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The Effect of Loving-Kindness Meditation on Physiological and Psychological Reactions to Violent Stimuli

Joseph A. Garcia

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THE EFFECT OF LOVING-KINDNESS MEDITATION ON PHYSIOLOGICAL AND
PSYCHOLOGICAL REACTIONS TO VIOLENT STIMULI

by

JOSEPH A. GARCIA

(Under the Direction of Janice N. Steirn)

ABSTRACT

In the past, meditation research has focused primarily on mindfulness meditation, but little research has examined Loving-Kindness Meditation (LKM). LKM may be an important addition to treatment or preventative programs for people at risk of exposure to violence or aggression in their lives or work. The current research aims to add to the currently growing body of literature concerning LKM and compassion based meditation practices. The researchers sought to determine if a 12-week course in LKM would have any effect on galvanic skin response (GSR) and heart rate in beats per minute (BPM) during the presentation of a video containing violent imagery of individuals engaged in physical altercations. Specifically, the current study sought to answer the following questions: (1) do GSR and BPM increase during the viewing of violent stimuli after a course in LKM, (2) do participants in the LKM group return to baseline on GSR and BPM measures more rapidly after a course in LKM than controls, and (3) are there any significant changes in measures of psychological factors after a course in LKM relative to individuals' baseline. While the results for the physiological measures were not significant they did offer information that may prove valuable for future research. Several psychological measures were significant or trended toward significant outcomes indicating the need for further research in this area suggesting a relationship between LKM and physiological states. Taken

together the results of this study indicate that the LKM course may have sensitized participants to the concerns of others as well as their own emotional states.

INDEX WORDS: Meditation, Loving-kindness meditation, Metta, Violence, Aggression, Buddhist psychology, Galvanic skin response

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Fulfillment of the Requirements for the Degree

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DEDICATION

This work is dedicated to Un Shin Cindy Beach, Sensei of the Savannah Zen Center. I met Sensei Un Shin during the beginning of my doctoral work. In addition to being my meditation instructor, she has been a guide, mentor, counselor, editor, and friend. Her compassionate teaching and dedication, to me and my work, were invaluable. By teaching me the things I did not know that I did not know, she instilled in me the confidence, skill, and knowledge necessary to guide others in their experience of Loving-Kindness Meditation. Through her I learned the stillness and compassion that I personally needed in order to offer it to others. With Sensei Un Shin's guidance, the writing of this dissertation became a deeply personal and spiritual journey that has helped me to become a better person. For that I will be eternally grateful.

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CHAPTER 1

INTRODUCTION

Purpose of the Study

The current study sought to determine if loving-kindness meditation (LKM) can be used as an effective intervention to sympathetic nervous system reactivity for individuals at high risk of being exposed to aggression or violence. These populations include inpatients and staff in psychiatric facilities, inmates and staff in prisons, students and teachers in school systems, police officers, military personnel, and many others. In this study we examined the effects of LKM on physiological reactivity to exposure to violent stimuli. This reactivity was measured by galvanic skin response (GSR) and heart rate in beats per minute (BPM). GSR is a measure of the electrical conductivity of the skin. Conductivity increases as sweat glands open, allowing low voltage electricity to jump from one metal electrode to another (Kucera, Goldenberg, & Kurca, 2004). GSR increases as the sweat glands open.

Utilizing a pretest-posttest design, we examined reactions to violent visual stimuli prior to a 12-week course in LKM and again after the course. In addition, we gave several pretest and posttest psychosocial and personality assessments (see Chapter 3). It was hypothesized that post-LKM, GSR and BPM may increase with the application of the stimuli due to increased empathy. It was further hypothesized that increased self-regulation would contribute to GSR and BPM returning to baseline more rapidly. In addition, it was hypothesized that increases in positive aspects of personality, emotion and psychological flexibility would be observed.

In the pilot study to this proposed research, a trend was found indicating that LKM as well as mindfulness meditation potentially decreased GSR readings whereas concentration meditation appeared to increase GSR readings. LKM appeared to have the greatest decrease on

GSR. These changes were not statistically reliable although they were indicative of a possible relationship between GSR and meditation. As is explored in more depth below (see Operational Definitions of Mindfulness, Concentration, and LKM) a potential reason for the lack of statistically reliable differences between these three categories of meditation may be due to how they are defined and measured. Furthermore, it is important to clarify how constructs such as aggression have been defined.

Defining Aggression and Violence

Konrad Lorenz (1966) begins his discussion on aggression by describing the hunter/prey scenario of many animals. While the act of an animal killing another for food certainly looks like aggression and by some definitions may be considered “aggressive,” Lorenz’s introduction of the concept of intent is important. Lorenz describes the “expressive movement” of animals as being a possible indicator of intent. In this case he describes a lion chasing his prey as being similar to a dog hunting a rabbit with an “excited happy expression” that is more like the expression seen before receiving a treat from his master than what one would consider to be aggressive (Lorenz, 1966).

However, should a scavenger approach the lion and his felled prey, the lion may behave in a similar manner, only this time charged with the “emotion” and “intent” necessary for the type of aggression and violence that we will discuss. At its most fundamental level the survival instinct plays a part in the “aggression” of the hunt. For if the lion does not hunt, the lion dies. Survival is also the reason for aggressive defense of the felled prey. There seems to be a hidden difference in these two forms of the same behavior. That difference may be as simple as the emotional valence during the act, similar to what Lorenz called intent. In hunting, impassioned reaction to momentary emotional states may be maladaptive. Lorenz (1966) points out that other

aggressive expressions, such as the baring of teeth and lying back of ears, are not seen in the lion during the kill unless the prey fights back, eliciting a fear response in the lion.

Johnson (1972) also begins his exploration of aggression with an attempt to define it. In his work, "Can Aggression be Defined?" Johnson explores the question of intent (e.g., predation) as a defining principle for aggression but also takes it further with an exploration of the many levels of aggression. In his book he examines the intention of the father who spans his child or the "silence of the hen-pecked husband" that is perceived by the wife as an aggressive act. It is quickly and easily seen that a definition of aggression may go far beyond simple "animal like" behaviors. Indeed, the definition of aggression begins to look like a highly individualized social construct more than a naturally occurring phenomenon.

To avoid potential confusion in this paper, the term aggression will be used as a description of the feeling state that is ultimately tied to a fear (especially of death or threats to genetic fitness) which may elicit acts of violence. Violence will be defined as a description of the behavior resulting from aggression and acted out on the self, another being, or object. However, when discussing the subject from the point of view of other authors, their terminology will be used. Defining aggression in this way is beneficial as we begin to explore the physiological reactivity of aggression and the behavioral action (violence) that often follows. When one animal acts on aggression and gives chase, the response is the same physiological arousal in the animal being chased. The behavior is different. In one it is an aggressive chase. In the other it is an aggressive escape. Should these two animals make contact, and the hunted fights for survival, there is a violent exchange. While the intent of the behaviors are quite different, the physiological reactions they stem from (sympathetic nervous system fight and flight activity) are the same.

How we react or behave based on our physiological state is largely a question of what Porges (2011) termed *neuroception*. Neuroception represents the primitive brain's appraisal of a stimulus as either being safe or a threat. It also allows the brain and body to begin the process of determining if prosocial or defensive behavior is warranted. Porges (2011) further suggests that, "From a theoretical perspective, faulty neuroception – that is, an inability to detect accurately whether the environment is safe or another person is trustworthy – might lie at the root of several psychiatric disorders" (p. 17). Schachter and Singer's misattribution of arousal and Two Factor Theory of Emotions may go a long way to explaining the faulty neuroception phenomena (Cotton, 1981; Schachter & Singer, 1962). The Two-Factor Theory of Emotion, very basically, asserts that there are two levels or phases of emotion: the physiological arousal associated with the emotion and the label assigned to the emotion. Further, when physiological arousal occurs it will be interpreted as a particular emotion if that emotional context is available in the environment. In this way physiological arousal can easily be "misattributed" to emotional arousal.

Humans have evolved the capacity for pro-social behavior through tens of thousands of years of social interaction. One can easily make the leap that pro-social behavior is more adaptive than anti-social or violent behavior. This point was also made by Darwin (1871):

As man advances in civilization, and small tribes are united with larger communities, the simplest reason would tell each individual that he ought to extend his social instincts and sympathies to all members of the same nation, though personally unknown to him. This point being once reached, there is only an artificial barrier to prevent his sympathies extending to the men of all nations and races. (pp. 100-101)

The questions that naturally follow are, what is this “artificial barrier,” and what can be done to break it, thereby increasing pro-social behavior in humans?

Is LKM the Answer?

Behaviorally speaking, LKM may act as an opponent process countering feelings of anger and aggression. Meditation, in all of its manifestations, has been found to be an effective treatment, or addition to treatment, for many major mental health concerns. There is a considerable body of research looking at the effects of meditation on a range of disorders including, but not limited to depression, anxiety, Attention Deficit Hyperactivity Disorder (ADHD), Post-Traumatic Stress Disorder (PTSD), addiction, chronic pain, trauma, and even schizophrenia (e.g., Brewer, 2013; Briere, 2013; Johnson et al., 2009; Kabat-Zinn, 2013; Lord, 2013; Marzabadi & Hashem Zadeh, 2014; Pedulla, 2013; Roemer & Orsillo, 2013; Siegel, 2013; Zylowska, 2012).

Mindfulness-based therapies and mindful meditation have also been observed as viable treatments for violent and aggressive behaviors (Brady, O'Connor, Burgermeister, & Hanson, 2012; Singh et al., 2007; Singh, Wahler, Adkins, & Myers, 2003; Wongtongkam, Ward, Day, & Winefield, 2014). However, LKM specifically has not had as much attention as a technique in its own right. Emory University's Emory Tibet Partnership has been a major forerunner in compassion and LKM research. Tibetan Buddhism has a strong base in compassion and loving-kindness practices (called *lojong*), and this was actualized in Compassion-Based Cognitive Therapy (CBCT) in 2005-2006 by Dr. Lobsang Tenzin Negi (Emory University, 2014).

Operational Definitions of Mindfulness, Concentration, and LKM

When looking at the various forms, styles and techniques of meditation and the similarities and overlap between them, it can be a difficult task to separate them out into

operational and distinct categories. This task can become even more confusing when attempting to sort through the various names given to these practices across cultures and through history. For the purpose of clarity in the present context I will utilize Western terminology after introducing the traditional terminology. I will then discuss two basic techniques that appear to stand alone in form, mindfulness and concentration. I will also discuss a third meditation technique that blends elements of the other two but utilizes a distinct feeling state known as LKM.

Before discussing the distinctions between these three meditation techniques a disclaimer is in order. It may be impossible to distinguish these techniques in practice. When one sits down to practice strict concentration meditation it becomes very apparent that the mind requires some training for this technique (Lee et al., 2012). The initial reaction to attempting to restrict the mind's activity is often excessive and seemingly uncontrollable activity. Many have termed this "the monkey mind" due to its often unruly and disruptive nature (Epstein, 2001). Teachers often instruct students through this phase of mind training by encouraging non-judgmental compassion (loving-kindness) with the self and a gentle nudging of the mind back to its point of concentration. The practice of any form of meditation often necessitates the use of a combination of the techniques being discussed. Separating these techniques is largely artificial and is only being attempted here in order to facilitate an understanding of the processes.

Mindfulness is the English translation of *sati*. *Sati* is a Pali word (the original tongue of The Buddha's time) meaning awareness, attention and remembering (Germer, 2013). Mindfulness meditation, also called insight or *vipassana* meditation is the most popular form of meditation used in therapy and as an addition to therapeutic techniques today. In fact, the term "mindfulness" is often used to encapsulate the entire tradition of Eastern philosophy and practice

within the Western context (Germer, 2013; Kabat-Zinn, 2011). In this paper I have chosen to use “meditation” as the umbrella term and consider mindfulness itself as a distinct technique based on the predominant way in which it is defined and taught.

Kabat-Zinn (2013) defines mindfulness as “paying attention in a particular way: on purpose, in the present moment, and non-judgmentally” (p. *xxvii*). Later he adds “with a little kindness” (p. *xli*). Boorstein (1996) defines mindfulness meditation as an attempt to “cultivate composure with a wide focus of attention on all current experience, internal and external. An attempt is made to be aware of all changing physical sensations, mental states, thoughts, and perceptions while maintaining a nonreactive attitude toward them” (p. 347).

Concentration meditation (*samatha* in Pali) in contrast, connotes a focused attention on a single object (Germer, 2013). The breath is often used, as it is ever present and represents one of the biological functions that is simultaneously automatic and within our direct control. In fact, the breath represents an interesting focal point for precisely the reason that it cannot come under our direct control unless we have become aware of it and are attending to its presence. The breath however is certainly not the only common focal point for concentration meditation. Objects of attention in meditation may be repeated phrases, visual objects (e.g., candle flames or sacred pictures) or mental images (Boorstein, 1996). It may be seen that even LKM could be considered a concentration meditation, with the cultivated emotional state being the object of attention.

Loving-kindness meditation (*metta* in Pali) incorporates elements of both mindfulness and concentration, but has a distinct quality that allows it to be distinguished from the other two. This quality is the focus on emotional valence. Germer (2013) opens his discussion of LKM by stating that it is the “*quality* of mindful awareness – the attitude or emotion – rather than the

direction of awareness” (p. 19). This appears to be true when considering that the results obtained through meditation are often reported as a sense of unity, equanimity, and connectedness with the world around them that immediately brings the individual to a deep sense of care, compassion and love for themselves, others, and the world in general (Morgan, Morgan, & Germer, 2013).

In LKM the meditation practitioner is expected to maintain attention on the feeling of love, kindness, and compassion during the course of the meditation session. To do this the practitioner cultivates these feelings for the self initially, which includes forgiveness of the self when the mind wanders, as well as compassion and acceptance for the self when suffering or any aversive emotional states, like anger or depression, are experienced.

One commonly used technique for this meditation involves the use of mantra-like phrases that are repeated to the self, aloud or internally. Similar phrases are employed by many practitioners (Alba, 2013; Engstrom & Soderfeldt, 2010; Kabat-Zinn, 2013; Pace et al., 2009; Weng et al., 2013; Yoona, Gray, & Dovidio, 2014). These phrases often include a sequence which goes, “May I be happy, may I be well, may I be without suffering.” This is repeated for some time. In the next phase the individual is instructed to conjure the image of a person whom they love dearly and while holding the person’s image in the mind to repeat, “May my loved one (or name) be happy, may my loved one (or name) be well, may my loved one (or name) be without suffering.” Again this is repeated for some time. The third phase is often not added until the meditation practitioner has developed some skill with the first two chants as it is often much more difficult. The meditator is finally asked to conjure the image of someone with whom they have had difficulty and asked to repeat, “May my difficult person (or name) be happy, may my difficult person (or name) be well, may my difficult person (or name) be without suffering.” The

ultimate goal, if there may be said to be one, in this practice is to eventually be able to hold one's full attention on the feeling of love, kindness, and compassion in the body, absent of any images or verbal cues and to radiate this feeling into the world at large.

Some proficiency in mindfulness practice may be necessary to adequately concentrate on a single object. In the same way, some concentration practice may be necessary to hold one's attention on the emotional valence generated by LKM. This is not to say that one technique must be mastered before practicing the other. Considering the different personality types of practitioners, it may be easier for one practitioner to begin with a practice of concentration and another the practice of LKM (Boorstein, 1996). Regardless of this, as is seen when one applies the theory to the practice, the elements of all three methods are not only imbedded within one another but are dependent on one another.

CHAPTER 2

LITERATURE REVIEW

In the process of writing about meditation from a psychological perspective and as a technique for mental health I am humbled by the volume of historical texts and the depth with which this subject has been covered in the literature, past and present. It is well beyond the scope of this paper to give a detailed account of meditation throughout history or to give comprehensive coverage to the many lineages, traditions, and practices contained within the practice of meditation. I will however, attempt to give a brief overview of the cultural history of meditation and how it made its way into the West. Following this, the review of the current literature will focus on LKM.

A Brief History

The first historical reference to meditation may have been discovered in pictographic form on what is thought to be an ancient coin dating back 4,500 years to the early Indus Valley civilization. The image on the coin was that of a horned human sitting in what appears to be a meditation posture (Nagasawa, 2005). From this region, Hinduism evolved and is the oldest spiritual tradition still practiced on Earth (Occhiogrosso, 1996b). Not surprisingly, it appears to be the first formal spiritual tradition that practiced meditation as a means of worship and spiritual practice. Early Brahmanism (1750-500 B.C.E), or the priestly class of the time, seemed to focus heavily on animal sacrifice and prayer as a means to communicate with the gods (Michaels, 2004a). From this time a spiritual revolution began to take form in the practices of the early ascetics. These ascetics ventured into the forests, leaving civilization behind to concentrate their spiritual efforts by fasting, yoga, and meditation (Michaels, 2004b). It is within this tradition that Siddhartha Gautama began his spiritual quest some 2500 years ago. After approximately 6 years

with the ascetics, Siddhartha obtained enlightenment and became The Buddha (The Teaching of Buddha, 1966). Buddhism represented a “middle path” between the city/town dwelling, politically involved Brahmans and the complete worldly renunciation of the ascetics (Michaels, 2004b).

Very similar meditation practices to that of Hinduism and Buddhism seem to have been being developed around the same time periods in China. Though the date and authenticity of a single author is often debated, it is commonly accepted that Lao Tzu wrote the seminal text of Taoism, The Tao Te Ching, sometime within the 5th century B.C.E. (Watts, 1975a). Taoism, with its many mystical traditions, such as the alchemy of immortality, has a rich history of contemplative meditation practice. Girardot (1983) noted that these mystical practices seem to have come during a later stage of Taoism. The focus of early Taoism was on meditation and breathing techniques designed to bring the practitioner to an experiential awareness of *hun-tun*, primordial chaos or pre-birth states (Girardot, 1983). These states are similar, if not identical, to those described by the Hindu and Buddhist traditions of India. The experience of full absorption in meditation is called *samadhi* in Hinduism, and *satori* in Zen Buddhism. These states can be thought of as the experience of one’s core or essential being and/or an experience of oneness/union by the dropping away of dualistic perceptions, and are ultimately believed to be empty and without form (Occhiogrosso, 1996b; Watts, 1957a).

It has been estimated that Buddhism “officially” arrived in China around 65 C.E. (Pine, 1987). The “silk road” trade route between India and China became heavily travelled around 200 B.C.E. (Fagan, 2002). However, travelers and monks were making their way between India and China long before this time, sharing the philosophy and techniques of their respective traditions (Occhiogrosso, 1996a). During this time Buddhism blended with the similar practices

and styles of Taoism to become known as Ch'an Buddhism and many years later was brought to Japan by Dogen Zenji (13th century) to become Zen Buddhism (Occhiogrosso, 1996a; Watts, 1957b).

Later in history we find discussion of mystical experiences and references to meditation throughout the writing of the early psychiatrists (Masson, 2010). Although never seeming to be able to experience any personal success with meditation himself, Sigmund Freud did not shy from discussing the topic in his writing. He noted that although he had difficulty with the concepts involved, that a friend of his had achieved great success in practicing yoga and fixing his attention on the body and breath. He further noted that this friend was able to "evoke new sensations and coenaesthesias in oneself, which he regards as regression to primordial states of mind which have long ago been overlaid" (Freud, 1930, p. 47). Though Freud seemed accepting of "mysticism" on occasion, as a whole he interpreted the altered states of consciousness achieved through meditation to be a narcissistic regression to the womb, at best, and infantile defense states, at worst (Bankart, 2003; Bogart, 1991; Freud, 1930).

Carl Jung, though having written a favorable forward to a book by Zen Master T.D. Suzuki, as well as a forward to a translation of the Tibetan Book of the Dead, seemed to have mixed feelings about meditation practices as well (Suzuki, 1964; *The Tibetan Book of the Dead*, trans. 1960). On the one hand, he apparently had his own meditation practice and felt that meditation was a method by which the collective unconscious could be contacted (Bankart, 2003). On the other hand, he expressed the belief that Eastern meditation practices were not compatible with, and ultimately could damage, the underdeveloped "Self" of Westerners (Bankart, 2003). Echoing Freud, he espoused the belief that meditation could in fact cause regressive dissociations and could ultimately result in psychotic decompensation (Bogart, 1991).

Bankart (2003) speculates that some of Jung's resistance to the psychotechnologies of the East may have been born of a bias toward his own theories of the structure of the mind as well as psychoanalysis as the "appropriate" form of introspection for Westerners.

Buddhism and its meditative practices made their way into North America in the early 20th century with the influx of Chinese immigrants. Japanese Buddhism with its Zen (meditation) practices was not far behind (Bankart, Dockett, & Dudley-Grant, 2003). During this time language barriers and possible resistance to acculturation kept these practices largely isolated within the Chinese and Japanese communities. Inspired by the many religions entering the United States, the World's Parliament of Religions was held in Chicago during the year of 1893 and is seen as a pivotal event in the merging of Eastern and Western spiritual practices (Nordstrom, 2009; Seager, 1999).

In 1897, D.T. Suzuki came to the United States and began translating Buddhist texts. In 1922, Paramahansa Yogananda was sent by his guru in India to spread the practice of yoga to North America. He founded a practice center in Los Angeles in 1925 to teach Kriya Yoga (Occhiogrosso, 1996b). In the 1950s D.T. Suzuki began teaching courses on Buddhism at Columbia University (Seager, 1999). In 1957, Eric Fromm invited Zen Master D.T. Suzuki and several colleagues to his home in Mexico for a self-styled retreat on Buddhism and psychology (Bankart, 2003). Between the publishing of Buddhist texts, the introduction of yoga, and the growing interest of the Western intellectuals (to include the philosophers, psychologists and psychiatrists) of the time, a movement was born that swept through the 1950s and continues to this day.

The Current State of the Research

Research in meditation has an extensive history in psychology and psychiatry. However, interest in LKM specifically has only recently made an appearance in the literature as a distinct practice. Reactivity to violent stimuli is of interest when considering the benefits of LKM due to the implications of a potential opponent process. The Opponent Process Theory of Motivation put forth by Solomon and Corbit (1974) implies that conflicting emotional states cannot be experienced simultaneously and further that recovery from one takes time and that recovery time is related to the intensity of the emotional or hedonic state experienced. No research specifically looking at LKM and aggression or violence was found by the current researchers. However, in both fields of research, LKM and aggression, there is research examining biopsychology and neuropsychology. As will be shown, the analysis of these two fields of literature may serve as the link between LKM and aggression.

Because LKM involves the learning and practice of compassion, it is reasonable to ask whether compassion can be learned. Jazaiera et al. (2012) utilized compassion cultivation training (CCT), developed by Jinpa, and others in 2010 (as cited in Jazaiera et al. 2012). Looking specifically at CCT's effect on compassion for others, compassion from others, and self-compassion, significant improvements in all three domains were found (Jazaiera et al., 2012). These three components were found to be closely related to one another and the authors propose that increases in these domains may potentially increase prosocial behavior.

The next question that arises may be: Why does LKM seem to work? Fredrickson's (1998) Broaden and Build Theory of positive emotions posits the idea that positive emotions enhance our lives not only through the experience of the emotions themselves but through the ripple effects of those emotional states (Fredrickson, Cohn, Coffey, Pek, & Fenkil, 2008). For

instance, when we feel a positive emotion this “broadens” our cognitive and emotional perceptual field allowing for greater psychological flexibility and creative thinking. As we interact with the world in this way, connections are made that act to “build” tangible circumstances and resources. Once these resources and circumstances have been actualized they essentially become the new foundation upon which further circumstances and resources are built. The growth cycle becomes exponential.

This positive growth is exactly what Fredrickson et al. (2008) found in their field study of LKM. Fredrickson and colleagues used the employees of a software corporation as participants, giving them a one hour per week, seven week, LKM seminar during their lunch hour. Not only did LKM increase positive emotions, when compared to a wait list control, but these positive emotions were related to increased life satisfaction which was “fully mediated by resource building” (Fredrickson et al., 2008, p. 1057). These results support the hypothesis that LKM is not a singular event. It is a skill building process that creates lasting changes in the practitioners’ psyche as well as the circumstances of their lives.

Not only does LKM appear to increase generalized positive emotions and life satisfaction, it has also been shown to decrease depression. Alba (2013) obtained Pretest-posttest data at two four-day LKM retreats. In her first study, Alba found that there were significant increases in reported happiness and significant decreases in reported anxiety, stress, and depression. In her second study, she obtained similar results with significant increases in happiness and significant decreases in stress. In addition, significant increases on the Compassion Love Scale were observed in both studies with no significant differences on this scale found between the two studies (Alba, 2013).

Neuroimaging

Desbordes et al. (2012) used fMRI to observe hypothesized differences in non-meditative state amygdala activity after mindful attention training (MAT), CBCT, and control group interventions. Participants underwent eight weeks of training in their assigned groups. Each class was held for two hours once a week. In addition to the fMRI observations, participants were also given the Beck Depression Inventory (BDI) and the Beck Anxiety Inventory (BAI). Significant differences in amygdala activity were found between the MAT group and the control but not between CBCT and either of the other two groups. When examining the Beck inventories, however it was found that CBCT participants showed greater activation in the amygdala in response to negative images. Further, greater amygdala activation was found to be negatively correlated with lower depression scores (Desbordes et al., 2012). The authors explain this result by highlighting an important difference between the two meditation styles. In CBCT the participant cultivates the capacity for empathy. It appears that CBCT participants may have experienced a heightened sense of empathy when viewing the suffering of others in the images as compared to the MAT group. This research lends support for the idea that meditation facilitates lasting changes that affect an individual's experiences through daily life, not just experiences during meditative states (Desbordes et al., 2012).

Using fMRI as well as continuous-performance tasks (CPT) and emotion-processing tasks (EPT), Lee et al. (2012) found that specific types of meditation seem to have specific effects on the neural activity of the brain. The CPT is a task that was originally designed to test human vigilance by recording participant's ability to detect small changes in the environment (Corkum & Siegel, 1993). The EPT looks at participant's responses to viewing happy, sad and neutral faces (Lee et al., 2012). In this study, long-term meditators were compared to short-term

(one week training) meditators. Additionally, focused-attention meditation (FAM) was compared to LKM. It was found that expert meditators in the FAM condition had significantly fewer omission errors on the CPT than novice meditators. Experts additionally had more activity in areas of the brain associated with attention, such as the right thalamus, right medial temporal gyrus, and the right precuneus. Although behavioral responses were similar between FAM and LKM, the LKM conditions showed significant differences in brain region activation during the EPT tasks. These regions included the left ventral anterior cingulate cortex (ACC), which is important for identifying emotional salience, and the right inferior frontal gyrus, implicated in emotional response regulation. The authors point out that although there was neural activation in response to the EPT in both FAM and LKM, the differences seemed to indicate that FAM activated regions of the brain dedicated to the maintenance of attention whereas LKM responses activated regions of the brain utilized in emotional contagion and the regulation processes of compassion and emotion. (Lee et al., 2012)

Lutz, Brefczynski-Lewis, Johnstone, and Davidson (2008) also showed that LKM modulates neural paths previously associated with empathy and emotional responses. In this study fMRI readings were taken while participants were actively engaged in LKM and exposed to emotionally-charged sounds (i.e., baby laughing or a person who sounds as if they are in pain). All participants showed increased activity in response to emotional sounds in the anterior insula as well as the ACC. In another study, activation in the anterior insula has also been shown to correlate with future engagement in LKM measured as time spent meditating (Mascaro, Rilling, Negi, & Raison, 2013). In addition, expert meditators showed stronger responses than novices to negative sounds vs. positive sounds in somatosensory areas.

Perspective taking, emotional regulation, and physiological changes in the brain are also related to these functions. Increased activity in the posterior superior temporal sulcus and the temporo parietal junction indicate that LKM may increase emotional sharing as well as perspective taking (Lutz et al., 2008). In an MRI study it was found that the right angular and posterior parahippocampal gyri (areas also associated with mediating anxiety, negative affect, empathy, and emotional regulation) appeared to have more gray matter volume in experienced LKM practitioners (5+ years) as compared to novices (Leung et al., 2012).

Increases in heart rate were demonstrated in LKM as opposed to breathing meditation in which heart rate decreased (Lumma, Kok, & Singer, 2015). Though the authors took this to mean that that LKM may not be “as relaxing” as breathing meditation, they also reported that the subjective experience of LKM meditation became more enjoyable over time despite the increased heart rate. It may be that the increase in heart rate was due to factors not associated with relaxation or the lack thereof. A substantial amount of literature links heart rate and physiological arousal with pleasant feelings and even attraction (Cotton, 1981; Foster, Witcher, Campbell, & Green, 1998). These are physiological sensations that may certainly be associated with the mentation occurring during LKM.

Perhaps in partial explanation of the Lumma et al. (2015) findings, heart rate and fMRI results have been positively correlated during LKM in the right middle insula and the anterior cingulate cortex (Lutz, Greischar, Perlman, & Davidson, 2009). These results indicate that compassion and LKM seems to enhance emotional as well as somatosensory regions in the brain contributing to an enhanced perception of others’ emotions. As in previous studies, this finding was more pronounced for expert meditators (Lutz et al., 2009).

In another fMRI study it was found that participants who had undergone an eight week CBCT training had increased scores on the Reading the Mind in the Eyes Test (RMET), in which participants are asked to judge the mental and emotional states of other via subtle expressions, as compared to controls. Increased scores on the RMET were likewise correlated with activity in inferior frontal gyrus (IFG) and the dorsomedial prefrontal cortex (Mascaro, Rilling, Negi, & Raison, 2012). This finding is also supported by fMRI studies looking at active brain regions during social aggression and evaluation (Lotze, Veit, Anders, & Birbaumer, 2006). This finding supports the hypothesis that LKM may enhance the practitioners' ability to accurately judge the emotional valence of subtle facial features. This could prove to be quite an important finding in consideration of aggression in antisocial and psychotic disorders. It has been demonstrated that individuals with violent antisocial and psychotic characteristics tend to misinterpret facial features as being aggressive, angry or disgusted more often than controls. It has further been shown that behavioral training can enhance the ability to accurately read emotional expression (Schönenberg et al., 2014). The implications for a combined treatment utilizing deep brain processes, such as LKM, and behavioral training, such as learning where on a face to focus attention, may prove to be valuable in future research and treatment protocols.

Activation in the left medial prefrontal cortex and the anterior cingulate cortex was also found in an fMRI case study of a single Tibetan Buddhist with many years of compassion based meditation practice (Engström & Söderfeldt, 2010). Both of these regions, as noted previously, have been implicated in the activation of empathy.

Psychopathology

While the above literature review suggests many potential uses of LKM for mental health purposes it lacks the specificity of many treatment research modalities (e.g. Acceptance

Commitment Therapy, Mindfulness based Cognitive-Behavior Therapy, and MBSR). There has however been some movement in the direction of looking at the effect of LKM on specific psychological disorders. At present the current literature seems to be limited to PTSD, schizophrenia, caregiver stress, and at-risk youth.

Kearney et al. (2013) found that veterans suffering from PTSD were accepting of loving-kindness treatment as evidenced by high rates of participation during their study. This treatment intervention consisted of 12 group meetings (1 per week) and was based on Salzberg's (1995) exercises. The course syllabus included all of the components previously mentioned and in addition included focusing loving kindness on the self, a neutral person, and a difficult person. In the later sessions, this course also included groups of people as well as walking meditation. A unique addition to this protocol included the assignment of 30 minutes of at-home LKM at the end of each weekly session. Results were promising. Participants in the LKM group experienced significant reductions in PTSD symptoms immediately as well as at a three month follow up. In addition, participants experienced significant increases in self-compassion and general mindfulness skills (Kearney et al., 2013).

Johnson et al. (2009) utilized a case study method to look at the effect of LKM on patients with schizophrenia. Their study focused on the negative symptoms of schizophrenia and applied the Broaden and Build Theory as support for the use of LKM. The Broaden and Build Theory, as noted above posits the idea that positive emotions enhance our lives not only through the experience of the emotions themselves but also through the ripple effects of those emotional states (Fredrickson et al., 2008). The results were favorable and it appeared that most of the participants benefited in some way from the LKM treatment. Of note were improvements in motivation and sociability. The study also illustrated the benefit, and in some cases the need, for

some basic mindfulness training prior to beginning a LKM practice (Johnson et al., 2009).

Johnson et al. (2011) followed this initial case study with a pilot study utilizing qualitative and quantitative data from a treatment-satisfaction questionnaire. Results were again promising.

Participants reported large increases in positive emotions (in frequency and intensity) as well as increases in self-acceptance, feelings of control and life satisfaction. In addition, decreases were found in global negative symptoms, particularly anhedonia (Johnson et al., 2011).

In a study examining at-risk youth, Reddy et al. (2013) found benefits in the use of CBCT. The researchers used a six-week CBCT intervention with foster children ranging in age from 13-17 years. No differences were found between psychosocial measures pre-intervention vs. post-intervention. However, the researchers noticed during the course of therapy that free-time practice frequency increased in the last three weeks of the intervention. In post-hoc testing it was revealed that there was a significant positive correlation between increased practice frequency and hopefulness.

Though the psychosocial quantitative measures did not differ significantly in the Reddy et al. (2013) study, promising trends were indicated in the qualitative analysis. Considering the paucity of affective treatments and the need for interventions with at-risk youth, willingness to participate in and subjective reports of benefits from the youth involved in the program is worthy of attention. The majority of participants indicated that the program was helpful. When interviewed, 69% of the children were able to give specific examples of utilizing learned skills in their daily lives. Of particular interest to the current study, it was reported that 56% of respondents reported utilizing CBCT skills when confronted with anger in interactions with others. The specific skills mentioned were meditation, diaphragmatic breathing, and getting away from the situation (Reddy et al., 2013).

A similar observation was made in a study looking at interleukin (IL)-6 and cortisol responses to LKM (Pace et al., 2009). While the results were inconclusive, follow-up testing revealed an interesting pattern. Participants in the meditation group who had greater meditation time (via meditating at home and better class attendance) showed decreased scores on the Profile of Mood States prior to the Trier Social Stress Test in post-testing. This finding, as noted by the authors, may have implications for establishing a baseline for the amount of time that is necessary to establish stress response reductions (Pace et al., 2009).

Cognitively based compassion training may also aid in buffering the effects of early life adversity. In another study utilizing foster children it was found that the amount of time spent engaged in activities of CBCT negatively correlated with the inflammatory biomarker C-reactive protein (CRP; Pace et al., 2013). This is potentially important as links between high levels of CRP and future development of depression have also been demonstrated (Haroon, Raison, & Miller, 2011).

Caregiver stress, especially in caregivers of family members suffering from dementia or Alzheimer's disease, can be debilitating and negatively affect the outcomes of caregiving. Involvement in a yoga and LKM group was found to be effective in reducing stress levels as well as depression in participants as compared to an untreated control group (Danucalov et al., 2013). In this study participants attended the group for 1.25 hours, three times a week, for three months. One session was in person and the other two weekly groups were at home DVD led sessions.

Aggression and the Brain

While there appears to be no specific research concerning LKM and aggression, a brief review of the neuropsychological literature on aggression reveals many parallels. Many of the same areas of the brain that are noted in the LKM literature also appear in the literature on

aggression. These areas, not surprisingly, include regions in the frontal lobes (executive control and decision making) and the limbic system (implicated in emotional interpretation and regulation). The amygdala is often found to play a role in studies of aggression as well as meditation. One study, for example, found increased amygdala reactivity in response to angry facial expressions from faces with a high face width to height ratio, which they attribute to pubertal testosterone (Carre', Murphy, & Hariri, 2013). Another study found increased activity in the amygdala was also associated with MAT and decreases in depression in LKM in the Desbordes et al. (2012) study.

Brunnlieb, Münte, Krämer, Tempelmann, & Heldmann (2013) examined aggression reactivity in participants given neuropeptide arginine vasopressin (known to decrease aggression in laboratory animals). Increased activity of superior temporal sulcus was found in participants during decision trials in which a decision was required under threat of punishment. It was likewise, noted in a previously explored study, that increased activity in the posterior superior temporal sulcus and the temporo-parietal junction may indicate that LKM increases emotional sharing as well as perspective taking (Lutz et al., 2008).

Diminished rACC activity was found in hypo-reactive antisocial offenders during high risk financial decision making tasks and in the right IFG when showing uncertainty about making decisions (Prehn et al., 2013). A meta-analysis study also found that the rACC was highly implicated throughout the literature with antisocial/violent/psychopathic behavior as associated with deficits in inhibitory control and emotional processing (Yang & Raine, 2009). Loving-kindness meditation was related to increases in ACC activation during emotional processing tasks in the IFG and during RMET tasks (Mascaro et al., 2012).

Although speculative at this stage, the findings discussed above, draw attention to the similarities in brain regions that have been implicated in both aggression and LKM. The connections between the frontal-lobe regions of the brain in executive control as well as the limbic system in emotional regulation have been understood for some time. With new understandings of neural plasticity and the possibility of actually strengthening connections in localized areas of the brain, there are strong implications for the use LKM in therapy, as well as a possibility that similar brain areas may be implicated in regard to aggression. Consequently, LKM may be useful in regard to aggression and particularly for populations that are at risk to experience aggression and violence from self or others.

CHAPTER 3

METHOD

Participants

Participants included eight senior-level Georgia Southern University students who signed up for a Directed Study class called Meditation. In addition, seven students from a senior-level psychology course agreed to participate as controls. One participant in the Meditation class was dropped due to lack of attendance at posttest.

All Meditation group participants ranged in age from 21 to 23 ($M_{\text{age}} = 21.86$). All Control group participants ranged in age from 21 to 22 ($M_{\text{age}} = 21.57$). The Meditation group consisted of six participants identifying as female and one participant identifying male. The Control group consisted of three participants identifying male and four participants identifying female. All participants identified as Christian except one participant in the Meditation group who did not identify a religious preference. Three participants in the Meditation group reported some prior experience with meditation and five participants in the Control group reported some previous experience with meditation. However, only one person (from the Control group) reported having a personal meditation practice currently. Responses for this participant did not deviate sufficiently from the sample population to warrant removal from the analysis.

Recruitment and Incentives

The senior-level Meditation class was offered through the Georgia Southern University Psychology Department course listing for the Fall 2015 semester. Students received full academic credit for the course. The students' grades were not contingent on allowing the researchers to use their data, and the experimenters were blind to the students' choice to allow or disallow use of their data in the study. Participants in the Control group were self-selected from

another unrelated senior-level psychology course. Those who consented to the study were not excluded for any reason unless they chose not to participate. There were no age restrictions (other than participants were required to be 18 years of age or older). There were no specific demographic identifiers necessary for inclusion or exclusion from this study.

No special incentives were offered for participation in the LKM group. All students in the class experienced the same learning and experiential training, and had the opportunity to participate in the pre-test and post-test procedures. Students in the Control group received extra credit in their class for participation, per university policy. Data were only analyzed for students who provided consent for their data used in the study by having agreed to and signed the informed consent, provided during class. Anonymity for participation vs. non-participation was maintained among students as well as from the researchers by using codes for the data rather than the students' names. Personal codes were generated by each student and maintained by that student.

Data Storage and Security

Only the primary researchers had access to stored data. Data were stored on a secure jump drive and locked in a secure location in a laboratory in the Psychology Department at Georgia Southern University. All data were stored by codes and not names. These codes were generated by the individual student and known only to that student.

Instruments and Measures Used

Galvanic skin response was measured with Neulog galvanic skin response logger sensor, NUL-217. Data were collected in Arbitrary Units (AU) in order to account for larger measurements ranging from 0-65279 AUs. Heart rate was measured by Neulog heart rate and pulse logger sensor, NUL-208. Data were collected in beats per minute.

GSR and BPM were measured while participants watched a 15-minute video. The video consisted of five minutes of peaceful nature scene imagery (see Figure 1), five minutes of individuals engaged in violent interactions (see Figure 2), and concluded with five more minutes of peaceful nature scene imagery.

Assessments given included a demographics questionnaire (see AppendixA), the Acceptance and Action Questionnaire (AAQ-II; see AppendixB; Bond et al., 2011), the 5-Facet Mindfulness Questionnaire (FFMQ; see AppendixC; Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006), the Big Five Inventory (BFI; see AppendixD; Arterberry, Martens, Cadigan, & Rohrer, 2014), the State Emotions Questionnaire (SEQ; see AppendixE; Joye & Dietrich, 2014), and the Self-Other Four Immeasurables (SOFI) Scale (see AppendixF; Kraus & Sears, 2009).

The AAQ-II is a seven-item Likert-style questionnaire measuring key components of Acceptance and Commitment Therapy (ACT). Specifically the assessment measures an individual's acceptance (a willingness to experience positive or negative internal or external events), experiential avoidance (the behaviors involved in avoiding unpleasant internal or external events), and psychological flexibility (basing actions and thoughts in a grounded recognition and acceptance of the present moment, regardless of emotional valence). The AAQ has a good overall reliability, with an average $\alpha = .84$. Test-retest reliability is also good, with an average $\alpha = .81$ at three months (Bond et al., 2011).

The FFMQ is a 39-question Likert-style assessment that measures five identified qualities of mindfulness; observing, describing, acting with awareness, nonjudging of inner experience, and nonreactivity to inner experience. The FFMQ has good overall construct validity with significant correlations with most other assessments tested against (Baer et al., 2008). When tested with meditators vs. non meditators the internal consistency ranged from $\alpha = .72$ to $\alpha = .92$.

In addition, all factors (except observation) accounted for 39% of the variance between psychological wellbeing of meditators vs. nonmeditators. Thus, four of the five factors had good incremental validity (Baer et al., 2008). All five factors of the FFMQ have been found to be reliable and valid in the acceptable range (Christopher, Neuser, Michael, & Baitmangalkar, 2012).

The BFI is a 44-item Likert-style assessment measuring openness, conscientiousness, agreeableness, extraversion, and neuroticism, based on the five factor theory of personality (Arterberry et al., 2014). This assessment has a strong history in the psychological literature and as such also has very strong convergent validity. The BFI is considered to have good reliability across personality domains with an average $\alpha = .80$ and an average test-retest reliability of $\alpha = .85$ (John & Srivastava, 1999).

The SEQ is an assessment developed by Joye and Dietrich (2014). The assessment consists of two questions. The first question being, “In the last two weeks, about how often have you experienced the following?” This is followed by 13 emotional state prompts (e.g., anger, love, joy, sadness, fear, surprise). The second question is, “In the last two weeks, how effective would you say you have been at doing the following?” This is followed by 11 behavioral response prompts (e.g., dealing with annoying people, being able to relax, trusting other people with my thoughts and emotions). These are answered by selecting from a 0-10 point Likert scale from “not effective” to “very effective” (Joye & Dietrich, 2014).

The final assessment given was the SOFI. This is a 16-item Likert-scale questionnaire that is based on the four immeasurable qualities that are said to be the result of Buddhist practice; loving-kindness, compassion, joy, and acceptance of self and others. Kraus and Sears (2009) point out that, for the purpose of assessment, these can also be seen as being polarized into four

subscales; positive qualities toward self, positive qualities toward others, negative qualities toward self and negative qualities toward others. The assessment consists of manifestations of these polarizations (e.g., friendly toward myself, friendly toward others vs. hateful toward myself, hateful toward others) with a 0-5 Likert scale (very slightly or not at all, a little, moderately, quite a bit, and extremely). Total internal consistency ranges from $\alpha = .54$ to $\alpha = .76$.

Design

This study was an experimental, pretest-posttest, control-group design. All dependent variable assessment measures were given prior to the viewing of a YouTube video containing five minutes of peaceful scenery (Peace), five minutes of a street fight (Fight), and concluded with another five minutes of peaceful scenery (Recovery). GSR and BPM were measured during the viewing of the full 15 minute video (Peace, Fight, and Recovery conditions). The treatment condition, the LKM course, was applied for 12 weeks. At the end of the 12 weeks this procedure was repeated. The same measurement procedures were followed for the control group minus the application of the LKM course.

Procedure

Meditation class. During the first week of class students were fully oriented to the nature of the class and the study. During this time the class syllabus was discussed. In addition, the informed consent was discussed in detail and given to students to review and sign. All students signed the informed consent which included instruction on how to omit their data from the study. Students were then instructed to generate and memorize a personal code that would be used to identify their data. They were further instructed to include an X at the end of their personal code if they wished their data to be omitted from the study.

Students then filled out the assessment packets, placing their personal code on each page. They were then fitted with the GSR and BPM monitors and asked to watch the 15-minute stimulus video. When the video was complete participants were asked to write their personal code on the back side of a sticky note and to stick this underneath the recording devices. They then placed the devices on a table, in random order, for collection. Participants were then individually debriefed.

During the semester the class consisted of academic discussion about assigned readings. The selected readings were comprised of articles on the subject of meditation from different cultural and religious perspectives. This portion of the class lasted approximately 45 minutes. The participants were then given time to gather their meditation cushions and sit in their chosen meditation posture. At this time brief meditation instruction was given and the primary researcher guided the participants in the 20-min LKM for the week. If time allowed, a brief discussion was held after meditation sessions. Discussions generally focused on experiences had during the day's meditation.

After 12 weeks, the participants filled out the assessment packets again. They were then fitted with the GSR and BPM monitors and asked to watch the 15-minute stimulus video. The same procedures were followed for attaching personal codes to the assessments and instruments. Participants were again debriefed.

Control group. The Control group was given time from class on the day of the pretest. They arrived in the computer lab where the Meditation class had taken the pretest. The Control group was given the same instruction and underwent the same procedure as the LKM group. During the semester the Control group proceeded with their classwork as normal. At the end of

12 weeks the Control group returned to the computer lab and underwent the same procedure as the Meditation group.

Special Conditions

The experimental design of this study raised unique considerations. To begin, the students were in the class together 2 days a week throughout the semester. The students were of course aware that each other student *may* be participating in the research itself but did not have access to who participated in the research and who did not.

Participants potentially experienced some physical discomfort. Being still for 20 min is not a normal activity, and the body often aches during seated meditation. This is a normal reaction to the stillness required by meditation and posed no sustained risk to the participants. Individuals were alerted to this possibility in the informed consent. In addition, individuals may have experienced unpleasant imagery or thought content depending on their emotional state prior to entering meditation. This is also normal and posed no greater risk to the participant than is associated with daily life. This was explained in the informed consent as well. Students were also provided with the Georgia Southern University Counseling Center's contact information as well as licensed psychologist Dr. Shauna Joye's email address, in the event that they felt they needed to confidentially process any experiences they may have had. The instructors also alerted the students of the drop date for the class in the event that students found the activity to be overwhelming. This allowed the students plenty of opportunity to drop the class if the need arose.

In addition, it is possible that the fight scene in the video may have been disturbing to some students. This possibility was fully explained and discussed with students before their participation in the initial data collection. Students were fully debriefed and assessed after the

video to insure that they did not experience any excessive or abnormal emotional reactions to the video itself. This assessment was performed by Joseph Garcia, M.S. (clinical Psy.D. student) under the supervision of Dr. Shauna Joye.

CHAPTER 4

RESULTS

A p -value of .05 is used for all analysis unless otherwise stated.

Physiological Measures

Three-way Mixed ANOVAs were conducted to examine the effects of Condition (Peace, Fight, and Recovery) and Time (Pretest, Posttest) as within-subjects factors and Group (Meditation, Control) as the between subjects factor on GSR and heart BPM.

Galvanic skin response. The main effect of Time showed a trend toward significance, $F(2,12) = 3.27, p < .01$. The main effect of Condition was significant, $F(2,24) = 37.58, p < .05$. The main effect for Group, $F(1,12) = .08$, was not significant (see Figure 3). These results indicate that there were differences among the Conditions (Peace, Fight, and Recovery) on GSR readings. Post-hoc LSD analysis revealed that there were significant differences between all Conditions at Posttest with the Fight condition showing higher GSR scores across the board (see Table 1). Neither The three- way interaction of Time \times Group \times Condition, $F(2,24) = 1.82$ nor the two-way interactions of Time \times Condition, $F(2,24) = .81$, Condition \times Group, $F(2,24) = 1.40$, and Time \times Group, $F(1, 12) = .00$, were significant (see Figure 3).

Heart beats per minute. The main effect of Time showed a trend toward significance, $F(1,12) = 4.522, p < .10$. The main effect for Condition was significant, $F(2,24) = 7.41, p < .05$. The main effect for Group was not significant, $F(1,12) = .05$ (see Figure 4). These results indicate that there were differences between the Conditions (Peace, Fight, and Recovery) on BPM readings. Post-hoc LSD analysis reveals that there were significant differences between the Conditions Peace-Recovery and Fight-Recovery indicating that BPM increased throughout the presentation of the video (see Table 2). Further analysis revealed a significant decrease in the

Meditation group Posttest Peace Condition ($M = 70.08$, $SD = 6.98$) as compared to the Control group Posttest Peace Condition ($M=74.73$, $SD=7.08$), $t(6) = 2.852$, $p < .05$. No other Group Condition comparisons were significant (see Table 3). These results indicate that the groups differed at the start of testing after the 12 week of LKM with the Control group experiencing significantly higher BPM than the Meditation group. Neither the three-way interactions of Time \times Group \times Condition, $F(2,24) = .19$ nor the two-way interactions of Time \times Condition, $F(2,24) = .11$, Condition \times Group, $F(2,24) = 1.87$, and Time \times Group, $F(1, 12) = .57$, were significant.

Latency. Two-way mixed ANOVAs were conducted to examine the within-subjects factor of latency (time from peak Fight measure to Recovery baseline or lowest point measured in seconds) between the Fight and Recovery Conditions and the between-subjects factor of the Meditation and Control groups.

Galvanic skin response latency. Neither the main effect of Time, $F(1,12) = .14$, the main effect for Group, $F(1,12) = .23$, nor the interaction of Time \times Group, $F(1,12) = .57$, were significant

Beats per minute latency. Neither the main effect of Time, $F(1,12) = .86$, the main effect for Group, $F(1,12) = 1.74$, nor the interaction of Time \times Group, $F(1,12) = .62$, were significant.

Psychological Measures

ANOVAs were conducted to examine the interaction and main effects of Time (Pretest, Posttest) and Group (Meditation, Control) on responses to the AAQ-II, FFMQ, BFI, SEQ, and the SOFI.

Acceptance and action questionnaire-II. Neither the main effect of Time, $F(1,12) = .52$, the main effect for Group, $F(1,12) = .73$, nor the interaction of Time \times Group, $F(1,12) = .00$, were significant.

Five-facet mindfulness questionnaire.

Observe. Neither the main effect for Time $F(1,12) = .12$, nor the main effect for Group, $F(1,12) = 2.17$, were significant. The interaction of Time \times Group was significant, $F(1,12) = 5.42$, $p < .05$ (see Figure 5). Paired sample t -tests were run to further examine simple effects time at each level of group. No difference was found between Pretests ($M = 23.86$, $SD = 3.72$) and Posttests ($M = 27.14$, $SD = 5.30$) within the Meditation group. Likewise, there was no significant difference found between Pretest ($M = 23.14$, $SD = 6.91$) and Posttest ($M = 20.71$, $SD = 3.68$) in the Control group. Further independent samples t -tests revealed no significant difference between the Meditation group ($M = 23.86$, $SD = 1.40$) and Control group ($M = 23.14$, $SD = 6.91$) at Pretest but did reveal a significant difference between the Meditation group ($M = 27.14$, $SD = 5.30$) and Control group ($M = 20.71$, $SD = 3.68$) at Posttest, $t(12) = 2.63$, $p < .05$. These results indicate that while the results between groups were not significantly different at Pretest their mean scores diverged significantly at posttest with the Meditation group increasing in Observation and the Control group decreasing.

Describe. Neither the main effect for Time, $F(1,12) = .40$, nor the main effect for Group, $F(1,12) = .28$, were significant. The interaction of Time \times Group showed a trend toward significance, $F(1,12) = 3.269$, $p < .10$ (see Figure 6). Paired sample t -tests were run in order to determine interaction simple effects of time at each level of group. A trend toward significance was found between Pretests ($M = 25.86$, $SD = 6.59$) and Posttests ($M = 30.00$, $SD = 9.33$) within the Meditation group $t(6) = -2.08$, $p < .10$. There was no significant difference found between

Pretest ($M = 30.86$, $SD = 7.56$) and Posttest ($M = 28.86$, $SD = 6.28$) in the Control group. These results indicate that the Meditation group increased slightly on the “describe” factor. While not significant it is important to note that the Control group decreased on this factor.

Act with awareness. Neither the main effects of Time, $F(1,12) = 1.59$, nor Group $F(1,12) = .09$, was significant. There was no interaction of Time \times Group, $F(1,12) = .71$.

Non-judging of inner experience. Neither the main effect of Time, $F(1,12) = 1.75$, nor the main effect for Group, $F(1,12) = .09$ was significant., The interaction of Time \times Group, $F(1,12) = .54$ was not significant.

Non-reactivity to inner experience. Neither the main effect of Time, $F(1,12) = .48$, nor the main effect of Group $F(1,12) = 1.46$, was significant. The interaction of Time \times Group was significant, $F(1,12) = 5.92$, $p < .05$ (see Figure 7). Paired sample t -tests were conducted in order to examine interaction simple effects at each level of group. No difference was found between Pretest ($M = 21.86$, $SD = 2.67$) and Posttest ($M = 23.29$, $SD=2.81$) within the Meditation group. Likewise, there was no significant difference found between Pretest ($M = 21.14$, $SD = 5.46$) and Posttest ($M = 18.57$, $SD = 5.94$) in the Control group. Independent sample t -tests to examine group differences at each level of time revealed no significant differences between Meditation ($M = 21.86$, $SD = 2.67$) and Control ($M = 21.14$, $SD = 5.46$) group at Pretest but did show a trend toward significance between Meditation ($M = 23.29$, $SD = 2.81$) and Control ($M = 18.57$, $SD = 5.94$) groups at Posttest $t(12) = 1.90$, $p < .10$. These results indicate that while there was no significance found within each group independently, there was a significant difference in the pattern shown between the Meditation and Control groups. At post-test, the Meditation group increased somewhat on the “non-reactivity” measure and the Control group decreasing.

Big five inventory.

Openness. Neither the main effect of Time, $F(1,12) = 2.40$, nor the main effect for Group, $F(1,12) = .05$, was significant. The interaction of Time \times Group, $F(1,12) = 1.96$, was not significant.

Conscientiousness. Neither the main effect of Time, $F(1,12) = 1.36$, nor the main effect for Group $F(1,12) = .15$, was significant. The interaction of Time \times Group, $F(1,12) = .15$, was not significant.

Agreeableness. Neither the main effect of Time, $F(1,12) = .75$, nor the main effect for Group $F(1,12) = 1.81$ was significant. The interaction of Time \times Group, $F(1,12) = .08$, was not significant.

Extraversion. Neither the main effect of Time, $F(1,12) = .25$, nor the main effect for Group $F(1,12) = .00$, was significant. The interaction of Time \times Group, $F(1,12) = .25$, was not significant.

Neuroticism. . The main effect of Time was significant, $F(1,12) = .858$, $p < .05$. The main effect for Group $F(1,12) = .79$, was not significant. The interaction of Time \times Group was not significant, $F(1,12) = .21$ These results indicate that while there was a significant decrease from Pretest to Posttest scores in both the Meditation and Control groups there was no significant difference between the groups.

State emotions questionnaire.

Negative stress. Neither the main effect of Time $F(1,12) = .76$, nor the main effect for Group $F(1,12) = .66$ was significant. The interaction of Time \times Group showed trend toward significance, $F(1,12) = 3.84$, $p < .10$ (see Figure 8). Paired sample t -tests were run in order to determine interaction simple effects of time at each level of group. There were no significant

differences found between Pretest ($M = 5.86$, $SD = 2.19$) and Posttest ($M = 6.57$, $SD = 2.94$) within the Meditation group or between Pretest ($M = 6$, $SD = 3$) and Posttest ($M = 4.14$, $SD = 3.34$) in the Control group. Independent samples t -tests examining group differences at each level of time also showed no significance between the Meditation group ($M = 5.85$, $SD = 2.19$) and Control group ($M = 6.00$, $SD = 3.00$) at Pretest, nor between the Meditation ($M = 6.57$, $SD = 2.93$) and Control ($M = 4.14$, $SD = 3.34$) group at Posttest. Divergent from expectations these results revealed a slight antagonistic interaction in which the Meditation group increased on the negative stress measure and the Control group decreased, although these differences were not significant.

Anger. Neither the main effect of Time, $F(1,12) = .04$, nor the main effect for Group, $F(1,12) = .42$, was significant. The interaction of Time \times Group was significant, $F(1,12) = 9.71$, $p < .05$ (see Figure 9). Paired sample t -tests were run in order to determine simple effects of time at each level of group. There was a trend toward significance found between Pretests ($M = 2.43$, $SD = 1.62$) and Posttests ($M=4.43$, $SD=2.37$) within the Meditation group, $t(6) = -2.00$, $p < .10$. A trend toward significance was also found between Pretest ($M = 4$, $SD = 2.38$) and Posttest ($M = 1.71$, $SD = 1.89$) in the Control group, $t(6) = 2.42$, $p < .10$. Further analysis (independent-samples t -tests examining group at each level of time) found no significant difference between Groups at Pretest. However, there was a significant difference between Groups at Posttest, $t(6) = -2.88$, $p < .05$. Contrary to expectations these results indicate that reported experience of anger for those in the Meditation group increased slightly whereas participants in the Control group experienced slight decreases in reported experience of anger. Further, the Meditation group reported experiencing anger more at Posttest than Controls.

Sadness. Neither the main effect of Time, $F(1,12) = .14$, nor the main effect for Group, $F(1,12) = .09$, was significant. The interaction of Time \times Group was significant, $F(1,12) = 6.80$, $p < .05$ (see Figure 10). Paired sample t -tests were conducted to assess simple effects of time at each level of group. No significant difference was found between Pretests ($M = 2.71$, $SD = 1.7$) and Posttests ($M = 4.23$, $SD = 2.82$) within the Meditation group. A trend toward significance was found between Pretest ($M = 5$, $SD = 2.52$) and Posttest ($M = 2.71$, $SD = 1.8$) in the Control group, $t(6) = 2.36$, $p < .10$. Further independent samples t -test analysis indicated that groups approached significance at Pretest, $t(12) = -1.99$, $p < .10$, but there was no significant difference between groups at Posttest t value. This trend indicates that there was an antagonistic interaction in which Controls decreased in their report of sadness and Meditators increased in sadness scores.

Frustration. The main effect of Time was significant, $F(1,12) = 7.56$, $p < .05$, however the main effect for Group, $F(1,12) = .03$, was not significant. The interaction of Time \times Group was significant, $F(1,12) = 7.56$, $p < .05$ (see Figure 11). Paired sample t -tests were run in order to determine the simple effects of time at each level of group. There was no significant difference found between Pretest ($M = 5.14$, $SD = 2.67$) and Posttest ($M = 5.14$, $SD = 2.19$) within the Meditation group. A significant decrease was found between Pretest ($M = 6.43$, $SD = 1.99$) and Posttest ($M = 3.43$, $SD = 3.05$) in the Control group, $t(6) = 5.61$, $p < .05$. These results indicate that reported experience of frustration remained the same for participants who underwent the LKM course and decreased for those who did not participate in the course.

Controlling my emotions. The main effect of Time was significant, $F(1,12) = 5.72$, $p < .05$, however the main effect for Group, $F(1,12) = .13$, was not significant. Participants on average reported significantly less control of their emotions at Posttest as

compared to Pretest regardless of Group. The interaction of Time \times Group was not significant $F(1,12) = 2.54$.

Controlling my behaviors. The main effect of Time was not significant, $F(1,11) = 1.95$, nor was the main effect of Group, $F(1,12) = .06$. The interaction of Time \times Group was significant, $F(1,11) = 6.47$, $p < .05$ (see Figure 12). Paired sample t -tests were run in order to examine interaction simple effects of time at each level of group. There was a trend toward a significant increase found between Pretest ($M = 8.67$, $SD = 1.21$) and Posttest ($M = 9.17$, $SD=1.17$) within the Meditation group, $t(5)=-2.24$, $p < .10$. A trend toward a significant decrease was found between Pretest ($M = 9.57$, $SD = .79$) and Posttest ($M = 7.86$, $SD=2.67$) in the Control group, $t(6)=2.20$, $p < .10$. These results indicate that reported experience of control of behaviors for those in the Meditation group increased marginally while participants in the Control group decreased marginally.

Concentrating. The main effect of Time was not significant, $F(1,12) = .67$, nor was the main effect for Group $F(1,12) = .04$. The interaction of Time \times Group was significant, $F(1,12) = 6.99$, $p < .05$ (see Figure 13). Paired sample t -tests were run in order to examine interaction simple effects of time within each level of group. There was no significant difference found between Pretest ($M = 5.29$, $SD = 2.5$) and Posttest ($M = 6.71$, $SD = 1.38$) within the Meditation group. A trend toward a significant decrease was found between Pretest ($M = 7.57$, $SD = 2.15$) and Posttest ($M = 4.86$, $SD = 3.72$) in the Control group, $t(6) = 2.14$, $p < .10$. These results indicate that the reported experience of concentration was trending in opposite directions for the two groups, with the Meditation group moving toward better concentration and the Control group moving toward worse concentration.

Staying alert. The main effect of Time was not significant, $F(1,12) = .85$, nor was the main effect for Group, $F(1,12) = .02$. The interaction of Time \times Group was significant, $F(1,12) = 12.64$, $p < .05$ (see Figure 14). Paired sample t -tests were run in order to determine interaction simple effects. There was a significant difference between Pretests ($M = 5.43$, $SD = 2.64$) and Posttests ($M = 7.86$, $SD = 1.77$) within the Meditation group, $t(6) = -3.74$, $p < .05$. No significant difference was found between Pretest ($M = 7.57$, $SD = 3.55$) and Posttest ($M = 6.14$, $SD = 3.02$) in the Control group. These results indicate that the reported experience of the ability to stay alert for those in the Meditation group increased significantly while participants in the Control group experienced no significant change.

Contentment. The main effect of Group, $F(1,12) = 1.84$ was not significant. However the main effect for Time was significant, $F(1,12) = 5.81$, $p < .05$. The interaction of Time \times Group was not significant, $F(1,12) = 1.57$. These results indicate that both groups increased at posttest in contentment scores.

Handling stressful situations. Neither the interaction of Time \times Group, $F(1,12) = .29$, nor the main effect for Time, $F(1,12) = .29$, were significant. However, the main effect of Group showed a strong tendency toward significance, $F(1,12) = 4.70$, $p < .10$ (see Figure 15). Examination of the means indicate that while the Control group did not change significantly the Meditation group, on average, reported greater ability to handle stressful situations.

Non-significant measures. No significant results were obtained in the measures of Positive Stress, Love, Joy, Fear, Surprise, Numbness, Loneliness, Guilt/Shame, Dealing With Annoying People, Being Able to Relax, Tolerating When I Make Mistakes, Tolerating When Others Make Mistakes, Trusting That I am Physically Safe With Other People, and Trusting Other People With My Thoughts and Emotions (see Table 4).

Self-other four immeasurables.

Positive self. Neither the main effect of Time, $F(1,12) = .02$, nor the main effect for Group, $F(1,12) = 1.08$, was significant. The interaction of Time \times Group was not significant, $F(1,12) = .59$.

Positive other. Neither the main effect of Time, $F(1,12) = .68$, nor the main effect for Group, $F(1,12) = .03$, was significant. The interaction of Time \times Group was not significant, $F(1,12) = 2.76$.

Negative self. The main effect of Time was not significant, $F(1,12) = .69$, nor was the main effect for Group, $F(1,12) = 1.47$. The interaction of Time \times Group was significant, $F(1,12) = 5.33$, $p < .05$ (see Figure 16). Paired sample t -tests were run in order to assess interaction simple effects of time within each level of group. No significant difference was found between Pretest ($M = 8.43$, $SD = 4.58$) and Posttest ($M = 6.00$, $SD = 1.15$) within the Meditation group or between Pretest ($M = 4.86$, $SD = 1.86$) and Posttest ($M = 6.00$, $SD = 3.61$) in the Control group. Independent samples t -tests showed no significant differences between groups at Posttest, however differences between groups at Pretest showed a trend toward significance between the Meditation and Control groups, $t(12) = 1.91$, $p < .10$. These results indicate an antagonistic relationship in that the Meditation group reported decreases in negative-self scores whereas the Control reported increases.

Negative other. The main effect of Time was not significant, $F(1,12) = .05$, nor was the main effect for Group $F(1,12) = .06$. The interaction of Time \times Group showed a trend, $F(1,12) = 4.30$, $p < .10$ (see Figure 17). Paired sample t -tests were run in order to further examine interaction simple effects. A trend toward significance was found between Pretest ($M = 7.00$, $SD = 2.65$) and Posttest ($M = 5.57$, $SD = .98$) within the Meditation group,

$t(6) = 1.987, p < .10$. There was no significant difference found between Pretest ($M = 5.43$, $SD = 1.27$) and Posttest ($M = 6.57$, $SD = 3.78$) in the Control group. These results indicate that, while not significant, there is a trend toward a significant interaction indicating that the Meditation group decreased slightly on the “negative other” measure while means indicate slight increases in this domain for the Control group.

CHAPTER 5

DISCUSSION

Purpose

The overall goal of this research was to determine if a 12-week course in LKM had an effect on physiological reactions to violent stimuli as measured by GSR and BPM. In addition, self-report assessments were given to determine various psychological effects that the Meditation course may have influenced. Specifically, the current study sought to answer the following questions: (1) GSR and BPM will decrease during the viewing of violent stimuli after a course in LKM compared to a control condition, (2) Participants in the Meditation group will return to baseline on GSR and BPM measures more rapidly after a course in LKM than Controls, and (3) There will be differential changes in measures of psychological factors after a course in LKM in the two groups.

Through the course of our analyses many individual results were found. These are detailed below. However looking at the global picture there is a pattern. Trends toward significance found in participants' abilities to observe and describe their emotional experiences as well as the potential ability to be less reactive to internal emotional experiences may have contributed to trends seen in several of the emotional subtests. Though it may seem counterintuitive at first glance the meditators appeared to score higher than controls in emotional experiences such as Negative Stress, Anger, Sadness, and Frustration. The combination of Observe and Describe factors with these increases in negative emotional experiences may be reflective of accuracy in naming and willingness to experience these emotional states. As will be discussed further below, an individual's ability to accurately and honestly have negative emotional experiences may have therapeutic implications as well as be an indicator of a

decreased need for defense mechanisms and or suppression when these emotional experiences do arise. It is a distinct possibility that LKM serves to sensitize individuals to their own internal experiences as well as aid in the development of healthy coping mechanisms for working with these emotional experiences. The timing of the administration of Posttest measures is of interest here. Posttests were given during the week prior to finals week at the University. This is typically a time of heightened emotions for students.

Physiological Measures

Galvanic skin response (GSR). Results indicated that there were significant differences in GSR readings between the Conditions Peace, Fight and Recovery for both groups. These differences indicated that GSR readings did increase during the fight scene and decrease again during Recovery. This supports the idea that the stimulus used was effective. However, there was no significant difference noted between the Meditation and Control groups. It was also found that there was a trend toward a significant decrease from Pretest and Posttest conditions. This trend did not extend to differences between Meditation and Control groups. Exposure to the stimulus itself may have had a small effect and the experiment may have picked up on an acclimation effect in which the participants' expectation of what they were going to see in the video acted as a mild buffer. As was reported by one participant, "The second time viewing the videos I [had] an idea of what to expect so I was a little more prepared."

Beats per minute (BPM). There were significant differences in BPM readings between the Conditions Peace, Fight and Recovery, with the Fight condition showing greater BPM means than Peace or Recovery. However, there was no significant difference between the Meditation and Control group. It was also found that there was a trend toward significance between the overall Pretest and Posttest Conditions. As with the GSR results, this supports the effectiveness

of the stimulus itself and the linking of these two measures. Moreover, this indicates that exposure to the stimulus at Pretest may have been responsible for differences found at Posttest due to acclimation affects. In addition, heart rate being significantly higher at Pretest may indicate a novelty effect where participants were excited by not knowing the procedure whereas participants knew what to expect at Posttest.

Again the pattern of results was contrary to predictions. It was hypothesized that the Meditation group may respond with increased heart rates at Posttest. However, the main effect of time revealed decreases in heart rate overall regardless of being in the Meditation or Control group.

Psychological Assessments

Though the physiological measures did not support predictions there were many notable results obtained from the psychological assessments that were given.

Five facet mindfulness questionnaire (FFMQ).

The FFMQ is a measure designed to assess five distinct aspects of mindfulness, observing, describing, acting with awareness, non-judging of inner experience, and non-reactivity to inner experience.

Observe. The observe factor of the FFMQ refers to one's attention to internal as well as external stimuli. These include sensations (i.e. visual, auditory, olfactory, and gestation) and perception (i.e. cognitive and emotional processes; Baer et al., 2008). The results show that the Meditation group did appear to become slightly more observant of their internal and external experiences after the LKM course and that Controls decreased slightly on this measure (see Figure 3). The development of this factor is a key component of the mindfulness practice itself and its appearance here may speak to the aspects of traditional mindfulness that are utilized

during LKM. In addition, the ability to attend, particularly to internal experience, can be seen as a prerequisite for all of the other four factors.

Describe. The describe factor of the FFMQ addresses an individual's tendency to label their emotions, sensation and perception as well as thoughts with words (Baer et al., 2008; Siegling, & Petrides, 2016) A trend toward significance was found in the experimental group on this factor with the Meditation group increasing slightly. In order to identify an emotional state or inner experience an individual necessarily must be aware of that state and in order to label that state must have a relatively clear understanding of what it is that they are experiencing. This labeling ability has long been an aspect of talk therapies from psychodynamic to emotion-focused therapy in which clients' are taught to become more aware of their personal emotional experience (Shahar, 2014).

Neuroimaging research has identified potential biological explanations for the benefits of emotional labeling which have long been held as conventional knowledge. Lieberman, et al. (2007) found that the process of labeling affective states disrupted the response pathways in the limbic system that are generally activated during the processing of negative emotional imagery. The dampening of amygdala activity in particular may be partly responsible for the observed therapeutic effects of labeling and talking about emotional experience in therapy. Mindfulness as well as compassion based meditation practices have been found to be directly related to significant alterations of amygdala activity as it relates to processing emotional stimuli and inner experience (Desbordes et al., 2012; Taren et al., 2015). If LKM has even a small effect on this ability it may have much larger implications for use as a therapeutic intervention. If, for example, an individual has developed an ability to label their emotional experiences more readily this may

allow for a lessening of emotional reactivity to aggression or violence through this dampening of the limbic pathways responsible for emotional reactivity.

Non-reactivity to inner experience. The “non-reactivity to inner experience” variable of the FFMQ looks at an individual’s ability to allow feelings and emotional content to rise and fall in the self without ruminating or reacting behaviorally to them (Baer et al., 2008). While analyses did not reveal differences among Meditation and Control groups, observations of the means indicated that the Meditation group increased slightly on this measure whereas the Control group decreased slightly as compared to Posttest scores (see Figure 5). Though no significance between groups at Pretest and Posttest were found it is important to note the direction of the small changes in means that did occur. As noted above, non-reactivity may be directly related to the describe factor. The ability to label emotional stimuli and inner experience is physiologically linked to the limbic pathways responsible for regulating emotional reactivity. Cognitive behavior therapy bases much of its methodology on the idea of the cognitive triangle. This triangle details the relationship between emotions, thoughts, and behavior and in very simple terms shows clients how the regulation of one leads to regulation in the others (Beck, 2011).

State emotions questionnaire (SEQ). The SEQ is a measure that looks at several factors individually utilizing a 1 to 10 Likert scale. The first 13 items ask the participant to rate emotional experience by Time (*not at all to all the time*). The next 11 items ask the participant to report on effectiveness of emotional regulation (e.g. controlling, tolerating, and trusting).

Negative stress. Negative stress is here defined as stress that results from the adverse events that occur in one’s life. This is in contrast to positive stress which occurs due life events that may be seen as advantageous. However, as Anderson and Arnoult (1989) point out, there are

often layers of stress within an event. When looked at in detail it may be seen that events traditionally seen as positive such as marriage, the birth of a child, or graduation may contain deeply impactful levels of negative stress. The results for negative stress were not significant however there was a trend toward significance of the interaction of Time and Group. Counterintuitively the Meditation group increased slightly in their report of negative stress whereas Control group decreased slightly as a function of time. This increase in the Meditation Group may be reflective of increased empathy in participants. With increased empathy individuals may be more susceptible to experiencing effects from the negative stress of others. Theoretically, LKM would increase this capacity.

Anger. When considering the emotional experience of anger it is important not to confuse the term anger with the behaviors associated with it (Scheff, 2015). The emotional experience of anger is here defined as one of the “pain signals that alert us to the state of the world inside and around us” (Scheff, 2015). Indeed, Scheff (2015) points out that anger can be considered a very positive and helpful emotion as it can alert the individual as well as those around the individual to information that can be used in a constructive manner. This is particularly true when combined with non-reactivity. In the current analysis it was found that, whereas the Meditation group increases and Control group decreases were slight, participants in the Meditation group reported experiencing Anger more than Controls. This finding supports the idea that LKM increased the capacity to experience emotional honestly and with acceptance.

Sadness. Like Anger, Sadness can also be defined as a response to external events such as loss, threats to self-image, or rejection (Vansteelandt & Mechelen, 2006). Often the word distresses or grief is used in place of sadness and there seems to be little agreement on the name for this particular emotional experience (Scheff, 2015). In any event, the specifics of the meaning

of the word sadness in this study was left to the interpretation of the participants. Results from Sadness measures show that the Meditation and the Control groups were different from one another at Pretest, with Controls reporting more Sadness than Meditators. This may indicate some selection bias within the study as participants self-selected to participate in the Meditation course and Controls self-selected to participate in the study from another psychology class occurring during the same semester

Frustration. Frustration is here conceived of as an emotional state brought on by the experience of being unable to achieve some desired goal. Results on the Frustration measure revealed an interaction such that Meditators reported no change in frustration levels from Pretest to Posttest. The Control group however showed significant decreases in their reporting of Frustration.

The development of the ability to identify and sit with negative emotional experiences is common to the meditation practice. In the LKM course students were asked to work with the negative emotions associated with individuals and groups with whom they had identified difficulties. Being able to identify these emotions and to experience them in a nonreactive way may have contributed to increases in reporting of negative stress. Some reflections from the Meditation group seem to corroborate this explanation; “I think what I learned most of all was self-honesty and how much learning can come from within”, “Accepting suffering or conflict helps to overcome it and be able to move forward. It actually gives me a different view that isn’t upsetting, and can also help myself to better understand others”, “I find that I am better prepared to handle stress now. It’s also just very nice to be able to sit down and appreciate the little things whether I’m stressed or not.” These self-reported experiences speak to the ability cultivated in

meditation, to be with an emotional experience, pleasant or unpleasant, and to process that experience internally.

Controlling my behaviors. This measure is used as an indication of the participants' perceived ability to control their own behavioral reaction, especially as they relate to reactions to emotional states. Results on this measure indicated marginal increases in the experience of control of their behaviors by Meditators and marginal decreases in Controls. It is plausible that the physical practice of meditation may have contributed to the experience of increased behavioral control in the Meditation group.

Concentration. Concentration is here conceptualized as the ability to hold one's attention on an idea or object. Results here indicated an interaction (or trend if that was the case) such that the Meditation group maintained similar levels of concentration at Pretest and Posttest whereas Controls decreased marginally on this measure. Research has shown that meditation does seem to positively affect attention (Desbordes et al., 2012; Lee et al., 2012). However, these results may be indicative of a protective factor as Posttests were given the week prior to finals week and Controls appear to have decreased on this measure somewhat.

Staying alert. Staying alert refers to the participants' perception of their ability to maintain awareness of their surroundings. Meditators reported experiencing increases in their ability to stay alert and Controls showed no change. Increases on this measure may be indicative of the mindfulness practice aspects that participants learned during the LKM course. Maintaining an awareness of one's inner experiences necessitates an ability to stay alert to changes in one's mind as well as the environment.

Self-other four immeasurables (SOFI). The SOFI is a measure that was designed specifically to measure the compassion related aspects of meditation practice; loving-kindness,

compassion, joy and acceptance toward the self and others. These are broken down into four subscales; negative feelings toward self, negative feelings toward others, positive feelings toward self, and positive feelings toward others (Kraus & Sears, 2008).

Negative self. While no significant differences were noted in post-hoc testing on this measure, the interaction itself was significant. As can be seen in Figure 13, an antagonistic interaction was observed. This indicates that the Meditation and Control group differed slightly at Pretest but equalized at Posttest. Though non-significant, it is of interest that the Meditation group reported slight decreases and the Control group reported slight increasing in negative feelings toward self. The Posttest difference in scores may have been an artifact of selection bias for the groups indicating the possibility that those who self-selected to participate in the LKM course had more negative feelings toward the self at the outset of the course than Controls. Increases in negative feelings toward the self in Controls may have been due to the pressures of the ending semester. It is conceivable that absent of the LKM course meditators would have similarly increased on this measure.

Negative other. Results of this measure indicate that those in the LKM group reported slight, though non-significant, decreases in their experience of negative feelings toward others while Controls showed no change. These results are in line with expectations as one of the key components of LKM is the cultivation of a sense of acceptance of others. During the course, meditators were instructed in projecting feelings of loving-kindness toward people and groups with whom they experienced negative emotions or had experienced difficulties.

Limitations

The current study has limitations that are important to note for purposes of interpretation as well as future directions. First, it is important to note that the nature of the analysis was

exploratory. Due to the small sample size a MANOVA was impractical, therefore analysis of psychological measures was performed individually by subtest. This may have inflated type-1 error. The experimental design of this study made it difficult to recruit larger numbers of participants. It is believed that this had a significant impact on the results obtained. Specifically, this can be seen in differences between Groups at Pretest. In addition, there was a possible selection bias incorporated into this design as students elected to participate in the LKM course from the university course listing and by seeing advertisements on campus for the course. Future research may benefit from increased sample sizes and random assignment of participants to groups. In addition, there may have been some acclimation to the video stimulus itself. Future research may benefit from utilizing comparable but differing videos at Pretest and Posttest.

Conclusion

In summary the current study did not support the physiological hypothesis that GSR and BPM should increase during the viewing of a violent video after a course in LKM, or that participants in the Meditation group would return to baseline on GSR and BPM measures more rapidly than Controls. However, a pattern suggesting an interaction between condition and group in regard to the GSR and BPM measures during the Fight scene did reveal that the means were in the expected direction, indicating that LKM may have the potential to mitigate physiological reactivity. Given this pattern, it is plausible that more intensive training or larger sample sizes in future research may produce more pronounced differences between groups.

The exploratory use of psychological measures yielded quite a few interesting, if not expected, results. The premise that LKM may have beneficial emotional and regulatory benefits was supported. The ability to recognize and accept negative emotions is a major factor in mental health. The results of psychological measures (e.g., the ability to observe, describe, and not-react

to inner experience) illustrated a theoretical trend that has important implications for clinicians. In particular these findings lend support to cognitive behavioral therapies such as Acceptance Commitment Therapy and Cognitive Behavioral Therapy. Hayes et al. (2012) discusses the idea that our initial reactions to negative emotions is to “escape, avoid, or attempt to suppress” (p. 271). Hayes and colleagues refer to this as experiential avoidance, and very well may be what the meditation group was engaged in with reported decreases in emotional experiences like sadness, anger, and frustration. Conversely, the reported increase in the Meditation group may be indicative of the ability to not only recognize negative emotional experiences but also to accept and be with those experiences. In support of these findings, Graser, Höfling, Weßlau, Mendes, and Stangier, (2016) found, in their 12-week study of a mindfulness and LKM course, that at follow up participants reported significantly increase acceptance and significantly decreased levels of emotional suppression.

In addition to the above mentioned benefits this research also has some implications within the field of rural mental health. Informal communications with the LKM group indicated that many of these participants were from rural areas in the southeast United States. Considering that rural residents tend to be more Christian in their religious preference it is important that techniques introduced in these populations does not conflict with religious ideology (Ellison & Musick, 1993; Nelson, Yokley, & Madron, 1971). The positive experiences noted by many of the participants indicate that this approach may be easily accepted by individuals who live in rural areas or have rural psychosocial histories. In addition, the paucity of resources in rural areas creates a need for techniques and interventions that are low cost and require little time and travel commitment for training. LKM can help to fill this gap. With little training required and the

ability to practice while sitting in a chair or on a pillow on the floor, LKM can present a low-cost and effective addition to mental health treatments.

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Table 1: Comparison of GSR Main Effect for Condition

Condition		<i>M diff</i>	SE	<i>p</i>
Peace	Fight	4970.04	701.49	< .001
Fight	Recovery	2756.79	502.17	< .001
Recovery	Peace	2213.25	495.61	0.001

Table 2: Comparison of BPM Main Effect for Condition

Condition		<i>M diff</i>	SE	<i>p</i>
Peace	Fight	.35	.61	.57
Fight	Recovery	2.53	.83	.01
Recovery	Peace	2.88	.97	.012

Table 3: Comparison of BPM Simple effects

Group/Time/Condition	<i>M diff</i>	SE	<i>p</i>
Meditation Pretest Peace	.021	4.91	1.00
Control Pretest Peace			
Meditation Pretest Fight	1	5.09	.85
Control Pretest Fight			
Meditation Pretest Recovery	2.64	5.13	.63
Control Pretest Recovery			
Meditation Posttest Peace	-6.40*	2.24*	.03
Control Posttest Peace			
Meditation Posttest Fight	-3.05	2.71	.30
Control Posttest Fight			
Meditation Posttest Recovery	-2.86	3.17	.40
Control Posttest Recovery			

Note: * $p < .05$

Table 4: Non-Significant SEQ results (cont. on next page)

SEQ Measure	df	Error df	<i>F</i>	<i>p</i>
Positive stress				
Time x Group	1	12	3.023	.19
Time	1	12	.000	1.00
Group	1	12	3.023	.63
Love				
Time x Group	1	12	.016	.90
Time	1	12	.403	.54
Group	1	12	.005	.94
Joy				
Time x Group	1	12	.300	.59
Time	1	12	1.875	.20
Group	1	12	1.467	.25
Fear				
Time x Group	1	12	2.679	.13
Time	1	12	.298	.60
Group	1	12	.014	.91
Surprise				
Time x Group	1	12	.784	.40
Time	1	12	.479	.50
Group	1	12	.392	.54
Numbness				
Time x Group	1	12	1.984	.18
Time	1	12	.034	.86
Group	1	12	.067	.80
Loneliness				
Time x Group	1	12	.000	1.00
Time	1	12	.923	.36
Group	1	12	1.237	.29
Guilt/shame				
Time x Group	1	12	.341	.57
Time	1	12	.341	.57
Group	1	12	.239	.63
Dealing with annoying people				
Time x Group	1	12	.849	.38
Time	1	12	1.509	.24
Group	1	12	.019	.89

(Table 4 Continued)

SEQ Measure	df	Error df	<i>F</i>	<i>p</i>
Being able to relax				
Time x Group	1	12	.270	.61
Time	1	12	.138	.72
Group	1	12	2.394	.61
Tolerating when I make mistakes				
Time x Group	1	12	.107	.75
Time	1	12	.107	.75
Group	1	12	.701	.42
Tolerating when others make mistakes				
Time x Group	1	12	.107	.70
Time	1	12	.107	.70
Group	1	12	.654	.43
Trusting that I am physically safe with other people				
Time x Group	1	12	1.114	.31
Time	1	12	.568	.47
Group	1	12	1.464	.25
Trusting other people with my thoughts and emotions				
Time x Group	1	12	.661	.43
Time	1	12	.661	.43
Group	1	12	.165	.69

Figure 1: Peaceful imagery

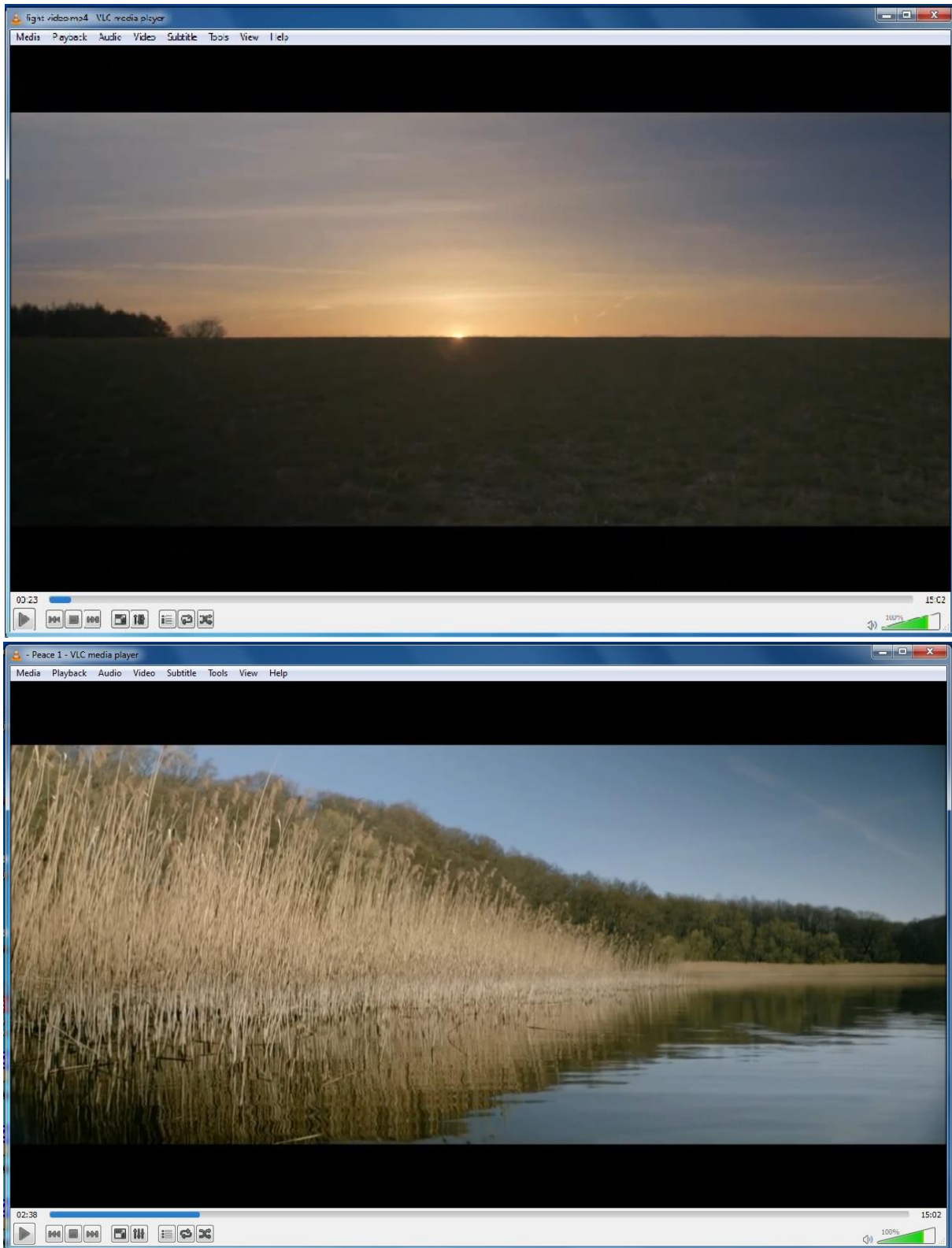


Figure 2: Violent interactions



Figure 3: Means of GSR at Conditions (Peace, Fight and Recovery) for Meditation and Control groups at Pretest and Posttest. Significant differences were found between Conditions but not between Groups or Pretest and Posttest.

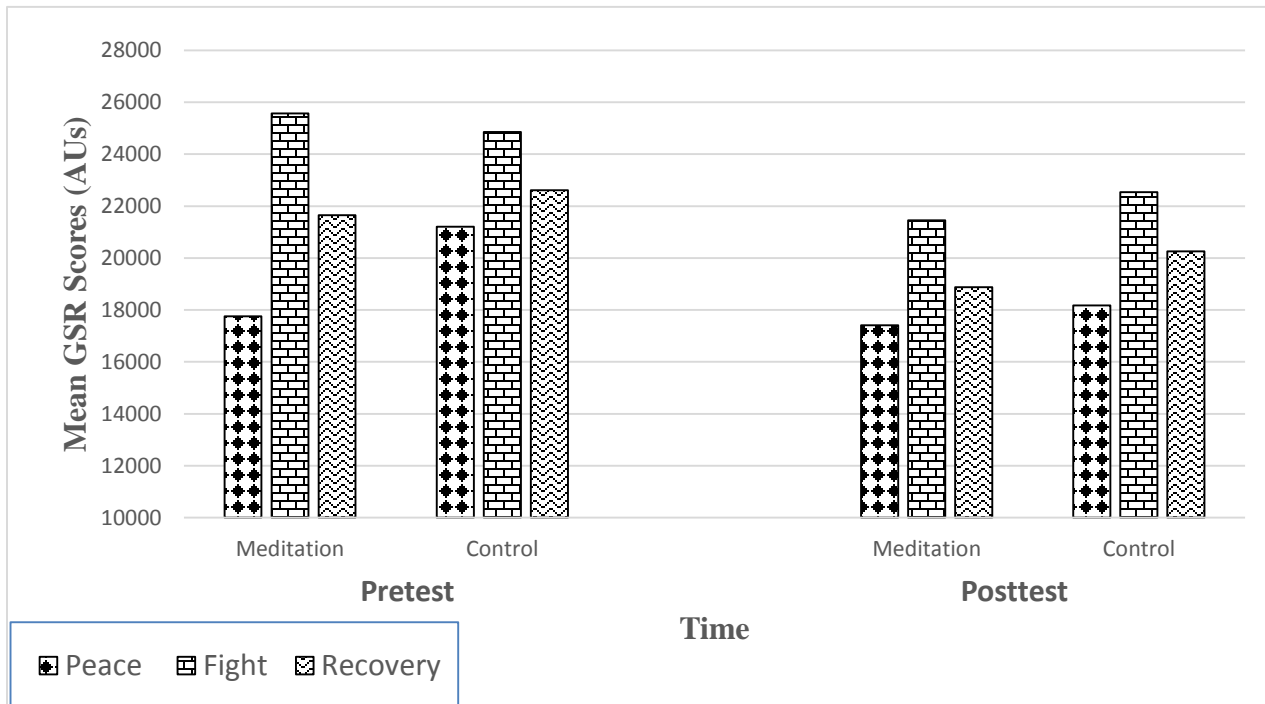


Figure 4: Means of BPM at Conditions (Peace, Fight and Recovery) for Meditation and Control groups at Pretest and Posttest. While there were significant differences between Conditions there were no significant interactions.

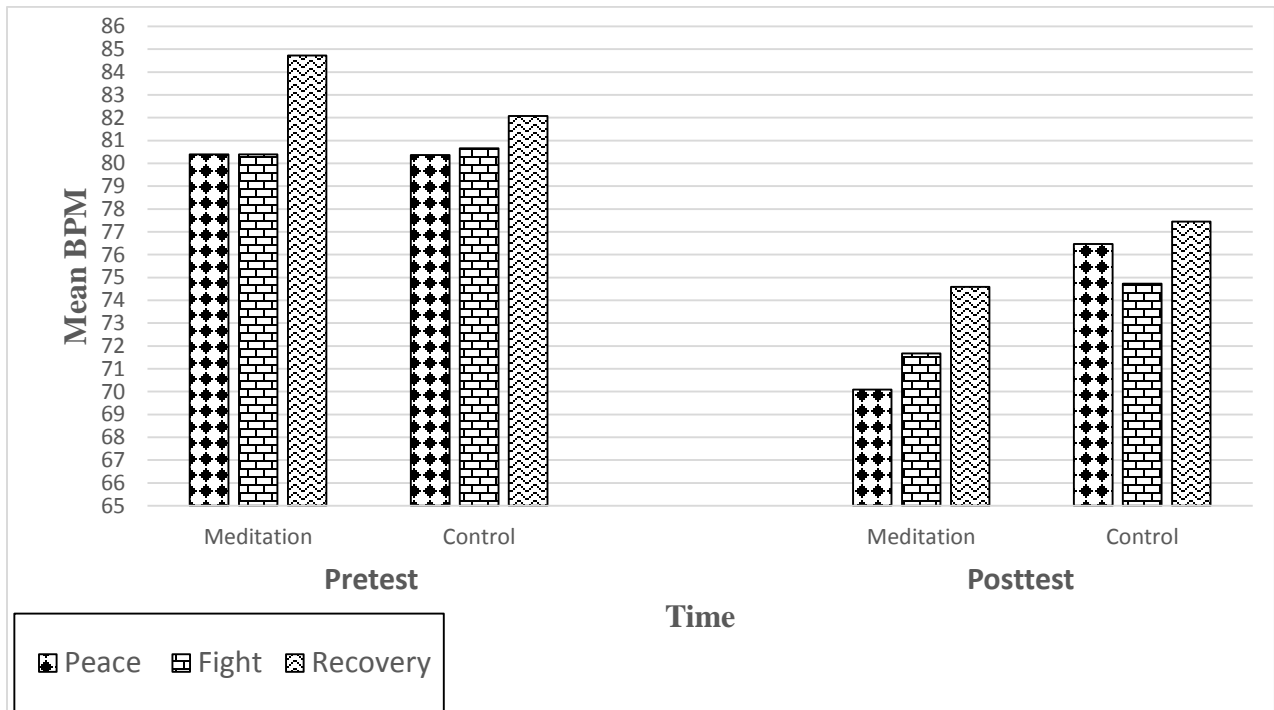


Figure 5: Means for the FFMQ Observe scores indicate that participants in both the Meditation group and Control group were not significantly different at Pretest but differed at Posttest with the meditation group showing increases in observation and Controls showing less.

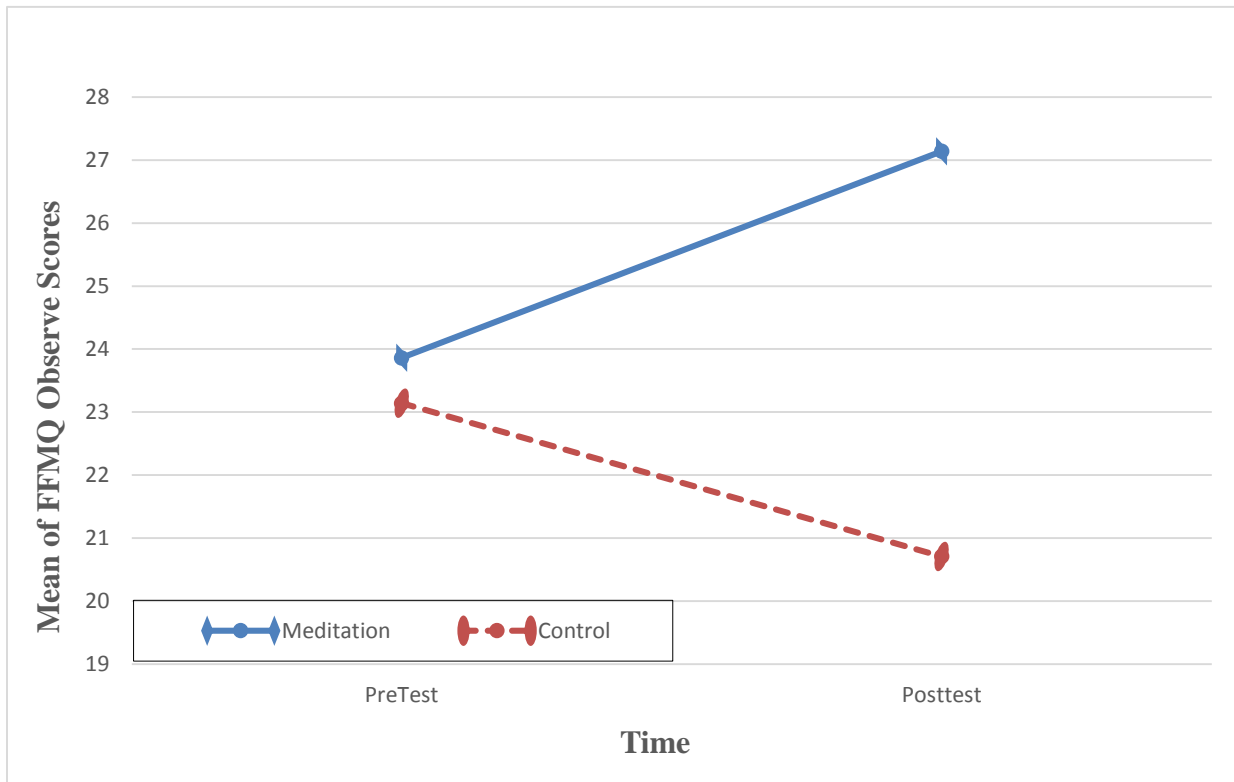


Figure 6: Means of FFMQ Describe scores at Pretest and Posttest for Meditation and Control groups. While there were significant differences between Conditions there were no significant interactions. Favorable trends toward significance were found in Time \times Group as well as in post-hoc tests on Pretest and Posttest differences within the meditation group but not within the Control group.

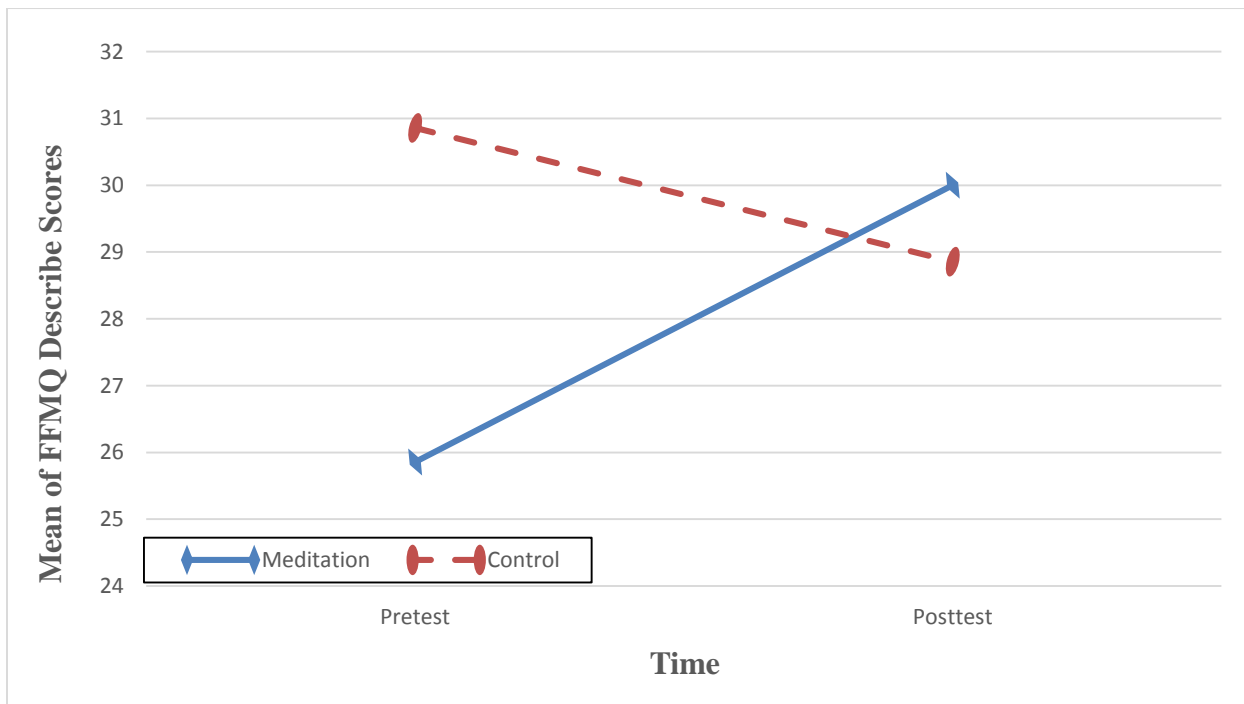


Figure 7: Means of FFMQ Nonreact scores at times Pretest and Posttest for Meditation and Control. There was no significant effect for Time however the interaction for Time \times Group was significant. No significance was found in post-hoc analysis.

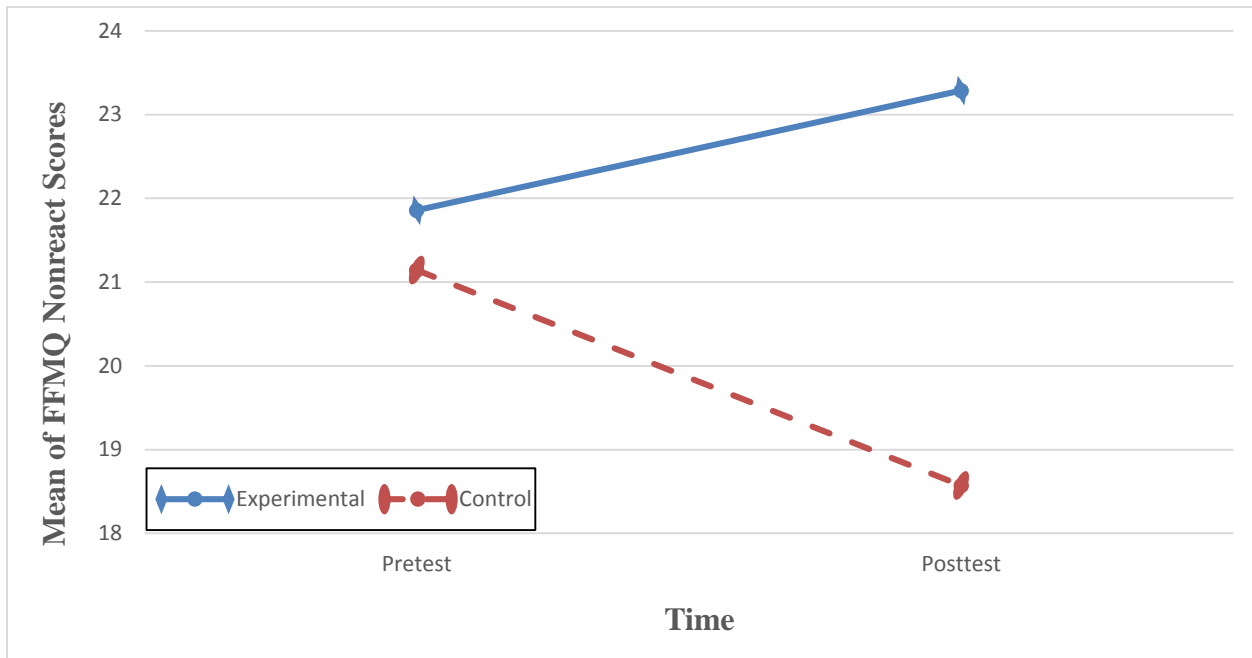


Figure 8: Means of SEQ scores for Negative Stress at Times Pretest and Posttest for Meditation and Control. Main effect of Time was not significant. The interaction of Time \times Group showed a distinct trend toward significance.

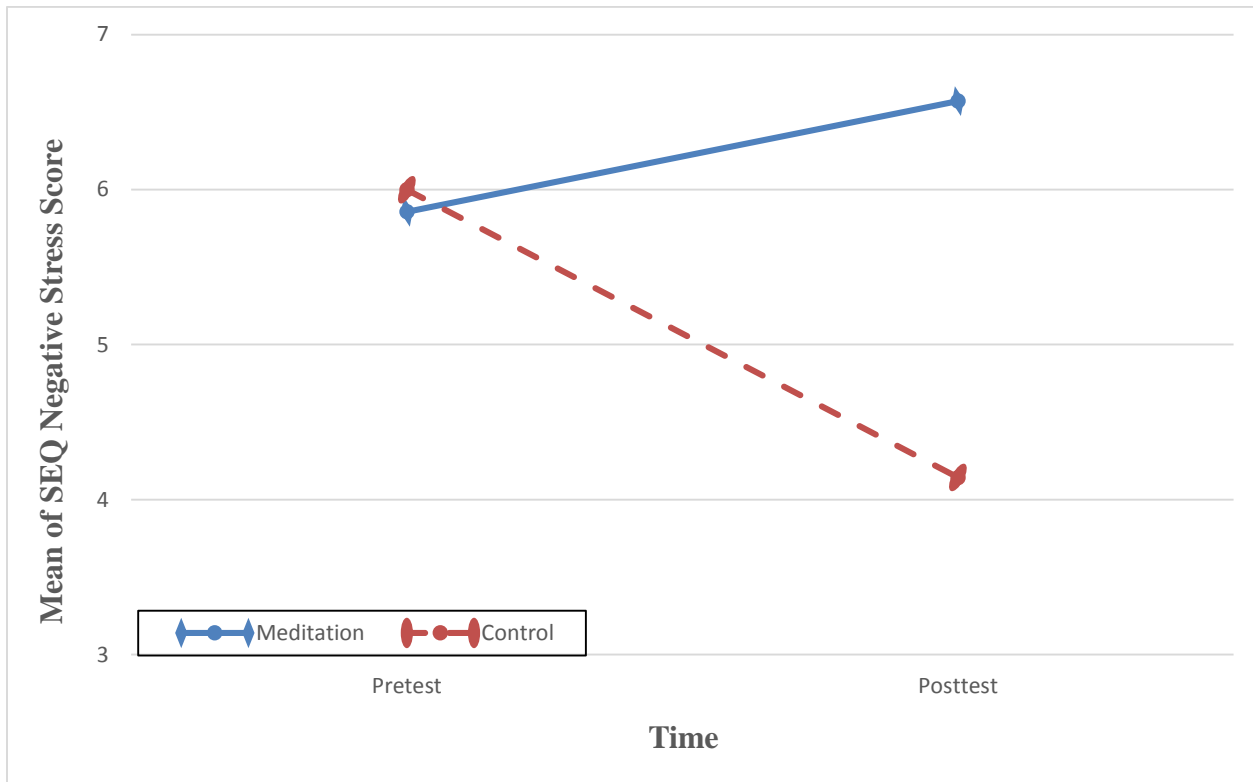


Figure 9: Means of SEQ scores for Anger at Times Pretest and Posttest for Meditation and Control. Main effect of Time was not significant. The interaction of Time \times Group was significant. Both the increases in Anger scores in the Meditation group and the decrease seen in the Control group approached significance.

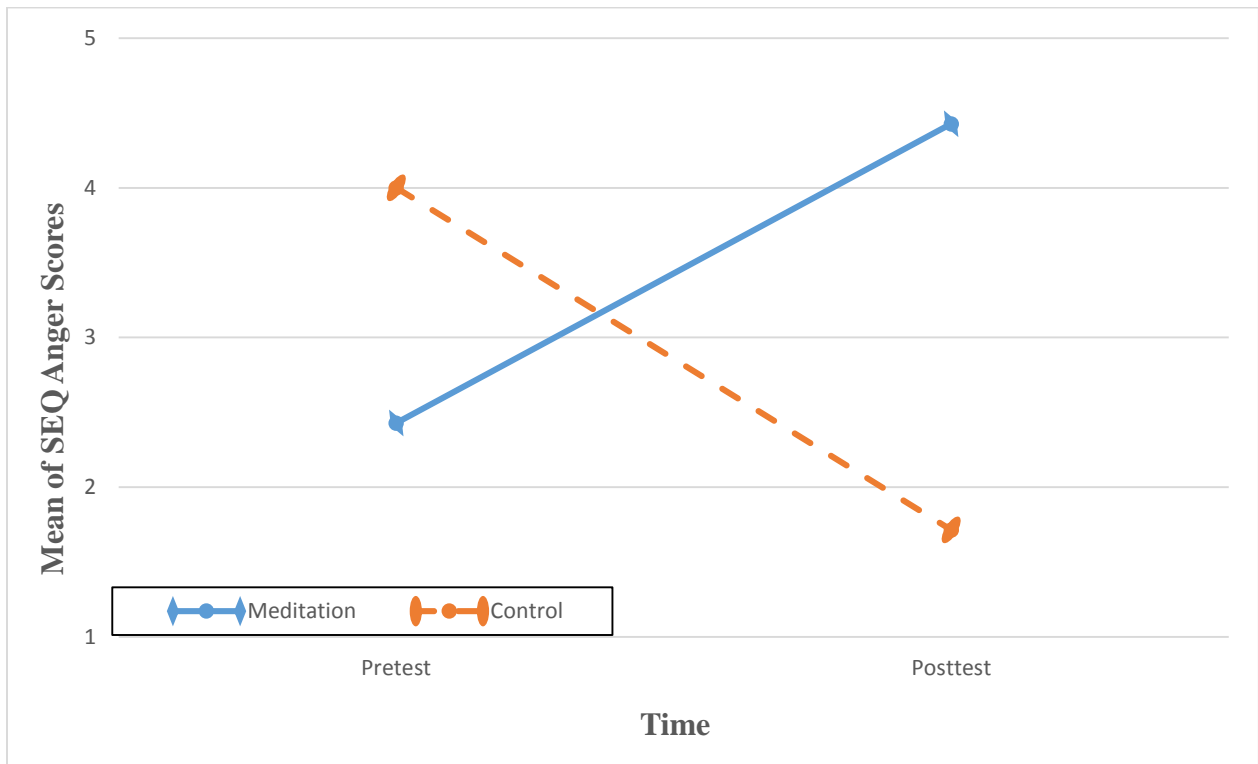


Figure 10: Means of SEQ scores for Sadness at Times Pretest and Posttest for Meditation and Control. The interaction of Time \times Group was significant. Main effect of Time was not significant. Post-hoc analysis showed a trend toward a significant difference in the Control group means at Pretest and Posttest. Meditators showed an increase in sadness while Controls showed a decrease.

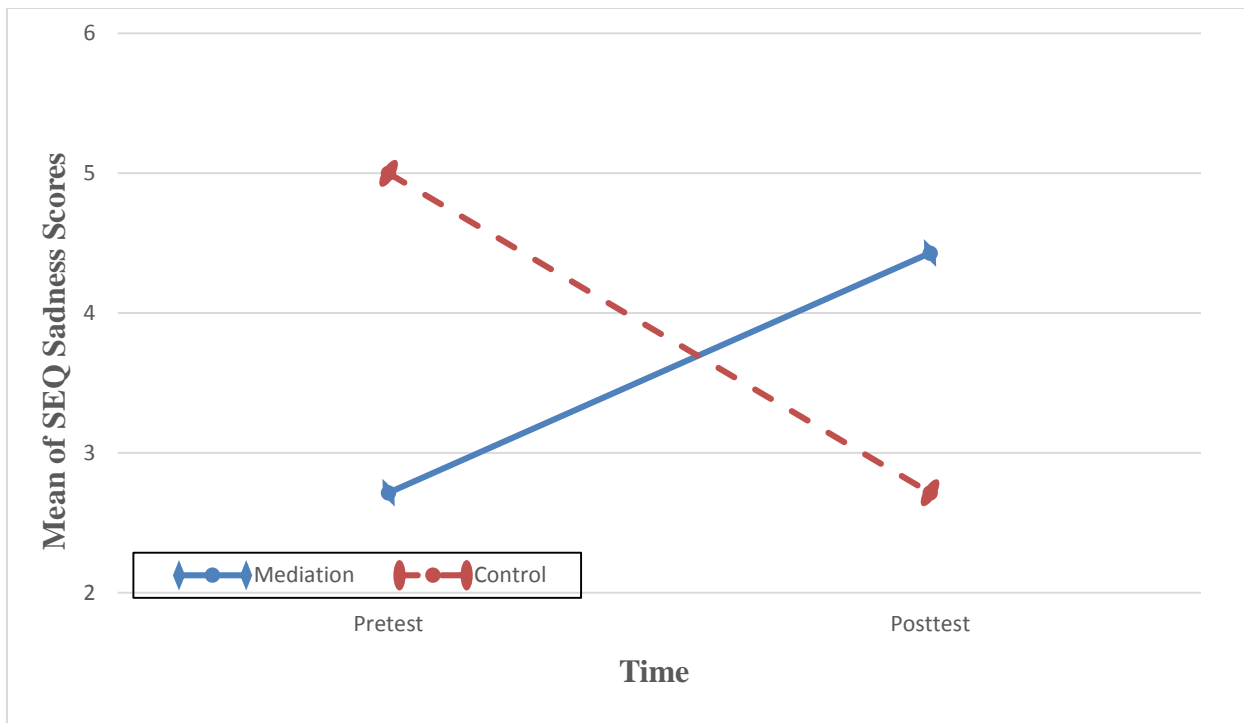


Figure 11: Means of SEQ scores for Frustration at Times Pretest and Posttest for the groups meditation and Control. Main effect of Time was significant. The interaction of Time \times Group was also significant. Post-hoc analysis indicates that the meditation group differences were not significant and that Control group differences were significant.

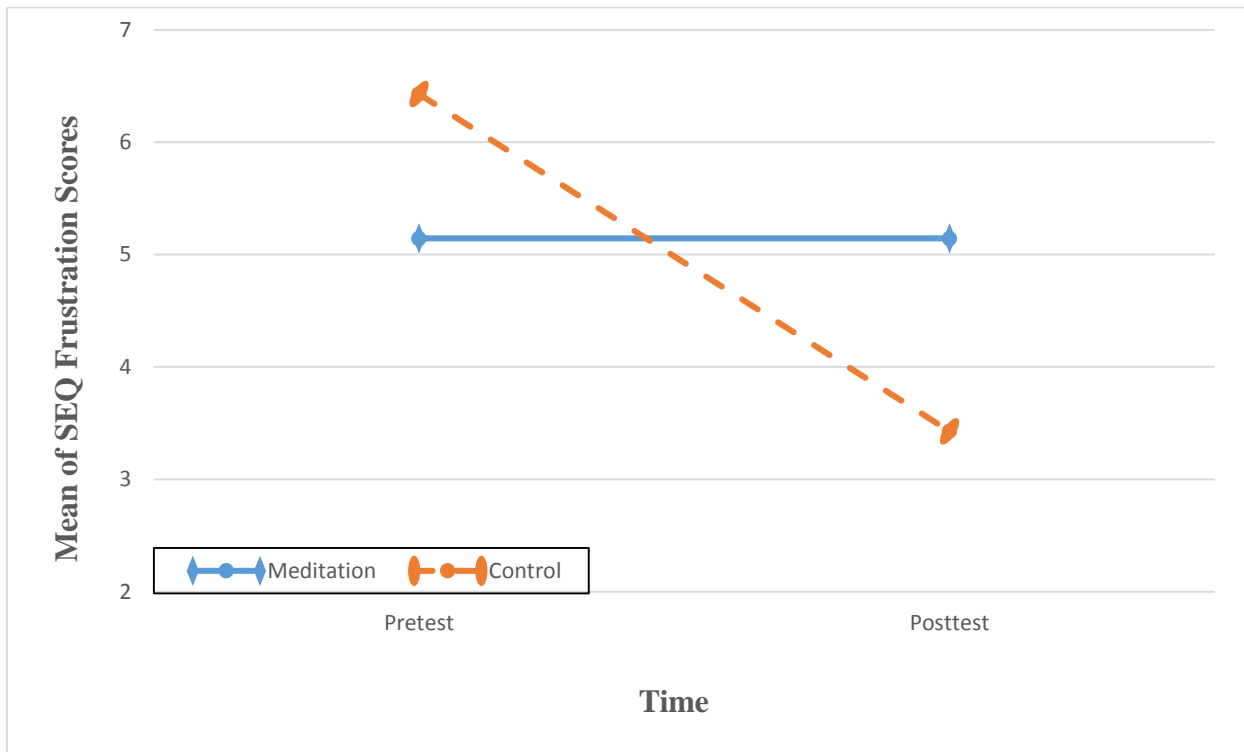


Figure 12: Means of SEQ scores for “Controlling my Behaviors” at Times Pretest and Posttest for groups meditation and Control. The main effect of Time was not significant. However, the interaction of Time \times Group was significant. Post-hoc analysis indicates that the meditation and Control groups both showed trends toward significance with the meditation group increasing and Control group decreasing.

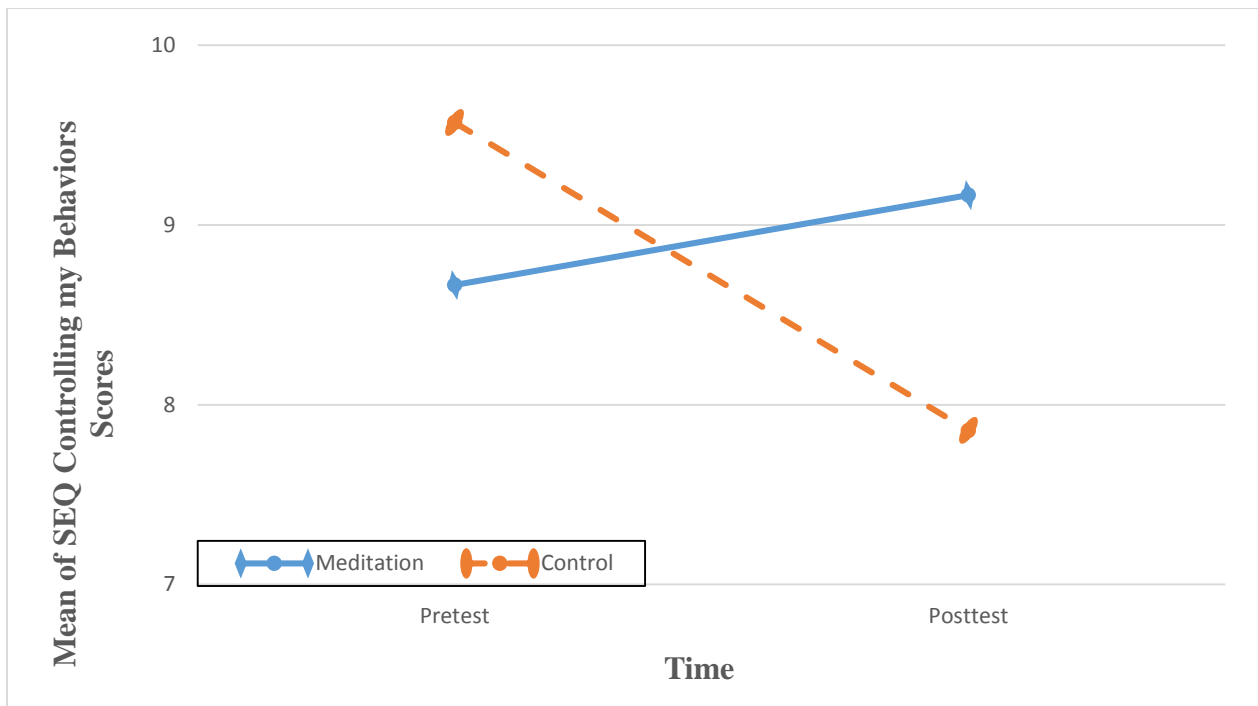


Figure 13: Means of SEQ scores for Concentration at Times Pretest and Posttest for groups Meditation and Control. The main effect of Time was not significant. However, the interaction of Time \times Group was significant. Post-hoc analysis indicates that the Meditation group scores did not differ significantly from pretest to posttest, while Control group scores showed marginally decreased Concentration scores.

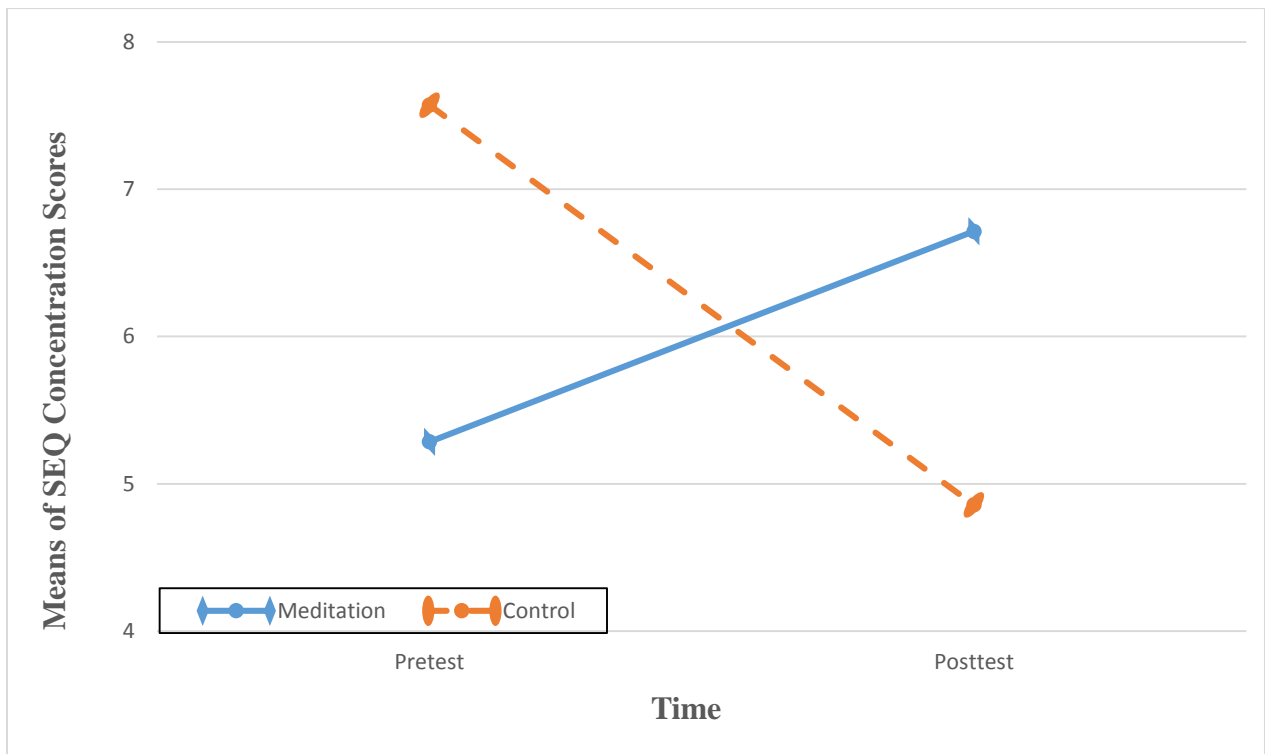


Figure 14: Means of SEQ scores for Staying Alert at Times Pretest and Posttest for groups meditation and Control. The main effect of Time was not significant. However, the interaction of Time \times Group was significant. Post-hoc analysis indicates that the meditation group scores differed significantly while Control group scores showed no significance.

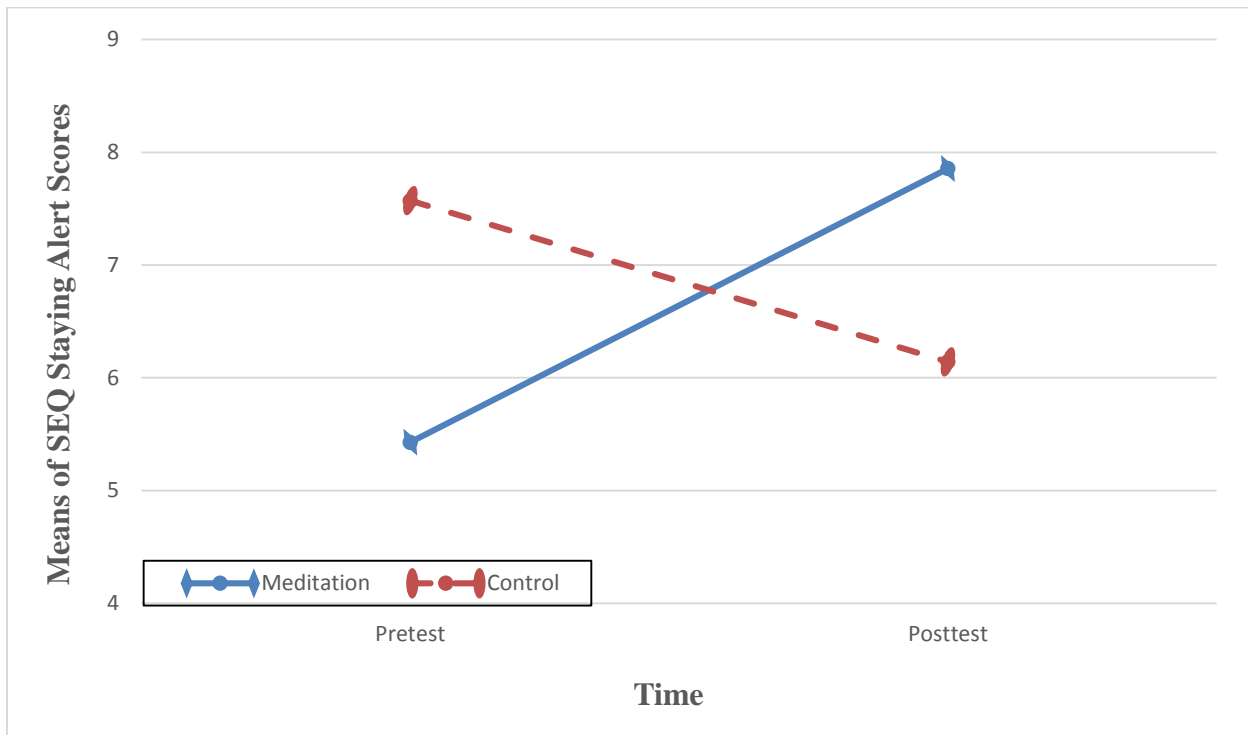


Figure 15: Means of SEQ scores for Handling Stressful Situations at Times Pretest and Posttest for groups Meditation and Control. The main effect of Time was not significant however the main effect for group showed a strong trend toward significance.

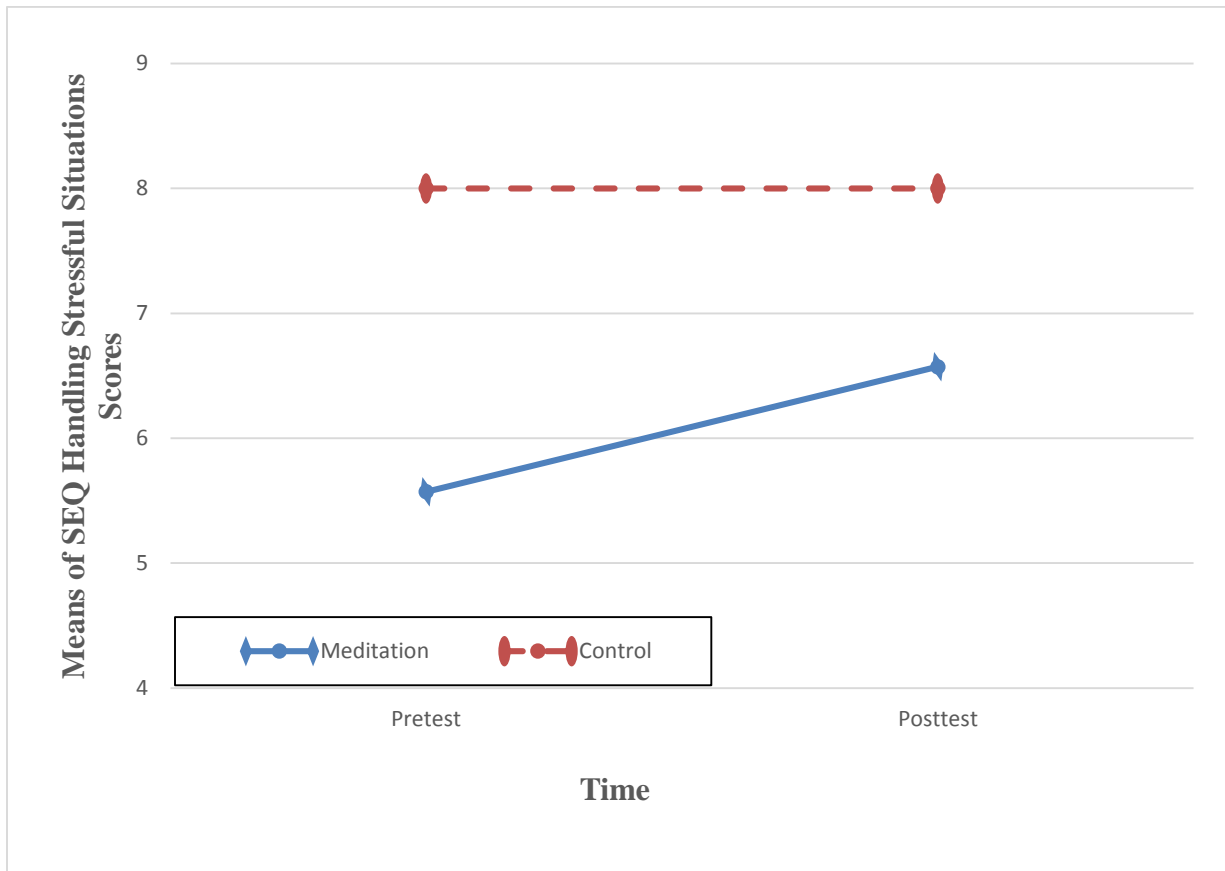


Figure 16: Means of SOFI scores for Negative Self at Pretest and Posttest for groups Meditation and Control. The interaction of Time \times Group was significant. Post-hoc analysis indicates that the neither the Meditation group scores nor Control group scores differed significantly. The main effect of Time was not significant.

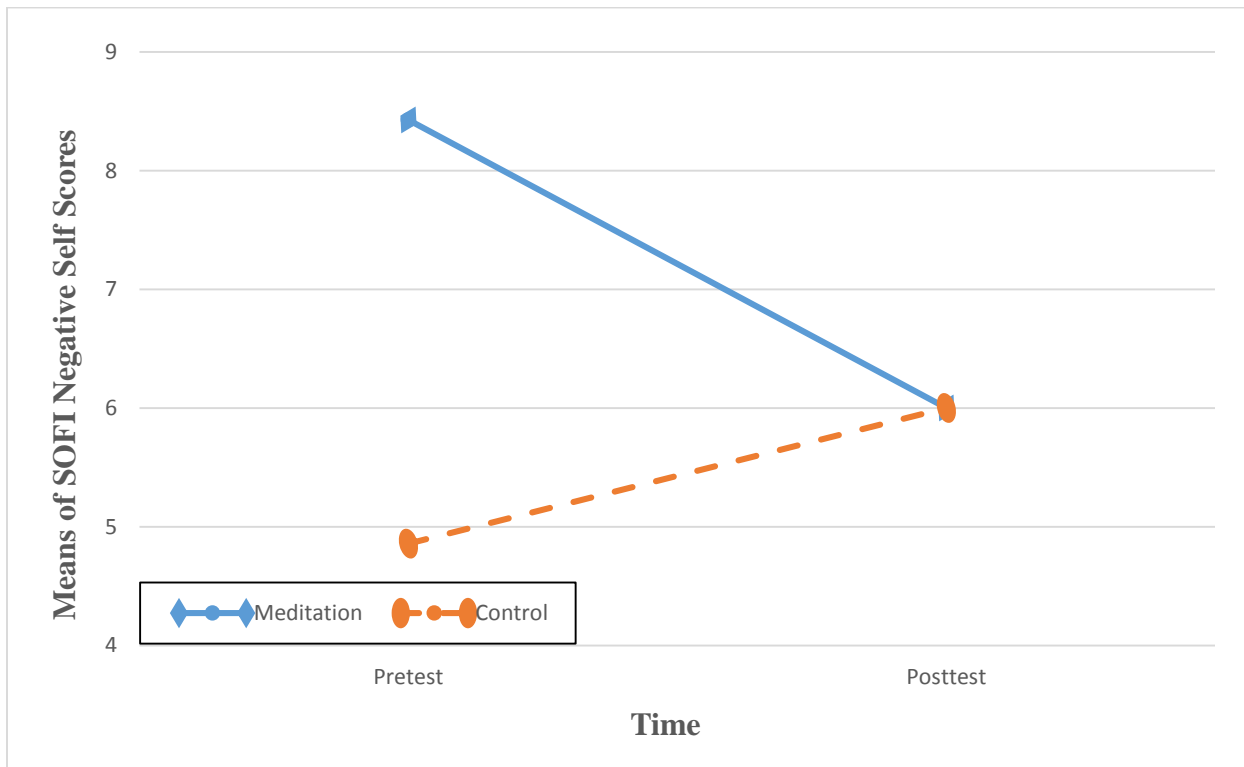
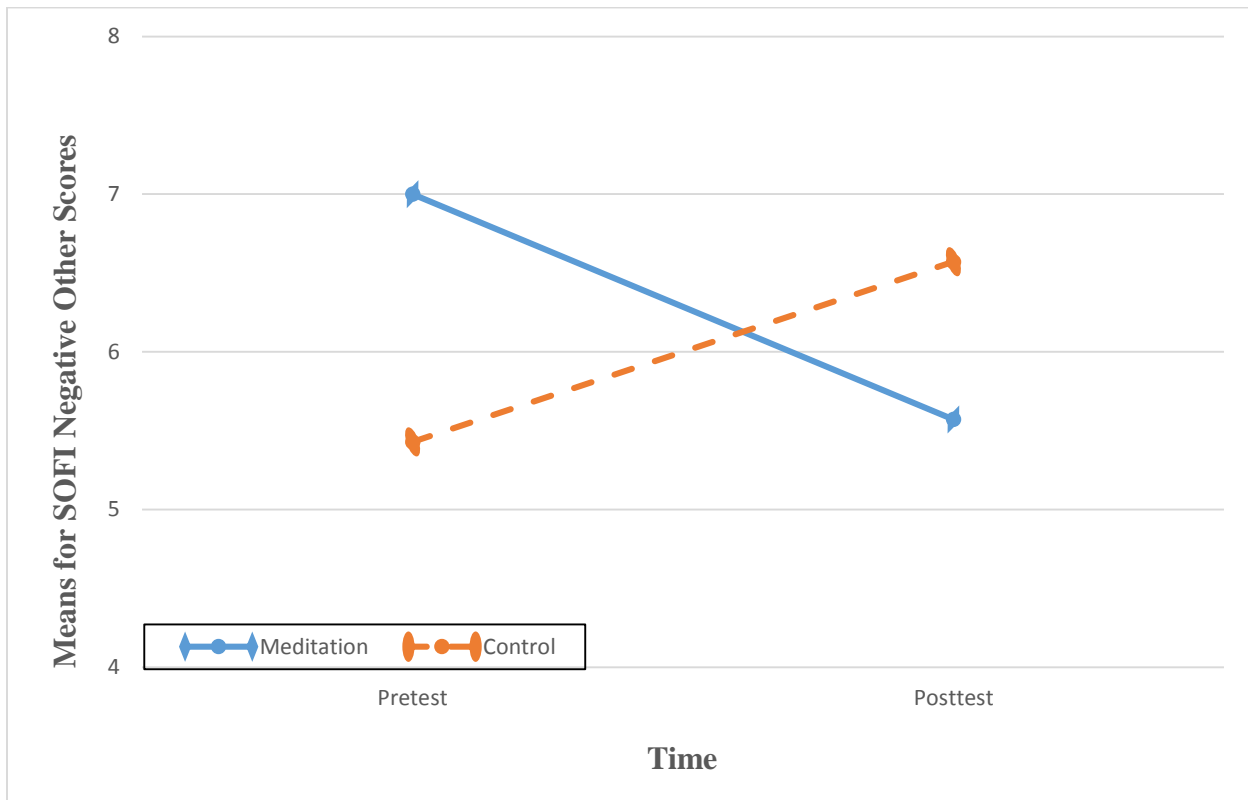


Figure 17: Means of SOFI scores for Negative Other at Times Pretest and Posttest for the groups Meditation and Control. The main effect of Time was not significant. However, the interaction of Time \times Group showed a suggestive trend toward significant. Post-hoc analysis indicates a favorable trend in the Meditation group scores and no significant trend in the Control group.



B AAQ-II**AAQ-II**

Below you will find a list of statements. Please rate how true each statement is for you by circling a number next to it. Use the scale below to make your choice.

1	2	3	4	5	6	7
never true	very seldom true	seldom true	sometimes true	frequently true	almost always true	always true

1. My painful experiences and memories make it difficult for me to live a life that I would value.	1	2	3	4	5	6	7
2. I'm afraid of my feelings.	1	2	3	4	5	6	7
3. I worry about not being able to control my worries and feelings.	1	2	3	4	5	6	7
4. My painful memories prevent me from having a fulfilling life.	1	2	3	4	5	6	7
5. Emotions cause problems in my life.	1	2	3	4	5	6	7
6. It seems like most people are handling their lives better than I am.	1	2	3	4	5	6	7
7. Worries get in the way of my success.	1	2	3	4	5	6	7

C FFMQ

5-FACET M QUESTIONNAIRE

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.

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

- ____ 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.

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

____ 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.

D BFI**BFI**

Here are a number of characteristics that may or may not apply to you. For example, do you agree that you are someone who likes to spend time with others? Please write a number next to each statement to indicate the extent to which you agree or disagree with that statement.

Disagree strongly 1	Disagree a little 2	Neither agree nor disagree 3	Agree a little 4	Agree Strongly 5
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I see Myself as Someone Who...

- | | |
|---|--|
| <p>___ 1. Is talkative</p> <p>___ 2. Tends to find fault with others</p> <p>___ 3. Does a thorough job</p> <p>___ 4. Is depressed, blue</p> <p>___ 5. Is original, comes up with new ideas</p> <p>___ 6. Is reserved</p> <p>___ 7. Is helpful and unselfish with others</p> <p>___ 8. Can be somewhat careless</p> <p>___ 9. Is relaxed, handles stress well</p> <p>___ 10. Is curious about many different things</p> <p>___ 11. Is full of energy</p> <p>___ 12. Starts quarrels with others</p> <p>___ 13. Is a reliable worker</p> <p>___ 14. Can be tense</p> <p>___ 15. Is ingenious, a deep thinker</p> <p>___ 16. Generates a lot of enthusiasm</p> <p>___ 17. Has a forgiving nature</p> <p>___ 18. Tends to be disorganized</p> <p>___ 19. Worries a lot</p> <p>___ 20. Has an active imagination</p> <p>___ 21. Tends to be quiet</p> <p>___ 22. Is generally trusting</p> | <p>___ 23. Tends to be lazy</p> <p>___ 24. Is emotionally stable, not easily upset</p> <p>___ 25. Is inventive</p> <p>___ 26. Has an assertive personality</p> <p>___ 27. Can be cold and aloof</p> <p>___ 28. Perseveres until the task is finished</p> <p>___ 29. Can be moody</p> <p>___ 30. Values artistic, aesthetic experiences</p> <p>___ 31. Is sometimes shy, inhibited</p> <p>___ 32. Is considerate and kind to almost everyone</p> <p>___ 33. Does things efficiently</p> <p>___ 34. Remains calm in tense situations</p> <p>___ 35. Prefers work that is routine</p> <p>___ 36. Is outgoing, sociable</p> <p>___ 37. Is sometimes rude to others</p> <p>___ 38. Makes plans and follows through with them</p> <p>___ 39. Gets nervous easily</p> <p>___ 40. Likes to reflect, play with ideas</p> <p>___ 41. Has few artistic interests</p> <p>___ 42. Likes to cooperate with others</p> <p>___ 43. Is easily distracted</p> <p>___ 44. Is sophisticated in art, music, or literature</p> |
|---|--|

E SEQ

In the last two weeks, about how often have you experienced the following?											
	Not at all						All the time				
<i>Negative Stress</i>	0	1	2	3	4	5	6	7	8	9	10
<i>Positive Stress</i>	0	1	2	3	4	5	6	7	8	9	10
<i>Anger</i>	0	1	2	3	4	5	6	7	8	9	10
<i>Love</i>	0	1	2	3	4	5	6	7	8	9	10
<i>Joy</i>	0	1	2	3	4	5	6	7	8	9	10
<i>Sadness</i>	0	1	2	3	4	5	6	7	8	9	10
<i>Fear</i>	0	1	2	3	4	5	6	7	8	9	10
<i>Surprise</i>	0	1	2	3	4	5	6	7	8	9	10
<i>Numbness</i>	0	1	2	3	4	5	6	7	8	9	10
<i>Contentment</i>	0	1	2	3	4	5	6	7	8	9	10
<i>Frustration</i>	0	1	2	3	4	5	6	7	8	9	10
<i>Loneliness</i>	0	1	2	3	4	5	6	7	8	9	10
<i>Guilt/Shame</i>	0	1	2	3	4	5	6	7	8	9	10

In the last two weeks, how effective would you say you have been at doing the following?											
	Not Effective						Very Effective				
<i>Handling stressful situations</i>	0	1	2	3	4	5	6	7	8	9	10
<i>Dealing with annoying people</i>	0	1	2	3	4	5	6	7	8	9	10
<i>Controlling my emotions</i>	0	1	2	3	4	5	6	7	8	9	10
<i>Controlling my behaviors</i>	0	1	2	3	4	5	6	7	8	9	10
<i>Concentrating</i>	0	1	2	3	4	5	6	7	8	9	10
<i>Being able to relax</i>	0	1	2	3	4	5	6	7	8	9	10
<i>Staying alert</i>	0	1	2	3	4	5	6	7	8	9	10
<i>Tolerating when I make mistakes</i>	0	1	2	3	4	5	6	7	8	9	10
<i>Tolerating with others make mistakes</i>	0	1	2	3	4	5	6	7	8	9	10
<i>Trusting that I am physically safe with other people</i>	0	1	2	3	4	5	6	7	8	9	10
<i>Trusting other people with my thoughts and emotions</i>	0	1	2	3	4	5	6	7	8	9	10

F SOFI

	Very slightly or not at all	A little	Moderately	Quite a bit	Extremely
Friendly—toward myself	1	2	3	4	5
Friendly—toward others	1	2	3	4	5
Hateful—toward myself	1	2	3	4	5
Hateful—toward others	1	2	3	4	5
Angry—with myself	1	2	3	4	5
Angry—with others	1	2	3	4	5
Joyful—for myself	1	2	3	4	5
Joyful—for others	1	2	3	4	5
Accepting—toward myself	1	2	3	4	5
Accepting—toward others	1	2	3	4	5
Cruel—toward myself	1	2	3	4	5
Cruel—toward others	1	2	3	4	5
Compassionate—toward myself	1	2	3	4	5
Compassionate—toward others	1	2	3	4	5
Mean—toward myself	1	2	3	4	5
Mean—toward others	1	2	3	4	5

This scale consists of a number of words that describe different thoughts, feelings, and behaviors. Read each item and then circle the appropriate answer next to that word

Indicate to what extent you have thought, felt, or acted this way toward yourself and others *during the past WEEK*