	t	p
Hours	0.72	0.22	0.72	3.30	0.008

Linear Regression of Contemplative Practice Experience and Correct Net Change (15min)

Effect	B	SE B	β	t	p
Hours	0.79	0.19	0.79	4.06	0.002

Linear Regression of Contemplative Practice Experience and Correct Net Change (20 min)

	B	SE B	β	t	p
Hours	0.38	0.29	0.38	1.29	0.225

Experiment 2

Sample Characteristics

The total sample size for experiment 2 was 16 participants, and they were randomly assigned to either the treatment group or the control group. Experiment 2 was also racially diverse given the small sample size (see Table 6), and the average age was relatively younger ($M = 27.81$, $SD = 3.19$) likely because most participants were recruited in the graduate school setting. The sample consisted of significantly more male ($n = 12$) than female ($n = 4$) participants. In terms of religious and spiritual beliefs, 43.8% of participants identified as “Atheist/not religious” followed by smaller percentages of Christianity, Agnostic, “Spiritual but not religious,” and Catholicism.

Table 6

Demographic Characteristics of Sample		
Characteristic	<i>M</i>	<i>SD</i>
Age	27.81	3.19
	<i>N</i>	%
Sex		
Female	4	25.00
Male	12	75.00
Race		
Asian	6	37.50
Black/African American	2	12.50
Hispanic/Latino	3	18.80
White	5	31.30
Religion		
Catholicism	1	6.30
Christianity	4	25.00
Atheism/not religious	7	43.80
Questioning/agnostic/not sure	3	18.80
Spiritual but not religious	1	6.30

Hypothesis 2a

For experiment 2, I first hypothesized that the experimental (focus) group would exhibit significantly greater levels of increase from pretest to posttest scores in mindfulness, psychological well-being, spiritual transcendence, spirituality, and physical health and significantly greater levels of decrease from pretest to posttest scores in depression, anxiety, and subjective trauma symptoms than the control group. For each measure, an ANCOVA model

(Table 7) was used with type of treatment group as the independent variable, pretest scores as the covariate, and posttest scores as the dependent variable. Using ANCOVA analyses, results suggested a significant decrease in scores for depression and anxiety along with a significant increase in scores for spiritual transcendence, general health, and psychological well-being for the treatment group compared with the control group, depression: $F(2, 13) = 5.60, p = 0.018, R^2 = 0.46$; anxiety: $F(2, 13) = 6.32, p = 0.012, R^2 = 0.49$; spiritual transcendence: $F(2, 13) = 6.44, p = 0.011, R^2 = 0.500$; general health: $F(2, 13) = 7.65, p = 0.006, R^2 = 0.54$; psychological well-being: $F(2, 13) = 15.97, p < 0.001, R^2 = 0.71$. ANCOVA analyses also revealed no significant treatment effect in physical health, spirituality, mindfulness, and subjective trauma: $F(2, 13) = 2.13, p = 0.158, R^2 = 0.25$; spirituality: $F(2, 13) = 6.97, p = 0.093, R^2 = 0.52$; mindfulness: $F(2, 13) = 2.03, p = 0.172, R^2 = 0.24$; subjective trauma: $F(2, 13) = 0.49, p = 0.623, R^2 = 0.07$. However, spirituality ($p = 0.093$) and mindfulness ($p = 0.082$) exhibited trend level effects.

The same ANCOVA model was used for each measure a second time while controlling for gender in order to test whether there would be a treatment effect while keeping gender differences constant. Using ANCOVA analyses, results remained the same with a significant decrease in scores for depression and anxiety along with a significant increase in scores for spiritual transcendence, general health, and psychological well-being for the treatment group compared with the control group, depression: $F(1, 12) = 5.42, p = 0.014, R^2 = 0.58$; anxiety: $F(1, 12) = 7.38, p = 0.019, R^2 = 0.56$; spiritual transcendence: $F(1, 12) = 5.10, p = 0.043, R^2 = 0.51$; general health: $F(1, 12) = 15.85, p = 0.002, R^2 = 0.58$; psychological well-being: $F(1, 12) = 5.35, p = 0.039, R^2 = 0.71$. Similarly, ANCOVA analyses revealed no significant change in physical health, spirituality, mindfulness, and subjective trauma after controlling for gender, physical health: $F(1, 12) = 0.01, p = 0.920, R^2 = 0.33$; spirituality: $F(1, 12) = 2.43, p = 0.145, R^2 = 0.54$;

mindfulness: $F(1, 12) = 3.44$, $p = 0.088$, $R^2 = 0.25$; subjective trauma: $F(1, 12) = 2.40$, $p = 0.147$, $R^2 = 0.27$. While controlling for gender, only mindfulness ($p = 0.088$) continued to exhibit a trend level effect, and spirituality ($p = 0.145$) did not.

Table 7

ANCOVA Depression T2					
Predictor	B	SE B	β	<i>t</i>	<i>p</i>
(Constant)	2.90	2.44		1.19	0.255
Group	-2.33	1.03	-0.46	-2.27	0.041
Depression T1	0.61	0.24	0.51	2.53	0.025
ANCOVA Anxiety T2					
Predictor	B	SE B	β	<i>t</i>	<i>p</i>
(Constant)	4.56	1.57		2.91	0.012
Group	-3.00	0.88	-0.74	-3.40	0.005
Anxiety T1	0.50	0.21	0.52	2.37	0.034
ANCOVA Trauma T2					
Predictor	B	SE B	β	<i>t</i>	<i>p</i>
(Constant)	23.15	3.59		6.44	0.000
Group	-3.28	3.31	-0.43	-0.99	0.340
Trauma T1	0.15	0.18	0.36	0.82	0.427
ANCOVA Mindfulness T2					
Predictor	B	SE B	β	<i>t</i>	<i>p</i>
(Constant)	79.91	32.68		2.45	0.029
Group	19.10	10.14	0.53	1.89	0.082
Mindfulness T1	0.30	0.19	0.44	1.57	0.141
ANCOVA Transcendence T2					
Predictor	B	SE B	β	<i>t</i>	<i>p</i>
(Constant)	11.54	19.07		0.61	0.555
Group	18.61	7.50	0.51	2.48	0.027
Transcendence T1	0.63	0.19	0.67	3.24	0.006
ANCOVA Spirituality T2					
Predictor	B	SE B	β	<i>t</i>	<i>p</i>
(Constant)	9.15	25.32		0.36	0.724
Group	15.87	8.74	0.37	1.82	0.093
Spirituality T1	0.81	0.22	0.74	3.66	0.003
ANCOVA Physical Health T2					
Predictor	B	SE B	β	<i>t</i>	<i>p</i>
(Constant)	34.62	4.32		8.02	0.000
Group	-1.28	3.27	-0.13	-0.39	0.702
Physical Health T1	-0.18	0.15	-0.40	-1.23	0.240
ANCOVA General Health T2					
Predictor	B	SE B	β	<i>t</i>	<i>p</i>
(Constant)	57.51	10.52		5.47	0.000
Group	15.58	4.03	0.76	3.87	0.002
General Health T1	0.13	0.26	0.10	0.51	0.619
ANCOVA Psychological Well-being T2					
Predictor	B	SE B	β	<i>t</i>	<i>p</i>
(Constant)	17.35	32.80		0.53	0.606
Group	24.05	9.48	0.39	2.54	0.025
Psychological Well-being T1	0.81	0.15	0.86	5.55	0.000

Hypothesis 2b

I further hypothesized that the change in depression and anxiety for the experimental group from pretest to posttest would be mediated by change in physical health but not for the control group. For this hypothesis, I used the Andrew Hayes PROCESS macro v3.5.3 mediation analysis tool with the group type as the independent variable, change in physical health as the mediating variable, and change in depression and anxiety as the dependent variable. For the mediating variable, I additionally used two separate variables—the Physical Health Questionnaire (PHQ) and the Medical Outcomes Study (MOS) 36-item Short Form Survey (SF-36) General Health subscale—because both of these scales capture physical health and physical functioning. A mediation analysis (Table 8) revealed that there was a significant positive indirect effect (IE = 0.91) of group via change in general health on change in depression, 95% CI [0.14, 2.19]. Through mediation analyses, the results also revealed a positive non-significant effect (IE = 0.12) of group via change in physical health on depression and a negative non-significant effect (IE = -0.27) of group via change in physical health on anxiety, 95% CI [-1.15, 0.71]; 95% CI [-1.47, 0.03]. A mediation analysis also revealed a positive non-significant effect (IE = 0.13) of group via change in general health on anxiety, 95% CI [-0.59, 1.05].

Similarly for hypothesis 3b, I conducted the mediation analyses while controlling for gender. Through the same analyses while controlling for gender, the significance results remained the same as well. A mediation analysis revealed that there was a significant positive indirect effect (IE = 0.91) of group via change in general health on change in depression, 95% CI [0.16, 2.08] while controlling for gender. The remaining mediation analyses revealed a positive non-significant effect (IE = 0.12) of group via change in physical health on depression, a

negative non-significant effect (IE = -0.21) of group via change in physical health on anxiety, and positive non-significant effect (IE = 0.00) of group via change in general health on anxiety, 95% CI [-1.06, 0.83]; 95% CI [-1.16, 0.08]; 95% CI [-0.67, 0.79].

Table 8

Mediation Analysis of Total Physical Health and Depression

Effects	Effect	SE	t	p	95% Confidence Interval of the Difference	
					Lower	Upper
Total Effect of Group on Depression	0.98	0.45	2.20	0.045	0.02	1.94
Direct Effect of Group on Depression	0.86	0.62	1.38	0.190	-0.48	2.19
Indirect Effect of Group on Depression	0.12	0.48			-1.15	0.71

Mediation Analysis of Total Physical Health and Anxiety

Effects	Effect	SE	t	p	95% Confidence Interval of the Difference	
					Lower	Upper
Total Effect of Group on Anxiety	1.44	0.34	4.19	0.001	0.71	2.18
Direct Effect of Group on Anxiety	1.72	0.47	3.69	0.003	0.71	2.73
Indirect Effect of Group on Anxiety	-0.27	0.42			-1.47	0.03

Mediation Analysis of Total General Health and Depression

Effects	Effect	SE	t	p	95% Confidence Interval of the Difference	
					Lower	Upper
Total Effect of Group on Depression	0.98	0.45	2.20	0.045	0.02	1.94
Direct Effect of Group on Depression	0.07	0.56	0.13	0.896	-1.13	1.28
Indirect Effect of Group on Depression	0.91	0.43			0.14	2.19

Mediation Analysis of Total General Health and Anxiety

Effects	Effect	SE	t	p	95% Confidence Interval of the Difference	
					Lower	Upper
Total Effect of Group on Anxiety	1.44	0.34	4.19	0.001	0.71	2.18
Direct Effect of Group on Anxiety	1.32	0.51	2.60	0.022	0.22	2.41
Indirect Effect of Group on Anxiety	0.13	0.42			-0.59	1.05

Hypothesis 2c

Lastly for experiment 2, I hypothesized that both groups (treatment & control) would exhibit significant increases in mindfulness, psychological well-being, spiritual transcendence,

spirituality and physical health and decreases in depression, anxiety, and subjective trauma symptoms from pretest to posttest. Paired Samples T-tests were conducted for each measure and each experimental group to test the pretest to posttest changes in scores. My hypothesis was partially confirmed. As predicted, the experimental group (Table 10) exhibited significant increases in mindfulness, psychological well-being, spiritual transcendence, spirituality and physical health (PHQ & General Health subscale of the Medical Outcomes Study (MOS) 36-item Short Form Survey (SF-36)), $t(7) = -3.91, p = 0.003$; $t(7) = -3.97, p = 0.003$; $t(7) = -5.33, p < 0.001$; $t(7) = -3.43, p = 0.006$; $t(7) = 3.64, p = 0.004$; $t(7) = -16.82, p < 0.001$. Paired samples T-tests also revealed that the experimental group exhibited significant decreases in depression, anxiety, and subjective trauma, $t(7) = 8.05, p < 0.001$; $t(7) = 20.43, p < 0.001$; $t(7) = 6.72, p < 0.001$. In the control group, mindfulness, spirituality, and general health exhibited significant increases as hypothesized, $t(7) = -2.12, p = 0.04$; $t(7) = -2.97, p = 0.01$; $t(7) = -15.15, p < 0.001$. Additionally, in the control group, only depression significantly decreased from pretest to posttest, $t(7) = 2.62, p = 0.02$. Other variables in the control group including psychological well-being, spiritual transcendence, physical health, anxiety, and subjective trauma did not exhibit significant changes, $t(7) = -1.79, p = 0.06$; $t(7) = -0.90, p = 0.20$; $t(7) = 0.19, p = 0.43$; $t(7) = 1.69, p = 0.07$; $t(7) = 0.00, p = 0.50$. Psychological well-being and anxiety, however, exhibited trend level changes.

The same analyses were conducted while controlling for gender as well. Specifically, I conducted a repeated measures ANOVA with gender as the between subjects factor and examined the interaction effect between time point (within-subjects factor) and gender. For the control group, the interaction effect for each measure was non-significant, suggesting that gender did not significantly influence the results, mindfulness: $F(1, 6) = 0.10, p = 0.764$; psychological

well-being: $F(1, 6) = 1.28, p = 0.302$; spiritual transcendence: $F(1, 6) = 0.66, p = 0.446$;
spirituality: $F(1, 6) = 3.33, p = 0.118$; general health: $F(1, 6) = 0.35, p = 0.577$; physical health:
 $F(1, 6) = 2.11, p = 0.196$; depression: $F(1, 6) = 4.02, p = 0.092$; anxiety: $F(1, 6) = 3.47, p =$
 0.112 ; subjective trauma: $F(1, 6) = 0.65, p = 0.451$. For the experimental group, the interaction
effect for each measure was also non-significant, suggesting that gender did not significantly
influence the results, mindfulness: $F(1, 6) = 0.00, p = 0.963$; psychological well-being $F(1, 6) =$
 $0.08, p = 0.783$; spiritual transcendence: $F(1, 6) = 0.12, p = 0.738$; spirituality: $F(1, 6) = 0.19, p$
 $= 0.675$; general health: $F(1, 6) = 0.29, p = 0.611$; physical health: $F(1, 6) = 0.01, p = 0.912$;
depression: $F(1, 6) = 0.02, p = 0.887$; anxiety: $F(1, 6) = 0.26, p = 0.629$; subjective trauma: $F(1,$
 $6) = 2.30, p = 0.180$.

Table 9

Paired Samples T-Test Control Group

Pair (T1-T2)	Mean Difference	<i>SD</i>	SE Mean	<i>t</i>	<i>df</i>	<i>p</i>	Cohen's <i>d</i>
Mindfulness	-7.13	9.49	3.36	-2.12	7	0.04	0.75
Psychological Well-being	-6.63	10.46	3.70	-1.79	7	0.06	1.38
Spiritual Transcendence	-5.13	16.08	5.68	-0.90	7	0.20	1.02
Spirituality	-8.50	8.09	2.86	-2.97	7	0.01	1.91
Physical Health	0.38	5.48	1.94	0.19	7	0.43	0.63
General Health	-48.00	8.96	3.17	-15.15	7	< 0.001	8.18
Depression	2.38	2.56	0.91	2.62	7	0.02	0.07
Anxiety	1.50	2.51	0.89	1.69	7	0.07	0.18
Subjective Trauma	0.00	6.19	2.19	0.00	7	0.50	0.69

Table 10

Paired Samples T-Test Experimental Group

Pair (T1-T2)	Mean Difference	<i>SD</i>	SE Mean	<i>t</i>	<i>df</i>	<i>p</i>	Cohen's <i>d</i>
Mindfulness	-45.63	32.98	11.66	-3.91	7	0.003	1.38
Psychological Well-being	-34.00	24.25	8.57	-3.97	7	0.003	1.40
Spiritual Transcendence	-28.25	14.98	5.30	-5.33	7	< 0.001	1.89
Spirituality	-26.63	21.97	7.77	-3.43	7	0.006	1.21
Physical Health	19.25	14.96	5.29	3.64	7	0.004	1.29
General Health	-67.40	11.34	4.01	-16.82	7	< 0.001	5.95
Depression	4.75	1.67	0.59	8.05	7	< 0.001	2.85
Anxiety	5.38	0.74	0.26	20.43	7	< 0.001	7.22
Subjective Trauma	15.50	6.52	2.31	6.72	7	< 0.001	2.38

Discussion

Summary of Findings

The present study sought to examine (1) whether selective attention acts as a directive mechanism for energy, as measured by temperature, in the human body and (2) how a meditation practice that utilizes a volitional concentration of one's selective attention on the lower abdomen area of the body (i.e., dantian) impacts mental and physical health compared to a standard Mindfulness-based Stress Reduction (MBSR) program over an six-week period. In experiment 1, results revealed a positive net change in hand temperatures (i.e., change in focus hand - change in non-focus hand) for each time point after baseline, confirming the initial hypothesis. The focus hand increased in temperature only for time points 10 min, 15 min, and 20 min while there was no significant change in temperature for the non-focus hand across all time points.

Contemplative practice experience was also positively associated with correct net temperature change for time points 10 min and 15 min but not for time points 5 min and 20 min. In experiment 2, the experimental group (i.e., concentration on lower abdomen) exhibited greater levels of increase in scores for transcendence, general health, and psychological well-being and greater levels of decrease in scores for depression and anxiety. No significant differences were found between the groups for the other outcome measures. A mediation analysis, moreover, revealed that general health mediated the relationship between group and change in depression. No other mediation effects were found. Lastly, for the experiment 2, the experimental group exhibited significant changes across all outcome measures while the control group exhibited significant changes for only mindfulness, spirituality, general health, and depression. The findings across these two experiments suggest that selective attention may in fact act as a

directive mechanism for energy (measured by temperature) in the human body and that this mechanism may be used therapeutically for mental and physical health.

Experiment 1 Implications and Future Directions

Experiment 1 examined mechanistic and functional questions regarding human selective attention. Selective attention as an empirically studied concept emerged as early as the 1800s. William James (1890) called selective attention “sustained, voluntary attention,” and described it as “successive efforts which bring back the topic to the mind.” Even earlier, in non-empirical contexts, concepts similar to selective attention appeared in religious texts. For instance, *Samadhi* appeared in the Suttas and *Dhyana* in the Vedas, the former of which has been translated as “concentration” or “one-pointedness of mind” and the latter of which Berry & Berry (1996) likened to “sustained attention” and the “application of mind to the chosen point of concentration” (Gunaratana, 1988). This quality of attention has been widely received in many Buddhist and meditative traditions as a key component on the path to enlightenment or liberation from dukkha (i.e., suffering) (Bullitt, 2005; Van Gordon, et al., 2015). More recently, the theoretical understanding of selective attention has evolved in light of an increasing body of empirical data. While this understanding has evolved from Broadbent’s filter theory of attention to constructivist theories and Kahneman’s capacity theory of attention and its subsequent iterations, all such modern theories have posited a unidirectional relationship between selective attention and information (Broadbent, 2013; Deutsch & Deutsch, 1963; Driver, 2001; Hochberg, 2007; Johnston & Heinz, 1978; Kahneman, 1973; Navon & Gopher, 1978; Neisser, 1967; Norman, 1968; Treisman & Gelade, 1980). In essence, selective attention has been conceptualized as only an information-processing mechanism, whereby salient information

within the “spotlight” of attention is processed and the content and object of attention are not influenced in any way. More specifically, the content of attention, either of visual nature or of mental representations, according to these theories, should not influence the physical correlate of these endogenous and subjective attentional experiences within the unidirectional framework.

The present study, however, provides evidence that suggests that selective attention can reliably impact the object of attention within one’s own body. In experiment 1, participants of varying degrees of contemplative practice experience were taught a single-pointed concentration technique widely taught in many meditative traditions. Each participant was asked to use this technique to focus on the palm of one randomly assigned hand (experimental group) and not the other (control group). While body temperature across different parts of the body differ slightly with core body temperature being the highest and temperature of extremities being the lowest, the temperature of corresponding bilateral body parts should theoretically be constant (Saladin & Porth, 2010). In order to control for potential differences in temperature between hands, however, I examined the correct net change of hand temperatures (i.e., temperature difference between change in focus hand and change in non-focus hand) in addition to absolute changes in temperature. Moreover, the room temperature remained constant throughout the experiment and likely could not have impacted the present results.

The null hypotheses for experiment 1 were mostly rejected (with the exception of two time points in hypothesis 1c). I argue that the combination of the results of the three hypotheses (1a, 1b, 1c), rather than one single hypothesis, suggests the possibility that selective attention could be a directive mechanism for energy in the body. Results of the first hypothesis show that there was a marked increase in energy, as measured by temperature, in the focus hand relative to the non-focus hand without the use of muscles or significant movement of any body part, as

evidenced by video footage. These results suggest that there isn't an overall increase in body temperature; but rather, there is an increase in the area of the body that the participant's selective attention is placed relative to an area of the body where selective attention is not placed. Results of the second hypothesis show that there is an absolute increase in temperature in the focus hand but neither an increase nor decrease in the non-focus hand. In conjunction with results of hypothesis 1a, there was not only an increase in the focus hand relative to the non-focus hand but also an absolute increase in temperature in the focus hand. This absolute increase indicates an increase in energy in the focus location and discredits the possibility that the focus hand was experiencing only a relative increase compared with the non-focus hand and an absolute decrease in temperature. Lastly, results of hypothesis 3 show a positive relationship between contemplative practice experience and correct net temperature change. These results suggest that lifetime contemplative practice experience, in some way, improves one's ability to impact temperature with selective attention. This finding corresponds to Kahneman's conceptualization of attention as a plastic skill that can be developed with practice (Kahneman, 1973; Kahneman, 2011). The results of the third hypothesis, moreover, imply that it is likely that a cognitive or attentional ability that improves with the practice of meditation contributes to one's ability to increase temperature via the focusing technique. With the use of a focusing technique that uses selective attention and the abundance of data suggesting that meditation improves attentional capacity, I propose that selective attention is the mechanism that explains the results in the present study (Hodgins & Adair, 2010; Lutz et al., 2008; MacLean et al., 2010; Norris et al., 2018). Potential alternative explanations are noted in the limitations section.

There are several important implications for the existing literature of these findings from experiment 1. First, the results of experiment 1 expand our theoretical understanding of selective

attention. Johnston & Dark (1986) defines selective attention as “the differential processing of simultaneous sources of information” and notes that in nature, these sources are “internal (memory and knowledge) as well as external (environmental objects and events).” Regardless of whether the object of attention is internal or external, selective attention has been theorized as a processing of information, which implies that it serves solely as a mechanism of interpreting information in our environment. The present findings suggest that selective attention has an important alternative mechanism—it directs energy to the object of attention in one’s own body. It is yet unclear how energy or heat may be impacted if selective attention is focused on internal processes such as memory or knowledge; however, when selective attention is focused on an object, specifically, within one’s own body, it seems to have a precise and reliable directive effect on energy. Moreover, it is important to note that participants focused their selective attention on a mental representation of the focus area either using a visual representation or sensorimotor cues. While they were permitted to look at the focus hand to reorient their mental representation throughout the experiment, the majority of the time for each participant was spent with their eyes closed or not looking directly at the focus hand (as seen on video footage). Therefore, results imply that selective attention that is placed on a mental or sensorimotor representation of a location in the body directs energy to the physical location in a reliable way.

There have been previous studies that revealed human capacity to manipulate body temperature as well as other somatic processes that have historically been considered unconscious (King & Montgomery, 1980; Lynch et al., 1976; Maslach, Marshall, & Zimbardo, 1972; Peper & Gibney, 2003; Roberts et al., 1973; Suter & Loughry-Macado, 1981; Tahsini et al., 2017). For instance, Roberts et al. (1973) were able to train four out of six subjects to regulate hand temperatures by using hypnosis, auditory feedback, and heating and cooling pads.

Another study found participants were able to change temperature of one hand in suggested direction by 2.2 degrees to 6.5 degrees Fahrenheit after four sessions of training (Taub & Emurian, 1976). The training consisted of variable intensity light biofeedback and suggestion to use thermal imagery, and participants who were able to exhibit criterion changes were compensated monetarily. Participants in this study reported using various different methods to achieve peripheral temperature control such as mental imagery (non-specific), relaxation techniques, self-suggestion, mental commands, etc. Lynch et al. (1976), moreover, found that children were able to control hand temperatures, and one child in particular was able to control individual finger temperature in one hand via practice through visual feedback and monetary compensation. Importantly, this study along with several others were able to demonstrate that temperature control was possible in the absence of somatic activity including respiratory, skeletal-muscular, or cardiovascular mediation (Hunter et al., 1976; Surwit et al., 1976; Taub & Emurian, 1976). While in the present study, direct respiratory, skeletal-muscular, and cardiovascular data was not acquired, each participant was audio and video recorded, and these recordings were reviewed to detect skeletal-muscular movements. Lastly, in a review of the literature on biofeedback induced peripheral temperature control, King & Montgomery (1980) found that the consistent themes across studies were the small magnitudes in peripheral temperature changes, the ease of temperature decrease in comparison to temperature increase, and the large magnitude in individual ability to control peripheral temperature.

Despite the numerous studies that have examined peripheral temperature control, there are two important gaps that the present study fills in this area of research. First, there are no studies to my knowledge that clarifies the specific underlying mechanism behind volitional peripheral temperature control. As mentioned in the previous paragraph, studies have generally

found biofeedback, monetary compensation, or hypnotic induction to be successful catalysts for peripheral temperature control. Most studies do not reference what the participants were doing endogenously, and if they do, the participants report having used a variety of endogenous strategies, thereby obscuring the underlying mechanism (Taub & Emurian, 1976). Importantly, each peripheral temperature control study that I have reviewed reveal to the participant that their peripheral temperature is being measured and often reveal the live temperatures of each body part to the participant (i.e., biofeedback). In contrast, participants in the present study are not aware of the purpose of the study, the fact that their hand temperatures are being measured, nor the actual live temperatures of their hands. The blind nature of participants in this study reduces potential noise or obscurity in detecting the mechanism of temperature change because knowing the purpose of the study may lead the participant to using various endogenous techniques that deter from the provided instructions. Moreover, there must be a mediating mechanism between a cause such as biofeedback or hypnotic induction and temperature control. Biofeedback, for instance, is an exogenous cause that inevitably leads to an endogenous mechanism; hypnotic induction enhances yet is not a prerequisite of temperature control. Results of the present study suggest this endogenous mediating mechanism is selective attention because most alternative reasons are eliminated through the experimental design and participants are specifically taught a practice of selective attention.

Secondly, many studies examining this phenomenon do not use a control group. In the present study, I used one hand of a given participant as the control group and the other hand as the experimental group. The experimental group hand was the hand that the participant was asked to focus their selective attention on, and the control group hand was not focused on. Many previous studies only examine broad temperature changes in both hands, one hand, or a body

part, and as a result, these changes could be attributed to a general change in core body temperature (Benson et al., 1982; Blizard et al., 1975; Graham et al., 1958; Mittelman & Wolff et al., 1939; Peper & Gibney, 2003; Surwit et al., 1976). The use of a control group in conjunction with other factors in the present study allow for a high likelihood that selective attention is acting as a directive mechanism for energy.

Importantly, results in the present study suggest that the content of imaginal mental representations impacts the corresponding physical object within one's body. These findings suggest a different relationship between the mind and body than what has been previously assumed in the materialist perspective. There have been several different theories of the mind-body relationship throughout the history of modern science, religions, philosophies including mind-body dualism, materialistic monism, idealistic or phenomenistic monism, double aspect theories, and various iterations of these fundamental theories (Borst, 1970 Jonathan & Barnes, 1987; Kant, 1908; Patrick, 1922; Robinson, 2008; Russell, 2009; Solomon, 2001). As discussed earlier, the modern scientific worldview has been primarily dominated by materialism, the monistic idea that physical matter is the only or fundamental substance of reality, and more specifically, that any mental process can be reduced to processes in the brain. The present study contributes relevant empirical data to this discussion.

Under the materialistic view, the content of consciousness, attention, or mind should not impact physical processes—mental processes are mere byproducts of physical systems. There is evidently a correlation between mental and bodily (brain-based) processes. Specific mental, emotional, cognitive states, and even specific object recognition have been shown to have neural correlates as well (Coull, 1998; Dolcos et al., 2011; Hipp et al., 2011; Johnson & Olshausen, 2003; Koch et al., 2016; Martin et al., 1996; Varela et al., 2001). In others words, we are able to

detect specific neurological patterns that correlate with psychological experiences via functional magnetic resonance imaging (fMRI) or event-related potential (ERP) with accuracy and specificity. For instance, several studies have found that we can detect the recognition of different object categories and more specific differential object recognition (e.g., difference between chair and table; difference between styles of furniture) as well via ERPs (Johnson & Olshausen, 2003; Kiefer, 2001; Lauer et al., 2021; Lin et al., 2011; Miyakoshi et al., 2007; Rebai et al., 2001; Tanaka & Curran, 2001; Wang, 2021; Van Strien & Isbell, 2017; van Vliet et al., 2018). While specific mental states are associated with verifiable neural processes and other somatic processes (e.g., hormonal, cardiovascular, exocrine, respiratory), there is little research to date that examines whether the endogenous contents of mental processes (specifically object of selective attention) have a corresponding effect in the physical world or within one's body.

The present findings show that mental processes—specifically selective attention focused on mental representations—may have a corresponding effect (i.e., increase in temperature) in specific areas of one's own body. Placing our selective attention to a specific area of one's own body via mental representations increases the temperature of this area in both an absolute sense and a relative sense compared to other areas of the body. These results do not support any specific theory of the mind-body problem; however, they provide evidence against the materialist idea that mental processes are epiphenomenal to physical reality. Beauregard et al. (2014) describes *scientific materialism* as “the belief system that implies that the mind is nothing but the physical activity of the brain, and that our thoughts cannot have any effect upon our brains and bodies, our actions, and the physical world.” Moreover, proponents of the mind/brain identity theory, a materialist or physicalist perspective, for instance, argue that experiences “*are* brain processes, not merely *correlated with* brain processes,” thereby denying the existence of

qualia and “irreducible non-physical properties” (Smart, 2017). Under this assumption, the content of selective attention should not impact the corresponding physical object in a reliable way. The present findings, however, do not resolve the hard problem of consciousness (i.e., how or why we have qualia or phenomenal experiences). I find in the present study that energy is reliably directed toward the object of selective attention within the physical body. These findings in no way suggest a certain direction of causality in the mind-body relationship.

I argue, however, that these findings present evidence that the content of mental processes can differentially impact the physical body in a precise and *corresponding* way. I hope to use the word “*corresponding*” to describe the phenomenon, in which the mental representation (i.e., mental imagery or sensorimotor representation) of a specific area of the physical body directs energy precisely to this specific area in the physical body instead of other areas of the body. This stated relationship is different from previous findings that show the neural and somatic correlates to global mental states. Much of the literature discuss either neural or somatic correlates of global mental states or features of the mind (e.g., anxiety, depression, consciousness) or correlates of category-specific recognition or knowledge but fail to address whether contents of cognition and selective attention might impact the corresponding object in the physical world (Cameron & Nesse, 1988; Chaudhury et al., 2015; Kaufman et al., 1997; Koch et al., 2016; Martin et al., 1996; Rees et al., 2002; Spampinato et al., 2009). To my knowledge, the present study is the first to show that placing selective attention to an area within the body (by attending to the mental representation of the area) directs energy (i.e., increase in temperature) to the corresponding area in the physical body. Within a materialist perspective, the content of attention should not impact its physical correlate in any way.

The premise of the present study is based upon widely held beliefs in numerous Eastern meditation practices, philosophies, branches of medicine, and religions. One of the fundamental beliefs, from which Traditional Chinese Medicine (TCM) and Eastern Medicine are built upon, is that life's vital force or energy (also known as qi, prana, anima, ruh, pneuma, ruah in other cultures) flows through all living things, and the unimpeded flow of this energy is necessary for health (i.e., the impediment of this energy results in disease). Specifically in TCM and Eastern Medicine, it is believed that this energy, qi, flows through meridians, channels or pathways in the body that are separate from blood vessels, lymph vessels, nerves, or other commonly known pathways in Western medicine (Soh, 2009; Van Wijk et al., 2007). The existence of qi as well as Chinese medicine have not been accepted by many in mainstream science because it has been difficult to validate empirically and to tease out effective methods from ineffective ones (i.e., there are many different forms of TCM and Eastern medicine under this broad umbrella) (Eigenschink et al., 2020; Flowers, 2006; Scientific American Editors, 2019; Gorski, 2018; Nature, 2007).

Despite this contention, however, the theoretical background of Qi within the context of Eastern medicine and meditative traditions is extensive and detailed. Within traditional Eastern teachings, Qi is viewed as phenomenologically distinct from blood or temperature despite its correlation and close relationships with them; common phrases within TCM teachings include, “qi guides the blood” and “qi is the commander of blood” (Xutian et al., 2012). These phrases suggest observable properties like blood and temperature are guided by and follow Qi rather than the other way around. While observable substances like blood moves with Qi, according to Daoism and traditional Eastern philosophy, Qi is more fundamental to physical reality and life—Qi is believed to have existed before the universe and to be a “formless, nebulous, and creative”

substance from which life develops (Xutian et al., 2012). Some researchers have drawn parallels between Qi and the recently discovered *dark energy*, a form of energy that is not directly observable but has been deduced to be in existence to explain the accelerated expansion of the universe (Chang, 2021; Xutian et al., 2012; Xutian et al., 2015; Weil, 2006). Dark energy is believed to exclusively exert gravitational force upon observable physical properties, but the “energy” itself is not observable or measurable via means that typical sources of energy are (Peebles & Ratra, 2003). Qi is taught to have similar qualities, specifically in that it is difficult to directly observe and measure but plays a vital role in all things. Eastern philosophers and healers, importantly, note that within the human body, blood and temperature are theorized to flow with Qi (Xutian et al., 2012). In the current study, I interpret the results based upon phenomenological theories of Qi in traditional Eastern philosophy; as a result, I propose that the increase in temperature may be interpreted as an increase in Qi.

Notably, there is an adage that is commonly taught in the Qigong practices and TCM: “the mind intent leads the qi energy, and the blood follows” (Majoe et al., 2007). The word Qigong is comprised of two words, Qi (i.e., vital energy) and Gong (i.e., cultivation, work). In essence, the practice of Qigong is the practice of cultivating, developing, and moving Qi by breathing, movement, and the use of attention or intent (i.e., Yi). Therefore, many ancient meditative practices such as Qigong and Yoga presuppose consciousness and attention as a fundamental element of not only healing but also physical reality (Avalon, 1974). This relationship between attention and Qi plays a pivotal role in Eastern meditative and yogic traditions because it is believed that the cultivation of Qi through one’s attention is the ultimate path toward spiritual development and *enlightenment* or the cessation of suffering (i.e., Bodhi, Kensho, Satori, Moksha, Nirvana), which is considered to be the goal of many Eastern religions.

Different religious and spiritual traditions purport various and numerous paths to *enlightenment*, some of which include selfless action, yoga and meditation, mindfulness, prayer, repentance, romantic love, conceptual knowledge, and different forms of self-restraint (Ainslie, 1919; Bryant, 2017; Cho, 2013; Cortright, 2007; Lagutina, 2012; Mulla & Krishnan, 2006). The use of the relationship between attention and Qi has primarily been used in the traditions that focus on yoga and meditation.

Several different types of yoga and meditation such as Kundalini yoga, Kriya yoga, Kouksundo, Tummo meditation, Tibetan tantric practice, forms of Qigong, and many forms of Daoist practices use this mechanism as a means of achieving health and spiritual enlightenment. In these practices, spiritual enlightenment has been equated to “mental unit, a still mind, and awareness of the inter-connectedness of all things” or a “looking into the nature of things in contradistinction to the analytical or logical understanding of it” (Stein, 2019; Suzuki, 1996). Others, such as in Buddhism, have equated enlightenment to the cessation of a constant, universal sense of dissatisfaction and suffering in life (Teasdale & Chaskalson, 2011). This change in perspective often entails a categorical shift in how one relates to the external world and how one views herself in relation to the external world; specifically, one realizes that the dualistic distinction of self and other is an illusion—all aspects of reality are deeply interconnected (Suzuki, 1996). The practitioners of aforementioned disciplines of yoga and meditation, moreover, believe that the most effective way of achieving this shift in perspective is by changing the body (specifically the Qi in one’s body) through the use of the attention-body relationship. In essence, the process of cultivating Qi first, then directing Qi up a pathway in one’s spine and again directing it down a specific pathway in the ventral side of the body

(through one's selective attention) represents the physiological equivalent of enlightenment (Avalon, 1974; Saraswati, 1984).

While practitioners believe that these energetic pathways are open at birth, they are gradually blocked as humans grow older and experience activations of the sympathetic nervous system in conjunction with cognitive restraint and processing (Avalon, 1974). These pathways being open at birth, according to these theories, may be why new-born infants experience the “oceanic feeling” coined by Romain Rolland and are unable to distinguish self from other or environment (Parson & Parsons, 1999; Rochat, 2003; Ross, 1975). This similarity explains many practitioners' perspective that the process of enlightenment is a process of returning to an infant state of consciousness without losing one's identity as an adult (Ross, 1975). The progressive blockage of these pathways ultimately lead to the deterioration of mental and physical health as well as the fixed notion of self as distinctly separate from the environment (Avalon, 1974). Through the cultivation of one's selective attention, the practitioner uses this mechanism (i.e., energy is directed toward the object of selective attention) to build Qi in her body and ultimately the flow of Qi through the energy pathways in the body. As such, these practices involve first, an intensive training in maintaining one's attention on the lower chakra or dantian, and eventually, once sufficient Qi is generated, slowly moving the attention upward the spinal column to “unblock” the pathways (Avalon, 1974; Danaos, 2002).

Experiment 2 Implications and Future Directions

Such practices and their conceptualization of Qi are also closely related to mental and physical health as conceptualized in Eastern medicine. In experiment 2, I examined the impact of focusing one's selective attention on the dantian on mental and physical health. The results of

experiment 2 suggest that practicing meditation that involves focusing on the dantian over the course of six weeks improved symptoms of depression and anxiety as well as levels of transcendence, general health, and psychological well-being to a greater extent compared with practicing a meditation practice derived from Mindfulness-based Stress Reduction (MBSR). Moreover, in experiment 2, general health (a proxy measure for physical health) mediated the relationship between group (i.e., control or experimental) and change in depression. In other words, the difference in change in depression for the groups was observed to go hand in hand with change in physical health. These results pose significant implications in the mental health literature.

A large body of research suggests the practice of meditation and mindfulness functions by and large as a positive catalyst for health and a protective factor against various forms of psychopathology including depressive disorders, anxiety disorders, personality disorders, and many others (Delmonte, 1985; Hofmann et al., 2010; Irving et al., 2009; Koons et al., 2001; Peterson & Pbert, 1992; Sng & Janca, 2016). The mechanisms of mindfulness and meditation have also been widely studied but have been primarily focused on psychological and neurological mechanisms (Hölzel et al., 2011; Shapiro et al., 2006). Some important psychological mechanisms of mindfulness and meditation include re-perceiving, cognitive flexibility, decentering, deautomatization, increased attention to all stimuli, reduction of self-related affective biases, enhanced self-regulation, self-transcendence, emotion regulation, body awareness, and change in perspective of self (Deikman, 1983; Hölzel et al., 2011; Kang, 2019; Lee & Orsillo, 2014; MacLean et al., 2010; Safran & Segal, 1996; Shapiro et al., 2006). These psychological shifts that are enhanced via meditation and mindfulness practices have been shown to play an important mediating role in the alleviation of psychiatric symptoms.

More recently, there has also been an examination of the neurological and physiological mechanisms of meditation and mindfulness. Neurologically, studies indicate that many different areas including the dorsolateral prefrontal and parietal cortices, hippocampus, temporal lobe, pregenual anterior cingulate cortex, insula, striatum, central gyri, supplementary motor area, occipital lobe, Wernicke region, visual cortex, and ventral striatum among other areas are associated with different types of meditation practice (Herzog et al., 1990; Hölzel et al., 2011; Jindal et al., 2013; Kjaer et al., 2002; Lazar et al., 2000; Lou et al., 1999; Luders et al., 2013; Newberg et al., 2001; Newberg & Iversen, 2003). The two broad types of meditation (i.e., focused attention (FA) and open monitoring (OM)) are generally each associated with different regions of the brain (Jindal et al., 2013). Such practices have also been associated with increased melatonin, serotonin, dopamine, and GABA, which collectively may play a role in the sense of calmness, euphoria, and well-being as well as the reduction in anxiety that practitioners often experience during meditation (Elias et al., 2000; Hölzel et al., 2011; Kjaer et al., 2002; Newberg & Iversen, 2003; Tooley et al., 2000; Walton et al., 1995; Vollenweider et al., 1999). Lastly, another physiological mechanism of meditation and mindfulness that has been explored is the autonomic nervous system. Several studies have shown that meditation and mindfulness practices lead to an activation in the parasympathetic response and a reduction in arousal in the HPA axis and sympathetic response. Specifically, indicators of the parasympathetic response such as a decrease in heart rate, blood pressure, CO₂ generation by muscles, serum cortisol levels, breath rates, and reaction time were observed in meditators (Benson, 1997; Benson et al., 1974; Jevning et al., 1992; John et al., 2011; Sudsuang et al., 1991; Travis, 2001).

Despite the plethora of research examining the mechanisms of meditation, there is a scant body of literature that involves mechanistic interpretations through the lens of an Eastern

perspective of medicine and consciousness. Given the results and implications of experiment 1 in the present study, there are significant implications of the results of experiment 2 on not only the healing mechanisms of dantian based meditation but also on the integration of an Eastern and Western understanding of health. Eastern medicine or Traditional Chinese Medicine (TCM) is a holistic medical practice founded over 3000 years ago that uses various methods such as acupuncture, herbs, and qigong for mental and physical illnesses and ailments (Andrews, 2014). Eastern medicine is based upon three fundamental theories—YinYangism (i.e., a philosophical concept that describes the opposite yet complementary forces that make up the universe), essential Qi (i.e., the tenet that Qi is the fundamental energy of life, and it circulates through the human body via meridians (channels for Qi)), and the five elements (Wuxing) (i.e., wood, metal, fire, earth, and water each representing basic metaphorical properties of nature) (Raphals, 2015). One major difference between Eastern medicine and Western medicine is the predominant relative focus in Eastern thought on holistic functions of the body rather than anatomical structures (e.g., moisture in the body, nourishment of blood and tissue) (Matuk, 2006). This difference has led to several refutations of the efficacy and effectiveness of Eastern and Chinese medicine as well as assertions that these traditional approaches lack anatomical evidence (Eigenschink et al., 2020; Nature, 2007). Others argue that Chinese or Eastern medicine translated and interpreted through the lens of Western or modern medicine “becomes partly nonsensical, partly irrelevant, and partly mistaken” and that “the essential questions cannot be resolved by measuring static “things; rather, answers become stories about interactions and relationships” (Beinfield & Korngold, 2013; Sivin, 1987).

The human body is, in a sense, viewed as a microcosm of the universe at large—an ecosystem with various systems working together. Theoretically, pathology of both mind and

body arises when the balance of these forces (e.g., Yin and Yang, heat and cold, blood and qi) is disrupted. Treatment therefore focuses on enhancing human body's resistance to diseases and prevention by improving the inter-connections among self-controlled systems (Lu et al., 2004). While treatment through Eastern medicinal techniques creates a more harmonious and balanced environment in the body, many meditative traditions believe that a meditation or yoga practice is necessary for a more sustainable level of health (Danaos, 2002). The primary health related issue of the modern person as seen by these traditions is often the lack of sufficient Qi and lack of a balanced distribution of Qi in the body (Lin, 1981). As the distinction between psychiatric and physical illnesses are less differentiated in Eastern philosophy, the cultivation of Qi and its balance in the body theoretically is believed to heal mental and physical illness alike.

The meditation technique taught in the experimental group of experiment 2 is a preliminary technique in many meditative traditions to begin the cultivation of Qi in the lower dantian or chakra. By focusing one's selective attention on this dantian area in the lower abdomen, one is able to cultivate and cumulate Qi in this area; once the dantian is sufficiently filled with Qi, the Qi is believed to flow naturally to locations in the body (specifically organs) that are in need of Qi or have stagnation of Qi (Richardson, 2010; Yang, 1989). This phenomenon is believed to occur because of the direct connection that this dantian has to the *dai mai* (i.e., extraordinary vessel; only meridian that flows horizontally) and all the meridians (vertically flowing) in the body (Richardson, 2010). Due to the theoretical background of this meditative technique, I hypothesized in experiment 2 that the experimental group would not only exhibit greater magnitudes of improvement in measures of mental health compared to the control group (MBSR) but also that the improvement in mental health measures (i.e., depression and

anxiety) for the experimental group would be mediated by improvement in physical health. The present results largely confirmed these hypotheses.

First, the experimental group exhibited greater levels of improvement in depression, anxiety, transcendence, general health, and psychological well-being but not for trauma, spirituality, mindfulness, and physical health. Greater levels of improvement in depression, anxiety, general health, and psychological well-being suggest that the focused attention dantian method of meditation distinctly alleviates symptoms of psychopathology, enhances well-being more efficaciously, and more effectively improves general health (i.e., one proxy to physical health) than a standard MBSR practice over a period of six weeks. These results are aligned with the aforementioned theories of disease and treatment of Eastern medicine and meditative traditions. Importantly, the results in experiment 1 further suggest that the Eastern interpretation of the mechanism of improvement is valid and feasible. While I did not measure temperature of the dantian in the participants (due to Covid-19 restrictions), we can assume that the temperature of the dantian increased relative to other areas of the body for the experimental group, who focused their selective attention on the dantian, given findings in experiment 1.

According to the Eastern perspective, participants in the experimental group should exhibit a greater increase in Qi in the dantian area, which would eventually lead to deficiencies and blockages in Qi throughout the body being alleviated; this physical (Qi-related) change would equate to an alleviation in the symptoms of depression and anxiety, an enhancement in psychological well-being, and an improvement in physical health. It is important to note, that while there was a significantly larger increase in the general health scale, there was not significant effect for the Physical Health Questionnaire (PHQ). While both scales measure physical health, the PHQ more aptly measures somatic symptoms such as gastrointestinal

problems and headaches while the general health scale more accurately covers the domains of physical limitations, activity levels, bodily pain, and energy levels. The distinction in these two scales may suggest that the focused attention meditation involving the dantian may improve certain aspects of physical health (i.e., energy and activity levels, pain) but not others (i.e., somatic symptoms) within the context of six-week practice period.

Importantly, general health (a proxy measure for physical health) mediated the relationship between group and change in depression. This significant mediation suggests that improvement of depressive symptoms and improvement in physical health (specifically related to energy levels, activity levels, and pain) go hand in hand—they are phenomenologically equivalent through the lens of Eastern medicine. Improvements in Qi distribution, physical health, and mental health are viewed to be one and the same in Eastern medicine (Aung et al., 2013; Liu, 1981). In other words, within this framework, both physical and psychiatric illnesses are born from the blockages or problems of Qi (Liu, 1981). As such, an alleviation of Qi-related issues theoretically leads to improvements in both physical and psychiatric symptoms. The findings showed that an improvement in physical health (specifically related to energy level, activity levels, pain) went hand in hand with the reduction in symptoms of depression for the experimental group but not for the control group. This further highlights the theoretical framework of Eastern meditative practices—selective attention enhances Qi in the dantian, which improves physical health and symptoms of psychopathology—from which this practice originates from. Moreover, no mediation effect for anxiety was found to be significant in the present study. This suggests that improvement in anxiety symptoms did not go hand in hand with physical health as measured by the two physical health scales. It is possible that the improvement in anxiety symptoms in the experimental group do not embody certain aspects of physical health

portrayed in the two physical health measures, as conceptualized in Eastern medicine, in the present study but may be attributed to other physical factors not captured in the scales. Several studies have found neurological differences between anxiety and depression, and these differences may also be indicative of distinct mechanisms at play between the two disorders (Kendall & Watson, 1989; Oyarce et al., 2020; Weinberg et al., 2016). Future studies might explore the mechanistic differences between depression and anxiety in the context of dantian-based meditation practices.

Participants in the experimental group also exhibited greater levels of increase in transcendence. These findings suggest that focusing one's selective attention on the dantian area impacts one's sense of transcendence differently than a standard mindfulness practice. Historically and traditionally, meditation has been practiced not only for the cultivation of health but also for spiritual transcendence (Goldberg, 2013; Plante, 2010). Many forms of meditation exported to the West, however, have secularized the practices in order to apply them in a broad spectrum of therapeutic contexts, including the MBSR practice that was used for the control group in experiment 2 in the present study (Kabat-Zinn, 2003). While the meditation practice taught in the experimental group does not contain explicitly spiritual or religious aspects, many traditions believe that placing attention on the dantian part of the body is directly related to transcendent experiences (Avalon, 1974; Richardson, 2010). Many East Asian traditions believe there are three dantians in the body (lower, middle, upper) while South Asian traditions believe there are seven or more chakras. Both Qi based meditative traditions from the East alike, however, collectively believe such energy centers in the body are closely related to consciousness and transcendent experiences. From a Chinese tradition point of view, it is believed that the "Heavenly Qi" from the upper dantian connects with the "Earthly Qi" from the

lower dantian, which leads to a categorical shift in consciousness so as to perceive the underlying unity of all things (Matteson, 2009). Many Indian traditions similarly view the cultivation of chakras as a means to achieve “union with the Supreme Self or Paramatma” (Avalon, 1974). While qualitative data was not systematically collected in the present study, it is possible that focusing on the lower dantian (two inches below the umbilicus), given beliefs and teachings in meditative traditions, may have increased participants’ lived transcendent experience. It is important to also note, however, that there was no significant difference in the spirituality measure. Results indicate that the meditation practice taught in the experimental group increased level of transcendence to a greater extent than an MBSR practice, but one’s level of spirituality is increased to a similar extent for both practices. Because the spirituality scale contains aspects of beliefs, lifestyle choices, practices, and rituals (some of which were influenced by the current study), it is possible that both groups exhibited similar extents of change given that the duration of the study was only six weeks. In contrast, despite the short duration of the study, a dantian-focused meditation practice may have shifted one’s experience with transcendence more drastically than a standard mindfulness practice, given the transcendence scale measures one’s feelings of connectedness and universality.

Results of experiment 2 also indicated that there are no significant differences between the groups for trauma and mindfulness. While these results were not expected, there may be potential explanations for them. In regards to subjective trauma symptoms, it has been documented in the literature that certain types of meditation could induce a heightened sense of anxiety, depression, or distress due either to the meditation technique, over-meditation, or rise of repressed trauma into conscious awareness (Compson, 2014; Engler, 1984; Epstein, 1990; Lazarus, 1976; Otis, 1973). Due to the precarious relationship between meditation and trauma, it

is possible that neither practice in the present study exhibits a significantly greater benefit over the other for trauma symptoms. Despite the lack of difference, it is important to note that trauma symptoms were not exacerbated in either group. Additionally, while there was an increase in mindfulness levels for both groups, neither group exhibited a greater level of increase than the other. MBSR has been shown to increase one's mindfulness skills and involves the specific use of this skill, while the dantian meditation also utilizes mindfulness skills (Carmody & Baer, 2008). The presence of mindfulness in both practices may have led to a lack of significant difference between the groups in this domain.

Limitations

While the findings in the present study represent compelling support for both the role that selective attention plays in directing energy in the body as well as the therapeutic benefits of a dantian-focused meditation practice, there are several limitations to this study that should be considered for each experiment. For experiment 1, there are psychological mechanisms other than selective attention that may be causing temperature to increase in the focus area relative to the non-focus area. It is possible that although participants were given instructions to focus their attention on a small area (i.e., size of dime) on the palm of their hand, they were engaging in a different endogenous strategy such as visualization of task related or unrelated imagery (e.g., heat related imagery on one hand, imagery of an object exerting pressure on one hand). Another explanation may be that the instructions given to participants do not direct them to use selective attention. Selective attention refers to the ability that allows one to focus on a particular input for further processing while simultaneously suppressing irrelevant or distracting stimuli (Stevens & Bavelier, 2012). While the instructions given to participants evidently encourage them to focus

on a particular input while ignoring or suppressing other irrelevant stimuli, it may be that there are confounding mental processes that may be used in conjunction with selective attention, such as visual mental representations or sensorimotor or somatosensory representations, that may obscure a single psychological mechanism of temperature change. Moreover, although most participants had their eyes closed through the majority of the study, as shown on video footage, they were allowed to look at their focus hand to reorient their attention. As a result, some participants may have relied more on visual processes than others. Future studies might incorporate a components study that more explicitly distinguishes these cognitive and attentional aspects. Participants' handedness, moreover, was not collected for experiment 1, which may have been a factor that impacted findings. The random assignment process, however, should have mitigated any impact handedness may have had to a large extent.

Another limitation in experiment 1 is that only the temperature on the palm of each hand was measured. It is possible that other areas of the body may have exhibited contrasting or unexpected temperature changes during the experiment. However, given that different areas of the body have varying temperatures and that bilateral body parts have more similar temperatures, the present study only measured bilateral hand temperature (Saladin & Porth, 2010; Sund-Levander et al., 2002). Future studies might also examine bilateral body temperatures in other areas of the body as well. Moreover, although participants were unaware of what the sensors attached to their hands were measuring, it is possible that they may have developed expectations as to what the function of the sensors were. These expectations may have in turn caused demand characteristics that may have interfered with instructions given to participants. Future directions may also consider how expectations or demand characteristics may impact the influence of attention on body temperature. Lastly for experiment 1, participants were recruited based upon

their experience with and expertise level of a contemplative practice (as shown on a flyer or as detected through word of mouth). While no participant who expressed interest were denied participation, this recruitment process, did not involve random selection. Efforts, however, were made to address this limitation by incorporating a recruitment process that involved recruiting five participants from five separate levels of contemplative practice experience in a randomly selected manner. This method was not implemented, however, due to the advent of Covid-19 restrictions. Despite these limitations in experiment 1, however, the present study provides strong evidence for mental processes acting as a directive mechanism of energy in the human body.

Several limitations exist for experiment 2 as well. First, the therapeutic mechanism for the experimental group is a conjecture based upon the results of experiment 1. Because I did not measure the temperature of the dantian area (due to Covid-19 restrictions and the difficulty of measuring the temperature of a more vulnerable area of the body), the temperature in the dantian area may not have increased relative to other areas in the body. Moreover, the existence of Qi as an energy form separate from well-documented forms has not been empirically validated in a way that has garnered consensus in the scientific community. As a result, it cannot be concluded with certainty that Qi in the dantian is the mechanism for which participants in the experimental group improved mental and physical health. Future avenues of research, however, might measure the temperature of the dantian area as well as other areas of the body during this meditation practice. The contrast in these measurements may allow for a more compelling case for the Eastern tradition based therapeutic mechanism. Belly breathing and slowing down the breath may also be a potential mediator of the improvement in health for both the experimental and control groups. Slower breathing has been shown to be associated with the activation of the

parasympathetic response, which in turn has been associated with various health related indices (Benson & Klipper, 1975; Hamer & Steptoe, 2007; Jerath et al., 2006). The treatment effects observed in experiment 2, however, is likely not related to this breathing effect because both treatment and control groups practiced slowed, deep breathing.

Additionally, for experiment 2, all sessions with participants were conducted remotely via Zoom because of Covid-19 restrictions. It is possible that the meditation practices (both control and experimental) that are usually taught in-person may have had a different impact when taught remotely. For instance, one important component of a dantian-based meditation practice is the observation of the movement of the lower abdomen by the teacher or facilitator. Due to all sessions being held over a video conference format, this observation was not possible. Conversely, however, the video conference remote format may have somewhat mitigated experimenter bias because of the difficulty in conveying unconscious body language intent. The researcher teaching and administering the meditation practices was additionally not blind to the group or condition of a given form of meditation. Importantly, the investigating researcher conducted both the teaching of the meditation practices and the research (including analyses and writing of the manuscript). While the researcher played a standardized protocol and instruction script that were audio recorded, it is possible the non-blind nature of teaching the practices may have led to experimenter bias especially in the period of time when the participants could ask the researcher questions regarding the practice, answers for which could not be recorded.

Participants were recruited during the Covid-19 pandemic, and consequently, there may have been a larger need and desire in the population to participate in research studies that taught psychological or attentional techniques that could be beneficial for mental health. The mean pretest depression ($M = 7.7$) and anxiety ($M = 7.0$) scores for participants suggests that the

sample in the present study has significantly higher levels of psychological distress than those of the population at large. The significant reduction in symptoms of psychopathology and improvement in mental health may in turn have been partly due to the fact that participants already had relatively higher levels of these symptoms. It is also possible that participants in experiment 2 were more likely to respond efficaciously to meditation practices because they elected to participate after viewing a flyer advertising a study on meditation—these participants may have been seeking to learn meditation. The participants, however, were unaware of the experimental design nor of the information regarding whether they were in a treatment group or a control group.

Lastly, there are some limitations that apply to both experiments 1 and 2 in the current study. The samples in this study represent a relatively small number of participants ($N = 12$ for experiment 1; $N = 16$ for experiment 2). While the effect sizes of both studies are high, future studies might recruit a higher sample size. The participants in the present study due to the small sample sizes may not have been representative of the population at large. The samples collected represent a portion of the population that have access to the internet (due to Covid-19 restrictions) and are mostly related in some way to the Columbia University, Teachers College network (due to the recruitment process); therefore, the present study does not utilize a random selection process. The present samples may therefore have some limitations with generalizability. In terms of measures, some of the method of data acquisition relied on self-report instruments rather than behavioral ratings, or clinician-administered interviews. The instruments I employed, however, have shown high validity and high concordance with clinician administered DSM-IV-TR diagnoses in previous studies (Löwe et al., 2008; Manea et al., 2012).

Conclusion

In the present study, I examined the relationship between selective attention and body temperature as well as the efficacy of a dantian-based meditation practice on health. To my knowledge, it is the first study to empirically explore selective attention as a directive mechanism for energy, specifically heat, within the human body. The results revealed that selective attention indeed has a bidirectional relationship with the physical body. Specifically, energy, as measured by heat, increased in the location that selective attention was placed—energy is directed toward the object of selective attention. The results of experiment 1 confirm teachings and theoretical underpinnings of Eastern meditative and medicinal practices. Namely, Qi flows to the object of Yi (i.e., intent or attention), and the contents of consciousness may have a corresponding influence on the physical body. I then applied the mechanistic basis of experiment 1 to a clinical and therapeutic context in experiment 2. In experiment 2, I sought to examine the impact of focusing on one's dantian area of the body on health compared to that of a standard MBSR practice. Findings from experiment 2 largely confirmed the efficacy of a dantian focused meditation practice and further suggested the mediating role that physical health can play in the alleviation of depressive symptoms. These findings present preliminary evidence that may help integrate traditional insights from Eastern meditative and medicinal practices with the empirical findings of Western psychology.

References

- Agrillo, C. (2011). Near-death experience: out-of-body and out-of-brain?. *Review of General Psychology, 15*(1), 1-10.
- Ainslie, D. (1919). The Dance of Siva. Fourteen Indian Essays. The Sunwise Turn, Inc. 2, East 31st Street, New York, 1918. *Journal of the Royal Asiatic Society, 51*(3), 414-419.
- Allain, R. (2017, Sep 27). Temperature is Not What You Think It Is. Wired.
<https://www.wired.com/story/temperature-is-not-what-you-think-it-is/>
- Allport, A. (1987). Selection for action: Some behavioral and neurophysiological considerations of attention and action. *Perspectives on perception and action, 15*, 395-419.
- Andrews, B. (2014). *The making of modern Chinese medicine, 1850-1960*. ubc Press.
- Avalon, A. (1974). *Serpent Power-the Secrets of Tantric and Shaktic Yoga*. Dover Publications Incorporated.
- Aung, S. K., Fay, H., & Hobbs, R. F. (2013). Traditional Chinese medicine as a basis for treating psychiatric disorders: a review of theory with illustrative cases. *Medical acupuncture, 25*(6), 398-406.

- Azhar M. Z., Varma S. L., Dharap A. S. (1994). Religious psychotherapy in anxiety disorder patients. *Acta Psychiatr. Scand.* 90, 1–3. 10.1111/j.1600-0447.1994.tb01545.x
- Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment*, 13(1), 27-45.
- Balaji, P. A., Varne, S. R., & Ali, S. S. (2012). Physiological effects of yogic practices and transcendental meditation in health and disease. *North American journal of medical sciences*, 4(10), 442.
- Barton Y. A., Miller L., Wickramaratne P., Gameroff M. J., Weissman M. M. (2013). Religious attendance and social adjustment as protective against depression: A 10-year prospective study. *J. Affect. Disord.* 146, 53–57. 10.1016/j.jad.2012.08.037
- Beauregard, M., Schwartz, G. E., Miller, L., Dossey, L., Moreira-Almeida, A., Schlitz, M., ... & Tart, C. (2014). Manifesto for a post-materialist science. *Explore: The Journal of Science and Healing*, 10(5), 272-274.
- Beecher, H. K. (1955). The powerful placebo. *Journal of the American Medical Association*, 159(17), 1602-1606.
- Beinfeld, H., & Korngold, E. (2013). *Between heaven and earth: A guide to Chinese medicine*. Ballantine Books.

Benedetti, F. (2014). *Placebo effects*. Oxford University Press.

Benedetti, F., Lanotte, M., Lopiano, L., & Colloca, L. (2007). When words are painful: unraveling the mechanisms of the nocebo effect. *Neuroscience*, *147*(2), 260-271.

Benson, H. (1997). The relaxation response: therapeutic effect. *Science*, *278*(5344), 1693-1697.

Benson, H., Beary, J. F., & Carol, M. P. (1974). The relaxation response. *Psychiatry*, *37*(1), 37-46.

Benson, H., & Klipper, M. Z. (1975). *The relaxation response* (p. 240). New York: Morrow.

Benson, H., Lehmann, J. W., Malhotra, M. S., Goldman, R. F., Hopkins, J., & Epstein, M. D. (1982). Body temperature changes during the practice of g Tum-mo yoga. *Nature*, *295*(5846), 234-236.

Berry, T., & Berry, T. M. (1996). *Religions of India: Hinduism, yoga, buddhism*. Columbia University Press.

Bhasin, M. K., Dusek, J. A., Chang, B. H., Joseph, M. G., Denninger, J. W., Fricchione, G. L., ... & Libermann, T. A. (2013). Relaxation response induces temporal transcriptome changes

- in energy metabolism, insulin secretion and inflammatory pathways. *PloS one*, 8(5), e62817.
- Blizard, D. A., Cowings, P., & Miller, N. E. (1975). Visceral responses to opposite types of autogenic-training imagery. *Biological Psychology*, 3(1), 49-55.
- Bohm, D. (2002). *Wholeness and the implicate order*. Psychology Press.
- Bonelli R. M., Koenig H. G. (2013). Mental disorders, religion and spirituality 1990 to 2010: a systematic evidence-based review. *J. Relig. Health* 52, 657–673. 10.1007/s10943-013-9691-4
- Borst, C. V. (1970). *Mind-brain Identity Theory*. Macmillan International Higher Education.
- Bowen, S., Witkiewitz, K., Dillworth, T. M., Chawla, N., Simpson, T. L., Ostafin, B. D., ... & Marlatt, G. A. (2006). Mindfulness meditation and substance use in an incarcerated population. *Psychology of addictive behaviors*, 20(3), 343.
- Brabant, O. (2016). More than meets the eye: toward a post-materialist model of consciousness. *Explore*, 12(5), 347-354.
- Braun, B. G. (1983). Psychophysiological phenomena in multiple personality and hypnosis. *American Journal of Clinical Hypnosis*, 26(2), 124-137.

Broadbent, D. E. (2013). *Perception and communication*. Elsevier.

Bruya, B., & Tang, Y. Y. (2018). Is attention really effort? Revisiting Daniel Kahneman's influential 1973 book attention and effort. *Frontiers in psychology*, 9, 1133.

Bryant, E. F. (2017). *Bhakti yoga: tales and teachings from the Bhagavata Purana*. North Point Press.

Bullitt, J. T. (2005). What is Theravada Buddhism?. *Access to Insight*, 2005-09.

Burke, A. (2012). Comparing individual preferences for four meditation techniques: Zen, Vipassana (Mindfulness), Qigong, and Mantra. *Explore*, 8(4), 237-242.

Cameron, O. G., & Nesse, R. M. (1988). Systemic hormonal and physiological abnormalities in anxiety disorders. *Psychoneuroendocrinology*, 13(4), 287-307.

Carhart-Harris, R. L., Erritzoe, D., Williams, T., Stone, J. M., Reed, L. J., Colasanti, A., ... & Hobden, P. (2012). Neural correlates of the psychedelic state as determined by fMRI studies with psilocybin. *Proceedings of the National Academy of Sciences*, 109(6), 2138-2143.

Carmody, J., & Baer, R. A. (2008). Relationships between mindfulness practice and levels of mindfulness, medical and psychological symptoms and well-being in a mindfulness-based stress reduction program. *Journal of behavioral medicine*, 31(1), 23-33.=

Chang, B. (2021). The Formation of the Electronic Tornado is the Basis of Superconductivity. *Journal of Computer Science Research*, 3(1).

Chaudhury, D., Liu, H., & Han, M. H. (2015). Neuronal correlates of depression. *Cellular and Molecular Life Sciences*, 72(24), 4825-4848.

Chen, K. W. (2004). An analytic review of studies on measuring effects of external Qi in China. *Alternative Therapies in Health and Medicine*, 10(4), 38-51.

Cherry, E. C. (1953). Some experiments on the recognition of speech, with one and with two ears. *The Journal of the acoustical society of America*, 25(5), 975-979.

Cho, E. S. (2013). Repentance as a Bodhisattva Practice: Wŏnhyo on Guilt and Moral Responsibility. *Philosophy East and West*, 39-54.

Cloninger, C. R. (2006). The science of well-being: an integrated approach to mental health and its disorders. *World Psychiatry*, 5(2), 71.

- Colloca, L., & Miller, F. G. (2011). The nocebo effect and its relevance for clinical practice. *Psychosomatic medicine*, 73(7), 598.
- Compson, J. (2014). Meditation, trauma and suffering in silence: raising questions about how meditation is taught and practiced in Western contexts in the light of a contemporary trauma resiliency model. *Contemporary Buddhism*, 15(2), 274-297.
- Coons, P. M. (1988). Psychophysiologic aspects of multiple personality disorder. *A Review. Dissociation*, 1(1), 47-53.
- Cortright, B. (2007). *Integral psychology: Yoga, growth, and opening the heart*. SUNY Press.
- Coull, J. T. (1998). Neural correlates of attention and arousal: insights from electrophysiology, functional neuroimaging and psychopharmacology. *Progress in neurobiology*, 55(4), 343-361.
- Coward, D. D. (1996). Self-transcendence and correlates in a healthy population. *Nursing Research*, 45(2), 116-121.
- Creath, K., & Schwartz, G. E. (2004). Biophoton images of plants: Revealing the light within. *The Journal of Alternative & Complementary Medicine*, 10(1), 23-26.

- Crum, A. J., Corbin, W. R., Brownell, K. D., & Salovey, P. (2011). Mind over milkshakes: mindsets, not just nutrients, determine ghrelin response. *Health Psychology, 30*(4), 424.
- Curiati, J. A., Bocchi, E., Freire, J. O., Arantes, A. C., Braga, M., Garcia, Y., ... & Fo, W. J. (2005). Meditation reduces sympathetic activation and improves the quality of life in elderly patients with optimally treated heart failure: a prospective randomized study. *Journal of Alternative & Complementary Medicine, 11*(3), 465-472.
- Danaos, K. (2002). *Nei Kung: The Secret Teachings of the Warrior Sages*. Simon and Schuster.
- Davidson, R. J., & Lutz, A. (2008). Buddha's brain: Neuroplasticity and meditation [in the spotlight]. *IEEE signal processing magazine, 25*(1), 176-174.
- Deikman, A. J. (1983). *The observing self*. Beacon Press.
- Dein, S. (2003). Psychogenic death: Individual effects of sorcery and taboo violation. *Mental Health, Religion & Culture, 6*(3), 195-202.
- Delaney, C. (2005). The spirituality scale: Development and psychometric testing of a holistic instrument to assess the human spiritual dimension. *Journal of Holistic Nursing, 23*(2), 145-167.

- Delmonte, M. M. (1985). Meditation and anxiety reduction: A literature review. *Clinical Psychology Review*, 5(2), 91-102.
- Desimone, R., & Duncan, J. (1995). Neural mechanisms of selective visual attention. *Annual review of neuroscience*, 18(1), 193-222.
- Deutsch, J. A., & Deutsch, D. (1963). Attention: Some theoretical considerations. *Psychological review*, 70(1), 80.
- Dolcos, F., Iordan, A. D., & Dolcos, S. (2011). Neural correlates of emotion–cognition interactions: A review of evidence from brain imaging investigations. *Journal of Cognitive Psychology*, 23(6), 669-694.
- Driver, J. (2001). A selective review of selective attention research from the past century. *British Journal of Psychology*, 92(1), 53-78.
- Eigenschink, M., Dearing, L., Dablander, T. E., Maier, J., & Sitte, H. H. (2020). A critical examination of the main premises of Traditional Chinese Medicine. *Wiener Klinische Wochenschrift*, 132(9), 260-273.
- Elias, A. N., Guich, S., & Wilson, A. F. (2000). Ketosis with enhanced GABAergic tone promotes physiological changes in transcendental meditation. *Medical hypotheses*, 54(4), 660-662.

- Engler, J. (1984). Therapeutic aims in psychotherapy and meditation: Developmental stages in the representation of self. *Journal of Transpersonal Psychology*, 16(1), 25-61.
- Epstein, M. (1990). Psychodynamics of meditation: Pitfalls on the spiritual path. *Journal of Transpersonal Psychology*, 22(1), 17-34.
- Eriksen, C. W., & Rohrbaugh, J. W. (1970). Some factors determining efficiency of selective attention. *The American Journal of Psychology*, 330-342.
- Eriksen, C. W., & Spencer, T. (1969). Rate of information processing in visual perception: Some results and methodological considerations. *Journal of Experimental Psychology*, 79(2p2), 1.
- Evans, D. (2004). *Placebo: Mind over matter in modern medicine*. Oxford University Press.
- Flowers J. (2006). What is qi?. *Evidence-based complementary and alternative medicine : eCAM*, 3(4), 551–552. <https://doi.org/10.1093/ecam/nel074>
- Fox, K. C., Nijeboer, S., Dixon, M. L., Floman, J. L., Ellamil, M., Rumak, S. P., ... & Christoff, K. (2014). Is meditation associated with altered brain structure? A systematic review and meta-analysis of morphometric neuroimaging in meditation practitioners. *Neuroscience & Biobehavioral Reviews*, 43, 48-73.

- Friston, K. J., Frith, C. D., Liddle, P. F., & Frackowiak, R. S. J. (1991). Investigating a network model of word generation with positron emission tomography. *Proceedings of the Royal Society of London. Series B: Biological Sciences*, 244(1310), 101-106.
- Francolini, C. M., & Egeth, H. E. (1980). On the nonautomaticity of “automatic” activation: Evidence of selective seeing. *Perception & Psychophysics*, 27(4), 331-342.
- Goyal, M., Singh, S., Sibinga, E. M., Gould, N. F., Rowland-Seymour, A., Sharma, R., ... & Haythornthwaite, J. A. (2014). Meditation programs for psychological stress and well-being: a systematic review and meta-analysis. *JAMA internal medicine*, 174(3), 357-368.
- Graham, D. T., Stern, J. A., & Winokur, G. (1958). Experimental investigation of the specificity of attitude hypothesis in psychosomatic disease. *Psychosomatic Medicine*, 20(6), 446-457.
- Gray, J. A., & Idderburn, A. A. I (1960). Grouping strategies with simultaneous stimuli. *Quarterly Journal of Experimental Psychology*, 12, 180-184.
- Goodyear, B. G., & Douglas, E. A. (2009). Decreasing task-related brain activity over repeated functional MRI scans and sessions with no change in performance: implications for serial investigations. *Experimental brain research*, 192(2), 231.

Gorski, D. 2018. The World Health Organization: Embracing traditional Chinese medicine pseudoscience in ICD-11 (blog entry). Respectful Insolence (October 4). Available online at <https://respectfulinsolence.com/2018/10/04/the-world-health-organization-embracing-traditional-chinese-medicine-pseudoscience-in-icd-11/>.

Gu, H. S., & Cheng, Z. J. (1980). Observation of static electricity in external qi. *The Nature Journal (Chinese)*, 10, 747.

Gu, H. S., & Lin, H. S. (1978). Preliminary experimental results of the investigation of material basis of 'therapy of qi mobilization' in qigong. *The Nature Journal (Chinese)*, 1(1978), 12.

Gu, H. S., & Zhao, W. (1979). Observation of the electric particle flow in external Qi. *The Nature Journal (Chinese)*, 2, 5-6.

Gunaratana, H. (1988). *The jhanas in Theravada Buddhist meditation*. Kandy,, Sri Lanka: Buddhist Publication Society.

Haid, M., & Huprikar, S. (2001). Modulation of germination and growth of plants by meditation. *The American journal of Chinese medicine*, 29(03n04), 393-401.

Hamer, M., & Steptoe, A. (2007). Association between physical fitness, parasympathetic control, and proinflammatory responses to mental stress. *Psychosomatic medicine*, *69*(7), 660-666.

Hard to swallow. *Nature* **448**, 106 (2007)

Harden K. P. (2010). Does religious involvement protect against early drinking? A behavior genetic approach. *J. Child Psychol. Psychiatry* *51*, 763–771. 10.1111/j.1469-7610.2010.02247.x

Harris, S. (2014). *Waking up: A guide to spirituality without religion*. Simon and Schuster.

Haxby, J. V., Horwitz, B., Ungerleider, L. G., Maisog, J. M., Pietrini, P., & Grady, C. L. (1994). The functional organization of human extrastriate cortex: a PET-rCBF study of selective attention to faces and locations. *Journal of Neuroscience*, *14*(11), 6336-6353.

Hayes, A. F. (2012). PROCESS: A versatile computational tool for observed variable mediation, moderation, and conditional process modeling.

Herzog, H., Lele, V. R., Kuwert, T., Langen, K. J., Kops, E. R., & Feinendegen, L. E. (1990). Changed pattern of regional glucose metabolism during yoga meditative relaxation. *Neuropsychobiology*, *23*(4), 182-187.

- Hinson, V. K., Iinsein, S., Bernard, B., Leurgans, S. E., & Goetz, C. G. (2006). Single-blind clinical trial of psychotherapy for treatment of psychogenic movement disorders. *Parkinsonism & related disorders*, *12*(3), 177-180.
- Hipp, J. F., Engel, A. K., & Siegel, M. (2011). Oscillatory synchronization in large-scale cortical networks predicts perception. *Neuron*, *69*(2), 387-396.
- Hodgins, H. S., & Adair, K. C. (2010). Attentional processes and meditation. *Consciousness and cognition*, *19*(4), 872-878.
- Hofmann, S. G., Sawyer, A. T., Witt, A. A., & Oh, D. (2010). The effect of mindfulness-based therapy on anxiety and depression: A meta-analytic review. *Journal of consulting and clinical psychology*, *78*(2), 169.
- Hölzel, B. K., Carmody, J., Vangel, M., Congleton, C., Yerramsetti, S. M., Gard, T., & Lazar, S. W. (2011). Mindfulness practice leads to increases in regional brain gray matter density. *Psychiatry research: neuroimaging*, *191*(1), 36-43.
- Hölzel, B. K., Lazar, S. W., Gard, T., Schuman-Olivier, Z., Vago, D. R., & Ott, U. (2011). How does mindfulness meditation work? Proposing mechanisms of action from a conceptual and neural perspective. *Perspectives on psychological science*, *6*(6), 537-559.

Hou SL, Wang XB, Li DD, Meng SF, Li YZ, 1993. "Detection and analysis of infrasonic sound signals from Qigong and extraordinary function." *Journal of Chinese Somatic Science*. 3(1): 24-28.

Huber, M., & den Camp, M. O. (1997). *Meervoudige persoonlijkheden: Een handboek voor overlevenden van extreem geïld*. Wereldbibliotheek.

Hunter, S. H., Russell, H. L., Russell, E. D., & Zimmermann, R. L. (1976). Control of fingertip temperature increases via biofeedback in learning-disabled and normal children. *Perceptual and Motor Skills*, 43(3), 743-755.

IBM Corp, N. (2013). IBM SPSS statistics for windows. *Version 22.0*.

Irving, J. A., Dobkin, P. L., & Park, J. (2009). Cultivating mindfulness in health care professionals: A review of empirical studies of mindfulness-based stress reduction (MBSR). *Complementary therapies in clinical practice*, 15(2), 61-66.

Jahn, R. G., & Dunne, B. J. (1986). On the quantum mechanics of consciousness, with application to anomalous phenomena. *Foundations of physics*, 16(8), 721-772.

Jahn, R. G., & Dunne, B. J. (2001). A modular model of mind/matter manifestations (M5). *Journal of Scientific Exploration*, 15(3), 299-329.

James, W. (1890). The perception of reality. *Principles of psychology*, 2, 283-324.

Jamieson, J. P., Nock, M. K., & Mendes, W. B. (2012). Mind over matter: Reappraising arousal improves cardiovascular and cognitive responses to stress. *Journal of experimental psychology: General*, 141(3), 417.

Jang, J. H., Jung, W. H., Kang, D. H., Byun, M. S., Kwon, S. J., Choi, C. H., & Kwon, J. S. (2011). Increased default mode network connectivity associated with meditation. *Neuroscience letters*, 487(3), 358-362.

Jerath, R., Edry, J. W., Barnes, V. A., & Jerath, V. (2006). Physiology of long pranayamic breathing: neural respiratory elements may provide a mechanism that explains how slow deep breathing shifts the autonomic nervous system. *Medical hypotheses*, 67(3), 566-571.

Jevning, R., Wallace, R. K., & Beidebach, M. (1992). The physiology of meditation: a review. A wakeful hypometabolic integrated response. *Neuroscience & Biobehavioral Reviews*, 16(3), 415-424.

Jindal, V., Gupta, S., & Das, R. (2013). Molecular mechanisms of meditation. *Molecular neurobiology*, 48(3), 808-811.

John, S., Verma, S. K., & Khanna, G. L. (2011). The effect of mindfulness meditation on HPA-Axis in pre-competition stress in sports performance of elite shooters. *National Journal of Integrated Research in Medicine*, 2(3), 15-21.

Jonathan, B., & Barnes, J. (1987). *Early Greek Philosophy*.

Johnson, J. S., & Olshausen, B. A. (2003). Timecourse of neural signatures of object recognition. *Journal of vision*, 3(7), 4-4.

Johnston, W. A., & Dark, V. J. (1986). Selective attention. *Annual review of psychology*, 37(1), 43-75.

Johnston, L. D., O'Malley, P. M., & Bachman, J. G. (2000). Monitoring the Future National survey results on drug use, 1975-1999. Volume II: College students and adults ages 19-40. Bethesda, MD: National Institute on Drug Abuse.

Johnston, W. A., & Heinz, S. P. (1978). Flexibility and capacity demands of attention. *Journal of Experimental Psychology: General*, 107(4), 420.

Kahneman, D. (1973). *Attention and effort* (Vol. 1063). Englewood Cliffs, NJ: Prentice-Hall.

Kahneman, D. (2011). *Thinking, fast and slow*. Macmillan.

- Kaliman, P., Álvarez-López, M. J., Cosín-Tomás, M., Rosenkranz, M. A., Lutz, A., & Davidson, R. J. (2014). Rapid changes in histone deacetylases and inflammatory gene expression in expert meditators. *Psychoneuroendocrinology*, *40*, 96-107.
- Kammers, M. P., Rose, K., & Haggard, P. (2011). Feeling numb: Temperature, but not thermal pain, modulates feeling of body ownership. *Neuropsychologia*, *49*(5), 1316-1321.
- Kang, Y. (2019). Examining interpersonal self-transcendence as a potential mechanism linking meditation and social outcomes. *Current opinion in psychology*, *28*, 115-119.
- Kant, I. (1908). Critique of pure reason. 1781. *Modern Classical Philosophers*, Cambridge, MA: Houghton Mifflin, 370-456.
- Kaufman, J., Birmaher, B., Perel, J., Dahl, R. E., Moreci, P., Nelson, B., ... & Ryan, N. D. (1997). The corticotropin-releasing hormone challenge in depressed abused, depressed nonabused, and normal control children. *Biological psychiatry*, *42*(8), 669-679.
- Kendall, P. C., & Watson, D. E. (1989). *Anxiety and depression: Distinctive and overlapping features*. Academic Press.
- Kiang, J. G., Ives, J. A., & Jonas, W. B. (2005). External bioenergy-induced increases in intracellular free calcium concentrations are mediated by Na⁺/Ca²⁺ exchanger and L-type calcium channel. *Molecular and cellular biochemistry*, *271*(1-2), 51-59.

- Kiecolt-Glaser, J. K., McGuire, L., Robles, T. F., & Glaser, R. (2002). Psychoneuroimmunology: Psychological influences on immune function and health. *Journal of consulting and clinical psychology, 70*(3), 537.
- Kiecolt-Glaser, J. K., Page, G. G., Marucha, P. T., MacCallum, R. C., & Glaser, R. (1998). Psychological influences on surgical recovery: perspectives from psychoneuroimmunology. *American Psychologist, 53*(11), 1209.
- Kiefer, M. (2001). Perceptual and semantic sources of category-specific effects: Event-related potentials during picture and word categorization. *Memory & Cognition, 29*(1), 100-116.
- Kim, B. H. (1963). On the Kyungrak System. *J Acad MedSci (DPR Korea), 90*, 2-41.
- King, N. J., & Montgomery, R. B. (1980). Biofeedback-induced control of human peripheral temperature: A critical review of literature. *Psychological Bulletin, 88*(3), 738.
- Kjaer, T. W., Bertelsen, C., Piccini, P., Brooks, D., Alving, J., & Lou, H. C. (2002). Increased dopamine tone during meditation-induced change of consciousness. *Cognitive Brain Research, 13*(2), 255-259.
- Koch, C., Massimini, M., Boly, M., & Tononi, G. (2016). Neural correlates of consciousness: progress and problems. *Nature Reviews Neuroscience, 17*(5), 307-321.

- Koenig, H. G. (2009). Research on religion, spirituality, and mental health: A review. *The Canadian Journal of Psychiatry*, 54(5), 283-291.
- Kokubo, H., YAMAMOTO, M., HIRASAWA, M., KAWANO, K., FURUKAWA, M., & SAKAIDA, H. (1999). Review on recent measurements of anomalous bio-magnetic fields. *Journal of International Society of Life Information Science*, 17(1), 20-31.
- Koons, C. R., Robins, C. J., Tweed, J. L., Lynch, T. R., Gonzalez, A. M., Morse, J. Q., ... & Bastian, L. A. (2001). Efficacy of dialectical behavior therapy in women veterans with borderline personality disorder. *Behavior therapy*, 32(2), 371-390.
- Korotkov, K., DeVito, D., Arem, K., Madappa, K., Williams, B., & Wisneski, L. (2009). Healing experiments assessed with electrophotonic camera. *Subtle Energies & Energy Medicine Journal Archives*, 20(3).
- Kouk Sun Do. (2008). In *Kouk Sun Do: The art of breathing*. Retrieved from <http://www.sundousa.org/>
- Kozhevnikov, M., Elliott, J., Shephard, J., & Gramann, K. (2013). Neurocognitive and somatic components of temperature increases during g-tummo meditation: legend and reality. *PloS one*, 8(3), e58244.

- Krygier, J. R., Heathers, J. A., Shahrestani, S., Abbott, M., Gross, J. J., & Kemp, A. H. (2013). Mindfulness meditation, well-being, and heart rate variability: a preliminary investigation into the impact of intensive Vipassana meditation. *International Journal of Psychophysiology*, 89(3), 305-313.
- Lagutina, A. N. (2012). Yoga in modern life: practical experience.
- Lauer, T., Schmidt, F., & Vö, M. L. H. (2021). The role of contextual materials in object recognition. *Scientific reports*, 11(1), 1-12.
- Lazar, S. W., Bush, G., Gollub, R. L., Fricchione, G. L., Khalsa, G., & Benson, H. (2000). Functional brain mapping of the relaxation response and meditation. *Neuroreport*, 11(7), 1581-1585.
- Lazarus, A. A. (1976). Psychiatric problems precipitated by transcendental meditation. *Psychological Reports*, 39(2), 601-602.
- Lazar, S. W., Kerr, C. E., Wasserman, R. H., Gray, J. R., Greve, D. N., Treadway, M. T., ... & Rauch, S. L. (2005). Meditation experience is associated with increased cortical thickness. *Neuroreport*, 16(17), 1893.
- Lavie, N. (2001). Capacity limits in selective attention: Behavioral evidence and implications for neural activity. *Visual attention and cortical circuits*, 49-68.

- Lee, J. K., & Orsillo, S. M. (2014). Investigating cognitive flexibility as a potential mechanism of mindfulness in generalized anxiety disorder. *Journal of Behavior Therapy and Experimental Psychiatry*, 45(1), 208-216.
- Lewis, D. O., Yeager, C. A., Swica, Y., Pincus, J. H., & Lewis, M. (1997). Objective documentation of child abuse and dissociation in 12 murderers with dissociative identity disorder. *American Journal of Psychiatry*, 154(12), 1703-1710.
- Lim, Y. M., & Hong, G. R. S. (2010). Effect of 16-Iek Kouk-Sun-Do exercise on physical fitness, emotional state, and immunoglobulin A in community-dwelling elders in Korea. *Applied nursing research*, 23(2), 91-100
- Lin, K. M. (1981). Traditional Chinese medical beliefs and their relevance for mental illness and psychiatry. In *Normal and abnormal behavior in Chinese culture* (pp. 95-111). Springer, Dordrecht..
- Lin, M. H., Wang, C. Y., Cheng, S. K., & Cheng, S. H. (2011). An event-related potential study of semantic style-match judgments of artistic furniture. *International Journal of Psychophysiology*, 82(2), 188-195.
- Liu, X. (1981). Psychiatry in traditional Chinese medicine. *The British Journal of Psychiatry*, 138(5), 429-433.

- Llobera, J., Sanchez-Vives, M. V., & Slater, M. (2013). The relationship between virtual body ownership and temperature sensitivity. *Journal of the Royal Society Interface*, *10*(85), 20130300.
- Lou, H. C., Kjaer, T. W., Friberg, L., Wildschiodtz, G., Holm, S., & Nowak, M. (1999). A 15O-H₂O PET study of meditation and the resting state of normal consciousness. *Human brain mapping*, *7*(2), 98-105.
- Löwe B., Decker O., Müller S., Brähler E., Schellberg D., Herzog W., et al. . (2008). Validation and standardization of the Generalized Anxiety Disorder Screener (GAD-7) in the general population. *Med. Care* *46*, 266–274. 10.1097/MLR.0b013e318160d093
- Luders, E., Thompson, P. M., Kurth, F., Hong, J. Y., Phillips, O. R., Wang, Y., ... & Toga, A. W. (2013). Global and regional alterations of hippocampal anatomy in long-term meditation practitioners. *Human brain mapping*, *34*(12), 3369-3375.
- Lutz, A., Greischar, L. L., Rawlings, N. B., Ricard, M., & Davidson, R. J. (2004). Long-term meditators self-induce high-amplitude gamma synchrony during mental practice. *Proceedings of the national Academy of Sciences*, *101*(46), 16369-16373.
- Lutz, A., Slagter, H. A., Dunne, J. D., & Davidson, R. J. (2008). Attention regulation and monitoring in meditation. *Trends in cognitive sciences*, *12*(4), 163-169.

Lynch, W. C., Hama, H., Kohn, S., & Miller, N. E. (1976). Instrumental control of peripheral vasomotor responses in children. *Psychophysiology*, *13*(3), 219-221.

MacLean, K. A., Ferrer, E., Aichele, S. R., Bridwell, D. A., Zanesco, A. P., Jacobs, T. L., ... & Saron, C. D. (2010). Intensive meditation training improves perceptual discrimination and sustained attention. *Psychological science*, *21*(6), 829-839.

Majoe, D., Kulka, I., & Gutknecht, J. (2007, July). Qi energy flow visualisation using wearable computing. In *2007 2nd International Conference on Pervasive Computing and Applications* (pp. 285-290). IEEE.

Manea L., Gilbody S., McMillan D. (2012). Optimal cut-off score for diagnosing depression with the Patient Health Questionnaire (PHQ-9): a meta-analysis. *Can. Med. Assoc. J.* *184*, E191–E196. 10.1503/cmaj.110829

Martin, A., Wiggs, C. L., Ungerleider, L. G., & Haxby, J. V. (1996). Neural correlates of category-specific knowledge. *Nature*, *379*(6566), 649-652.

Maslach, C., Marshall, G., & Zimbardo, P. G. (1972). Hypnotic control of peripheral skin temperature: A case report. *Psychophysiology*, *9*(6), 600-605.

Matteson, K. (2009). Why Should Meditation Practitioners Learn about Chinese Qigong?.

Matuk, C. (2006). Seeing the body: The divergence of ancient Chinese and western medical illustration. *Journal of Biocommunication*, 32(1), 1-8.

Meador, C. K. (1992). Hex death: voodoo magic or persuasion?. *Southern medical journal*, 85(3), 244-247.

Miller, L., Bansal, R., Wickramaratne, P., Hao, X., Tenke, C. E., Iissman, M. M., & Peterson, B. S. (2014). Neuroanatomical correlates of religiosity and spirituality: a study in adults at high and low familial risk for depression. *JAMA psychiatry*, 71(2), 128-135.

Miller, L., Wickramaratne, P., Gameraoff, M. J., Sage, M., Tenke, C. E., & Iissman, M. M. (2012). Religiosity and major depression in adults at high risk: a ten-year prospective study. *American Journal of Psychiatry*, 169(1), 89-94.

Miller, S. D. (1989). Optical differences in cases of multiple personality disorder. *Journal of Nervous and Mental Disease*.

Mittelman, B., & Wolff, H. G. (1939). Affective states and skin temperature: experimental study of subjects with " cold hands" and Raynaud's syndrome. *Psychosomatic Medicine*.

- Miyakoshi, M., Nomura, M., & Ohira, H. (2007). An ERP study on self-relevant object recognition. *Brain and cognition*, 63(2), 182-189.
- Moene, F. C., Spinhoven, P., Hoogduin, K. A., & Dyck, R. V. (2003). A randomized controlled clinical trial of a hypnosis-based treatment for patients with conversion disorder, motor type. *International Journal of Clinical and Experimental Hypnosis*, 51(1), 29-50.
- Moody, R. A. (1975). *Life after life: And reflections on life after life*. Guideposts.
- Moray, N. (1959). Attention in dichotic listening: Affective cues and the influence of instructions. *Quarterly journal of experimental psychology*, 11(1), 56-60.
- Moseley, G. L., Olthof, N., Venema, A., Don, S., Wijers, M., Gallace, A., & Spence, C. (2008). Psychologically induced cooling of a specific body part caused by the illusory ownership of an artificial counterpart. *Proceedings of the National Academy of Sciences*, 105(35), 13169-13173.
- Mulla, Z. R., & Krishnan, V. R. (2006). Karma Yoga: A conceptualization and validation of the Indian philosophy of work. *Journal of Indian Psychology*, 24(1/2), 26-43.
- Navon, D., & Gopher, D. (1978). *Interpretations of task difficulty in terms of resources: efficiency, load, demand, and cost composition*. TECHNION-ISRAEL INST OF TECH HAIFA FACULTY OF INDUSTRIAL AND MANAGEMENT ENGINEERING.

Neisser, U. (1967). *Cognitive psychology*. Appleton-Century-Crofts. [JH, GR](1976) *Cognition and reality: Principles and implications of cognitive psychology*.

Neumann, O. (1987). Beyond capacity: A functional view of attention. *Perspectives on perception and action*, 14, 361-394.

Newberg, A., Alavi, A., Baime, M., Pourdehnad, M., Santanna, J., & d'Aquili, E. (2001). The measurement of regional cerebral blood flow during the complex cognitive task of meditation: a preliminary SPECT study. *Psychiatry Research: Neuroimaging*, 106(2), 113-122.

Newberg, A. B., & Iversen, J. (2003). The neural basis of the complex mental task of meditation: neurotransmitter and neurochemical considerations. *Medical hypotheses*, 61(2), 282-291.

Nidich, S., Mills, P. J., Rainforth, M., Heppner, P., Schneider, R. H., Rosenthal, N. E., ... & Rutledge, T. (2018). Non-trauma-focused meditation versus exposure therapy in veterans with post-traumatic stress disorder: a randomised controlled trial. *The Lancet Psychiatry*, 5(12), 975-986.

Nidich, S., O'Connor, T., Rutledge, T., Duncan, J., Compton, B., Seng, A., & Nidich, R. (2016). Reduced trauma symptoms and perceived stress in male prison inmates through the

- Transcendental Meditation program: A randomized controlled trial. *The Permanente Journal*, 20(4).
- Ninio, A., & Kahneman, D. (1974). Reaction time in focused and in divided attention. *Journal of Experimental Psychology*, 103(3), 394.
- Norman, D. A. (1968). Toward a theory of memory and attention. *Psychological review*, 75(6), 522.
- Norris, C. J., Creem, D., Hendler, R., & Kober, H. (2018). Brief mindfulness meditation improves attention in novices: Evidence from ERPs and moderation by neuroticism. *Frontiers in human neuroscience*, 12, 315.
- Ohnishi, T., Ohnishi, T., Nishino, K., Tsurusaki, Y., & Yamaguchi, M. (2005). Growth inhibition of cultured human liver carcinoma cells by Ki-energy (life-energy): scientific evidence for Ki-effects on cancer cells. *Evidence-Based Complementary and Alternative Medicine*, 2.
- Ospina, M. B., Bond, K., Karkhaneh, M., Tjosvold, L., Vandermeer, B., Liang, Y., ... & Klassen, T. P. (2007). Meditation practices for health: state of the research. *Evid Rep Technol Assess (Full Rep)*, 155(155), 1-263.

Otis, L. (1973). The psychobiology of meditation: some psychological changes. In APA Convention, Montreal.

Oyarce, D. A. E., Shaw, M. E., Alateeq, K., & Cherbuin, N. (2020). Volumetric brain differences in clinical depression in association with anxiety: a systematic review with meta-analysis. *Journal of Psychiatry and Neuroscience*, 45(6), 406-429.

Pariante, C. M., & Lightman, S. L. (2008). The HPA axis in major depression: classical theories and new developments. *Trends in neurosciences*, 31(9), 464-468.

Parsons, W. B., & Parsons, W. B. (1999). *The enigma of the oceanic feeling: Revisioning the psychoanalytic theory of mysticism*. Oxford University Press on Demand.

Patrick, G. T. W. (1922). The emergent theory of mind. *The Journal of Philosophy*, 19(26), 701-708.

Peebles, P. J. E., & Ratra, B. (2003). The cosmological constant and dark energy. *Reviews of modern physics*, 75(2), 559.

Peper, E., & Gibney, K. H. (2003). A teaching strategy for successful hand warming. *Somatics*, 14(1), 26-30.

- Peters, R. W. (1954). *Competing messages: The effect of interfering messages upon the reception of primary messages*. OHIO STATE UNIV RESEARCH FOUNDATION COLUMBUS.
- Peterson, L. G., & Pbert, L. (1992). Effectiveness of a meditation-based stress reduction program in the treatment of anxiety disorders. *Am J Psychiatry*, *149*(7), 936-943.
- Phongsuphap, S., Pongsupap, Y., Chandanamattha, P., & Lursinsap, C. (2008). Changes in heart rate variability during concentration meditation. *International journal of cardiology*, *130*(3), 481-484.
- Piedmont, R. L. (1999). Does spirituality represent the sixth factor of personality? Spiritual transcendence and the five-factor model. *Journal of personality*, *67*(6), 985-1013.
- Radin, D., Hayssen, G., Emoto, M., & Kizu, T. (2006). Double-blind test of the effects of distant intention on water crystal formation. *Explore*, *2*(5), 408-411.
- Radin, D., Michel, L., Galdamez, K., Indland, P., Rickenbach, R., & Delorme, A. (2012). Consciousness and the double-slit interference pattern: Six experiments. *Physics Essays*, *25*(2), 157.
- Radin, D. I., & Nelson, R. D. (1989). Evidence for consciousness-related anomalies in random physical systems. *Foundations of Physics*, *19*(12), 1499-1514.

Raphals, L. (2015). Chinese philosophy and Chinese medicine.

Raichle, M. E., MacLeod, A. M., Snyder, A. Z., PoIrs, W. J., Gusnard, D. A., & Shulman, G. L. (2001). A default mode of brain function. *Proceedings of the National Academy of Sciences*, 98(2), 676-682.

Rebai, M., Poiroux, S., Bernard, C., & Lalonde, R. (2001). Event-related potentials for category-specific information during passive viewing of faces and objects. *International Journal of Neuroscience*, 106(3-4), 209-226.

Rees, G., Kreiman, G., & Koch, C. (2002). Neural correlates of consciousness in humans. *Nature Reviews Neuroscience*, 3(4), 261-270.

Ren, S. (1990). Reports of Cooperative Group of Qigong Study. *Tongji Medical Univ.*

Richardson, T. (2010). Vertical and Horizontal Integration: The Dynamic Flow of Qi at the Level of Humanity. *The Lantern*, 7(2), 23-27.

Richardson, T. The Dai Mai: Dynamic Structural Flexibility and Spherical integration. *The American Acupuncturist*, 28.

Richter, C. P. (1957). On the phenomenon of sudden death in animals and man. *Psychosomatic Medicine*, 19(3), 191-198.

- Roberts, A. H., Kewman, D. G., & MacDonald, H. (1973). Voluntary control of skin temperature: Unilateral changes using hypnosis and feedback. *Journal of Abnormal Psychology, 82*(1), 163.
- Robinson, H. (2008). Dualism.
- Rochat, P. (2003). Five levels of self-awareness as they unfold early in life. *Consciousness and cognition, 12*(4), 717-731.
- Ross, N. (1975). Affect as cognition: With observations on the meanings of mystical states. *International Review of Psycho-Analysis, 2*, 79-93.
- Russell, B. (2009). *An outline of philosophy*. Routledge.
- Ryff, C. D. (2014). Psychological well-being revisited: Advances in the science and practice of eudaimonia. *Psychotherapy and psychosomatics, 83*(1), 10-28.
- Safran, J., & Segal, Z. V. (1996). *Interpersonal process in cognitive therapy*. Jason Aronson, Incorporated.
- Saladin, K. S., & Porth, C. (2010). *Anatomy & physiology: the unity of form and function* (Vol. 5). New York, NY, USA:: McGraw-Hill.

Sancier, K. M. (1996). Medical applications of qigong. *Alternative therapies in health and medicine*, 2, 40-46.

Saraswati, S. S. (1984). Yoga nidra: Bihar School of Yoga.

Savitz, J., Solms, M., Pietersen, E., Ramesar, R., & Flor-Henry, P. (2004). Dissociative identity disorder associated with mania and change in handedness. *Cognitive and behavioral neurology*, 17(4), 233-237.

Scalora, S., Anderson, M., Crete, A., Drapkin, J., Portnoff, L., Athan, A., & Miller, L. (2020). A Spirituality Mind-Body Wellness Center in a University Setting; A Pilot Service Assessment Study. *Religions*, 11(9), 466.

Schat, A. C., Kelloway, E. K., & Desmarais, S. (2005). The Physical Health Questionnaire (PHQ): construct validation of a self-report scale of somatic symptoms. *Journal of occupational health psychology*, 10(4), 363.

Schrödinger, E. (1931). Interviews with Great Scientists: no. 4. *Prof. Schrödinger. The Observer*, January, 11, 15-16.

Schwartz, G., Russek, L., She, Z. S., Song, L., & Xin, Y. (1997). Anomalous Organization Of Random Events During An International Qigong Meeting: Evidence for Group

Consciousness or Accumulated Qi Fields?. *Subtle Energies & Energy Medicine Journal Archives*, 8(1).

Scientific American Editors. 2019. The World Health Organization gives the nod to traditional Chinese medicine. Bad idea. *Scientific American* 320(4): 6.

Sedlmeier, P., Eberth, J., Schwarz, M., Zimmermann, D., Haarig, F., Jaeger, S., & Kunze, S. (2012). The psychological effects of meditation: a meta-analysis. *Psychological bulletin*, 138(6), 1139.

Shannahoff-Khalsa, D. S., Ray, L. E., Levine, S., Gallen, C. C., Schwartz, B. J., & Sidorowich, J. (1999). Randomized controlled trial of yogic meditation techniques for patients with obsessive-compulsive disorder. *CNS spectrums*, 4(12), 34-47.

Shapiro, S. L., Carlson, L. E., Astin, J. A., & Freedman, B. (2006). Mechanisms of mindfulness. *Journal of clinical psychology*, 62(3), 373-386.

Shapiro, D. H. (2017). Overview: Clinical and physiological comparison of meditation with other self-control strategies. *Meditation*, 5-12.

Shapiro, A. K., & Shapiro, E. (2000). *The powerful placebo: From ancient priest to modern physician*. JHU Press.

- Shulman, G. L., Fiez, J. A., Corbetta, M., Buckner, R. L., Miezin, F. M., & Raichle, M. E. others. 1997. Common blood flow changes across visual tasks: II. Decreases in cerebral cortex. *J Cogn Neurosci*, 9, 648-63.
- Sivin, N. (1987). *Traditional medicine in contemporary China: a partial translation of Revised outline of Chinese medicine (1972): with an introductory study on change in present day and early medicine* (No. 2). University of Michigan Center for chinese.
- Smart, J. J. C., "The Mind/Brain Identity Theory", *The Stanford Encyclopedia of Philosophy* (Spring 2017 Edition), Edward N. Zalta (ed.), URL = [<https://plato.stanford.edu/archives/spr2017/entries/mind-identity/>](https://plato.stanford.edu/archives/spr2017/entries/mind-identity/).
- Sng, A. A., & Janca, A. (2016). Mindfulness for personality disorders. *Current opinion in psychiatry*, 29(1), 70-76.
- Soh, K. S. (2009). Bonghan circulatory system as an extension of acupuncture meridians. *Journal of Acupuncture and Meridian Studies*, 2(2), 93-106.
- Solomon, R. C. (Ed.). (2001). *Phenomenology and existentialism*. Rowman & Littlefield.
- Spampinato, M. V., Wood, J. N., De Simone, V., & Grafman, J. (2009). Neural correlates of anxiety in healthy volunteers: a voxel-based morphometry study. *The Journal of neuropsychiatry and clinical neurosciences*, 21(2), 199-205.

- Spiegel, D. (2001). Mind matters—group therapy and survival in breast cancer.
- Stein, M. (2019). Psychological individuation and spiritual enlightenment: some comparisons and points of contact. *Journal of Analytical Psychology*, 64(1), 6-22.
- Stevens, C., & Bavelier, D. (2012). The role of selective attention on academic foundations: A cognitive neuroscience perspective. *Developmental cognitive neuroscience*, 2, S30-S48.
- Sudsuang, R., Chentanez, V., & Veluvan, K. (1991). Effect of Buddhist meditation on serum cortisol and total protein levels, blood pressure, pulse rate, lung volume and reaction time. *Physiology & behavior*, 50(3), 543-548.
- Sund-Levander, M., Forsberg, C., & Wahren, L. K. (2002). Normal oral, rectal, tympanic and axillary body temperature in adult men and women: a systematic literature review. *Scandinavian journal of caring sciences*, 16(2), 122-128.
- Surwit, R. S., Shapiro, D., & Feld, J. L. (1976). Digital temperature autoregulation and associated cardiovascular changes. *Psychophysiology*, 13(3), 242-248.
- Suter, S., & Loughry-Machado, G. (1981). Skin temperature biofeedback in children and adults. *Journal of Experimental Child Psychology*, 32(1), 77-87.

Suzuki, D. T. (1996). *Zen Buddhism: selected writings of DT Suzuki*. Harmony.

Tahsini, Z. G., Hosseini, S. M., Kianersi, F., Rashn, S., & Majdara, E. (2017). Biofeedback-Aided Relaxation Training Helps Emotional Disturbances in Undergraduate Students Before Examination. *Applied psychophysiology and biofeedback*, 42(4), 299-307.

Tanaka, J. W., & Curran, T. (2001). A neural basis for expert object recognition. *Psychological science*, 12(1), 43-47.

Tang, Y. Y., Ma, Y., Fan, Y., Feng, H., Wang, J., Feng, S., ... & Zhang, Y. (2009). Central and autonomic nervous system interaction is altered by short-term meditation. *Proceedings of the national Academy of Sciences*, 106(22), 8865-8870.

Taub, E., & Emurian, C. S. (1976). Feedback-aided self-regulation of skin temperature with a single feedback locus. *Biofeedback and Self-Regulation*, 1(2), 147-168.

Teasdale, J. D., & Chaskalson, M. (2011). How does mindfulness transform suffering? I: the nature and origins of dukkha. *Contemporary Buddhism*, 12(1), 89-102.

Thayer, J. F., & Lane, R. D. (2007). The role of vagal function in the risk for cardiovascular disease and mortality. *Biological psychology*, 74(2), 224-242.

- Tomasino, B., Fregona, S., Skrap, M., & Fabbro, F. (2013). Meditation-related activations are modulated by the practices needed to obtain it and by the expertise: an ALE meta-analysis study. *Frontiers in human neuroscience*, *6*, 346.
- Tooley, G. A., Armstrong, S. M., Norman, T. R., & Sali, A. (2000). Acute increases in nighttime plasma melatonin levels following a period of meditation. *Biological Psychology*, *53*(1), 69-78.
- Travis, F. (2001). Autonomic and EEG patterns distinguish transcending from other experiences during Transcendental Meditation practice. *International Journal of psychophysiology*, *42*(1), 1-9.
- Treisman, A. M., & Gelade, G. (1980). A feature-integration theory of attention. *Cognitive psychology*, *12*(1), 97-136.
- Treisman, A. M., & Riley, J. G. (1969). Is selective attention selective perception or selective response? A further test. *Journal of Experimental Psychology*, *79*(1p1), 27.
- Tsuyoshi Ohnishi, S., Nishino, K., Uchiyama, S., Ohnishi, T., & Yamaguchi, M. (2007). Ki-energy (life-energy) stimulates osteoblastic cells and inhibits the formation of osteoclast-like cells in bone cell culture models. *Evidence-Based Complementary and Alternative Medicine*, *4*.

- Turgay, A. (1990). Treatment outcome for children and adolescents with conversion disorder. *The Canadian Journal of Psychiatry*, 35(7), 585-589.
- Van Gordon, W., Shonin, E., Griffiths, M. D., & Singh, N. N. (2015). There is only one mindfulness: Why science and Buddhism need to work together. *Mindfulness*, 6(1), 49-56.
- Van Lommel, P. (2006). Near-death experience, consciousness, and the brain: A new concept about the continuity of our consciousness based on recent scientific research on near-death experience in survivors of cardiac arrest. *World Futures*, 62(1-2), 134-151.
- Van Lommel, P., Van Ies, R., Meyers, V., & Elfferich, I. (2001). Near-death experience in survivors of cardiac arrest: a prospective study in the Netherlands. *The Lancet*, 358(9298), 2039-2045.
- Van Strien, J. W., & Isbell, L. A. (2017). Snake scales, partial exposure, and the Snake Detection Theory: A human event-related potentials study. *Scientific Reports*, 7(1), 1-9.
- van Vliet, M., Van Hulle, M. M., & Salmelin, R. (2018). Exploring the organization of semantic memory through unsupervised analysis of event-related potentials. *Journal of cognitive neuroscience*, 30(3), 381-392.

- Van Wijk, R., Soh, K. S., & Van Wijk, E. P. (2007). Anatomic characterization of acupuncture system and ultra-weak photon emission. *Asian J Phys*, 16(4), 443-474.
- Varela, F., Lachaux, J. P., Rodriguez, E., & Martinerie, J. (2001). The brainweb: phase synchronization and large-scale integration. *Nature reviews neuroscience*, 2(4), 229-239.
- Veith, R. C., Lewis, N., Linares, O. A., Barnes, R. F., Raskind, M. A., Villacres, E. C., ... & Pascualy, M. (1994). Sympathetic nervous system activity in major depression: basal and desipramine-induced alterations in plasma norepinephrine kinetics. *Archives of general psychiatry*, 51(5), 411-422.
- Vollenweider, F. X., Vontobel, P., Hell, D., & Leenders, K. L. (1999). 5-HT modulation of dopamine release in basal ganglia in psilocybin-induced psychosis in man—a PET study with [11C] raclopride. *Neuropsychopharmacology*, 20(5), 424-433.
- Wallace, R. K., & Benson, H. (1972). The physiology of meditation. *Scientific American*, 226(2), 84-91.
- Walton, K. G., Pugh, N. D., Gelderloos, P., & Macrae, P. (1995). Stress reduction and preventing hypertension: preliminary support for a psychoneuroendocrine mechanism. *The journal of alternative and complementary medicine*, 1(3), 263-283.

- Wang, C. Y. (2021). Differences in perception, understanding, and responsiveness of product design between experts and students: an early event-related potentials study. *International Journal of Technology and Design Education*, 31(5), 1039-1061.
- Wang, R. G., Tian, M. Z., & Li, W. Z. (1995). *Physics of Atom and Molecular*.
- Ware Jr, J. E., & Sherbourne, C. D. (1992). The MOS 36-item short-form health survey (SF-36): I. Conceptual framework and item selection. *Medical care*, 473-483.
- Weil, A. (2006). *Subtle Energy and Well-Being*.
- Weinberg, A., Perlman, G., Kotov, R., & Hajcak, G. (2016). Depression and reduced neural response to emotional images: Distinction from anxiety, and importance of symptom dimensions and age of onset. *Journal of abnormal psychology*, 125(1), 26.
- Wolf, D. B., & Abell, N. (2003). Examining the effects of meditation techniques on psychosocial functioning. *Research on Social Work Practice*, 13(1), 27-42.
- Wu, S. D., & Lo, P. C. (2008). Inward-attention meditation increases parasympathetic activity: a study based on heart rate variability. *Biomedical Research*, 29(5), 245-250.

Wu, B. J., Xu, J. H., Liu, J. B., Wang, X. B., & Qiao, W. C. (1991). Dynamic study of the signal of external Qi in the zero-magnetic space laboratory. *Chinese Journal of Somatic Science*, 1(5), 195-200.

Xutian, S., Cao, D., Wozniak, J., Junion, J., & Boisvert, J. (2012). Comprehension of the unique characteristics of traditional Chinese medicine. *The American journal of Chinese medicine*, 40(02), 231-244.

Xutian, S., Cao, D., Wozniak, J., & Junion, J. (2015). Comprehension of the unique characteristics of traditional Chinese medicine. In *Handbook of Traditional Chinese Medicine* (pp. 1-15).

Yang, J. M. (1989). *The root of Chinese Chi kung: the secrets of Chi kung training*. Yang's Martial Arts Association.

Yin, J. G., Huang, X. H., & Sun, Y. (1998). A study of the inhibitory effect of qigong external qi on the Hepatitis B virus in vitro. *China Qigong*, 8(1998), 4-7.

Zgierska, A., Rabago, D., Chawla, N., & Kushner, K. (2013). Mindfulness meditation for substance use disorders: A systematic review. *Mindfulness-Related Treatments and Addiction Recovery*, 10-38.

Appendix A

Patient Health Questionnaire (PHQ-9)

Response:

0-not at all, 1-several 2-more than half the days, 3-nearly every day

Instructions: Over the last two weeks, how often have you been bothered by the following problems?

1. Little interest or pleasure in doing things
2. Feeling down, depressed, or hopeless
3. Trouble falling or staying asleep, or sleeping too much
4. Feeling tired or having little energy
5. Poor appetite or overeating
6. Feeling bad about yourself — or that you are a failure or have let yourself or your family
7. Moving or speaking so slowly that other people could have noticed? Or the opposite—being so fidgety or restless that you have been moving around a lot more than usual
8. Trouble concentrating on things, such as reading the newspaper or watching television
9. Thoughts that you would be better off dead or of hurting yourself in some way

RESPONSE:

Not at all Difficult / Somewhat Difficult / Very Difficult / Extremely Difficult

Instructions: Please select one of the following:

10. If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?

Appendix B

Generalized Anxiety Disorder Scale (GAD-7)

RESPONSE:

Not at all (0); Several (1); More than half the days (2); Nearly every day (3), (items 1-7)

1. Feeling nervous, anxious or on edge
2. Not being able to stop or control worrying
3. Worrying too much about different things
4. Trouble relaxing
5. Being so restless that it is hard to sit still
6. Becoming easily annoyed or irritable
7. Feeling afraid as if something awful might happen

Appendix C

PTSD Checklist—Civilian Version (PCL-C)

PTSD Checklist – Civilian Version (PCL-C)

Client's Name: _____

Instruction to patient: Below is a list of problems and complaints that veterans sometimes have in response to stressful life experiences. Please read each one carefully, put an "X" in the box to indicate how much you have been bothered by that problem *in the last month*.

No.	Response	Not at all (1)	A little bit (2)	Moderately (3)	Quite a bit (4)	Extremely (5)
1.	Repeated, disturbing <i>memories, thoughts, or images</i> of a stressful experience from the past?					
2.	Repeated, disturbing <i>dreams</i> of a stressful experience from the past?					
3.	Suddenly <i>acting or feeling</i> as if a stressful experience <i>were happening</i> again (as if you were reliving it)?					
4.	Feeling <i>very upset</i> when <i>something reminded</i> you of a stressful experience from the past?					
5.	Having <i>physical reactions</i> (e.g., heart pounding, trouble breathing, or sweating) when <i>something reminded</i> you of a stressful experience from the past?					
6.	Avoid <i>thinking about or talking about</i> a stressful experience from the past or avoid <i>having feelings</i> related to it?					
7.	Avoid <i>activities or situations</i> because they <i>remind you</i> of a stressful experience from the past?					
8.	Trouble <i>remembering important parts</i> of a stressful experience from the past?					
9.	Loss of <i>interest in things that you used to enjoy</i> ?					
10.	Feeling <i>distant or cut off</i> from other people?					
11.	Feeling <i>emotionally numb</i> or being unable to have loving feelings for those close to you?					
12.	Feeling as if your <i>future</i> will somehow be <i>cut short</i> ?					
13.	Trouble <i>falling or staying asleep</i> ?					
14.	Feeling <i>irritable</i> or having <i>angry outbursts</i> ?					
15.	Having <i>difficulty concentrating</i> ?					
16.	Being <i>"super alert"</i> or watchful on guard?					
17.	Feeling <i>jumpy</i> or easily startled?					

PCL-M for DSM-IV (11/1/94) Weathers, Litz, Huska, & Keane National Center for PTSD - Behavioral Science Division

This is a Government document in the public domain.

Appendix D

Five-Facet Mindfulness Questionnaire

Five Facet Mindfulness Questionnaire

Description:

This instrument is based on a factor analytic study of five independently developed mindfulness questionnaires. The analysis yielded five factors that appear to represent elements of mindfulness as it is currently conceptualized. The five facets are observing, describing, acting with awareness, non-judging of inner experience, and non-reactivity to inner experience. More information is available in:

Please rate each of the following statements using the scale provided. Write the number in the blank that best describes your own opinion of what is generally true for you.

1	2	3	4	5
never or very rarely true	rarely true	sometimes true	often true	very often or always true

- _____ 1. When I'm walking, I deliberately notice the sensations of my body moving.
- _____ 2. I'm good at finding words to describe my feelings.
- _____ 3. I criticize myself for having irrational or inappropriate emotions.
- _____ 4. I perceive my feelings and emotions without having to react to them.
- _____ 5. When I do things, my mind wanders off and I'm easily distracted.
- _____ 6. When I take a shower or bath, I stay alert to the sensations of water on my body.
- _____ 7. I can easily put my beliefs, opinions, and expectations into words.
- _____ 8. I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.
- _____ 9. I watch my feelings without getting lost in them.
- _____ 10. I tell myself I shouldn't be feeling the way I'm feeling.
- _____ 11. I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.
- _____ 12. It's hard for me to find the words to describe what I'm thinking.
- _____ 13. I am easily distracted.
- _____ 14. I believe some of my thoughts are abnormal or bad and I shouldn't think that way.

- _____ 15. I pay attention to sensations, such as the wind in my hair or sun on my face.
- _____ 16. I have trouble thinking of the right words to express how I feel about things
- _____ 17. I make judgments about whether my thoughts are good or bad.
- _____ 18. I find it difficult to stay focused on what's happening in the present.
- _____ 19. When I have distressing thoughts or images, I "step back" and am aware of the thought or image without getting taken over by it.
- _____ 20. I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.
- _____ 21. In difficult situations, I can pause without immediately reacting.
- _____ 22. When I have a sensation in my body, it's difficult for me to describe it because I can't find the right words.
- _____ 23. It seems I am "running on automatic" without much awareness of what I'm doing.
- _____ 24. When I have distressing thoughts or images, I feel calm soon after.
- _____ 25. I tell myself that I shouldn't be thinking the way I'm thinking.
- _____ 26. I notice the smells and aromas of things.
- _____ 27. Even when I'm feeling terribly upset, I can find a way to put it into words.
- _____ 28. I rush through activities without being really attentive to them.
- _____ 29. When I have distressing thoughts or images I am able just to notice them without reacting.
- _____ 30. I think some of my emotions are bad or inappropriate and I shouldn't feel them.
- _____ 31. I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow.
- _____ 32. My natural tendency is to put my experiences into words.
- _____ 33. When I have distressing thoughts or images, I just notice them and let them go.
- _____ 34. I do jobs or tasks automatically without being aware of what I'm doing.
- _____ 35. When I have distressing thoughts or images, I judge myself as good or bad, depending what the thought/image is about.
- _____ 36. I pay attention to how my emotions affect my thoughts and behavior.
- _____ 37. I can usually describe how I feel at the moment in considerable detail.
- _____ 38. I find myself doing things without paying attention.
- _____ 39. I disapprove of myself when I have irrational ideas.

Appendix E

Spiritual Transcendence Scale (STS)

Table 1
Definitions of the three dimensions of the Spiritual Transcendence Scale along with defining items and factor loadings

Spiritual Transcendence Scale and Definition	1	2	3
<i>Prayer Fulfillment:</i> An experienced feeling of joy and contentment that results from prayer. Prayer provides a sense of personal strength. Prayer is consuming and orients one to another state of being.			
2. I meditate and/or pray so that I can reach a higher spiritual plane of consciousness	.70	.30	.10
3. I have had at least one "peak" experience	.45	.15	.00
10. I have been able to step outside of my ambitions and failures, pain and joy, to experience a larger sense of fulfillment	.49	.24	.13
14. I find inner strength and/or peace from my prayers or meditations	.76	.22	.14
17. Sometimes I find the details of my life to be a distraction from my prayers and/or meditations	.54	.24	-.02
18. When in prayer or meditation, I have become oblivious to the events of this world	.69	.09	.03
19. I have experienced deep fulfillment and bliss through my prayers or meditations	.82	.18	.13
20. I have had a spiritual experience where I lost track of where I was or the passage of time	.62	.17	-.02
21. The desires of my body do not keep me from my prayers or meditations	.61	-.05	.22
<i>Universality:</i> A belief in the unity and purpose of life; a feeling that all life is interconnected and a sense of a shared responsibility of one creature to another.			
4. I feel that on a higher level all of us share a common bond	.07	.70	.26
5. All life is interconnected	.02	.69	.18
6. There is a higher plane of consciousness or spirituality that binds all people	.25	.75	.14
11. Although individual people may be difficult, I feel an emotional bond with all of humanity	.22	.51	.26
13. I believe that there is a larger meaning to life	.18	.61	-.01

Table 1 (cont.)

15. I believe that death is a doorway to another plane of existence	.30	.59	.07
16. I believe there is a larger plan to life	.22	.66	-.05
23. There is an order to the universe that transcends human thinking	.18	.58	.00
24. I believe that on some level my life is intimately tied to all of humankind	.26	.57	.31
<i>Connectedness:</i> A sense of personal responsibility to others that is both vertical, cross-generational commitments, and horizontal, commitments to others in my community.			
1. Although dead, images of some of my relatives continue to influence my current life	.12	-.07	.67
7. It is important for me to give something back to my community	.17	.14	.53
8. I am a link in the chain of my family's heritage, a bridge between past and future	-.06	-.07	.67
9. I am concerned about those who will come after me in life	-.19	.25	.56
12. I still have strong emotional ties with someone who has died	.24	-.08	.57
22. Although there is good and bad in people, I believe that humanity as a whole is basically good	.09	.24	.47

Spiritual Transcendence Scale, copyright Ralph L. Piedmont. Items used with permission.

Appendix F

Spirituality Scale (SS)

TITLE: *Spirituality Scale*

REFERENCE: Delaney, C. (2005). The Spirituality Scale: Development and Psychometric Testing of a Holistic Instrument to Assess the Human Spiritual Dimension. *Journal of Holistic Nursing*, 23, 145-167.

RESPONSE:

6 pt. Likert

1-Strongly Disagree, 2-Disagree, 3-Mostly Disagree, 4-Mostly Agree, 5-Agree, 6-Strongly Agree

(Questions 1-23)

1. I find meaning in my life experiences.
2. I have a sense of purpose.
3. I am happy about the person I have become.
4. I see the sacredness in everyday life.
5. I meditate to gain access to my inner spirit
6. I live in harmony with nature.
7. I believe there is a connection between all things that I cannot see but can sense.
8. My life is a process of becoming.
9. I believe in a Higher Power/Universal Intelligence.
10. I believe that all living creatures deserve respect.
11. The earth is sacred.
12. I value maintaining and nurturing my relationships with others.
13. I use silence to get in touch with myself.
14. I believe that nature should be respected.
15. I have a relationship with a Higher Power/Universal Intelligence.
16. My spirituality gives me inner strength.
17. I am able to receive love from others.
18. My faith in a Higher Power/Universal Intelligence helps me cope during challenges in my life.
19. I strive to correct the excesses in my own lifestyle patterns/practices.
20. I respect the diversity of people.
21. Prayer is an integral part of my spiritual nature.
22. At times, I feel at one with the universe.
23. I often take time to assess my life choices as a way of living my spirituality.

Appendix G

Physical Health Questionnaire (PHQ)

Physical Health Questionnaire

The following items focus on how you have been feeling *physically* during the *past [period of time]*. Please respond by circling the appropriate number.

Over the past [period of time] . . .	Not at all	Rarely	Once in a while	Some of the time	Fairly often	Often	All of the time
1. How often have you had difficulty getting to sleep at night?	1	2	3	4	5	6	7
2. How often have you woken up during the night?	1	2	3	4	5	6	7
3. How often have you had nightmares or disturbing dreams?	1	2	3	4	5	6	7
4. How often has your sleep been peaceful and undisturbed?	1	2	3	4	5	6	7
5. How often have you experienced headaches?	1	2	3	4	5	6	7
6. How often did you get a headache when there was a lot of pressure on you to get things done?	1	2	3	4	5	6	7
7. How often did you get a headache when you were frustrated because things were not going the way they should have or when you were annoyed at someone?	1	2	3	4	5	6	7
8. How often have you suffered from an upset stomach (indigestion)?	1	2	3	4	5	6	7
9. How often did you have to watch that you ate carefully to avoid stomach upsets?	1	2	3	4	5	6	7
10. How often did you feel nauseated ("sick to your stomach")?	1	2	3	4	5	6	7
11. How often were you constipated or did you suffer from diarrhea?	1	2	3	4	5	6	7
12. How many times have you had minor colds (that made you feel uncomfortable but didn't keep you sick in bed or make you miss work)?	0 times	1–2 time	3 times	4 times	5 times	6 times	7+ times
13. How many times have you had respiratory infections more severe than minor colds that "laid you low" (such as bronchitis, sinusitis, etc.)?	0 times	1–2 times	3 times	4 times	5 times	6 times	7+ times
14. When you had a bad cold or flu, how long did it typically last?	1 day	2 days	3 days	4 days	5 days	6 days	7+ days

Note. Item 4 should be reverse scored. This version of the Physical Health Questionnaire was used in Studies 1 and 2. The wording of and response alternatives for Items 12–14 were revised for Study 3 (see text for details).

Appendix H

Medical Outcomes Study (MOS) 36-item Short Form Survey (SF-36)



[RAND](#) > [RAND Health](#) > [Surveys](#) > [RAND Medical Outcomes Study](#) > [36-Item Short Form Survey \(SF-36\)](#) >

36-Item Short Form Survey Instrument (SF-36)

RAND 36-Item Health Survey 1.0 Questionnaire Items

Choose one option for each questionnaire item.

1. In general, would you say your health is:

- 1 - Excellent
- 2 - Very good
- 3 - Good
- 4 - Fair
- 5 - Poor

2. **Compared to one year ago**, how would you rate your health in general **now**?

- 1 - Much better now than one year ago
 - 2 - Somewhat better now than one year ago
 - 3 - About the same
 - 4 - Somewhat worse now than one year ago
 - 5 - Much worse now than one year ago
-

The following items are about activities you might do during a typical day. Does **your health now limit you** in these activities? If so, how much?

	Yes, limited a lot	Yes, limited a little	No, not limited at all
3. Vigorous activities , such as running, lifting heavy objects, participating in strenuous sports	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3
4. Moderate activities , such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3
5. Lifting or carrying groceries	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3
6. Climbing several flights of stairs	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3
7. Climbing one flight of stairs	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3
8. Bending, kneeling, or stooping	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3
9. Walking more than a mile	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3
10. Walking several blocks	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3
11. Walking one block	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3
12. Bathing or dressing yourself	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3

During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of your physical health**?

- | | Yes | No |
|---|-----------------------|-----------------------|
| 13. Cut down the amount of time you spent on work or other activities | <input type="radio"/> | <input type="radio"/> |
| | 1 | 2 |
| 14. Accomplished less than you would like | <input type="radio"/> | <input type="radio"/> |
| | 1 | 2 |
| 15. Were limited in the kind of work or other activities | <input type="radio"/> | <input type="radio"/> |
| | 1 | 2 |
| 16. Had difficulty performing the work or other activities (for example, it took extra effort) | <input type="radio"/> | <input type="radio"/> |
| | 1 | 2 |
-

During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of any emotional problems** (such as feeling depressed or anxious)?

- | | Yes | No |
|--|-------------------------|-------------------------|
| 17. Cut down the amount of time you spent on work or other activities | <input type="radio"/> 1 | <input type="radio"/> 2 |
| 18. Accomplished less than you would like | <input type="radio"/> 1 | <input type="radio"/> 2 |
| 19. Didn't do work or other activities as carefully as usual | <input type="radio"/> 1 | <input type="radio"/> 2 |
-

20. During the **past 4 weeks**, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?

- 1 - Not at all
 - 2 - Slightly
 - 3 - Moderately
 - 4 - Quite a bit
 - 5 - Extremely
-

21. How much **bodily** pain have you had during the **past 4 weeks**?

- 1 - None
 - 2 - Very mild
 - 3 - Mild
 - 4 - Moderate
 - 5 - Severe
 - 6 - Very severe
-

22. During the **past 4 weeks**, how much did **pain** interfere with your normal work (including both work outside the home and housework)?

- 1 - Not at all
 - 2 - A little bit
 - 3 - Moderately
 - 4 - Quite a bit
 - 5 - Extremely
-

These questions are about how you feel and how things have been with you **during the past 4 weeks**. For each question, please give the one answer that comes closest to the way you have been feeling.

How much of the time during the **past 4 weeks**...

- | | All of the time | Most of the time | A good bit of the time | Some of the time | A little of the time | None of the time |
|---|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| 23. Did you feel full of pep? | <input type="radio"/> 1 | <input type="radio"/> 2 | <input type="radio"/> 3 | <input type="radio"/> 4 | <input type="radio"/> 5 | <input type="radio"/> 6 |
| 24. Have you been a very nervous person? | <input type="radio"/> 1 | <input type="radio"/> 2 | <input type="radio"/> 3 | <input type="radio"/> 4 | <input type="radio"/> 5 | <input type="radio"/> 6 |
| 25. Have you felt so down in the dumps that nothing could cheer you up? | <input type="radio"/> 1 | <input type="radio"/> 2 | <input type="radio"/> 3 | <input type="radio"/> 4 | <input type="radio"/> 5 | <input type="radio"/> 6 |
| 26. Have you felt calm and peaceful? | <input type="radio"/> 1 | <input type="radio"/> 2 | <input type="radio"/> 3 | <input type="radio"/> 4 | <input type="radio"/> 5 | <input type="radio"/> 6 |
| 27. Did you have a lot of energy? | <input type="radio"/> 1 | <input type="radio"/> 2 | <input type="radio"/> 3 | <input type="radio"/> 4 | <input type="radio"/> 5 | <input type="radio"/> 6 |
| 28. Have you felt downhearted and blue? | <input type="radio"/> 1 | <input type="radio"/> 2 | <input type="radio"/> 3 | <input type="radio"/> 4 | <input type="radio"/> 5 | <input type="radio"/> 6 |
| 29. Did you feel worn out? | <input type="radio"/> 1 | <input type="radio"/> 2 | <input type="radio"/> 3 | <input type="radio"/> 4 | <input type="radio"/> 5 | <input type="radio"/> 6 |
| 30. Have you been a happy person? | <input type="radio"/> 1 | <input type="radio"/> 2 | <input type="radio"/> 3 | <input type="radio"/> 4 | <input type="radio"/> 5 | <input type="radio"/> 6 |
| 31. Did you feel tired? | <input type="radio"/> 1 | <input type="radio"/> 2 | <input type="radio"/> 3 | <input type="radio"/> 4 | <input type="radio"/> 5 | <input type="radio"/> 6 |

32. During the **past 4 weeks**, how much of the time has **your physical health or emotional problems** interfered with your social activities (like visiting with friends, relatives, etc.)?

- 1 - All of the time
 - 2 - Most of the time
 - 3 - Some of the time
 - 4 - A little of the time
 - 5 - None of the time
-

How TRUE or FALSE is **each** of the following statements for you.

	Definitely true	Mostly true	Don't know	Mostly false	Definitely false
33. I seem to get sick a little easier than other people	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5
34. I am as healthy as anybody I know	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5
35. I expect my health to get worse	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5
36. My health is excellent	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5

ABOUT

The RAND Corporation is a research organization that develops solutions to public policy challenges to help make communities throughout the world safer and more secure, healthier and more prosperous. RAND is nonprofit, nonpartisan, and committed to the public interest.



1776 Main Street
Santa Monica, California 90401-3208

RAND® is a registered trademark. Copyright © 1994-2016 RAND Corporation.

Appendix I

Psychological Well-being Scale

3. Ryff's Psychological Well-Being Scales (PWB), 42 Item version

Please indicate your degree of agreement (using a score ranging from 1-6) to the following sentences.

	Strongly disagree					Strongl y agree
1. I am not afraid to voice my opinions, even when they are in opposition to the opinions of most people.	1	2	3	4	5	6
2. In general, I feel I am in charge of the situation in which I live.	1	2	3	4	5	6
3. I am not interested in activities that will expand my horizons.	1	2	3	4	5	6
4. Most people see me as loving and affectionate.	1	2	3	4	5	6
5. I live life one day at a time and don't really think about the future.	1	2	3	4	5	6
6. When I look at the story of my life, I am pleased with how things have turned out.	1	2	3	4	5	6
7. My decisions are not usually influenced by what everyone else is doing.	1	2	3	4	5	6
8. The demands of everyday life often get me down.	1	2	3	4	5	6
9. I think it is important to have new experiences that challenge how you think about yourself and the world.	1	2	3	4	5	6
10. Maintaining close relationships has been difficult and frustrating for me.	1	2	3	4	5	6
11. I have a sense of direction and purpose in life.	1	2	3	4	5	6
12. In general, I feel confident and positive about myself.	1	2	3	4	5	6
13. I tend to worry about what other people think of me.	1	2	3	4	5	6
14. I do not fit very well with the people and the community around me.	1	2	3	4	5	6
15. When I think about it, I haven't really improved much as a person over the years.	1	2	3	4	5	6
16. I often feel lonely because I have few close friends with whom to share my concerns.	1	2	3	4	5	6
17. My daily activities often seem trivial and unimportant to me.	1	2	3	4	5	6
18. I feel like many of the people I know have gotten more out of life than I have.	1	2	3	4	5	6
19. I tend to be influenced by people with strong opinions.	1	2	3	4	5	6
20. I am quite good at managing the many responsibilities of my daily life.	1	2	3	4	5	6
21. I have the sense that I have developed a lot as a person over time.	1	2	3	4	5	6

Appendix J

Experiment 1 Flyer

MIND-BODY RESEARCH STUDY

TC IRB #: 212-
678-4105



Focused Attention and the Mind- Body Relationship

Purpose of Study:

We hope to examine the mind-body relationship and how engaging in contemplative practice might affect this.

Criteria for Eligibility:

Practitioners of a contemplative practice such as meditation, prayer, or qi gong at the following levels of experience: no experience, 0 – 5 years, 5 – 10 years, and 10+ years of practice. Must be 18 years of age or older. Must consent to video & audio recording to participate.

\$10 compensation for participating.

Location:

Remote Zoom Meeting

Time Commitment:

Approximately 35 minutes at a agreed upon time sometime between January and September of 2021

Contact Info:

If you are interested in participating in this study, or have any questions, please contact:

Simon Choi, Doctoral Student at Teachers College
Email: hsc2141@tc.columbia.edu

TEACHERS COLLEGE COLUMBIA UNIVERSITY

A Graduate School of Education, Health & Psychology

Appendix K

Experiment 2 Flyer

MIND-BODY RESEARCH STUDY

TC IRB #: 212-678-4105



The Effects of Meditation on Health

Purpose of Study:

We hope to examine the impact of a 6-week meditation practice on health and well-being.

Criteria for Eligibility:

Participants with little to no experience in any form of contemplative or meditative practice. Must be 18 years of age or older.

\$20 compensation for participating.

Location:

Remote Zoom Meeting

Time Commitment:

Approximately 1 hour of survey, 20 minutes of practice per day for 6 weeks sometime between February and September of 2020.

Contact Info:

If you are interested in participating in this study, or have any questions, please contact:

Simon Choi, Doctoral Student at Teachers College

Email: hsc2141@tc.columbia.edu

TEACHERS COLLEGE COLUMBIA UNIVERSITY

A Graduate School of Education, Health & Psychology

Appendix L

Experiment 1 Script

Thank you for participating in this research experiment. This study is being conducted to understand the effects of focusing one's attention on an area of the body on body functioning. At this point, the researcher should have taped a sensor to the palm of each of your hands. For the next 20 to 25 minutes, you will be asked to focus your attention on various spatial locations. You will be video and audio recorded throughout the experiment to detect potential movements and distractions as well as your verbal answers to questions we will ask. Please breathe normally throughout the experiment, get into a comfortable position, and try to limit moving your body during this experiment. When you are asked to focus on a part of your body later in the study, we recommend bringing your attention to that specific area of your body. It may be helpful to visualize a point, a size of a dime or smaller, in that spatial location. Furthermore, it may be helpful to concentrate on a point slightly below the surface of your skin rather than focusing beyond or on the surface of your skin. Please try your best to maintain your focus and concentration on the spatial location that will be indicated. If your mind wanders during the experiment, please gently redirect your attention to the target area of focus. Every few minutes, you will also be asked by this recording, "on a scale of 1 to 10, how distracted are you in this moment?" Please answer verbally out loud how distracted you are on a scale of 1 to 10, with 1 being least distracted and 10 being most distracted. Now we will begin the experiment.

(T = 0) For the new few minutes focus your attention on the cross shape on the piece of paper in front of you. Try to relax your body during this time and get yourself in a comfortable posture.

(4:45 minutes)
 $2:25 + 4:45 = 7:10$

(T=4:45) Now, please focus your attention on the palm of your (left or right) hand. Continue to keep your body relaxed in a comfortable posture. If your mind wanders, gently bring your attention to the palm of your (left or right) hand.

(4:30 minutes)
 $7:30 + 4:45 = 12:15$

(T=9:45) Now please answer verbally, out loud, on a scale of 1 to 10, how distracted are you in this moment?

Thank you. Please re-focus your attention on the palm of your (left or right) hand. Continue to keep your body relaxed in a comfortable posture. If your mind wanders, gently bring your attention to the palm of your (left or right) hand.

(4:45 minutes)

12:45+4:45 = 17:30

(T= 14:45) Now please answer verbally on a scale of 1 to 10, how distracted are you in this moment?

Thank you. Please re-focus your attention on the palm of your (left or right) hand. Continue to keep your body relaxed in a comfortable posture. If your mind wanders, gently bring your attention to the palm of your (left or right) hand.

(4:45 minutes)

18:00+4:45 = 22:45

(T=19:45) Now please answer verbally on a scale of 1 to 10, how distracted are you in this moment?

Thank you. Please re-focus your attention on the palm of your (left or right) hand. Continue to keep your body relaxed in a comfortable posture. If your mind wanders, gently bring your attention to the palm of your (left or right) hand.

(4:45 minutes)

23:15 + 4:45 = 28:00

(T=24:45) Now please answer verbally on a scale of 1 to 10, how distracted are you in this moment?

Thank you. You have completed this portion of the experiment. The researcher will be back in just a few moments.

Appendix M

Experiment 2 Script

Control Group:

To begin, make sure the body is in as comfortable a position as possible, sitting on your chair, allowing your eyes to close gently if you feel comfortable with it, and allowing the weight of the body to settle down towards the earth, taking a few deeper breaths and letting go a little bit more on each out breath.

Now, allowing your breath to settle and to find its own natural rhythm in accordance to the music. Inhaling when the music starts, then exhaling after each pause in music. Noticing how the body moves in response to the breath; the chest expanding and relaxing, the belly rising and falling. Take a breath and let your stomach swell forward as you breathe in, and fall back gently as you breathe out. And noticing now, that there is little or no movement on your chest.

And with each breath, allowing yourself to fall into a steady rhythm by taking the same depth of breath each time. And when you feel comfortable, trying to slow your breathing rate down by taking a short pause after you have breathed out and before you breathe in again. And, if the thought comes to mind that “I’m not getting enough air to nourish my body,” then simply noting it, and returning your attention to your breath and the gentle undulation of your belly. With regular practice, this slower rate will soon start to feel comfortable.

Noticing how each breath is unique, how no two breaths are the same. Noticing the texture, the quality, and the duration of each breath. If you notice the body or the mind tensing up around your experience, in the noticing you can gently let go again without judgment. Repeat this letting go over and over again if necessary with a kindly, gentle awareness.

And with every in breath, noticing how your belly rises and with every exhale, noticing the belly deflating with the evacuation of air in your body.

And as you continue this practice, inhaling for five seconds, pausing, then exhaling for five seconds then pausing.

And if you notice more thoughts entering your mind, just let them go and bring your attention back to breathing.

And when you are ready to do so, opening your eyes, and bringing this very deliberate, focused, well-tuned attentional quality to the remaining activities of the day, remembering that your breathing is always available to help you sustain or regain this quality of focused attention.

Experimental Group:

To begin, make sure the body is in as comfortable a position as possible, sitting on your chair, allowing your eyes to close gently if you feel comfortable with it, and allowing the weight of the body to settle down towards the earth, taking a few deeper breaths and letting go a little bit more on each out breath.

Now, allowing your breath to settle and to find its own natural rhythm in accordance to the music. Inhaling when the music starts, then exhaling after each pause in music. Noticing how the body moves in response to the breath; the chest expanding and relaxing, the belly rising and falling. Take a breath and let your stomach swell forward as you breathe in, and fall back gently as you breathe out. And noticing now, that there is little or no movement on your chest.

And with each breath, allowing yourself to fall into a steady rhythm by taking the same depth of breath each time. And when you feel comfortable, trying to slow your breathing rate down by taking a short pause after you have breathed out and before you breathe in again. And, if the thought comes to mind that “I’m not getting enough air to nourish my body,” then simply noting it, and returning your attention to your breath and the gentle undulation of your belly. With regular practice, this slower rate will soon start to feel comfortable.

Noticing how each breath is unique, how no two breaths are the same. Noticing the texture, the quality, and the duration of each breath. If you notice the body or the mind tensing up around your experience, in the noticing you can gently let go again without judgment. Repeat this letting go over and over again if necessary with a kindly, gentle awareness. And with every in breath, noticing how your belly rises and with every exhale, noticing the belly deflating with the evacuation of air in your body.

When you are ready, bringing your attention to your belly button by bringing your mind’s eye to this location. Please continue breathing as you were while maintaining concentration on your belly button. It may be helpful to visualize a point, a size of a dime or smaller, in that spatial location. Now, visualizing this point as a bright light, imagining the point to be the color of the sun at noon on a clear day. Furthermore, it may be helpful to concentrate on a point slightly below the surface of your skin rather than focusing beyond or on the surface of your skin. Now, moving this point of attention two inches below your belly button. From this point moving this point of attention approximately two inches inside your body from this point and keeping your attention on this area.

Please try your best to maintain your focus and concentration on the spatial location that will be indicated. If your mind wanders during the experiment, please gently redirect your attention to the target area of focus.

And as you continue this practice, inhaling for five seconds, pausing, then exhaling for five seconds then pausing.

And if you notice more thoughts entering your mind, just let them go and bring your attention back to breathing.

And when you are ready to do so, opening your eyes, and bringing this very deliberate, focused, well-tuned attentional quality to the remaining activities of the day, remembering that your breathing is always available to help you sustain or regain this quality of focused attention.