Fall 2016

Multiple Effects Of A Brief Mindfulness Training

Stephanie Aholt

MULTIPLE EFFECTS OF A BRIEF MINDFULNESS TRAINING

A Master's Thesis

Presented to

The Graduate College of

Missouri State University

In Partial Fulfillment

Of the Requirements for the Degree

Master of Science, Applied Behavior Analysis

By

Stephanie Aholt

December 2016

MULTIPLE EFFECTS OF A BRIEF MINDFULNESS TRAINING

Psychology

Missouri State University, December 2016

Master of Science

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ABSTRACT

Mindfulness-based interventions have been related to emotional regulation, reduced stress, and increased psychological flexibility. The current investigation extended previous findings by examining the short-term effects of a brief mindfulness training in undergraduate psychology students. The non-concurrent multiple baseline design evaluated heart rate and cortisol changes in response to a brief mindfulness-based intervention. The results found for some individuals, participation in the mindfulness intervention helped regulate their emotions and heart rate, as evidenced by the decrease in heart rate and cortisol and increase in psychological flexibility by changes in Acceptance and Action Questionnaire-2 and Perceived Stress Scale-14 scores. Findings suggest more frequent, but brief interventions incorporating mindful attention can be an effective means for managing stress, but further research is warranted.

KEYWORDS: mindfulness, emotional regulation, psychological flexibility, stress reduction, heart rate, cortisol

This abstract is approved as to form and content

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Chairperson, Advisory Committee
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ACKNOWLEDGEMENTS

This research was supported by the Missouri State University Graduate College. I would also like to thank Nikki Clauss and Dr. Jennifer Byrd-Craven from Oklahoma State University for analyzing the cortisol research. The completion of this project would not have been possible without the guidance and support from my advisor Dr. Michael Clayton. I would also like to thank my committee members Dr. Mitchell and Dr. Abernathy for their insight and access to materials, laboratory and research facilities. Without their expertise it would not have been possible to conduct this research.

Finally, I want to thank my parents Barb and Dale Aholt and my fiancé Josh Riegel for their unconditional love and encouragement throughout my graduate studies. For all the "one more minute" moments and sleepless nights, thank you for being my biggest cheerleaders.

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INTRODUCTION

Acceptance and Commitment Therapy (ACT) is a behavioral therapy developed by Steven Hayes in 1986 that aims to "increase acceptance of the full range of subjective experiences, including distressing thoughts, beliefs, sensations, feelings, in an effort to promote desired behavior change that will lead to improved quality of life" (Forman, Herbert, Moitra, Yeomans, & Geller, 2007; Harris, 2006). Through the six core principles of defusion, acceptance, contact with the present moment, observing the self, values and committed action, ACT aims to develop psychological flexibility (Harris, 2006). Forman et al. (2007) defined psychological flexibility as "the process of contacting the present moment fully as a conscious being." By developing psychological flexibility, an individual can begin to handle unwanted private experiences by living in the present movement to promote behavior change (Forman et al., 2007).

Acceptance and Commitment Therapy

Through brief and long term therapy, ACT has been effective in a variety of settings. In 2013, Luoma and Vilardaga utilized a two-day workshop and six sessions of phone consultations to train therapists in ACT. The study incorporated a randomized, between-group design over a three-month period and found therapists who received the intervention reported greater knowledge of ACT, decreased burnout, and improved psychological flexibility, but recommended further research on the extent of training and supervision (Luoma & Vilardaga, 2013).

Lappalainen, Lehtonen, Skarp, Taubert, Ojanen, and Hayes (2007) extended research on ACT in their study comparing the effectiveness of Cognitive Behavior Therapy (CBT) and ACT in 28 psychology trainee therapists and their clients. All therapists received minimal training in both models, but reported better results with ACT. The study also found therapists whose clients were treated within the ACT model showed better symptom improvement than those in CBT condition (Lappalainen et al., 2007). Forman et al. (2007) reported similar results in a study comparing ACT and Cognitive Therapy for participants experiencing anxiety and depression. The results indicated Cognitive Therapy and ACT utilized distinct mechanisms in reducing symptoms, but ACT was more effective at decreasing burnout and improving psychological flexibility (Forman et al., 2007).

One of the core components of ACT is the concept of mindfulness. In order to achieve psychological flexibility, mindful attention, or "consciously bringing awareness to your here and now experience with openness, interest and receptiveness" (Harris, 2006) is used to help clients recognize their destructive thoughts and adopt an attitude that focuses on present moment experiences.

By using simple instructions to prompt individuals to pay mindful attention and modify their mindsets, Delizonna, Williams and Langer (2009) found individuals could effectively regulate their emotions and heart rate. The experiment utilized a between-subjects experimental design where participants attended bi-weekly sessions and revealed mindfulness was an effective strategy for emotional regulation (Delizonna et al., 2009). Mindfulness has also been used to help clinicians increase awareness of themselves and

their reactions by building skills like attention, affect tolerance, acceptance, empathy and compassion (Hopkins & Proeve, 2013).

Designed originally to treat chronic pain, Kabat-Zinn developed mindfulness training procedures that have been widely adopted in clinical settings named Mindfulness Based Stress Reduction (MBSR) (Kabat-Zinn, 1982). In 1998, Shapiro, Schwartz, and Bonner found an 8-week MSBR intervention was effective at reducing stress and anxiety in both premedical and medical students. Shapiro, Astin, Bishop, and Cordova (2005) extended their results and found a similar eight-week MSBR intervention reduced stress and increased quality of life and self-compassion measures for health care professionals.

One consistently reported limitation in mindfulness training interventions is the time constraint. Moore (2008) reported mindfulness training typically involves weekly two-hour sessions for a minimum of eight weeks with 45 minutes of daily in home practices. Carmody and Baer (2009) found an insignificant correlation between effect size and contact hours in their study examining psychological distress and suggested shortened versions of MBSR are just as effective.

In 2006, Mackenzie, Poulin and Seidman-Carlson, conducted a brief 4-week MBSR intervention for nurses and nurse's aids. The study incorporated a shortened version of the traditional MBSR program and weekly training sessions with a homework assignment on compact disc to be used daily to practice mindful attention (Mackenzie et al., 2006). Significant improvements in burnout, relaxation and life satisfaction were reported in the patients who participated in the MBSR intervention, suggesting mindfulness training can be effective in a brief format (Mackenzie et al., 2006). Positive

results were also reported in a study using brief 10-minute exercises for clinical psychologists (Moore, 2008).

ACT has been effective at decreasing symptoms and improving psychological flexibility across many individuals and behaviors. ACT has also been effective in treating psychosis, chronic pain, OCD, substance abuse, and schizophrenia (Twohig, Hayes & Masuda, 2006; Dahl, Wilson & Nilsson, 2004; Bach & Hayes, 2002.) Due to the vast majority of exercises and training, more direct investigation is warranted on the mechanisms of training therapists in ACT in a time limited format (Lappalainen et al., 2007).

Behavioral Skills Training

In 2013, Luoma and Vilardaga suggested ACT training combined with feedback and behavioral rehearsal resulted in longer lasting gains. Behavioral Skills Training (BST) is a research-based intervention utilized to teach a variety of skills. By first identifying the target behavior or skill and the context of which it should occur, the teacher first models the target behavior and gives the learner an opportunity to rehearse the behavior (Himle & Wright, 2014). The teacher provides reinforcement, corrective feedback, and further modeling if necessary until the learner has met criterion for the target behavior (Himle & Wright, 2014).

BST can be utilized in a variety of ways across many settings and populations to train an individual to perform a series of target behaviors. Hine (2014) utilized video modeling and feedback to train childcare workers seven skills for data collection. While

three targeted skills were directly taught, workers achieved 80% or higher in performance for all skills, including four other skills that were not directly taught (Hine, 2014).

Behavioral staff at a school for students with Autism were also taught how to administer correctly an EpiPen® using a 10-item task analysis with a behavior skills package that included initial instructions, modeling, feedback, praise and role-playing (Whiting, Miller, Hensel, Dixon, & Szekely, 2014). Pretest measures indicated staff members were completing the steps inaccurately, but after a brief 10-minute training of the behavior skills package, the percentage of steps accurately completed reached 89% for those in the treatment condition (Whiting et al., 2014). BST has also been used to help teachers correctly administer Picture Exchange Communication System and Discrete Trail Training interventions for students with Autism in their classrooms (Homiltas, Rosale, & Candel, 2014; Dib & Sturmey, 2007).

Six and seven-old children were taught basic gun safety in a behavioral skills package that included instruction, rehearsal, and feedback. The trainer first discussed the dangers of gun play and explained the three targeted steps: do not touch the gun, leave the room, and notify a teacher or parent (Miltenberger et al., 2004.) The trainer placed a real, but disabled gun in different settings and provided praise and feedback until the behavior was correct and the child demonstrated the safety skills five consecutive times in different settings (Himle & Wright, 2014). The gun safety skills generalized to the participant's home settings and were maintained five months after training was completed (Miltenberger et al., 2004).

In another example, a multiple baseline design was used across 10 participants to assess behavioral skills training to improve installation of child passenger safety restraints (CPSR) (Himle & Wright, 2014). In the baseline phase, each participant was given a CPSR manual and asked to install the CPSR using an infant-size dummy to the best of their ability (Himle & Wright, 2014). The study measured the number of installation and use errors based on 10 specific target behaviors (Himle & Wright, 2014). After baseline, participants received a behavioral skills training program that consisted of instruction, modeling, rehearsal, descriptive praise, and corrective feedback. Results indicated all participants had committed critical errors in the baseline phase, but were able to install the CPSR without error after the brief behavioral skills training (Himle & Wright, 2014). BST can be effective at teaching a variety of skills and results have generalized across time and other settings.

The goals of this study were to extend literature on mindfulness, ACT and BST by examining the effectiveness of a brief mindfulness training intervention using a non-concurrent multiple baseline design. Heart rate and cortisol levels were collected as physiological dependent measures and responses on two behavior scales were scored as pre-and post-test measures.

METHOD

Participants

Seven students attending a medium-sized university in the Midwest were recruited to participate in the study and received course credit for participation in the study. Participants ranged in age from 19 to 25 years old and included six females and one male. Of the seven participants, three (2, 6, 7) indicated a minimal level of previous exposure to mindfulness through yoga practice. Prior approval for this project was obtained from the Missouri State University IRB (February 10, 2016; approval # 16-0261).

Setting and Materials

The study was conducted on the Missouri State University campus in a small room that contained one table and two chairs. The room light was dimmed to promote a relaxed atmosphere and participants were asked to face forward in a chair with their legs uncrossed and feet flat on the floor during baseline and intervention. Three adult-sized, unobtrusive adhesive electrodes were placed on each participant's right wrist and each ankle to monitor and record heart rate on a nearby monitor using BioPAC MP30 software and hardware.

Experimental Design, Response Measurement, and Interobserver Reliability

To evaluate the efficacy of brief mindfulness training, a non-concurrent multiple baseline across subjects design was used. The primary dependent variable for the study was heart rate. Heart rate was monitored continuously throughout the study and used to assess variability after the intervention was introduced. As a secondary dependent measure, each participant submitted four saliva samples through passive drool into small tubes on the first and last session. The saliva was collected non-invasively to extract cortisol, a hormone produced by the body in reaction to stress or arousal. Cortisol is produced by the hypothalamic-pituitary-adrenal (HPA) axis, which is responsible for regulating how individuals react to stressors and arousal and has been shown to be a reliable indicator of physiological response to stress (Randall, 2012). Saliva samples were kept at -20C in a locked laboratory freezer and destroyed following the study. Participants also completed questionnaires before and immediately following three sessions of intervention. Psychological flexibility was assessed by the Acceptance and Action Questionnaire-2 (AAQ-2) which measures experimental avoidance in the presence of unwanted private events (see Appendix A) (Bond & Bruce, 2003; Hayes, Strosahl, et al., 2004). Participants also completed the 14-item version of the Perceived Stress Scale (PSS14), which evaluated perceived stress within the past month (see Appendix B) (Cohen, Kamark, & Mermelstein, 1983).

Heart rate was recorded during all sessions and later measured by the experimenter and an assistant therapist. Interobserver reliability was calculated by examining a correlation of heart rate for 50 % of baseline sessions and 50% of intervention sessions. During baseline, heart rate was sampled at 60s and 120s for all

participants. During intervention, heart rate was sampled at 120s, 240s, and 360s into the mindfulness recording. After the participant was instructed to practice mindfulness on their own, heart rate was again sampled at 120s, 240s, and 360s during practice. Interobserver reliability for heart rate was averaged at 0.83 with beats per minute varying ± 1.5 beats per minute.

Procedure

Prior to beginning the study, each participant reviewed and signed an informed consent document (see Appendix C). Once consent was obtained, each participant filled out a demographic form before beginning each session to document characteristics that may have a direct effect on heart rate (e.g., exercise, caffeine and tobacco intake) and previous experience with any relaxing techniques (see Appendix D).

Once informed consent was obtained, the study began. During baseline, each participant first completed the demographic information form and the first saliva sample was obtained. Three adult-sized electrodes were then placed on each of the participant's ankles and right wrist. Once the electrodes were attached, the participant was instructed to sit with their legs uncrossed, feet flat on the floor, and limit their movements while the electrodes were attached. Heart rate was measured for a minimum of three minutes in order to determine a resting heart rate.

Once a *resting heart rate* had been recorded, participants were asked to read the first page of a short article, *Mindfulness without Meditation*, which briefly described mindfulness and provided a description of the steps utilized in the intervention phase for

teaching mindfulness (Harris, 2009). The description and steps were displayed in a PowerPoint slide, allowing participants to click to the next slide to not interfere with heart rate. After 15 minutes, the second saliva sample was collected before listening to a five-minute stressful recording. The audio recording mimicked everyday stressors (e.g., children crying) and was followed by the collection of the third saliva sample. After the video, participants were then asked to practice the mindfulness steps they had previously read to the best of their ability for 15 minutes. After the participant had practiced the steps, the fourth and final saliva sample was collected and the participant was asked to complete the two questionnaires. Baseline data consisted of a minimum of three beats per minute sampled at 120s for each participant.

During the next session, the intervention began and each participant attended three, 15-minute trainings. Each session began with the participant completing a demographic information sheet and establishing a resting heart rate. The participant then read a brief description of the targeted skills and listened to a 15-minute audio recording developed by Jason Luoma (ACT Resources, 2003). The first half of the mindful awareness recording gave specific instructions and frequently reminded participants to bring their attention back to the present moment and the second half of the recording was left blank to allow participants time to rehearse the targeted skills on their own. After each intervention session, the experimenter delivered a statement of behavior specific praise (e.g., “You did a nice job practicing the steps with the audio recording.”) and gave corrective feedback (e.g., "Remember to keep bringing your thoughts back to the present moment if you get distracted.”)

Following two sessions of intervention, participants returned and followed the same procedure as baseline. One saliva sample was collected when the participant first arrived and a second sample was collected 15-minutes later before watching the stress video. Participants then listened to the same audio recording that was in baseline, but instead of the participants reading the steps and practicing to the best of their ability, they were asked to listen and follow along with the mindfulness audio recording developed by Jason Luoma (ACT Resources, 2013). A third saliva sample was collected immediately after the stress recording played and participants submitted a final saliva sample following the mindfulness recording. After, participants completed the AAQ-2 and the PSS-14.

Treatment Integrity

Treatment integrity was collected throughout the intervention phase of the study. Intervention sessions were video recorded and later assessed by an assistant therapist who scored the following components: a) electrodes attached to participant's right wrist and each ankle, b) researcher instructed participants to keep legs uncrossed and limit their movements while the electrodes were attached, c) a stable resting heart rate was recorded for at least three minutes, d) researcher instructed participants to read a brief description of mindfulness, e) researcher instructed participants to practice mindfulness to the best of their ability, f) researcher started the mindfulness recording, g)researcher gave feedback about the participant's heart rate, h) researcher gave corrective feedback about mindfulness training, and i) researcher detached electrodes (See Appendix E). Treatment

integrity was calculated by dividing the total number of correctly implemented session components by the total number of components and converting the result into a percentage. Treatment integrity was collected for 50% of sessions for all participants with an average of 99 %.

RESULTS

The study hypothesized that individuals who scored high on the AAQ-2 and PSS-14 would have greater heart rate deceleration after brief mindfulness training. The results indicated heart rate was variable throughout the intervention, but a significant decrease was found between baseline and the last intervention session for some participants and a significant decrease of arousal (as evidenced by the cortisol change) was found for the second stress recording. Scores also decreased on the AAQ-2 and PSS-14, indicating lower levels of stress and increased acceptance and action for all but two participants.

Demographic Information

Participants Two, Six and Seven indicated on the Demographic Information Sheet that they had previous exposure to mindfulness through yoga practice (see Table 1). Participant One was a smoker who indicated regular tobacco use. Participants Two, Three, Five and Seven indicated regular exercise and Participants Two and Four reported taking NyQuil™ over the course of the study.

Questionnaires

Participants completed the AAQ-2 and the PSS-14 before and immediately following the study. The AAQ-2 is scored on a seven point Likert-type scale from never true (1) to always true (7), range: {10,70}. Higher scores are reflective of greater experiential avoidance and immobility, while lower scores often reflect greater

acceptance and action. Scores decreased slightly for all participants following the mindfulness training expect for participants Four and Seven. Participant Four's AAQ-2 score remained the same and participant 7's score rose two points (see Table 2).

Each item on PSS-14 was ranked on a 5-point scale ranging from never (0) to almost always (4) range: {0,40}. The items on the PSS-14 were reversed scored and the total was summed with higher scores indicating more perceived stress. Scores from 0-13 are considered average levels of stress while scores between 14-40 are considered moderate and high levels of perceived stress. Scores on the PSS-14 decreased slightly for more than half of participants (see Table 3). Participant Five's score remained the same and Participant Three and Six rose slightly following the mindfulness training.

Cortisol

Cortisol scores were positively skewed. In all analyses, the natural log transformation for cortisol scores was used to normalize the distribution (Gordis et al., 2006). Cortisol was collected before and after mindfulness was practiced. During both pre- and post-mindfulness sessions, a saliva sample was collected four times. The first saliva sample was collected upon the participant's arrival. Participants then filled out the demographic information sheet, the questionnaires and once a stable resting heart rate had been established, another saliva sample was collected before the stress recording was presented. After, the participant watched the stress recording and a third saliva sample was collected. The fourth and final saliva sample was collected after the participant listened to the mindfulness audio recording. Change scores were configured by

subtracting time one of collection from time four of collection. This was done for both the pre-mindfulness and post-mindfulness data and was used to determine the stress response. Results revealed a significant difference between pre-meditation change scores and post-meditation change scores (t = -6.52, p = .001) (M pre = .20, M post = -.19) suggesting a lack of arousal to the second stress recording.

Heart Rate

Heart rate was recorded continuously throughout the study to assess changes after the mindfulness intervention was introduced (see Table 4). On the first and last session, heart rate was also recorded when the participant listened to a stress recording (See Table 5).

Participant One. Based on the information provided, Participant One indicated regular tobacco use and caffeine intake throughout the study. Participant One's AAQ-2 score decreased from 37 to 31 and PSS-14 score decreased from 23 to 21 over the course of the study, but still indicated a high level of stress. Participant One's heart rate results are displayed in Figure 1. During the stress recording, heart rate was recorded at an average of 80.19 beats per minute and after the mindfulness intervention was introduced, heart rate decreased to an average of 69.24 beats per minute (see Figure 2). Participant One's heart rate was monitored throughout baseline and intervention and revealed heart rate decreased after the mindfulness intervention was introduced, but rose significantly during session three. During baseline, Participant One had an average of 83.77 beats per minute which decreased slightly to 74.75 during session two, but rose to an average of

86.56 beats per minute during session three and decreased to an average of 77.35 beats per minute during session four.

Participant Two. Participant Two indicated regular exercise, previous exposure with mindfulness through yoga and taking NyQuil™ for flu-like symptoms during the course of the study. Scores on the AAQ-2 decreased significantly after the intervention was introduced, decreasing from 39 to 30. Participant Two's PSS-14 score only dropped slightly from 11 to 10 over the course of the study, but these numbers suggest an average level of stress. Participant Two's heart rate results are displayed in Figure 1. During the stress recording, the participant averaged 95 beats per minute, but when the participant listened to the stress recording on the last session, her heart rate averaged 70.75 beats per minute (see Figure 2). During baseline, Participant Two had an average of 80.29 beats per minute which decreased to 72.34 beats per minute during session two. Participant Two's heart rate rose slightly to 74.19 beats per minute during session three, and dropped to an average of 70.38 beats per minute during the last session.

Participant Three. Participant Three indicated regular exercise and caffeine intake within the past three hours for all sessions throughout the study which could have an effect on heart rate. Scores on the AAQ-2 decreased slightly from 31 to 30 and scores on the PSS-14 rose from 8 to 12, which still reflects an average level of stress. Heart rate results for Participant Three are displayed in Figure 1. When Participant Three first listened to the stress recording, heart rate was averaged at 85.12 beats per minute. After the intervention, the stress recording was re-introduced and indicated heart rate slightly dropped to an average of 82.18 beats per minute (see Figure 2). During baseline,

Participant Three averaged 87.53 beats per minute and dropped to an average of 77.21 beats per minute during session two. During session three, however, Participant Three's heart rate rose significantly to an average of 99.4 beats per minute then dropped to an average of 78.29 beats per minute during session four.

Participant Four. Participant Four recorded caffeine intake within the past three hours and reported taking NyQuil™ over the course of the study. Participant Four's AAQ-2 scores remained at 31 throughout the study and the PSS-14 score decreased slightly from 17 to 16. The heart rate results for Participant Four are shown in Figure 1. During the first exposure to the stress recording, Participant Four averaged 78.79 beats per minute and after intervention, Participant Four's averaged heart rate slightly rose to 81.63 beats per minute when the stress recording was played again on the last session (see Figure 2). During baseline, Participant Four averaged 83.53 beats per minute and after the intervention was introduced, their averaged heart rate decreased to 81.17 on session two. Participant Four's heart rate continued to decrease on sessions three and four with averages of 78.87 and 68.89 beats per minute.

Participant Five. Participant Five indicated regular exercise on the Demographic Information Sheet, but no other factors that could influence heart rate were noted. Throughout the course of the study, Participant Five's PSS-14 score remained the same at 23 which is indicative of high levels of stress. Scores on the AAQ-2 dropped slightly from 36 to 34. Based on the data collected, the mindfulness exercise was not effective at reducing Participant Five's heart rate (see Figure 1). During the stress recording, the participant's heart rate averaged 84.39 beats per minute and after the intervention was

introduced and the stress recoding was played again, heart rate was averaged at 103.75 beats per minute (see Figure 2). During baseline, Participant Five averaged 85.18 beats per minute, but during session two, heart rate was averaged at 88.07 beats per minute. On session three, heart rate was averaged at 83.45 beats per minute and session four was averaged at 90.62 beats per minute.

Participant 6. Participant Six noted food intake within the past three hours on all sessions and caffeine intake on session two which could influence heart rate. Participant Six's PSS-14 rose slightly from 19 to 20 which is reflective of high stress, but the AAQ-2 score fell from 35 to 31. Participant Six's heart rate results are displayed in Figure 1. During the stress recording, Participant Six averaged 94.7 beats per minute (see Figure 2). On the last session, the participant averaged 80.36 beats per minute during the stress recording. During baseline, Participant Six averaged 95.43 beats per minute, but once the mindfulness intervention was introduced, heart rate average fell to 75.25 beats per minute. During sessions three and four, heart rate averaged 76.61 and 76.90 beats per minute.

Participant Seven. Participant Seven reported regular exercise, food intake on during baseline and on the third and fourth session and caffeine intake during baseline which could affect heart rate. Throughout the study. Participant Seven's PSS-14 score decreased slightly from 12 to 11 which is considered average level of stress, but AAQ-2 scores rose from 28 to 30 which is reflective of experimental avoidance. Heart rate results for Participant Seven are found in Figure 1. When the stress recoding was first introduced, the participant averaged 74.81 beats per minute and when it was played again

on the last session, heart rate averaged at 73.78 beats per minute (See Figure 2). During baseline, Participant Seven averaged 72.01 beats per minute. Throughout the study, heart rate averages remained the same, only decreasing slightly on session two to 70.47 beats per minute. On sessions three and four, heart rate was recorded at an average of 72.56 and 72.8 beats per minute.

DISCUSSION

The current study sought to investigate whether a brief exposure to mindfulness could be effective at decreasing stress and increasing psychological flexibility as evidenced by changes in heart rate, cortisol levels and questionnaire scores. This study intended to replicate and extend previous research that shortened versions of mindfulness can be effective at reducing stress and mindfulness combined with corrective feedback could result in longer lasting behavior gains (Mackenzie et al., 2006; Luoma &Vilardaga, 2013). The results of the current study partially support the previous finding that mindfulness exercises can be effective at reducing stress and improving psychological flexibility (Carmody & Baer, 2009; Delizonna et al., 2009; Moore, 2008). Heart rate data was variable, but for some individuals, brief exposure to mindfulness was helpful in increasing psychological flexibility (according to test scores), decreasing the rate of arousal to the stress recording, and decreasing scores on the Perceived Stress Scale. Unlike previous research, this investigation examined the participant's physiological reaction to a stress video after mindfulness was introduced and revealed the participants had a lack of arousal to the second stress recording, suggesting that practicing the mindfulness steps helped change their stress response.

Limitations

While participants did not vary much demographically, some participants indicated past exposure to mindfulness and the study utilized a small sample size with

overall low levels of perceived stress. The author sought to recruit participants with high levels of anxiety or stress who wished to find ways to effectively manage their stress, but was ultimately unsuccessful. Ceiling and floor effects are a possible limitation of the study for participants who had a high or low resting heart rate. For Participants One and Three, heart rate rose during session three.

Future Research

Future research should incorporate other physiological measures, like urinary excretion rates of noradrenaline (NA), adrenaline (A), dopamine and cortisol, and the ratio of NA/A, to measure the effectiveness of mindfulness and target participants with high levels of stress. Other face validity measures could be utilized to assess if the participant noticed a decrease in stress or felt more accepting of unwanted private experiences. Different mindfulness exercises should be evaluated and future research should employ a way to measure to the effectiveness of mindfulness in a natural setting over longer periods of time. Future research could incorporate daily or weekly mindfulness exercises and a way for participants to monitor their own heart rate.

Mindfulness has been helpful in treating a variety of disorders and decreasing stress and burnout in health care professionals. The brief mindfulness exercise utilized in this study can be incorporated into a variety of health care settings and future research should target other professionals at risk for burnout, including behavior therapists, social workers, and teachers.

Although further research is required to gain a more complete understanding of the effectiveness of mindfulness, data is easy to collect and can be incorporated into a variety of settings. Even in a brief format, mindfulness can be effective at increasing psychological flexibility and decreasing stress and could be helpful in keeping experienced professionals in the field. While this study utilized heart rate, cortisol and questionnaire measures, measuring the effectiveness of mindfulness remains a challenge. Further research is needed to quantify results, but the present study suggests mindfulness could produce lasting behavior change and help participants accept unwanted private experiences.

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Table 1. Participant Demographic Information. Data was collected before beginning each session. An X indicates a participant marking yes on the Demographic Information Sheet.

Baseline

Participant Number	Food Intake	Caffeine Intake	Medication	Regular Exercise	Tobacco Use	Mode of Travel	Previous Exposure
1	X	X			X	Car	
2			X	X		Car	X
3	X	X		X		Car	
4	X	X				Car	
5				X		Car	
6	X					Car	X
7	X	X		X		Car	X
Session 2							
1	X	X			X	Car	
2				X		Car	X
3	X			X		Car	
4	X	X				Car	
5				X		Bus	
6	X					Car	X
7				X		Car	X
Session 3							
1		X			X	Car	
2				X		Car	X
3	X	X		X		Car	
4	X		X			Car	
5				X		Bus	
6	X	X				Car	X
7				X		Car	X
Session 4							
1		X			X	Car	
2			X	X		Car	X
3	X	X		X		Car	
4	X					Car	
5				X		Bus	
6	X	X				Car	X
7				X		Car	X

Table 2. Acceptance and Action Questionnaire-2 Scores.

Participant	AAQ-2 Score 1	AAQ-2 Score 2	Change Scores
1	37	34	3
2	39	30	9
3	31	30	1
4	33	33	0
5	36	34	2
6	35	31	4
7	28	30	2
AVERAGE	34	32	2

Note. AAQ-2 Score 1 was taken during baseline and before the mindfulness intervention was introduced. AAQ-2 Score 2 was taken on the last session of intervention.

Table 3. Perceived Stress Scale-14 Scores.

Participant	Perceived Stress Score 1	Perceived Stress Score 2	Change Scores
1	23	21	2
2	11	10	1
3	8	12	-4
4	17	16	1
5	23	23	0
6	19	20	-1
7	12	11	1
AVERAGE	19	18	1

Note. Perceived Stress Score 1 was taken during baseline and before the mindfulness intervention was introduced. The Perceived Stress Score 2 was taken on the last session of intervention.

Table 4**.** Averaged Heart Rate Results. Baseline represents heart rate recorded before the intervention was introduced and subsequent sessions contain heart rate recorded after the intervention was introduced.

Participant	**Baseline**	**Session 2**	**Session 3**	**Session 4**
1	83.77	74.75	86.56	77.35
2	80.90	72.34	74.19	70.83
3	87.53	77.21	99.40	78.29
4	83.53	81.17	78.87	68.89
5	85.18	88.07	83.45	90.62
6	95.43	75.25	76.61	76.90
7	72.01	70.47	72.56	72.80
AVERAGE	84.05	77.03	81.66	76.5

Table 5. Heart Rate Results during Stress Recording.

Participant	Stress Recording 1	Stress Recording 2	Change Scores
1	80.19	69.24	10.95
2	95.00	70.75	24.25
3	85.12	82.18	2.94
4	78.79	81.63	-2.84
5	84.39	103.75	-19.34
6	94.7	80.36	14.34
7	74.81	73.38	1.43
AVERAGE	84.71	80.18	4.53

Note. Stress Recording 1 contains the averaged heart rate in beats per minute taken during baseline when the stress video was first shown. Stress Recording 2 is the averaged heart rate taken during the second showing of the stress video and after the mindfulness intervention was introduced.

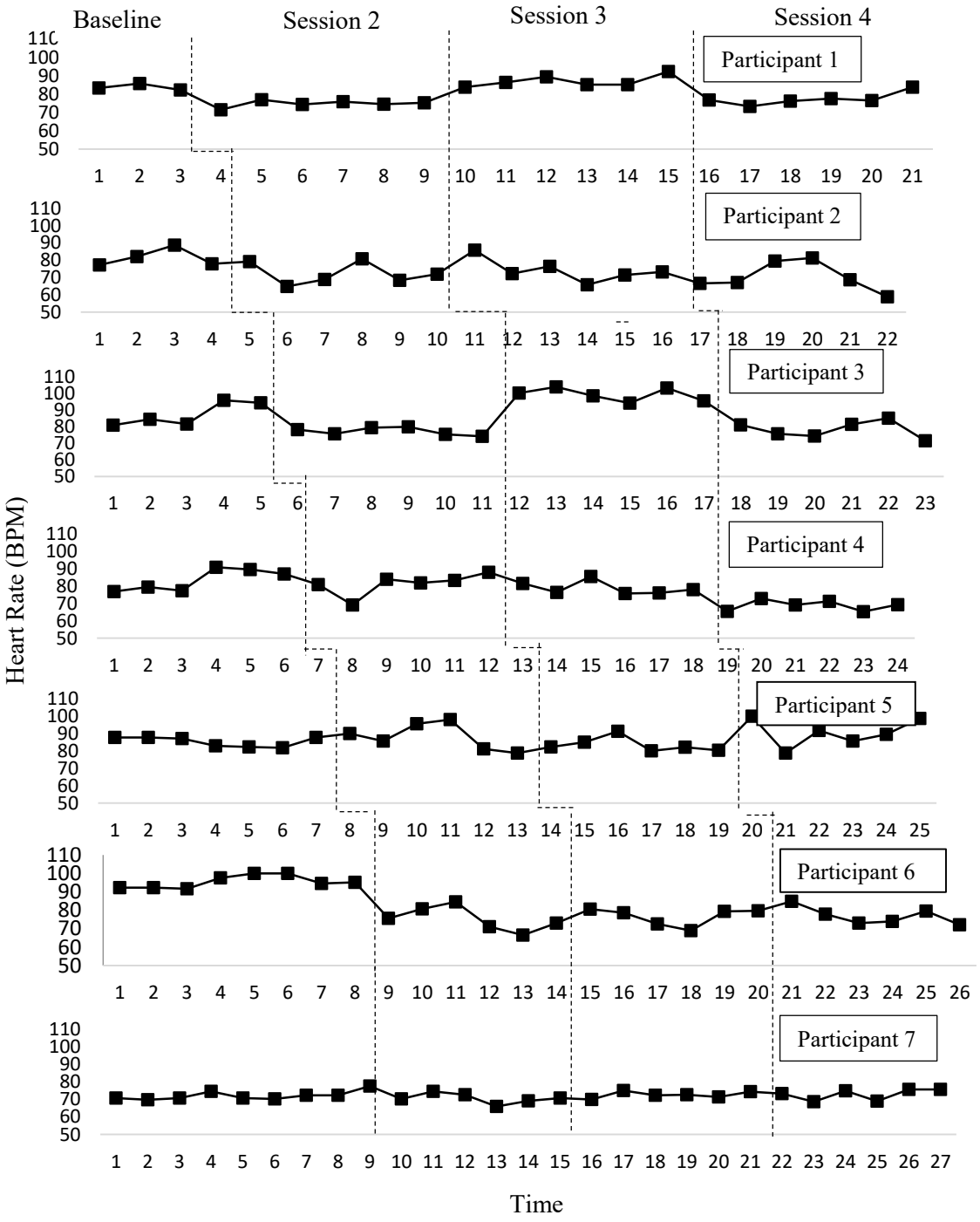

Figure 1. Heart Rate Results for Participants 1-7. Baseline represents heart rate before the intervention was introduced and subsequent sessions contain heart rate after the intervention was introduced.

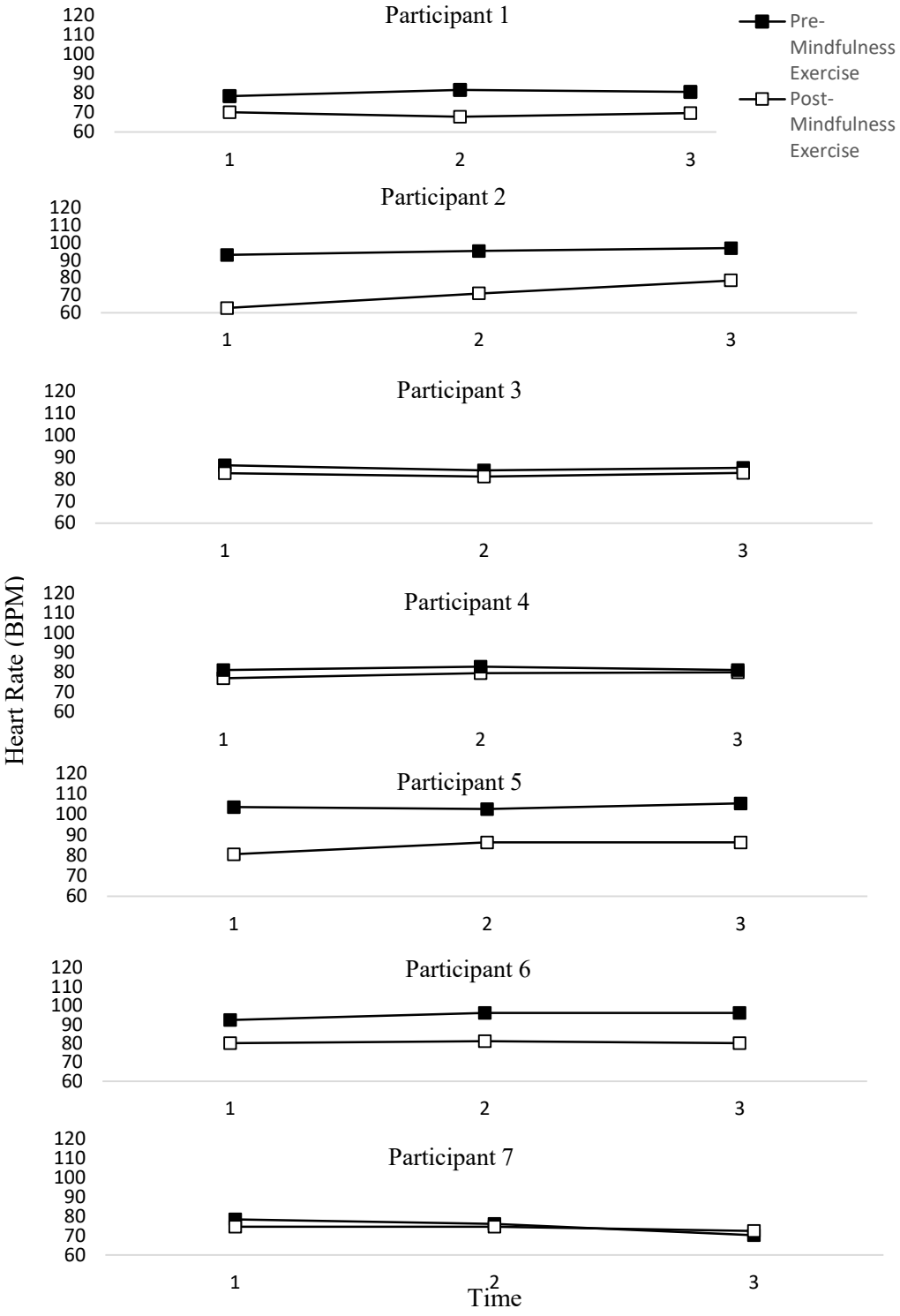

Figure 2. Heart Rate Results for Participants 1-7 During Stress Recording. The stress recording was shown during baseline and on the last session following the intervention.

APPENDICES

Appendix A

Acceptance and Action Questionnaire-2

1	2	3	4	5	6	7
Never True	Very Seldom True	Seldom True	Sometimes True	Frequently True	Almost Always True	Always True

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

Appendix B

Perceived Stress Scale-14

1. In the past month, how often have you been upset because of something that happened unexpectedly?

Never	Almost Never	Sometimes	Fairly Often	Very Often
0	1	2	3	4

2. In the past month, how often have you felt unable to control the important things in your life?

Never	Almost Never	Sometimes	Fairly Often	Very Often
0	1	2	3	4

3. In the past month, how often have you felt nervous or stressed?

Never	Almost Never	Sometimes	Fairly Often	Very Often
0	1	2	3	4

4. In the past month, how often have you felt confident about your ability to handle personal problems?

Never	Almost Never	Sometimes	Fairly Often	Very Often
0	1	2	3	4

5. In the past month, how often have you felt things were going your way?

Never	Almost Never	Sometimes	Fairly Often	Very Often
0	1	2	3	4

6. In the past month, how often have you found that you could not cope with all the things you had to do?

Never	Almost Never	Sometimes	Fairly Often	Very Often
0	1	2	3	4

7. In the past month, how often have you been able to control the irritations in your life?

Never	Almost Never	Sometimes	Fairly Often	Very Often
0	1	2	3	4

8. In the past month, how often have you felt that you were on top of things?

Never	Almost Never	Sometimes	Fairly Often	Very Often
0	1	2	3	4

9. In the past month, how often have you been angry because of things that have happened that were outside of your control?

Never	Almost Never	Sometimes	Fairly Often	Very Often
0	1	2	3	4

10. In the past month, how often have you felt that difficulties were piling up so high that you could not overcome them?

Never	Almost Never	Sometimes	Fairly Often	Very Often
0	1	2	3	4

Appendix C

Missouri State University Consent of Participation

This study is part of the Missouri State University Psychology Graduate Program designed to give us more information and to fulfill a thesis requirement for Stephanie Aholt. The following information is provided so that you can decide whether you wish to participate in this study. If you agree to participate, you will complete two paper-and-pencil questionnaires and submit two saliva samples. You will first be asked to read a brief article over mindfulness and practice the steps to the best of your ability. During this time, you will have 3 electrodes attached to you (one on each of your ankles and one on your right wrist) so to record and monitor your heart rate. You will be asked to return for three more sessions to listen to an audio recording over mindfulness and practice along. During two of mindfulness audio recording sessions, the experimenter will be recorded via video and later scored by an assistant researcher to ensure treatment integrity.

One of the members of the research lab should have explained the purposes and procedures of the study to you, and will answer any questions you might have. Please be assured that if you agree to participate, you are free to withdraw from the study even after you have signed this consent form. If you wish to withdraw, simply stop any on-going task and tell the research staff you wish not to continue. Should you decide to terminate the research session; all data pertaining to you that have been collected will be destroyed.

Since it is our policy to protect the confidentiality of all our participants, your name will not be included in any data analyses, subsequent publication or presentations related to this research study. All raw data collected during this study will be identified only an ID number to insure confidentiality of the information collected.

If questions arise after you have left the research laboratory, feel free to give Michael Clayton, Ph. D., a call at 417-836-3783 or at mclayton@missouristate.edu. We do not anticipate any risk to you as a result of participating in this study, your participation will, however, make an important contribution to our scientific knowledge, and we very much appreciate your cooperation.

In addition, we would appreciate you filling out the attached demographic sheet so we can document the characteristics of our participants. Any of the questions you feel uncomfortable about answering, please feel free to leave blank. As with the raw data collected, this information will be entered into our computer system and only identified by code-number to insure confidentiality.

Appendix D

Demographic Information Sheet

Participant's Name:

1. Date of Birth 2. Gender

3. Time you last ate today

Briefly, describe what and how much you ate.

4. Have you had caffeine in the past 3 hours? Yes No

Approximately, how much?

5. Are you currently taking any cold or allergy medicine or prescribed medication?

If yes, please explain

6. Do you exercise regularly?

If yes, how often and how long?

Type(s) of Exercise:

7. Do you smoke or use tobacco?

On average how much?

8. What mode of transportation did you use to get to the study?

9. Have you participated in any mindfulness programs in the past (e.g., yoga, meditation)?

If yes, please explain.

Appendix E

Treatment Integrity Checklist

For each of the 10 items, score a + for occurrence or – for nonoccurrence. For item 3, set a timer for three minutes at the start of the experimenter hitting a series of keys on the keyboard (end of resting heart rate is signaled by the experimenter hitting a set of keys on the keyboard).

1. Researcher attached electrodes to participant's right wrist and each ankle	
2. Instructed participants to limit movement and keep legs uncrossed while electrodes are attached	
3. Researcher recorded stable resting heart rate for at least 3 minutes	
4. Instructed participants to read a brief description of the targeted behavior: Mindfulness	
5. Following the reading, researcher instructed participants to follow along with audio recording to the best of their ability	
6. Started Mindfulness audio recording	
7. Following the mindfulness recording, researcher gave behavior specific praise, *e.g. "You did a nice job practicing mindfulness" or "You did a great job of following the steps with the recording"*	
8. Researcher gave feedback about the participant's heart rate, *e.g. "Your heart decreased during the mindfulness training" or "Your heart rate became more stable after practicing mindfulness for a couple of minutes"*	
9. Researcher gave corrective feedback about mindfulness training, *e.g. "If you find yourself getting distracted or wondering off, just bring your awareness back to the present moment."*	
10. Researcher detached electrodes	