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The Effectiveness of a Mindfulness-Based Intervention: A Neuropsychological Perspective using an Electroencephalography

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Abstract

In recent years, there has been a significant increase in mindfulness-related techniques. The willingness to experience emotions fully, just as they are, is a catalyst for psychological change to occur. Mindfulness has been used to alleviate stress and promote healthy living (Lagopoulos et al., 2009). The clinical utility of mindfulness has grown exponentially; however, the neuropsychological process of mindfulness is still being understood. The present study sought to examine the influence of a brief mindfulness intervention on brain activation in college students. A sample (n = 17) of undergraduate participants were randomly assigned into a pre-post mindfulness intervention or control group. Both groups received neurophysiological measures: Electroencephalogram (EEG), Electrocardiogram (EKG), and Galvanic Skin Response (GSR/EDA Electrodermal Activity), and self-report measures: Adverse Childhood Experiences (ACEs), Patient Health Questionnaire, Ninth Edition (PHQ-9), and Five Facet Mindfulness Questionnaire (FFMQ). Participants in the intervention group completed daily, independent

mindfulness practices via phone application (Headspace; developed by Puddicombe & Pierson, 2010) in conjunction with weekly mindfulness group meetings for 4 weeks. The control group met and watched TED talk videos for an equivalent frequency and duration. ACEs was used as a covariate. There were no statistically significant findings for the EEG results, likely due to the small sample size. Analysis of effect sizes indicate the intervention group experienced reduced activation in emotional reactivity of the limbic system post-intervention. Furthermore, there were frontal lobe responses showing a reduction in negative emotions aroused by the stimulus task. Results of self-report measures from the PHQ-9 and FFMQ did not produce an interaction or main effect. However, analysis of the FFMQ subscales indicated that both groups demonstrated improvement in the non-reactivity and non-judging domains of the FFMQ. Limitations and recommendations for future research are discussed.

Keywords: Mindfulness, Meditation, Neuropsychology, Electroencephalography (EEG), Relaxation, Stress, Emotional regulation.

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Chapter 1

Introduction

Defining Mindfulness

Emotional differentiation refers to an individual's ability to distinguish between different forms of affective experience (Barrett, Gross, Christensen, & Benvenuto, 2001). Individuals with affective clinical disorders, such as major depressive disorder (Demiralp et al., 2012), exhibit less emotional differentiation when compared to psychologically healthy individuals (Van der Gucht et al., 2019). Emotional differentiation skills aid in modifying negative emotions and stressful experiences and is an "essential component of the emotion regulation process" (Van der Gucht et al., p. 124).

Individuals who demonstrate emotional awareness are not as inclined to resort to maladaptive self-regulation techniques, such as excessive alcohol use (Kashdan, Ferssizidis, Collins, & Muraven, 2010), aggression (Pond et al., 2012), or self-injurious behavior (Zaki, Coifman, Rafaeli, Berenson, & Downey, 2013), and they show less neural reactivity to rejection (Kashdan et al., 2014). Despite emotional differentiation being a crucial component to psychological health, there is insufficient research regarding interventions that cultivate emotional awareness (Van der Gucht et al., 2019). It is possible that simply "acknowledging what is actually going on instead of dwelling on what 'should' be happening is all that is needed to transform our experience" (Williams, Teasdale, Segal, & Kabat-Zinn, 2007, p. 189). This emphasis on directing attention towards reality is foundational to mindfulness practice.

Mindfulness is an Eastern tradition that has emerged as an evidenced-based practice in clinical treatment modalities including Dialectical Behavior Therapy (DBT; Linehan, Armstrong, Suarez, Allmon, & Heard, 1991) and Mindfulness-Based Stress Reduction (MBSR; Kabat-Zinn, 2003). One of the most common definitions of mindfulness is ‘‘awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmentally to the unfolding of experience moment by moment’’ (Kabat-Zinn, 2003, p. 145). Mindfulness-based interventions are implemented to train individuals to notice and radically accept their dynamic psychological states while minimizing attempts to modify them. The ability to sit with discomfort openly, and resist mitigating aversive emotional states is counter to Western culture; however, the clinical utility of mindfulness has grown exponentially.

Foundational components of mindfulness emphasize awareness, self-compassion, acceptance, and a non-judgmental stance. These factors may aid in emotional regulation and insight. Mindfulness practices have been used to promote physical health and psychological well-being, including the treatment for chronic pain and mood disorders such as anxiety and depression (Kabat-Zinn, 1990; Lutz, Jha, Dunne, & Saron, 2015; Segal, Williams, & Teasdale, 2002).

In recent years, there has been a significant increase in the use of meditation and mindfulness-related relaxation techniques to alleviate stress and promote healthy living (Lagopoulos, 2009). Mindfulness is understood to be both a trainable skill and a dispositional variable that can be measured with self-report questionnaires (Gawrysiak et al., 2018). Wong et al. (2018) found that the combination of behavioral activation and mindfulness performed well in the prevention of major depressive disorder (MDD) in a primary care population. Specifically,

the occurrence of MDD was less than half in the mindfulness group when compared to the control (Wong et al., 2018).

Neurological Aspects of Mindfulness and Down Regulation

Self-report measures offer valuable insight into an individual's self-perception of change and growth. However, self-report measures rely on subjective responses and thus may be sensitive to demand characteristics or impression management. In contrast, neuropsychological measures rely on objective data to explore the relationship between behavior, cognition, emotion, and neurological functions.

An electroencephalogram (EEG) is an instrument commonly used in neuropsychological research that detects electrical activity in the brain. Information obtained from an EEG removes participant subjectivity and promotes unbiased research data. Despite recent mindfulness popularity, research about the "neural mechanisms by which meditation works" is scarce, and "there is a need for more rigorous investigations of the underlying neurobiology" (Lagopoulos, 2009, p. 1187). Howells, Ives-Deliperi, Horn, and Stein (2012) implemented mindfulness based cognitive therapy and found an improvement in frontal lobe control in a sample of bipolar patients. The study was measured using an EEG. Specifically, Howells et al. discovered an increase in "anterior and frontal midline theta," which has been positively correlated with "internalized attention and positive emotional state" (p. 6). In another EEG study researching the effectiveness of non-directive mediation, Lagopoulos et al. (2009) found that meditation techniques, which are "perhaps similar to methods based on mindfulness or concentration", alter theta and alpha EEG patterns "significantly more" than regular relaxation techniques (p. 1187).

In an fMRI study, Farb et al. (2010) found that mindfulness practitioners engaging in a "metacognitive focus" exhibited "sensory representations in the insula and secondary somatosensory cortices" (p. 26). Furthermore, "Neuroimaging results are beginning to demonstrate some consistency of localization for meditation practice; frontal and prefrontal areas are shown to be relatively activated" (Cahn & Polich, 2013, p. 79).

A considerable body of research supports the idea that meditative training can mitigate the effects of anxiety and stress on psychological and physiological functioning. The functional plasticity of the central nervous system (CNS) affords "significant neurophysiological state changes that may evolve into trait effects secondary to the long hours of practice, stylized attentional deployment, reframing of cognitive context, and emotional regulation involved in meditative training" (Davidson, 2000, as cited in Cahn & Polich, 2013, p. 80).

Factors Affecting the Management of Stress

There are a multitude of factors that influence an individual's ability to manage psychological and physiological stress. One particularly salient risk factor is the number of adverse childhood experiences (ACEs) that an individual reports. Felitti et al. (1998) found that the impact of adverse childhood experiences on adult health status is "strong and cumulative", including elevated risk factors for "several of the leading causes of death in adults" (p. 251). Specifically, those who have experienced ACEs utilize health care at a higher rate (Chartier, Walker, & Naimark, 2010), yet experience poor adult health (Stringe et al., 2012). Furthermore, these individuals are more likely to develop posttraumatic stress disorder (Kaess et al., 2012), engage in non-suicidal self-injury, and experience higher rates of psychological distress and adult substance use problems (Walling, Eriksson, Putman, & Foy, 2011). Childhood trauma has

also been linked to clinical disorders including depression and anxiety (Spinazzola et al., 2014). Thus, the number of ACEs experienced by an individual is likely to influence their ability to acquire mindfulness skills to promote physiological down-regulation and/or coping skills to manage perceived stress.

Social Support as Protective Factor for Managing Stress

In contrast to the risk associated with ACEs, research has shown that social support is a powerful mediator that can promote physiological down regulation and the perception of a challenging task. There has been a recent emphasis regarding social support as a protective factor for health risk. Research has suggested that social support systems are strongly connected to mental and physical health (House, Landis, & Umberson, 1988, as cited in Haber, Cohen, Lucas, & Baltes, 2007). As stress activates physiological responses, including the sympathetic nervous system and the hypothalamic-pituitary-adrenocortical axis (Cohen, Kessler, & Gordon, 1995 as cited in Cohen, 2004), social support can mitigate these physiological responses and lessen perceived stress.

Notably, in two samples of students and adults, participants reported an increase in symptoms of depression and physical illness within the context of stress, but these findings were limited among those who viewed support from their social networks as available (Cohen, Mermelstein, Kamarck, & Hoberman, 1985 as cited in Cohen, 2004).

The Present Study

This study intended to answer the following questions: what areas in the brain show changes in activation levels following a mindfulness intervention, and are similar changes evident in self-report of mindfulness skills and/or mood as measured by the Five-Facet

Mindfulness Questionnaire (FFMQ) and the Patient Health Questionnaire Ninth Edition (PHQ-9). The independent variables included the mindfulness intervention and time. The dependent variables were objective neurophysiological measurements, including an Electroencephalography (EEG; 10 channels), Electrocardiogram (ECG), and Galvanic Skin Response (GSR/EDA Electrodermal Activity) and scores on the self-report measures of the FFMQ and the PHQ-9. This study aimed to address the following hypotheses:

H1: There will be a significant three-way interaction between group assignment (intervention vs. control) and time (pre-test vs. post-test) and ten channels, for changes in EEG mean power when engaged with the five levels of stimuli. This study focused on the channels that are most salient for gathering data on emotion and emotional control (T3, T4, FP1 and FP2).

H1a: The participants in the intervention group will demonstrate lower, bilateral mean power levels for the five levels of stimuli (simple, medium and difficult puzzle) in the insula located in the temporal regions of the limbic system as measured by T3 and T4 mean power scores when compared to the control group between Time 1 (pre-assessment) and Time 2 (post-assessment).

H1b: The participants in the intervention group will demonstrate reduced levels of negative emotion when responding to arousing stimuli as measured by the FP1 and FP2 scores when compared to the control group between Time 1 (pre-assessment) and Time 2 (post-assessment).

H2: The participants in both the intervention and the control groups will show improvement over time on the self-report measures of the Five-Facet Mindfulness Questionnaire (FFMQ) and Patient Health Questionnaire-9 (PHQ-9).

H3: There will be a significant interaction between intervention group and time with the intervention group showing significantly greater improvement than the control group on the self-report measures

Chapter 2

Method

Participants

Participants were recruited through undergraduate psychology courses to voluntarily participate in the study. All participants were full-time, traditional students at a private University. The sample included 17 participants in the study, with full retention. Exclusionary criteria included involvement in simulated psychotherapy. The participants (n = 17; age range 18-21, M = 18.76) included 13 females, 4 males. Participants were numbered and randomly assigned to either the experimental (n = 9) or control (n = 8) condition by an online system that determined random allocation. Results confirmed demographic equivalence between groups. The study was approved by the University Human Subjects Research Committee on February 14, 2018.

Design

This study employed a repeated measure, mixed-methods experimental design.

Materials

The pre-intervention measures included an informed consent for research participants (Appendix A), demographic questionnaire (Appendix B), Adverse Childhood Experiences (ACEs; Appendix C), Patient Health Questionnaire, Ninth Edition (PHQ-9; Appendix D), and Five Facet Mindfulness Questionnaire (FFMQ; Appendix E) and neurophysiological measures, including Electroencephalogram (EEG), Electrocardiogram

(EKG), and Galvanic Skin Response (GSR/EDA Electrodermal Activity). The post-intervention measures were the same as pre-intervention, except for the consent, demographic questionnaire, and ACEs questionnaire. Once the study was completed, participants received compensation for their participation in the form of a $50.00 VISA gift card funded by the Paul K. and Evelyn E.C. Richter Memorial Fund.

Mindfulness Intervention. The 30-minute mindfulness intervention included the use of a 10-minute relaxation application through iTunes (Headspace; developed by Puddicombe & Pierson, 2010) and questions regarding experience of the mindfulness exercise.

Stimulus. The stimulus included two aspects. The first utilized a computer screen to show a restful image before and after the challenging task, and the second involved paper and pencil to complete the Sudoku puzzles. The sequence was as follows: (a) Printed instructions were given to the participant to prepare for the primary measure, (b) participants viewed a rest screen (image of a mountain with a lake) that was timed to 5 minutes (Rest 1), (c) participants completed a simple cognitive puzzle (Sudoku) that was timed to 5 minutes, (d) followed by a moderate cognitive puzzle (Sudoku) was timed to 5 minutes (e) and an expert cognitive puzzle (Sudoku) which was also timed to 5 minutes, and (f) a final viewing of the identical rest screen was timed to 5 minutes (Rest 2). During the second EEG administration, post-intervention participants were provided a prompt to "use whatever mindfulness skills you might have learned."

Physiological Measures. All physiological measurements were gathered in the neurocognitive lab of a graduate school in clinical psychology in a private University. The equipment included: Encephalography (EEG), Electrocardiogram (ECG), and Galvanic Skin

Response (GSR/EDA Electrodermal Activity). The data were acquired using the Biopac Data acquisition system (http://www.biopac.com/data-acquisition-analysis-system-mp150-system). The system was set with a high pass of .5 hertz and a low pass of 35 hertz with a sample rate of 1000/sec and acquisition length at 3,600 at 2,000 gain.

A 24-channel electrode cap was applied to each participant during the recordings. Two gold ear clips were used for reference grounds. Silver GSR electrodes were attached to the second and third fingers of the participant's non-dominant hand. Electrode gel was pre-applied on the adhesive of the GSR and ECT electrodes. Electrode gel was applied to the scalp with a blunt syringe on the following 10 channel electrodes: FP1, FP2, F3, F4, T3, T4, P3, P4, C3, C4. The channel locations were chosen based on the literature cited for regional activation and anxiety in the brain (Farb et al., 2007; Cahn & Polich, 2013).

Acqknowledge, loaded on a PC computer, was used to follow and record the physiological measures. The researcher was seated behind the participant with direct sight of the second computer screen on which the visual stimulus is presented to the participant. During the measurement, the researcher completed an event record form (Appendix F) to note when each sequence occurred as well as any auditory or visual interruptions.

Self-Report Measures. The Adverse Childhood Experiences (ACEs; Felitti et al., 1998) is a survey designed to assess adverse childhood experiences. It includes 10 categories of possible adverse experiences, including: psychological, physical or sexual abuse, violence against mother, living with household members who were substance abusers, mentally ill, or ever imprisoned. Each category includes associated questions on the survey, for a total of 10 questions. Options for yes or no are given on the survey. If a participant endorses an item, it is

added to that category of experiencing an Adverse Childhood Experience. The test-retest reliability statistics from the ACEs study demonstrate sufficient reliability in reports during adulthood (Dube, Williamson, Thompson, Felitti, & Anda, 2004). See Appendix C.

The Five Facet Mindfulness Questionnaire (FFMQ; Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006) is a 39-item self-report measure used to assess mindfulness in daily life (Christopher, Neuser, Michael, & Baitmangalkar, 2012). The five facets include: "Observing – the process of noticing or attending to mental or physical experiences; describing – the use of language to label one's internal experiences; acting with awareness – the ability to attend to one's present activities; non-judging – the use of a non-evaluative point of view toward one's thoughts and feelings; and non-reacting –the ability to let thoughts and feelings come and go without becoming entangled in them" (Raphiphatthana, Jose, & Salmon, 2018, p. 77).

The individual five factors on the FFMQ have demonstrated sufficient internal consistency, with values ranging from 0.75 (Nonreactivity) to 0.91 (Describing; Christopher et al., 2012). Between factor correlations were statistically significant and ranged from 0.15 to 0.34 (Christopher et al., 2012). Overall, the FFMQ has demonstrated internal consistency, with Cronbach alpha ranging from 0.86 to 0.93 (Christopher et al., 2012). See Appendix E.

The Patient Health Questionnaire, Ninth Edition (PHQ-9; Spitzer, Williams, & Kroenke, 1999) is a brief, 9-item screener for symptoms of depression over the past two weeks, and takes a few minutes to complete (Kroenke, Spitzer, & Williams, 2001). PHQ-9 scores of 5, 10, 15, and 20 represent mild, moderate, moderately severe, and severe depression, respectively (Kroenke et al.). PHQ-9 scores >10 had a sensitivity of 88% and a specificity of 88% for Major Depressive Disorder (Kroenke et al., 2001). The PHQ-9 has been found to have strong test-retest reliability

(0.84; Kroenke et al., 2001). Furthermore, the PHQ-9 has demonstrated sound internal reliability (Cronbach's alpha = 0.89 and 0.86; Kroenke et al., 2001). See Appendix D.

Procedure

Permission from an undergraduate university professor was obtained to invite students to participate in the study. Participants were recruited via a brief presentation regarding an overview and purpose of the study, and flyers were provided for additional information. Participants were given the opportunity to voluntarily sign up following the presentation. Interested students contacted the primary researcher via email to schedule pre-intervention measurements. In the first session, a research assistant met with students in small groups to complete informed consent for research participants (Appendix A), demographic questionnaire (Appendix B), Adverse Childhood Experiences (ACEs; Appendix C), Patient Health Questionnaire, Ninth Edition (PHQ-9; Appendix D), and Five Facet Mindfulness Questionnaire (FFMQ; Appendix E).

Prior to initiating the EEG administration for participants, researchers set up the lab for testing. This included posting a "Quiet please, testing in progress" sign outside the lab door, preparing the computers, and setting up the instruction and sudoku paperwork in ascending order: simple, moderate, expert. The participants spent a total of approximately 45-60 minutes in the lab for each measurement period (pre and post intervention).

The participants were introduced to the application of the physiological electrodes, and research assistants began the process of applying the EEG cap, EKG patches, and GSR patches. See Appendix F.

The participants were seated in a comfortable chair facing the computer screen, approximately 250cm from the screen. This measurement session provided data points of mean power of the 10 EEG channels and GSR microsiemens (sweat) from the skin. The initial stimulus was presented on a computer screen using PowerPoint software. The participant was directed towards printed instructions for the sudoku puzzles on a sheet of paper on the table directly in front of them. They were provided an opportunity to ask questions and receive answers regarding the task. Following the initial stimulus on the computer, the participant was instructed to complete the three sudoku puzzles, followed by a final rest phase via PowerPoint.

Participant confidentiality was maintained by meeting the participant in the neurocognitive lab of the graduate school for the neurophysiological measures. The data for the recordings was kept on password protected computers and a password protected flash drive within a locked lab room. All participants were given an ID code used for all folders on the computers with data and all questionnaires.

Participants completed a 6-week study in which they were randomly assigned to an intervention (n = 9) or control group (n = 8). Both groups spent the 1st and 6th week of the study in pre-post data collection. The intervention group received a brief, 4-week, 30-minute, mindfulness intervention using a ten-minute relaxation phone application (Headspace; developed by Puddicombe & Pierson, 2010). In addition, they met each of the four weeks for 30 minutes to discuss and participate in mindfulness meditation as a group. As a validity check, students sent a weekly confirmation of their independent participation to the research assistant, who tracked the information in an excel document. The control group met each of the four weeks for 30 minutes

to watch and discuss a TED talk as a group. To control for researcher bias, both the intervention and control group meetings were led by a trained research assistant.

Control of Confounding Variables

Multiple environmental variables were potential confounds in the present study and therefore additional steps were taken in order to control for extraneous effects. All physiological measurements included an additional hand-recorded document to note any anomalies (i.e., loud sounds from outside of the lab room) during testing.

Data Analysis

The research question explored whether participants experienced changes in neurophysiological activity after receiving a mindfulness intervention. This was measured via mean power (EEG). Additionally, the research explored whether the mindfulness intervention would have a similar effect on self-report measures. Given these questions, a repeated measures MANCOVA was used to analyze the data.

Chapter 3

Results

Findings

Given the relationship between Adverse Childhood Experiences (ACEs) and physiological arousal, ACEs scores could confound the differences between groups on the dependent measures. A Levene's test confirmed there were significant differences between the groups on the number of ACEs ($F(1,15) = 14.00$, $p = .002$). Therefore, the subsequent analyses included ACEs scores as a covariate. This allowed us to analyze the results without the confound of the variance between the groups. The demographic data between groups were equivalent as were their pre-test scores on the self-report measures. The results of the study are reported below beginning with the results of the ACEs covariate analysis, followed by Hypotheses 1, 2, and 3.

Hypothesis 1. The first hypothesis explored the impact of the intervention on physiological arousal. We predicted there would be a statistically significant 3-way interaction between time, channel and group on physiological measures assessed during the five phases of the stimulus. This hypothesis was partially supported due to the lack of effect for group on changes in mean power at pre-post, different channels, and stimulus task levels.

A 2x10x5x2 repeated measures MANCOVA was used to test the interaction between time and the mindfulness intervention on physiological arousal as measured by changes on the ten EEG channels (FP1, FP2, F3, F4, T3, T4, P3, P4, C3, C4), during the five-phase stimulus arousal using a sudoku puzzle (pre-rest, puzzle 1, puzzle 2, puzzle 3, and post-rest).

Using a MANCOVA, follow up analysis showed that no main effect for group occurred ($F(1,14) = .199$, $p > .05$, eta = .014). Furthermore, there was no main effect for time ($F(1,14) = .002$, $p > .04$, eta = .00), and no main effect for phases ($F(4,56) = 3.067$, $p = .063$, eta = .527). There was a main effect for channels ($F(9,126) = 29.816$, $p = .0001$, eta = .680). Means can be found in Table 1. Part of this large effect size is due to the natural mean power range of FP1 and FP2 compared to the other eight channels. Further analyses were conducted to evaluate FP1 and FP2 alone, and T3 and T4 alone.

Table 1

EEG Mean Power (Channels X Phases)

Channel	Mean	*SD*
FFP1REST1	.0003598756	.0002902886
FFP1PUZ1	.0003403427	.0003667650
FFPIPUZ2	.0003258041	.0002416954
FFPIPUZ3	.0003428138	.0002013221
FFPIREST2	.0004392066	.0002957042
FFP2REST1	.0003400546	.0003325994
FFP2PUZ1	.0003014281	.0002724945
FFP2PUZ2	.0003572037	.0003313281
FFP2PUZ3	.0003585922	.0002289865
FFP2REST2	.0004305181	.0003435930
FF3REST1	.0001251985	.0001652130
FF3PUZ1	.0001610256	.0003130705
FF3PUZ2	.0001148124	.0000887044
FF3PUZ3	.0001186524	.0001529679
FF3REST2	.0001431986	.0001609628
FF4REST1	.0001262630	.0001625136
FF4PUZ1	.0001642386	.0003212182
FF4PUZ2	.0001132711	.0000904831
FF4PUZ3	.0001250476	.0001550816
FF4REST2	.0001677697	.0001816087
FT3REST1	.0000834883	.0001604985
FT3PUZ1	.0001462717	.0003599338

Table 1 *(continued)*

FT3PUZ2	.0000825480	.0001025096
FT3PUZ3	.0001132561	.0001753191
FT3REST2	.0001104873	.0001505196
FT4REST1	.0000864171	.0001594033
FT4PUZ1	.0001475001	.0003134002
FT4PUZ2	.0000950257	.0001077151
FT4PUZ3	.0001164601	.0001759947
FT4REST2	.0001182793	.0001584457
FP3REST1	.0000748526	.0001569560
FP3PUZ1	.0001033335	.0001784940
FP3PUZ2	.0000794523	.0000941058
FP3PUZ3	.0001135465	.0001710624
FP3REST2	.0001173573	.0001514536
FP4REST1	.0000895728	.0001711423
FP4RPUZ1	.0001542741	.0003642886
FP4PUZ2	.0000846844	.0001087038
FP4PUZ3	.0001150828	.0001800739
FP4REST2	.0001177395	.0001546513
FC3REST1	.0000910649	.0001722241
FC3PUZ1	.0001515215	.0003374570
FC3PUZ2	.0000896243	.0001096720
FC3PUZ3	.0001285327	.0001900436
FC3REST2	.0001232236	.0001612552
FC4REST1	.0000924909	.0001734763
FC4PUZ1	.0001588430	.0003694717
FC4PUZ2	.0000916951	.0001160424
FC4PUZ3	.0001262781	.0001933097
FC4REST2	.0001236892	.0001637313

Hypothesis 1a. Hypothesis 1a suggested that participants in the intervention group would demonstrate lower, bilateral mean power levels in the temporal regions of the insula of the limbic system, as measured by the T3 and T4 scores, when compared to the control group between Time 1 (pre-assessment) and Time 2 (post-assessment).

An initial MANCOVA exploring the 4-way dynamic between group, time, channel and phases was not significant. A MANCOVA for only T3 and T4 was used to analyze the

hypothesis that the mindfulness intervention would decrease the emotional reactivity of the limbic system when the participants were involved in a stimulating task such as the sudoku puzzles. There were no main effects and no significant interactions. This is common with EEG data and small *n* samples. Thus, the effect sizes were evaluated.

A large effect size (.297) occurred for the four way dynamic of time by channels by phases by group (F(4,56) = .1.163, p = .379, eta = .297). There was no main effect for group (F(1,14) = .008), p > .05, eta = .001). Furthermore, there was not an interaction between time and group (F(1,14) = 1.761, p = < .05, eta = .112).

Following the above analysis, a second MANCOVA exploring changes in T3 and T4 did not find a statistically significant interaction between group channels and phases (F(4,56) = .955, p = .469, eta = .258). However, results showed large effect size (.258). Furthermore, results indicated a very large effect size (.61) for time, channel and phases (F(9,60) = 23.27, p = .001, eta = .61; Table 1).

The final two analyses also failed to reach statistical significance, however, a large effect size (.240) occurred for phases and group (F(4,56) = .867, p = .514, eta = .240). Additionally, results showed very large effect size for phases (.509) indicating that there were differences in the T3 and T4 mean power across the different stimuli (F(4,56) = 2.85, p = .076, eta = .509). Taken together, the effect sizes indicate that with a larger sample, hypothesis 1a may reach statistical significance in those analyses failing to do so in the present study. See Figures 1 and 2.

Hypothesis 1b: Hypothesis 1b suggested that participants in the intervention group would demonstrate reduced levels of negative emotion when responding to arousing stimulus as

measured by the FP1 and FP2 mean scores while completing the 5-phase stimulus task when compared to the control group between Time 1 (pre-assessment) and Time 2 (post-assessment).

An initial MANCOVA exploring the 4-way dynamic between group, time, channel and stimulus phases was not significant ($F(4,56) = .691$, $p = .613$, eta = .201). However, there was a moderate effect size (.13) for time, channel, and phases ($F(36,504) = 2.08$, $p = <.001$, eta = .13). Additionally, there was a large effect size (.14) for channel and phase ($F(36,504) = 2.27$, $p = <$ .001, eta = .14). See Figure 3.

Hypothesis 2 and Hypothesis 3: Hypothesis 2 suggested participants in both the intervention and the control groups would demonstrate improvement over time on the self-report measures. Hypothesis 3 suggested there would be an interaction between time and group on mood, as measured by the self-report questionnaires.

A MANCOVA was utilized to determine if there was a significant difference between the intervention and control groups over time on the mindfulness and mood measures. Following a significant MANCOVA, we used the ANCOVA analyses to answer the specific hypotheses.

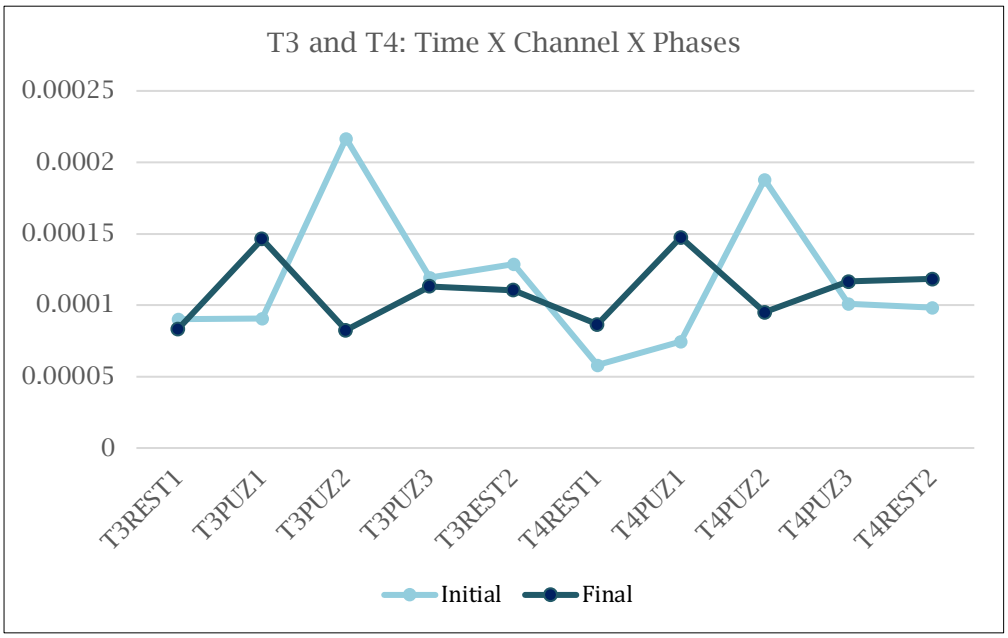

Figure 1. T3 and T4: Time X Channel X Phase.
Note. Data was multiplied by 100,000 in order to be analyzed by SPSS

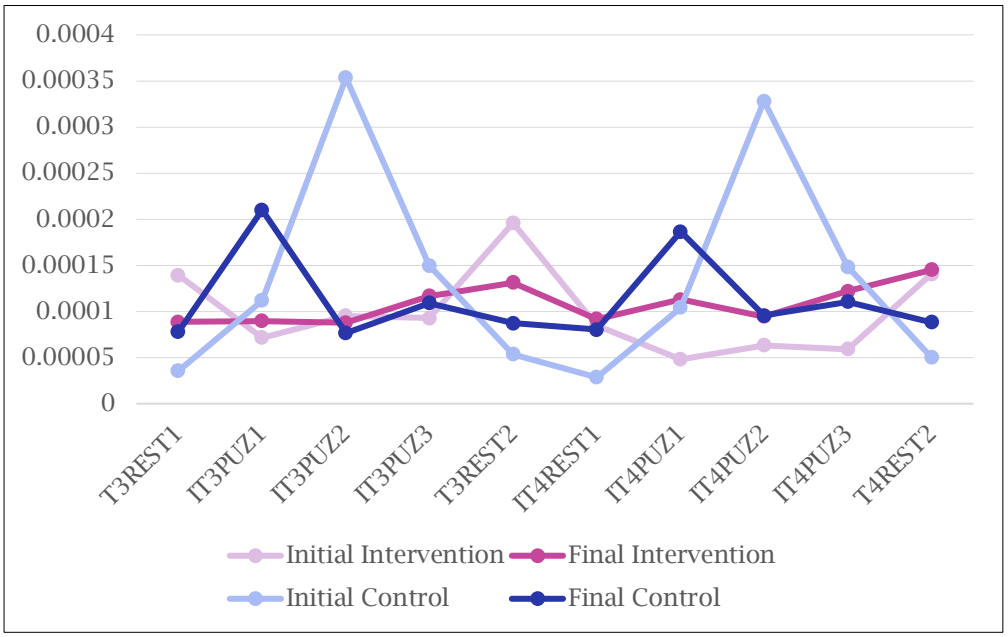

Figure 2. T3 and T4: Time X Channel X Phase X Group.
Note. Data was multiplied by 100,000 in order to be analyzed by SPSS

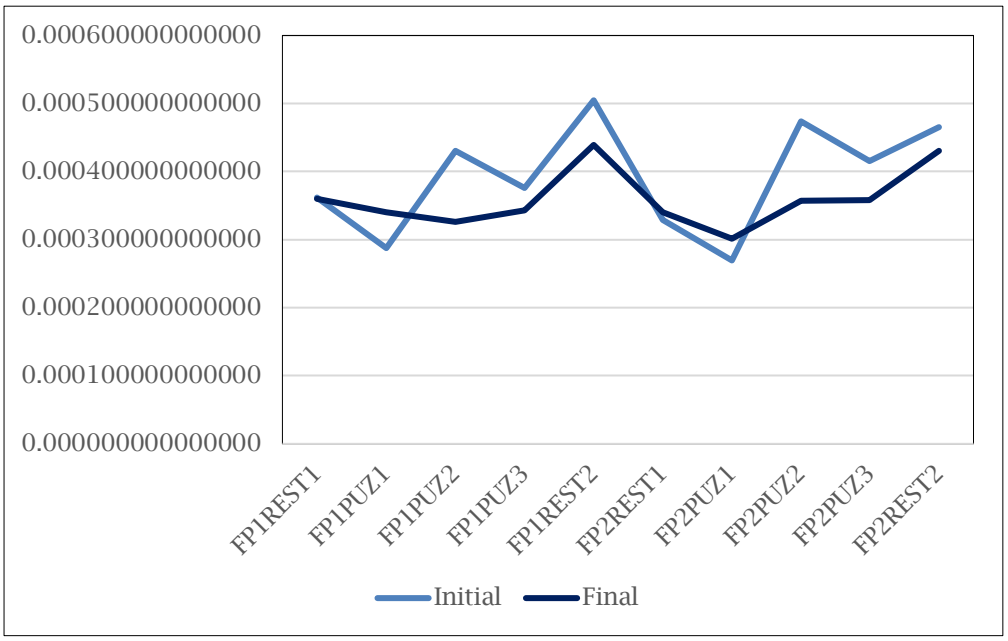

Figure 3. FP1 and FP2: Time X Channel X Phase.
Note. Data was multiplied by 100,000 in order to be analyzed by SPSS.

Results did not indicate significant changes or an interaction with respect to time or group, indicating there was not a significant impact on mood ($F(1,14) = .89$, $p = .36$).

Although there was no effect on mood, the results of the ANCOVA showed a main effect between T1 and T2 for both groups on two scales of the Five Facet Mindfulness Questionnaire (FFMQ), specifically non-judging and non-reactivity ($F(1,14) = 8.74$, $p = .01$; ($F(1,14) = 8.47$, $p = .01$). These results partially supported hypothesis 2 suggesting a main effect for time on the mindfulness scales, with two of the five subscales demonstrating changes over time.

The third hypothesis suggested that there would be a significant interaction between the intervention group and time, with the intervention group showing significantly greater improvement than the control group on the self-report measures: FFMQ and PHQ-9. The

analysis of the interaction between time and group on the FFMQ scales was not significant, therefore Hypothesis 3 was not supported. See Tables 2-5 and Figures 4-7.

Table 2

Five-Facet Mindfulness Questionnaire (FFMQ) Domain

Five-Facet Mindfulness Domain Total	Group	Pre		Post	
		Mean	*SD*	Mean	*SD*
	Treatment	126.00	16.492	140.44	10.899
	Control	126.13	26.150	129.25	24.230

Table 3

Five-Facet Mindfulness Questionnaire (FFMQ) Subtests

Five-Facet Mindfulness Subtest	Group	Pre		Post	
		Mean	*SD*	Mean	*SD*
Observing	Treatment	25.33	5.268	29.44	3.972
	Control	27.75	5.600	27.75	4.464
Describing	Treatment	28.00	5.568	32.89	3.621
	Control	27.88	7.259	28.75	8.311
Act with Awareness	Treatment	27.25	4.89	27.25	2.91
	Control	26.44	4.58	26.33	3.64
Non-judge	Treatment	26.11	5.578	28.44	4.876
	Control	22.88	6.978	25.88	8.132
Non-react	Treatment	20.11	4.755	23.33	3.122
	Control	20.38	7.409	19.63	5.012

Table 4

Patient Health Questionnaire -Ninth Edition (PHQ-9)

PHQ-9	Group	Pre		Post	
		Mean	*SD*	Mean	*SD*
	Treatment	6.33	4.444	3.67	2.500
	Control	6.63	4.565	6.13	3.871

Table 5

Adverse Childhood Experiences (ACEs)

ACE Total	Group	Mean	*SD*
	Treatment	2.11	2.57
	Control	.38	.51

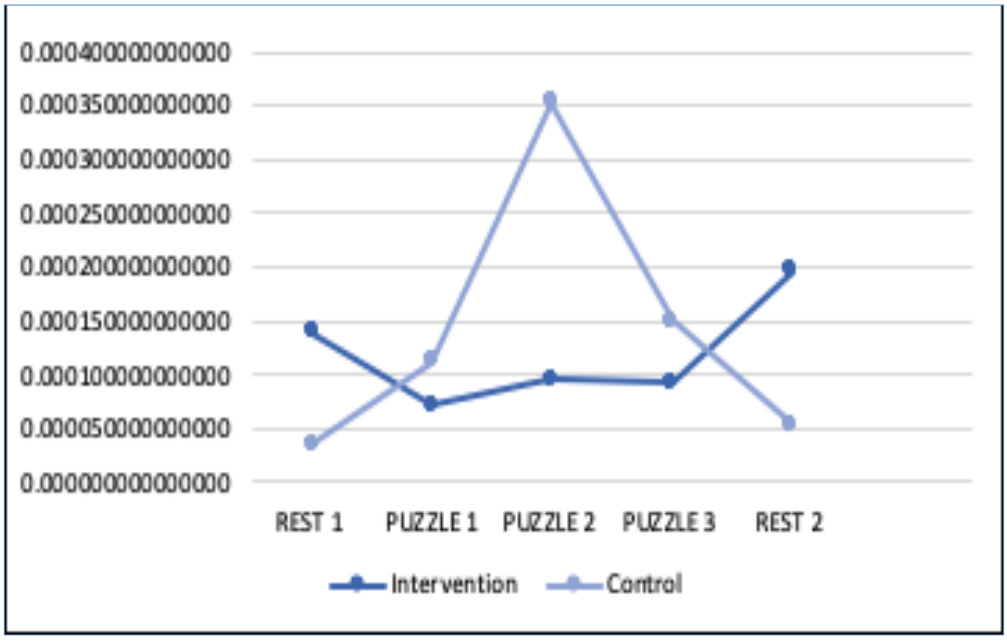

Figure 4. Changes in Mean Power Pre-Intervention in T3.
Note. Data was multiplied by 100,000 in order to be analyzed by SPSS.

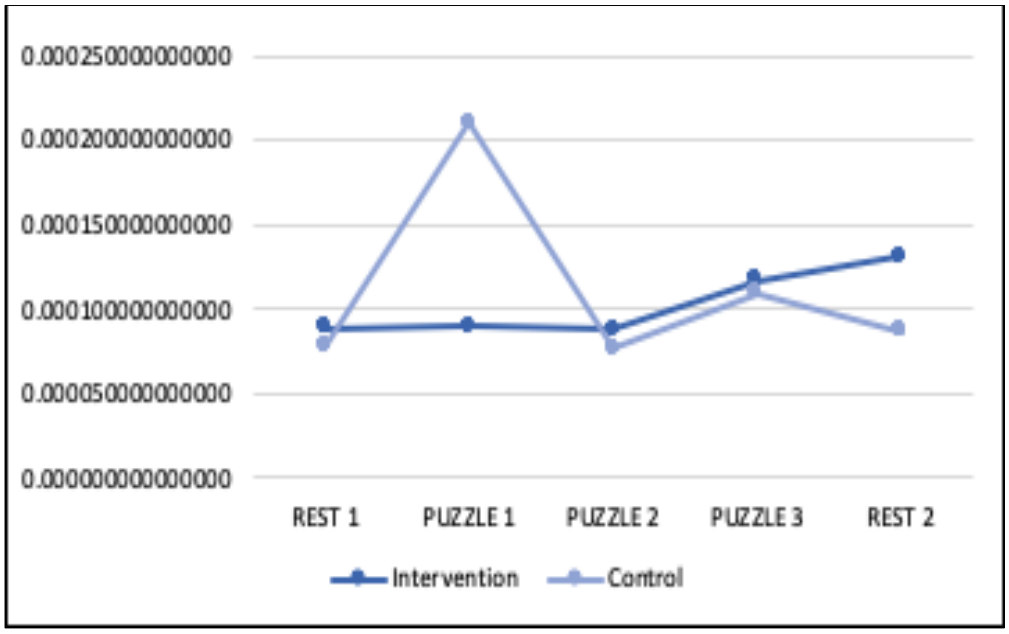

Figure 5. Changes in Mean Power Post-Intervention in T3.
Note. Data was multiplied by 100,000 in order to be analyzed by SPSS.

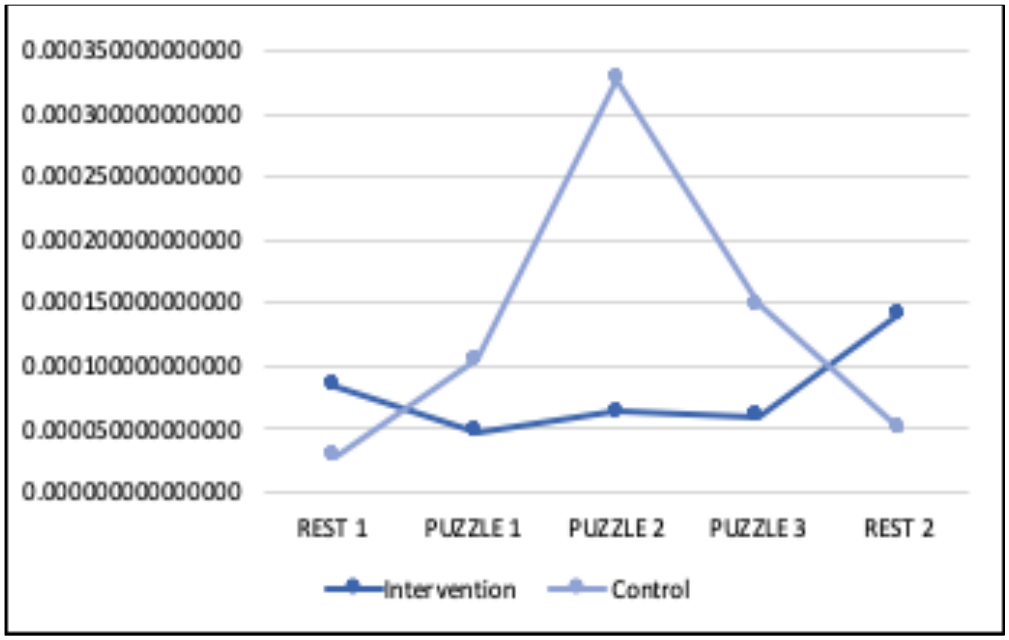

Figure 6. Changes in Mean Power Pre-Intervention in T4.
Note. Data was multiplied by 100,000 in order to be analyzed by SPSS.

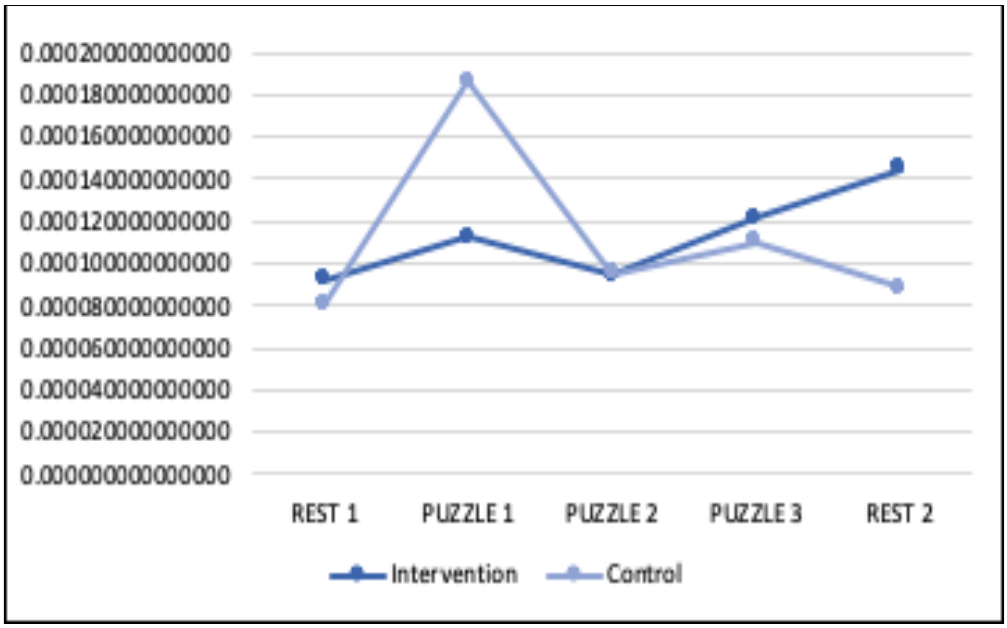

Figure 7. Changes in Mean Power Post-Intervention in T4.
Note. Data was multiplied by 100,000 in order to be analyzed by SPSS.

Chapter 4

Discussion

The purpose of this study was to explore the impact of a mindfulness intervention on brain activation, specifically in the frontal lobe and insula located in the limbic system, while performing a stressful task. Additionally, we wanted to know if the participants in the mindfulness intervention reported changes in their mindfulness skills or/and mood as measured by the Five-Facet Mindfulness Questionnaire (FFMQ) and the Patient Health Questionnaire-Ninth Edition (PHQ-9). Given the impact of adverse childhood experiences on mindful awareness and mood, participants were asked to report the number of ACEs they had experienced.

One of the more notable findings was the significant relationship between the ACEs score and the dependent measures across both groups. Additionally, there was a disproportionate and significantly higher total score in the mindfulness group (ACEs = 19) versus the control group total score (ACEs = 3). Participants who have experienced trauma, and subsequent high ACEs scores, may produce heightened emotional and physiological responses during stressful tasks, such as the sudoku puzzle used as the stimulus in this study. Furthermore, they may be more susceptible to difficulties with emotional regulation (O'Bryan, McLeish, Kraemer, & Fleming, 2015). Taken together, the correlation in the aggregated data (of all participants) and the discrepancies in ACEs scores between the control and intervention group would likely

function as an extraneous variable and impact the accuracy of the results. Therefore, the ACEs scores were covaried in all analyses, including self-report and neuropsychological data sets.

The implications of this finding reiterate the potential impact of adverse childhood experiences on both physiological and psychological domains of functioning. These results suggest the potential utility of incorporating an ACEs screener in both behavioral and medical healthcare settings. Furthermore, providers may want to consider a patient's history of adverse experiences in providing clinical care or in expected response to treatment.

Neurophysiological Data

When the ACEs scores were held constant neither the mindfulness intervention nor time had a statistically significant impact on the EEG results. Given the statistical limitations of a small sample size and the variability in EEG data, the effect sizes of the respective results were explored.

The effect sizes in the four-way interaction indicated changes in the emotional reactivity of the limbic system (as measured by mean power changes on T3 and T4). The first finding suggested the control group experienced a high degree of variability in mean power during the initial recording (Time 1), and especially during the second stimulus phase, puzzle 2 (moderate difficulty) bilaterally for the insula area. A second finding showed that both groups demonstrated increased activation during the post (Time 2) than during the initial recording, which may reflect their anticipation of the phase of the second puzzle. Although both groups showed higher levels of activation, there were some differences between the groups. Specifically, a third finding shows the intervention group had less variability in mean power and less activation bilaterally in the temporal lobe during the second puzzle and during the rest period immediately following.

Results continued to show variability in mean power for the control group bilaterally during the final recording. The possible conclusion is the control group continued to be more reactive to the sudoku puzzles than the intervention group.

One potential implication of this finding is that mindfulness training may have the potential to reduce limbic arousal (as measured by T3 and T4) during stressful tasks. If that is accurate, healthcare, education and work environments may want to consider incorporating mindfulness training for individuals managing stressful tasks or working in difficult environments. This finding increases in importance if we consider the detrimental impact of ACEs on biopsychosocial functioning.

The analysis of mean power changes in the prefrontal cortices indicated the channels FP1 and FP2 were most responsive to the changes in mean power arousal by the stimulus task. This result is congruent with previous research regarding metabolic activity in the prefrontal cortex, where this area of the brain has been found to demonstrate significantly more activity than other brain regions (Gusnard, Raichle, & Raichle, 2001). Furthermore, the interaction between channel and phase, suggested that regardless of the group or time, participants showed significantly higher levels of arousal when attempting a difficult task. This finding is expected, as the purpose of the stimulus was to promote reactivity and stress.

Contrary to our expectations, the significant interaction found between time, channel, and phases on channels FP1 and FP2 suggest that participants, regardless of group, experienced lower mean power during the final recording when responding to the stressful stimulus. One possible explanation for the lowered mean power is having previous experience with the equipment. One potential implication of the lowered mean power suggests that a relatively

minimal level of social support (being part of a weekly group meeting for four weeks) may positively affect the prefrontal cortical response to arousing stimulation.

Self-Report Data

Hypothesis 3 suggested that participants in the study would report an improvement in mindfulness skills and mood and there would be an interaction with participants in the mindfulness groups perceiving a greater improvement than those in the control group. Although the results failed to support an interaction between group participation and time on either mindfulness or mood, there was a main effect for time on two of the subscales (Non-reactivity and Non-judging) of the Five-Factor Mindfulness Scale (FFMQ).

Non-Reactivity and Non-Judging. These results suggest that simply participating in the study with a group of peers, regardless of the intervention, promoted non-reactivity and non-judging responses. One of the key components of mindfulness practice is to transition from reacting to responding. This ability to move away from reaction is a catalyst for mindful awareness. Anicha, Ode, Moeller, and Robinson (2012) describe the non-reacting component of mindfulness as the view that the "self is able to maintain control in the context of problematic situations, thoughts, or feelings" (p. 259). For example, on the Five Facet Mindfulness Questionnaire (FFMQ), one of the non-reactivity questions is as follows: "In difficult situations, I can pause without immediately reacting" (Baer et al., 2006). The ability to practice non-reactivity may aid in decreased physiological activation and aid in a parasympathetic response, otherwise known as down-regulation.

These findings are congruent with the results from T3 and T4 showing a large effect size in reduced arousal of the limbic system during the stimulus phases. Taken together, these

findings indicate that participants demonstrated neurophysiological non-reactivity, and when asked about their experience through a self-report measure via the FFMQ, participants also reported a subjective experience of non-reactivity.

In addition to a reduction in reactivity, results indicated that participants in both groups improved in the domain of non-judging on the FFMQ. Non-judging refers to the ability to utilize "a non-evaluative point of view toward one's thoughts and feelings" (Raphiphatthana et al., 2018, p. 77). For example, on the FFMQ, one of the non-judging questions (reverse scored) is as follows: "I criticize myself for having irrational or inappropriate emotions" (Baer et al., 2006).

There are two potential explanations for why participation in a group research study may influence reactivity or judgmental responses, social support and the Hawthorne effect.

Social Support: Results suggest that group participation in a research study promotes an improvement in both non-reactivity and non-judging responses towards others. These results are consistent with previous research showing that perception of social support has wide-ranging implications for stress management and physical and behavioral health. Additionally, previous research has shown that the perceived presence of available social support systems is strongly connected to mental and physical health (House, Landis, & Umberson, 1988, as cited in Haber et al., 2007).

In this study, participants were recruited from general psychology undergraduate classes. College students experience a range of stressors from developmental changes, academic pressure, and social relationships. It is possible that participating in a study where they all shared the atypical experience of wearing the EEG cap with multiple electrodes connecting them to the computer created a sense of community. This was a unique experience shared by a small group

of students who then met once a week to either participate in a mindfulness intervention or watch and discuss a TED talk. Taken together, social support may be the most likely explanation for the improvement in non-reactivity and non-judging domains of mindfulness practice.

One potential implication of these findings is that participation in a short-term group experience with peers may foster a perception of social connectedness which may be a catalyst for improving mindfulness skills, which in turn, may be a protective factor for managing stress.

The Hawthorne Effect. Another potential explanation for the significant findings on the two mindfulness domains may be attributed to the Hawthorne effect (first suggested by Henry A. Landsberger) which is a theory that indicates that being selected for a research study and then being observed has a significant effect on behavior. Specifically, the Hawthorne Effect refers to the tendency of some individuals to work harder and demonstrate improved performance when participating in an experiment. The term is often used to suggest that individuals may change their behavior due to the attention they are receiving from researchers rather than because of manipulation of independent variables. Taken together, changes in behavior may be due to the attention received by others as well as the demand effects to demonstrate an improved outcome.

Limitations

Several limitations to this study may restrict the generalizability of these findings. Primarily, the small sample size likely contributed to the lack of statistically significant findings. Additionally, the use of a short-term intervention may have hindered the opportunity for neurological and mood changes to occur. Furthermore, the participants were instructed to send confirmation of their completion of independent mindfulness practices, but additional confirmations were not administered outside of group meetings.

The methodology for data analysis was also a limitation in the study. As this research represents a novel approach to examining the effects of a mindfulness intervention on the brain, multiple approaches for analyzing the data were required.

The channels that were selected for this study were based on the literature review on neurological activity with down and up regulation, and the channels associated with those regions were prioritized. Additional changes in brainwave activity may be conspicuous in regions that were unmeasured.

Suggestions for Future Research

Future studies may want to focus on replication of these methods to examine the generalizability of the results. A larger sample size would provide greater insight regarding the variance demonstrated among participants.

Summary

This study explored the impact of a mindfulness intervention on neurophysiological changes in specific areas of the limbic system and prefrontal cortex while completing progressively more difficult activities. The neurophysiological data provided objective results, while the self-report of changes in mindfulness and mood provided a subjective assessment of change. Although not statistically significant, effect sizes highlighted the potential change between groups on specific limbic system arousal when completing a difficult task. These results aligned with participants' self-report of changes in the mindfulness domains of non-reactivity and non-judging. In addition to changes in the dependent measures, this study highlighted the relationship between the number of adverse childhood experiences (ACEs) and participants' response to an arousing stimulus. Potential implications of these findings include the need for

providers to consider the number of ACEs experienced by an individual when anticipating a treatment response. Additionally, the findings imply that group participation facilitates an experience of social support which may mitigate perceived stress or specific limbic system arousal when responding to a challenging task.

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Appendix A

Informed Consent for Research Participants

Background Information: The purpose of this research is to examine the influence of mindfulness practices and social interactions on psychological well-being. The study will last for approximately six weeks. If you choose to participate, you will be asked to fill out a questionnaire packet and screeners and participate in two electroencephalogram (EEG) administrations. You will be asked to complete a mindfulness exercise or social event on the George Fox campus four times. You may be asked to participate in your own practice at home in which you will share with the researcher each time you have completed the activity. The total procedure is estimated to take approximately 10-15 hours. Once you complete the study, the primary researcher will notify your professor of how many hours you completed for course credit. As an incentive for your time and participation, you will receive a $50.00 Visa gift card as a bonus for completing the study.

Signing this informed consent form will be considered assent to all of the above. Great care will be taken to provide as much confidentiality as possible. Each returned packet will be numbered by the department secretary and the numbers matched with names, which will be kept in a locked file. Faculty members will not have access to the names of students on the packets or on the faculty ratings. Raw data from the questionnaire will be kept in a locked file and access limited to the GDCP administrative Assistant.

Results will be made available to anyone who is interested, in the form of a journal manuscript. If you have any questions or concerns about your participation in this research, you may contact this researcher, Elizabeth Grace, MA, via email: bgrace15@georgefox.edu, or Mary Peterson, PhD, ABPP/CL via email: mpeterso@georgefox.edu

Consent: I have read the description of this research regarding graduate students in clinical psychology and have voluntarily chosen to participate. I understand that the questionnaire information is to be received and maintained in confidence and used for research purposes only. I also understand that if I wish to discontinue participation at any time prior to the completion of the packet, I may do so without penalty, and will not receive the $50.00 incentive and/or course credit. A copy of this consent form is available upon request.

_____
Printed Name of Participant

_____ _____
Signature of Participant Date

Appendix B

Demographic Questionnaire

Initials: _____ Age: _____

Gender (check one): Male_____ Female_____ Other_____

Race/Ethnicity (circle one):
- White
- Black or African American
- Hispanic, Latino, or Spanish
- American Indian or Alaska Native
- Asian
- Native Hawaiian or other Pacific Islander

Highest level of education completed (circle one):
- High school
- Some college
- Bachelor's Degree
- Some graduate school
- Graduate Degree

On average, how often do you engage in prayer? (circle one):
- None
- Few times per month
- Few times per week
- Daily

Do you currently use any mindfulness practices (e.g. focused breathing, meditation, guided relaxation)?
If so, approximately how many times per week? _____ And, how long is the average session _____ minutes

On average, how many hours per week do you engage in physical activity? (circle one):
- None
- Few times per month
- Few times per week
- Daily

Appendix C

Adverse Childhood Experiences

The following survey includes prompts that are personal in nature. Please feel free to skip any items that you are not comfortable answering.
Thank you.

Prior to your 18th birthday (circle one):

1. Did a parent or other adult in the household often or very often… Swear at you, insult you, put you down, or humiliate you? Or act in a way that made you afraid that you might be physically hurt?
   - Yes
   - No

2. Did a parent or other adult in the household often or very often… Push, grab, slap, or throw something at you? Or ever hit you so hard that you had marks or were injured?
   - Yes
   - No

3. Did an adult or person at least 5 years older than you ever… Touch or fondle you or have you touch their body in a sexual way? Or attempt or actually have oral, anal, or vaginal intercourse with you?
   - Yes
   - No

4. Did you often or very often feel that … No one in your family loved you or thought you were important or special? Or your family didn't look out for each other, feel close to each other, or support each other?
   - Yes
   - No

5. Did you often or very often feel that …You didn't have enough to eat, had to wear dirty clothes, and had no one to protect you? Or your parents were too drunk or high to take care of you or take you to the doctor if you needed it?
   - Yes
   - No

6. Were your parents ever separated or divorced?
   - Yes
   - No

7. Was your mother or stepmother: Often or very often pushed, grabbed, slapped, or had something thrown at her? Or sometimes, often, or very often kicked, bitten, hit with a fist, or hit with something hard? Or ever repeatedly hit over at least a few minutes or threatened with a gun or knife?
   - Yes
   - No

8. Did you live with anyone who was a problem drinker or alcoholic, or who used street drugs?
   - Yes
   - No

9. Was a household member depressed or mentally ill, or did a household member attempt suicide?
   - Yes
   - No

10. Did a household member go to prison?
   - Yes
   - No

Appendix D

Patient Health Questionnaire - Ninth Edition (PHQ-9)

Over the last 2 weeks, how often have you been bothered by any of the following problems?

1. Little interest or pleasure in doing things
   - Not at all
   - Several days
   - More than half the days
   - Nearly every day

2. Feeling down, depressed, or hopeless
   - Not at all
   - Several days
   - More than half the days
   - Nearly every day

3. Trouble falling or staying asleep, or sleeping too much
   - Not at all
   - Several days
   - More than half the days
   - Nearly every day

4. Feeling tired or having little energy
   - Not at all
   - Several days
   - More than half the days
   - Nearly every day

5. Poor appetite or overeating
   - Not at all
   - Several days
   - More than half the days
   - Nearly every day

6. Feeling bad about yourself — or that you are a failure or have let yourself or your family down
   - Not at all
   - Several days
   - More than half the days
   - Nearly every day

7. Trouble concentrating on things, such as reading the newspaper or watching television
- Not at all
- Several days
- More than half the days
- Nearly every day

8. Moving or speaking so slowly that other people could have noticed? Or the opposite being so fidgety or restless that you have been moving around a lot more than usual
- Not at all
- Several days
- More than half the days
- Nearly every day

9. Thoughts that you would be better off dead or of hurting yourself in some way
- Not at all
- Several days
- More than half the days
- Nearly every day

If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?
- Not difficult at all
- Somewhat difficult
- Very difficult
- Extremely difficult

Appendix E

Five Facet Mindfulness Questionnaire (FFMQ)

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 s sensations, and emotions.
_____ 12. It's hard for me to find the words to describe what I'm thinking.
_____ 13. I am easily distracted.
_____ 14. I believe some of my thoughts are abnormal or bad and I shouldn't think that way.
_____ 15. I pay attention to sensations, such as the wind in my hair or sun on my face.
_____ 16. I have trouble thinking of the right words to express how I feel about things
_____ 17. I make judgments about whether my thoughts are good or bad.
_____ 18. I find it difficult to stay focused on what's happening in the present.
_____ 19. When I have distressing thoughts or images, I "step back" and am aware of the thought or image without getting taken over by it.
_____ 20. I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.
_____ 21. In difficult situations, I can pause without immediately reacting.
_____ 22. When I have a sensation in my body, it's difficult for me to describe it because I can't find the right words.
_____ 23. It seems I am "running on automatic" without much awareness of what I'm doing.
_____ 24. When I have distressing thoughts or images, I feel calm soon after.
_____ 25. I tell myself that I shouldn't be thinking the way I'm thinking.
_____ 26. I notice the smells and aromas of things.
_____ 27. Even when I'm feeling terribly upset, I can find a way to put it into words.

_____ 28. I rush through activities without being really attentive to them.
_____ 29. When I have distressing thoughts or images, I am able just to notice them without reacting.
_____ 30. I think some of my emotions are bad or inappropriate and I shouldn't feel them.
_____ 31. I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow.
_____ 32. My natural tendency is to put my experiences into words.
_____ 33. When I have distressing thoughts or images, I just notice them and let them go.
_____ 34. I do jobs or tasks automatically without being aware of what I'm doing.
_____ 35. When I have distressing thoughts or images, I judge myself as good or bad, depending on what the thought/image is about.
_____ 36. I pay attention to how my emotions affect my thoughts and behavior.
_____ 37. I can usually describe how I feel at the moment in considerable detail.
_____ 38. I find myself doing things without paying attention.
_____ 39. I disapprove of myself when I have irrational ideas.

Appendix F

EEG Protocol

The participant was measured from inium to nasium in centimeters to determine height and width from the nasium for placing specific electrode pads for the FP1 and FP2 channels. Next, researchers used alcohol swabs to wipe the forehead, earlobes, and electrode gel to wipe the ring and index fingers, to eliminate dead skin cells and other debris that may interfere with measurements. Electrode pads for FP1 and FP2 were placed. The participant's ears were cleaned with an alcohol pad, and gold ear clips were filled with conductive gel and attached to the right and left earlobes of the participant. A Velcro harness was strapped around the participant's upper torso, starting over the sternum, looping under the armpits, and connecting at the rear deltoid area. The EEG cap was placed on the participant's head, followed by the connection straps which secure the cap to the harness. Each electrode was filled with conductive gel using a dull syringe from Biopac. Next, the GSR patches were placed on the pad of left middle and ring fingers, just below the first knuckle from the fingertip. These patches were connected to the Biopac system, followed by the gold ear clips and EEG cap cable. The equipment was tested by having the participant relax for 10 seconds, clench her or his jaw for 5 seconds, blink her or his eyes 5 times, and relax again for 10 seconds. Irregularities in measurement were addressed before moving forward with the stimulus phases.

Appendix G

EEG Sudoku

Date: _____

Demographic Information

Initials: _____

Age: _____

Gender (check one): Male _____ Female _____ Other _____

EEG Sudoku

Pre-Rest 5 Minutes

- Start time: _____
- Stop time: _____

Puzzle 1 (Difficulty: Simple)

- Start time: _____
- Stop time: _____

Puzzle 2 (Difficulty: Moderate)

- Start time: _____
- Stop time: _____

Puzzle 3 (Difficulty: Expert)

- Start time: _____
- Stop time: _____

Post-Rest 5 Minutes

- Start time: _____
- Stop time: _____

Comments:

Appendix H

Curriculum Vitae

E L I Z A B E T H M A R Y G R A C E

PROFESSIONAL EDUCATION

Doctoral Candidate in Clinical Psychology (PsyD) Anticipated July 2020
Graduate School of Clinical Psychology (APA Accredited)
George Fox University; Newberg, OR
Area of Emphasis: Health Psychology and Assessment
Advisor: Mary Peterson, PhD, ABPP

Dissertation – "The Effectiveness of a Mindfulness-Based Intervention:
A Neuropsychological Perspective using an Electroencephalograph"
Successfully Defended June 21, 2019
Chair: Mary Peterson, PhD, ABPP

Master of Arts in Clinical Psychology 2017
Graduate School of Clinical Psychology (APA Accredited)
George Fox University; Newberg, OR

Master of Arts in Counseling: Specialization in Clinical Mental Health 2015
School of Leadership and Education Sciences (CACREP Certified)
University of San Diego; San Diego, CA
Sub-specialization: Posttraumatic Stress Disorder and Borderline Personality Disorder
Successfully passed the National Counselor Examination (NCE)

Bachelor of Arts in Psychology; Minor in Philosophy 2011
College of Arts and Sciences
Gonzaga University; Spokane, WA
Dean's List Graduate

GRANTS, HONORS & AWARDS

Special Commendation Award 2018
Graduate School of Clinical Psychology
George Fox University; Newberg, OR

Richter Scholar Grant 2017
Paul K. and Evelyn E.C. Richter Memorial Fund
George Fox University; Newberg, OR
Topic: The Effectiveness of a Mindfulness-Based Intervention:
A Neuropsychological Perspective using an Electroencephalograph (Dissertation)

Dean's Graduate Merit Research Award 2014 – 2015
School of Leadership and Education Sciences
University of San Diego; San Diego, CA

Chi Sigma Iota International Honor Society 2014 – 2015
School of Leadership and Education Sciences
University of San Diego; San Diego, CA

Graduate Grant 2013
School of Leadership and Education Sciences
University of San Diego; San Diego, CA

AmeriCorps Service Award Recipient 2012
Jesuit Volunteer Corps
Oasis Center; Nashville, TN

FORMAL TRAINING EXPERIENCE

Clinical Psychology Internship July 2019 – Present
VA Western Colorado Health Care System; Grand Junction, CO
(APA Accredited)
Training Directors: Tabitha Emsley, PsyD and Dr. Spencer Baum, PsyD

- Treatment Setting: Rural Veteran Affairs medical facility
- General Mental Health major rotation (Health Psychology emphasis): Collaborate with a diversity of veterans experiencing a variety of psychosocial concerns and clinical diagnoses; Effectively conceptualize veteran's presenting concerns from the perspective of risk management, treatment efficacy, and recovery; and Provide evidence based treatments including Cognitive Behavioral Therapy (CBT) and mindfulness-based interventions. Anticipated training second half of the year for CBT for Chronic Pain (CBT-CP) and CBT for Insomnia (CBT-I). *Supervisors: Terrance Coombs, PhD and Joseph Horner, PhD*
- Posttraumatic Stress Disorder major rotation: Provide individual, group, and telehealth evidence-based therapeutic services including Cognitive Processing Therapy (CPT) and Prolonged Exposure (PE); Implement pre-treatment and Measurement Based Care (MBC) to aid in diagnostic conceptualization and track treatment process; Engage in weekly PTSD consultation team to review cases and relevant research; Utilize Whole

Health Model in treatment process; and Provide veterans with psychoeducation regarding neurological mechanisms of trauma and recovery. *Supervisor: Kara Harmon, PhD*

- Neuropsychological Assessment minor rotation: Implement neuropsychological, cognitive, and personality assessments (NAB, RBANS, CVLT, WAIS-IV, MMPI-2, etc.) to diverse veterans experiencing a myriad of neurocognitive concerns; Administer, score, report, and provide feedback to veterans and their care team; Consider differential diagnosis within military context; and Review relevant literature to inform conceptualization and treatment recommendations. *Supervisor: Spencer Baum, PsyD*
- Geropsychology minor rotation: Provide services in VA Community Living Center; Serve on an interprofessional treatment team and attend collaborative meetings; Implement individual psychotherapy and health psychology services to diverse veterans experiencing co-occurring medical diagnoses; Administer neuropsychological assessments and screeners with subsequent scoring, report writing, and feedback to veterans and providers; and Utilize a biopsychosocial framework to provide collaborative care. *Supervisor: Terrance Coombs, PhD*
- Home-Based Primary Care experience: Provide assessment and brief psychological services to rural veterans; Collaborate with interdisciplinary teams; and Aid in holistic treatment planning.
- Diversity and Inclusiveness Project (year-long): Complete resource acquisition and provide research distribution regarding Traumatic Brain Injury (TBI) to veterans and their family members, and the VA staff. Present on topic to psychology department staff.

Pre-Internship: Neuropsychological Assessment Coordinator 2018 – 2019
Oregon Health and Science University
Family Medicine at South Waterfront and Family Medicine at Richmond; Portland, OR
Supervisors: Joan Fleishman, PsyD and Glena Andrews, PhD, MSCP, ABPP

- Treatment Setting: Integrative primary care at a university medical center, and a federally qualified healthcare center
- Manage the testing referral process, including scheduling and coordinating diverse neuropsychological testing cases. Complete scoring, report writing, and feedback.
- Supervise fellow doctoral students in the process and implementation of neuropsychological assessments. Allocate assessments and consult with supervisors.
- Collaborate with medical providers to review results and recommendations.

Practicum Two: Neuropsychological Assessment Coordinator and Behavioral Health Consultant 2017 – 2018
Oregon Health and Science University
Family Medicine at Richmond; Portland, OR
Supervisors: Joan Fleishman, PsyD and Glena Andrews, PhD, MSCP, ABPP

- Treatment Setting: Integrative primary care at a federally qualified healthcare center
- Neuropsychological Responsibilities: Administered neuropsychological assessments and wrote reports outlining evidence-based recommendations for medical providers.

- Behavioral Health Responsibilities: Provided primary care behavioral health consultation to patients across the lifespan experiencing a myriad of symptoms. Integrated treatment planning and interventions with medical staff to provide collaborative patient care.

Practicum One: Primary Care Behavioral Health Consultant 2016 – 2017
Oregon Health and Science University
Family Medicine at Richmond; Portland, OR
Supervisor: Joan Fleishman, PsyD

- Treatment Setting: Integrative primary care at a federally qualified healthcare center
- Conducted primary care behavioral health consultation to diverse patients experiencing a variety of medical and psychological symptoms.
- Implemented evidence-based interventions and psychoeducational tools for comprehensive treatment interventions. Coordinated resources for providers.
- Responded to patient crisis, escalation, and immediate behavioral issues.

Pre-Practicum Fall 2015
Graduate School of Clinical Psychology
George Fox University; Newberg, OR
Supervisor: Glena Andrews, PhD, MSCP, ABPP

- Treatment Setting: Rural university
- Conducted intake interviews, mental-status exams, and client-centered therapy.
- Participated in weekly supervision, video review, case presentations, and consultation.
- Developed treatment plans, progress notes, and termination summaries.

Professional Clinical Counselor Trainee 2014 – 2015
Alvarado Parkway Institute Behavioral Health System; La Mesa, CA
Supervisor: Andrew Noorollah, PhD and Christopher Burden, PsyD

- Treatment Setting: Inpatient psychiatric hospital
- Conducted comprehensive psychotherapy services individually and in groups.
- Completed routine suicide and homicide assessments with intervention plans.
- Provided therapeutic services to forensic populations and culturally diverse clients.
- Designed and implemented treatment plans co-occurring disorders.

CLINICAL & PROFESSIONAL EXPERIENCE

Emergency Department Crisis Consultant 2017 – 2019
Selected for Promotion to "Super Trainer"
Providence Newberg Medical Center and
Willamette Valley Medical Center; Yamhill County, OR

- Treatment Setting: Rural emergency department
- Assessed patients in psychiatric crisis to determine risk level for imminent danger.
- Collaborated with a treatment team of medical professionals.

- Facilitated psychiatric and respite placement with community hospitals and agencies.

Psychiatric Assessment Counselor 2015 – 2018
Cedar Hills Hospital; Portland, OR

- Treatment Setting: Inpatient psychiatric hospital
- Coordinated referrals and intake process and aided in crisis triage.
- Completed comprehensive assessments to determine risk level for psychiatric crises, including: suicide, homicide, grave disability, and chemical dependency.
- Collaborated with medical staff and community providers to ensure optimal care.

Neuropsychological Assessor Fall 2017
Samaritan Health Neuropsychology Services; Albany, OR

- Treatment Setting: University
- Administered neuropsychological batteries to Oregon State University athletes for information regarding baseline functioning.

Masters Level Therapist Fall 2015
Health and Counseling Center
George Fox University; Newberg, OR

- Treatment Setting: Rural university
- Provided individual, solution-focused, and cognitive behavioral therapy to undergraduate and graduate college students.
- Completed regular intake interviews and subsequent reports.
- Collaborated with supervisor to implement evidence-based treatment plans.

Case Manager and Outreach Youth Worker 2011 – 2012
Jesuit Volunteer Corps
Oasis Center; Nashville, TN

- Treatment Setting: Homeless community and residential center
- Provided comprehensive case management services to a diverse population of over 300 homeless youth and adults in both residential and drop-in settings.
- Conducted community outreach to connect homeless individuals to essential resources and services pertaining to physical and psychological health.
- Attended weekly clinical meetings with a licensed clinical social worker regarding the mental health treatment of specific clientele. Participated in regular trauma-informed care seminars.

RESEARCH EXPERIENCE

Research Vertical Team February 2015 – Present
Graduate School of Clinical Psychology
George Fox University; Newberg, OR
Supervisor: Mary Peterson, PhD, ABPP

- Collaborate with supervisor and peers to discuss the design, methodology, and progress of dissertation and supplemental research projects.

Program Evaluation Consultant Fall 2018
Oregon Center for Change; Portland, OR
Supervisor: Marie-Christine Goodworth, PhD

- Partnered with an agency that treats court-ordered adult sex-offenders. Implemented subjective measures with subsequent feedback for program improvement.

Graduate Neuropsychology Research Assistant Summer 2017
Graduate School of Clinical Psychology
George Fox University; Newberg, OR
Supervisor: Glena Andrews, PhD, MSCP, ABPP

- Served as a researcher at the National Organization of Disorders of the Corpus Callosum to gather data using the Bayley-III neuropsychological assessment.

Psychiatric Research Assistant 2014 – 2015
Alvarado Parkway Institute Behavioral Health System; La Mesa, CA
Research Director: Andrew Noorollah, PhD

- Reviewed and organized literature regarding suicide risk factors.
- Contributed to the formal intake assessment to include emergent suicide literature.
- Formulated presentations and literature for professional agencies and organizations.

Director of Research and Development 2014 – 2015
East African Research and Trauma Hope; San Diego, CA
Research Director: Ronn Johnson, PhD, ABPP

- Analyzed over 80 peer-reviewed journal articles to identify themes for culturally-revenant trauma assessments and treatment interventions.
- Researched evidence-based treatment protocols for advocacy efforts, publications, and reports to support the efforts of East African refugee organizations.
- Identified effective programs and collaborated with clinical directors internationally.

Clinical Research Coordinator 2013 – 2015
School of Leadership and Education Sciences
University of San Diego; San Diego, CA
Research Director: Ronn Johnson, PhD, ABPP

- Supervised and mentored master and doctoral students conducting research.
- Organized, reviewed, and synthesized relevant peer-reviewed literature.
- Coordinated topics and abstract submissions for journals and national conferences.

Lead Clinical Research Assistant 2012 – 2015
School of Leadership and Education Sciences
University of San Diego; San Diego, CA
Research Director: Ronn Johnson, PhD, ABPP

- Gathered, organized, and reviewed relevant peer-reviewed clinical forensic literature.
- Constructed presentations and assembled research papers for publication.
- Presented at conferences for nationally and internationally recognized organizations.

Cognitive Research Assistant Spring 2011
Gonzaga University; Spokane, WA
Research Director: Gary Thorne, PhD

- Researched the incubation periods among visual-spatial problem-solving tasks.
- Assisted in conducting an IRB-approved pilot study and subsequent experiment.
- Recorded data and organized results.

PUBLICATIONS

Johnson, R., Saadatzadeh, Y., Kim, C., **Grace, E.,** & Mueller, J., (2015) Forensic Psychological Mindset of an American Suicide Bomber: The Next Risk-Assessment Terrorism Frontier. Proceeding of the Academy Criminal Justice Sciences, Orlando, FL.

Johnson, R., Lopez, M., **Grace, E.,** Link, M., & Axler, D., (2015) A Forensic Psychological Assessment of Terrorists: An Antiterrorism Approach for Radicalized Westerners. Proceeding of the Academy Criminal Justice Sciences, Orlando, FL.

Johnson, R., Ryan, C., Norton, E., **Grace, E.,** Young, D., & Link, M., (2015) Clinical Forensic Psychological Ethical Issues in the Delivery of Treatment Services to Juvenile Fire Setters and Bomb Makers. Proceeding of the Academy Criminal Justice Sciences, Orlando, FL.

Johnson, R., **Grace, E**., Kim, C., Saadatzadeh, Y., Little, M., & Koenigsberg, M. (2014) Organization and Delivery of Clinical Mental Health Services in Uganda. Vol. 37, Part 2, 95-100. Proceeding of the American Association for the Advancement of Science Pacific Division, 95th Annual Meeting.

Johnson, R., **Grace, E**., Wilhelm, M., Gambilado, M., & Boyd, N. (2014). An Overview of East African Research & Trauma Hope. Vol. 37, Part 2, 95-100. Proceeding of the American Association for the Advancement of Science Pacific Division, 95th Annual Meeting.

Johnson, R., Jacobs, E., **Grace, E**., Wilhelm, M., Kim, C., Del Vecchio, A., & Thomas, K. (2014) Culturally-Responsive Approaches for Addressing the Perceptions and Acceptability of Trauma Interventions in Uganda. Vol. 37, Part 2, 95-100. Proceeding of the American Association for the Advancement of Science Pacific Division, 95th Annual Meeting.

Johnson, R., Boyd, N., Bartuski, G., & **Grace, E**. (2014) Antiterrorism, Police Officers and

PTSD: A DSM-5 Paradigm. 103. Proceeding of the Academy Criminal Justice Sciences, 51st Annual Meeting.

JURIED PRESENTATIONS

Grace, E., Buckles, Z., Owen, E., Neff, M., and Peterson, M. (2020) Toward Connection: How Mindfulness and Social Engagement may induce Non-Judgmental Presence. American Psychological Association Conference, Washington, D.C.

Sklvarov, O., Finger, L., Gallup, S., **Grace, E**., and Goodworth, M., (2018) Effectiveness of Outpatient Sex Offender Treatment: An Outcome Study. American Psychological Association Conference, San Francisco, CA.

Ramirez, S., **Grace, E**., and Paxton, J. (2018) Improving Self-Efficacy Through an Interdisciplinary Persistent-Pain Program. American Psychological Association Conference, San Francisco, CA.

Davis, S., Dunbar, K., Getchell, R., **Grace, E**., Peterson, M., and Hamilton, E. (2016) Peer-Conflict Resolution: Improving Learning Culture in a Rural Elementary School Setting. Rural Behavioral Health Practice Conference, Minneapolis, MN.

Wynsma. E., Sanders, E., Davis, S., **Grace, E**., and Peterson, M. (2016) The Correlation Between Resiliency and Locus of Control in Bolivian Street Adolescents. American Psychological Association Conference, Denver, CO.

Wynsma, E., Sanders, E., Davis, S., **Grace, E**., and Peterson, M, (2016) The Correlations Between Resiliency and Supportive Spirituality In Bolivian Street Adolescents. American Psychological Association Conference, Denver, CO.

Johnson, R., **Grace, E**., Lee, J., & Gonzalez, B. (2015) Community-Police relations: A Muslim perspective. American Association for the Advancement of Science, San Francisco, CA.

Johnson, R., Kim, C., **Grace, E**., & Young, D. (2015) Forensic Psychology in Evaluating a Lone Wolf Terrorist: An Analysis of the New York City Cop Killer. American Association for the Advancement of Science, San Francisco, CA.

Johnson, R., Jacobs, E., Kim, C., & **Grace, E**. (2015) A forensic psychological analysis of violence against police officers. American Association for the Advancement of Science, San Francisco, CA.

Johnson, R., Jacobs, E., Lee, J., & **Grace, E**. (2015) Group Treatment and Psychopathology: Building Community Capacity via Culturally Responsive Mental Health Services. American Association for the Advancement of Science, San Francisco, CA.

Noorollah, A., & **Grace, E**., (2015) Self-Harm Intervention: Risk Factors, Assessment, and Intervention. California Association for Licensed Processional Clinical Counselors, San Diego, CA.

Johnson, R., Saadatzadeh, Y., Kim, C., **Grace, E**., & Mueller, J., (2015) Forensic Psychological Mindset of an American Suicide Bomber: The Next Risk-Assessment Terrorism Frontier. Academy Criminal Justice Sciences. Orlando, FL.

Johnson, R., Lopez, M., **Grace, E**., Link, M., & Axler, D., (2015) A Forensic Psychological Assessment of Terrorists: An Antiterrorism Approach for Radicalized Westerners. Academy Criminal Justice Sciences. Orlando, FL.

Johnson, R., Ryan, C., Norton, E., **Grace, E.,** Young, D., & Link, M., (2015) Clinical Forensic Psychological Ethical Issues in the Delivery of Treatment Services to Juvenile Fire Setters and Bomb Makers. Academy Criminal Justice Sciences. Orlando, FL.

Stepensky, A., **Grace, E**., Zanger, M., & Wilhelm, M. (2014) Implementing Mindfulness Evidence Based Practice into the Treatment of Diverse Populations: A MBSR Perspective. Western Association for Counselor Education and Supervision. Anaheim, CA.

Wilhelm, M., **Grace, E**., Zanger, M., & Stempensky, A. (2014) EMDR Practices for a Diverse Population: An Evidence-Based Trauma Treatment. Western Association for Counselor Education and Supervision. Anaheim, CA.

Johnson, R., Kim, C., **Grace, E**., Cunningham, S., & Young, D. (2014) Forensic Mental Health Treatment in Juvenile Justice Secure Care Facilities for Juvenile Fire Setters and Bomb Makers: Clinical and Forensic Public Safety Recommendations. OMICS. San Antonio, Tx.

Johnson, R., Mueller, J., Jacobs, E., **Grace, E**., & Lee, J., (2014) Forensic Use of the DSM-5 Quadrant in Juvenile Fire Setter and Bomb Maker Cases: A Mitigation of Criminal Responsibility? OMICS. San Antonio, Tx.

Johnson, R., **Grace, E**., Jacobs, E., Del Vecchio, A., & Jimenez, M. (2014) Clinical Issues for Mental Health Counselors after a School Shooting: Post Traumatic Stress Disorder. American Mental Health Counseling Association. Seattle, WA.

Johnson, R., **Grace, E**., Jacobs, E., & Del Vecchio, A. (2014) Trauma and Terrorism in Uganda: An Ethical and Clinical Mental Health Paradigm. American Mental Health Counseling Association. Seattle, WA.

Johnson, R., **Grace, E**., Jacobs, E., & Fessler, A. (2014) Clinical Issues for Mental Health

Counselors in advance of a School Shooting: Stress Inoculation Training as an Antiterrorism Strategy. American Mental Health Counseling Association. Seattle, WA.

Johnson, R., **Grace, E**., Wilhelm, M., Gambilado, M., & Boyd, N. (2014) An overview of East African Research & Trauma Help (EARTH). American Academy Advance Sciences – Pacific Division. Riverside, CA.

Johnson, R., Jacobs, E., **Grace, E**., Wilhelm, M., Kim, C., Del Vecchio, A., & Thomas, K. (2014) Culturally-responsive Approaches for Addressing the Perceptions and Acceptability of Trauma Interventions in Uganda. American Academy Advance Sciences –Pacific Division. Riverside, CA.

Johnson, R., **Grace, E**., Kim, C., Saadatzadeh, Y., Little, M., & Koenigsberg, M. (2014) Organization and Delivery of Clinical Mental Health Services in Uganda. American Academy Advance Sciences –Pacific Division. Riverside, CA.

Johnson, R., Wehrle, C., Boyd, N., & **Grace, E**., (2014) Clinical and Forensic Psychological Culturally-Relevant Risk Assessment Family Issues in Juvenile Fire Setters and Bomb Makers. Best Practices in Forensic Mental Health. Patton, CA.

Johnson, R., Boyd, N., Bartuski, G., & **Grace, E**. (2014) Antiterrorism, Police Officers and PTSD: A DSM-5 Paradigm. Academy Criminal Justice Sciences. Philadelphia, PA.

Johnson, R., **Grace, E**., Wehrle, C., Lee, J., Stempensky, A., & Callahan, E. (2013) Use of the DSM- 5 with Juvenile fire setters and bomb makers. American Association for the Advancement of Science. Las Vegas, NV.

Johnson, R., Zures. C., Kuo, B., **Grace, E**., & Garcia, A. (2013) Is there a nexus between historical trauma and PTSD vulnerability in military personnel? American Association for the Advancement of Science. Las Vegas, NV.

Johnson, R., Kou, B., **Grace, E**., & Stepensky, A. (2013) Forensic Psychological Issues From Terrorism to Officer-Involved Shootings: U.S. Border Patrol Critical Incident Investigative Teams. American Academy of Forensic Sciences. Washington, D.C.

TEACHING EXPERIENCE

Graduate Teaching Assistant: Cognitive Behavioral Therapy Fall 2018
Graduate School of Clinical Psychology
George Fox University; Newberg, OR
Professor: Mark McMinn, PhD, ABPP

- Demonstrate role-plays and educate students on theory and practice.
- Provide framework, conceptualization, and treatment approaches.

Graduate Teaching Assistant: Personality Assessment Spring 2017 & 2018
Graduate School of Clinical Psychology
George Fox University; Newberg, OR
Professor: Nancy Thurston, PhD, ABPP

- Mentored students on the administration and interpretation of assessments.
- Assisted in grading reports and provided feedback throughout the assessment process.

Graduate Teaching Assistant: Assessment Techniques in Counseling Spring 2015
School of Leadership and Education Sciences
University of San Diego; San Diego, CA
Professor: Ronn Johnson, PhD, ABPP

- Assisted in curriculum planning and development of presentations.
- Allocated essential coursework to master's level counseling students.

Graduate Teaching Assistant: Risk Assessment and Trauma Interventions in Clinical Mental Health Counseling Spring 2015
School of Leadership and Education Sciences
University of San Diego; San Diego, CA
Professor: Ronn Johnson, PhD, ABPP

- Provided mentorship, resources, and constructive feedback to students.
- Organized assignments and compute grading components.

Graduate Teaching Assistant: Counseling Psychology Theory and Practice Fall 2014
School of Leadership and Education Sciences
University of San Diego; San Diego, CA
Professor: Ronn Johnson, PhD, ABPP

- Assisted in the development and implementation of coursework.
- Mentored students on course content and theory implementation.

Graduate Teaching Assistant: Professional Orientation and Law/Ethics Fall 2014
School of Leadership and Education Sciences
University of San Diego; San Diego, CA
Professor: Ronn Johnson, PhD, ABPP

- Supervised students' coursework and professional reports.
- Aided in the computation of grades and provided feedback to students.

VOLUNTEER & COMMUNITY INVOLVEMENT

Student Chair Health Psychology Student Interest Group 2017 – 2019
Graduate School of Clinical Psychology
George Fox University; Newberg, Oregon

- Selected as co-leader of the health psychology network. Facilitated meetings to discuss research, training opportunities, and innovations in health psychology.

Advanced Mentor 2018 – 2019
Graduate School of Clinical Psychology
George Fox University; Newberg, OR
Professor: Roger K. Bufford, PhD

- Provided oversight to a doctoral student in domains of APA competencies.
- Aid in the facilitation of clinical team meetings and provide evaluative feedback.

Clinical Team Member 2015 – 2019
Graduate School of Clinical Psychology
George Fox University; Newberg, OR
Supervisors: Joel Gregor, PsyD, Elizabeth Hamilton, PhD,
Rodger K. Bufford, PhD, and Marie-Christine Goodworth, PhD

- Participated in weekly clinical meetings with peers across various levels.
- Presented two client presentations per semester which include patient history, diagnoses, assessment results, and case conceptualization.

Doctoral Program Orientation Leader Summer 2017 & 2018
Graduate School of Clinical Psychology
George Fox University; Newberg, Oregon

- Selected as a student leader to aid in the organization and preparation of incoming doctoral students.

Doctoral Peer Mentor 2018 – 2019
Graduate School of Clinical Psychology
George Fox University; Newberg, Oregon

- Mentored first year graduate students in transitioning to graduate school by providing professional and personal guidance.

Psychiatric Recreational Therapy Volunteer September 2014 – May 2015
Sharp Memorial and Mesa Vista Hospital; San Diego, CA

- Provided art therapy to adolescents in an inpatient psychiatric setting.
- Completed rotations for patients in oncology, intensive care, and surgical units.

SELECTED DIVERSITY INVOLVEMENT & TRAINING

Using Community Based Participatory Research to Promote Mental Health in American Indian/Alaska Native (AI/AN) Children, Youth and Families October 2017
Graduate School of Clinical Psychology
George Fox University; Newberg, Oregon

Presenter: Eleanor Gil-Kashiwabara, PsyD

Native Self-Actualization: Its Assessment and Application in Therapy February 2017
Graduate School of Clinical Psychology
George Fox University; Newberg, Oregon
Presenter: Sydney Brown, PsyD

Working with Diverse Clients March 2016
Graduate School of Clinical Psychology
George Fox University; Newberg, Oregon
Presenter: Sandra Jenkins, PhD

Risk Assessment and Trauma Intervention: Bali, Indonesia Summer 2014
School of Leadership and Education Sciences
University of San Diego; San Diego, CA
Professor: Ronn Johnson, PhD, ABPP

- Partnered with Balinese to assimilate cultural research regarding mental illness.
- Analyzed risk assessment and trauma interventions in the context of Asian culture.
- Interacted with local Balinese and discussed cultural considerations for suicide.

Multicultural Counseling: Falmouth, Jamaica Summer 2013
School of Leadership and Education Sciences
University of San Diego; San Diego, CA
Professor: Ian Martin, EdD

- Collaborated with a residential foster facility for youth to provide clinical services.
- Provided mentorship to girls with physical and psychological disabilities.
- Studied and implemented multicultural counseling in the context of global culture.

SELECTED PROFESSIONAL TRAININGS & WORKSHOPS

Rorschach Certificate Course 2018
Completed 12 hour Rorschach training utilizing the R-PAS scoring system

Workforce Development for Integrated Behavioral 2016
Health Care and Primary Care Behavioral Health Boot Camp:
Certification of Completion (40 hour training)
Graduate School of Clinical Psychology
George Fox University; Newberg, Oregon

Collaborative Assessment and Management of Suicidality Training (CAMS) 2015
CAMS Certified Clinician
Graduate School of Clinical Psychology
George Fox University; Newberg, Oregon

Neuropsychology: What Do We Know 15 Years After the Decade of the Brain? And Okay, Enough Small Talk. Let's Get Down to Business! 2016
Graduate School of Clinical Psychology
George Fox University; Newberg, Oregon
Presenters: Trevor Hall, PsyD and Darren Janzen, PsyD

Aaron T. Beck -Cognitive Therapy Past, Present and Future Pathways: 2013
Evolution of Psychotherapy Conference; Anaheim, CA.
Presenter: Aaron Beck, MD Interviewed by Judith Beck, PhD

Positive Psychology: New Developments 2013
Evolution of Psychotherapy Conference; Anaheim, CA.
Presenter: Martin Seligman, PhD

Trauma, Spirituality and Recovery 2013
Evolution of Psychotherapy Conference, Anaheim, CA.
Presenter: Donald Meichenbaum, PhD

Spirituality and Trauma 2013
Evolution of Psychotherapy Conference, Anaheim, CA.
Presenter: Peter Levine, PhD

Teaching Psychotherapy Through Narrative 2013
Evolution of Psychotherapy Conference, Anaheim, CA.
Presenter: Irvin Yalom, MD

The Addictive Family: The Legacy of Trauma 2013
Evolution of Psychotherapy Conference, Anaheim, CA.
Presenter: Claudia Black, PhD

Borderline Personality Disorder 2013
Evolution of Psychotherapy Conference; Anaheim, CA.
Presenters: Daniel Amen, MD and Otto Kernberg, MD

Chain Analysis of Dysfunctional Behavior 2013
Evolution of Psychotherapy Conference; Anaheim, CA.
Presenter: Marsha Linehan, PhD

Frontier of Trauma Treatment 2013
Evolution of Psychotherapy Conference; Anaheim, CA.
Presenter: Bessel Van Der Kolk, MD

Transforming Trauma 2013

Evolution of Psychotherapy Conference; Anaheim, CA.
Presenter: Peter Levine, PhD

Confronting Stigma in Diagnosing and Treating BPD in Adolescents and Young Adults 2013
National Education Alliance for Borderline Personality Disorder (NEABPD)
Diagnosing and Treating Borderline Personality Disorder in Adolescents and Young Adults.
University of California Los Angeles (UCLA); Los Angeles, CA.
Presenter: Blaise Aguirre, MD

Advances in DBT Research and Treatment 2013
National Education Alliance for Borderline Personality Disorder (NEABPD)
Diagnosing and Treating Borderline Personality Disorder in Adolescents and Young Adults.
University of California Los Angeles (UCLA); Los Angeles, CA.
Presenter: Alec Miller, PsyD

ORGANIZATIONAL MEMBERSHIPS

American Psychological Association (APA) 2016 – Present

REFERENCES

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