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Treatment Efficacy of Exposure Therapy and Mindfulness Meditation on Physiological and Self-
Perceived Measures of Stress for a Certain Public Speaking Task

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Project Title: Treatment Efficacy of Exposure Therapy and Mindfulness Meditation on Physiological and Self-Perceived Measures of Stress for a Certain Public Speaking Task.

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Abstract

Empirical research has demonstrated that the Trier Social Stress Test (TSST) consists of public speaking that has been used effectively to increase physiological and perceived stress. In addition, exposure therapy and mindfulness meditation have been widely used to decrease stress in a clinical setting. The purpose of this study was to see if practicing an exposure exercise or mindfulness meditation would decrease physiological and perceived measures of anxiety after speaking in front of a video camera. A total of 19 undergraduates were assigned to one of three conditions. The control condition completed no preparation, the mindfulness meditation condition practiced a formal mindfulness meditation breathing technique, and the exposure condition practiced a prompt in front of a mirror. At the end of the week participants were asked to prepare and present a speech by answering several self-evaluating job interview questions in front of a video camera. Participants' cortisol samples, heart rates, and subjective units of distress (SUDS) were taken before and after the speech. It was predicted that in all conditions, participants' physiological and perceived measures of stress would increase immediately after the stressor task. It was also predicted that in the exposure and mindfulness meditation conditions, participants' physiological and perceived stress would increase significantly less than the control condition. As predicted SUDS change scores were significantly lower in the exposure condition than in the control condition. There was also a positive correlation between SUDS and cortisol. These findings support that practicing in front of a mirror can decrease perceived stress and that perceived stress can act as a predictor of physiological stress. Future studies would want to include a larger sample size and a more controlled clinical laboratory setting.

Treatment Efficacy of Exposure Therapy and Mindfulness Meditation on Physiological and Self-Perceived Measures of Stress for a Certain Public Speaking Task

Anxiety can have a very detrimental impact on how many individuals perceive and respond to life experiences. While anxiety can affect all people to a certain degree, it tends to affect some individuals more than others (Chorpita, 2007). Chorpita (2007) indicates that some individuals respond very positively when they encounter ambiguous situations; whereas, others respond very negatively to similar situations. Those who are more likely to perceive ambiguous situations as threats are likely to have higher levels of negative affect. Chorpita (2007) suggests that there are several factors that when combined with negative affect can make a person more susceptible to anxious thinking. The first of these factors is perception of control. People are more likely to approach a new event negatively when they feel that they have no control over the event. The individual is more likely to undergo anxious feelings because they cannot predict or control the outcome of the event which often limits his or her ability to approach new experiences. The researcher goes on to express a second factor as specific life experiences. If an individual with high negative affect experiences a specific negative life event, this can reinforce the fear of the event occurring again. This can condition the individual to view the world as a fearful place and inhibit them from facing new events. Finally, a third factor is anxious thinking. People who exhibit higher levels of negative affect are more likely to ruminate about ambiguous situations through biased interpretations. These individuals perceive a more anxious outlook on life.

Foa & Kozak (1986) suggest that in the Emotion Processing Theory, when people with higher negative affect experience a feared stimulus, they are more likely to flee the situation. The researchers go on to elaborate that this phenomenon occurs because the fear structures are

triggered and the affected person finds relief by escaping from the situation. When the individual finds relief from fleeing the stressor stimulus, this reinforces the response so that they become conditioned to fear other feared stimuli in the future. Cannon (1929) coined the physiological response to these stressors as the fight of flight response. He suggests when a person or animal feels threatened that certain physiological responses of the sympathetic nervous system become heightened such as increased adrenaline, accelerated heart rate, and dilation of pupils. The parasympathetic nervous system then functions to regulate these heightened physiological responses.

One part of the fear structures is the hypothalamic pituitary adrenocortical (HPA) axis which functions to maintain a person's equilibrium when various stressors are encountered (Gunner, Tague, & Herrera, 2009). When the HPA axis is stimulated by a stressor, it releases elevated levels of corticosterone, more widely known as cortisol which can be measured through salivary secretions. Kemeny (2003) goes on to elaborate on this process by suggesting that the increase of cortisol can be measured in the blood, saliva and urine. The researcher expresses that when the body encounters a stressful stimulus that the stressor triggers the hypothalamus to release a corticotrophin-releasing hormone. This hormone then signals the anterior pituitary gland to produce another hormone, adrenocorticotropin. The adrenocorticotropin hormone then passes through the blood stream until it reaches the adrenal glands which then signal the adrenal cortex to release the steroid, cortisol.

While cortisol can be used as an accurate measure of the physiological stress response, many factors have been found that can alter cortisol levels. First, time of day is an important factor to consider when collecting saliva samples. Hanrahan, McCarthy, Kleiber, Lutgendorf, & Tsalikian (2006) indicated that cortisol reaches peak levels during the morning, declines

throughout the day, and begins to level out during the late afternoon. Consistent with the previous literature Kudielka, Schommer, Hellhammer, & Kirschbaum (2003) also found a spike in cortisol during morning hours and a gradual decline in these levels throughout the day. In a follow up study the researchers indicated that the cortisol awakening response (CAR) reaches peak values in the first 30 to 45 minutes of the day (Kudielka, Gierens, Hellhammer, Wust, & Schlotz, 2012). Therefore, it is critical to maintain consistency for the time of day of collection for individuals, especially when collecting samples over the course of multiple days.

In addition to time of day, another factor that has been suggested to affect cortisol is female menstrual cycle. Wolfram, Bellingrath, & Kudielka (2011) found higher cortisol levels in the luteal phase versus the follicular phase in females. The researchers go on to suggest that they found even higher levels of cortisol in the ovulation period. Thus, it is important to consider what phase of the menstrual cycle the individual is in when including female participants. Williams, Hagerty, & Brooks (2004) indicated that in addition to time of day and menstrual cycle some other factors that can affect cortisol levels are smoking, caffeine intake, pregnancy, and certain medications. The researchers go on to suggest that participants should be excluded from the study if they are currently using steroids. He states they should also be excluded if they have a seizure, endocrine, kidney, or liver disorder. Hanrahan et al. (2006) also found that an unusual emotional day, food intake within 30 minutes prior to saliva collection, and oral contraceptives can alter cortisol secretion. Therefore, while cortisol can be an accurate indicator of the body's physiological response to stress, control for these factors must be maintained in order to obtain reliable results.

While many studies have examined the relationship between various stressor tasks and the HPA release of cortisol, few stressor tasks have managed to produce consistent levels of

elevated cortisol. Previous studies have indicated that stressors such as parent and child conflict (Granger, Weisz, McCracken, Ikeda, & Douglass, 1996) and peer rejection (Stroud, Foster, Papandonatos, Handwerker, Granger, & Kivlighan, 2009) failed to produce consistent elevated levels of cortisol. There is one specific stressor paradigm, however, that has produced reliable levels of elevated cortisol called the Trier Social Stress Test (TSST) (Buske-Kirschbaum, Fischbach, Rauh, Hanker, & Hellhammer, 2004). The TSST encompasses factors such as social-evaluation, uncontrollability, and unpredictability to act as a stressor that stimulates the HPA axis (Dickerson & Kemeny, 2004). In this task participants are told to prepare and give a speech in front of a group of judges and an audience. In addition, they are told that their speeches will be videotaped. The participants are then required to complete a difficult arithmetic task where if they make an error, they are required to start over. Wirtz, Elsenbruch, Emini, Rüdüsüli, Groessbauer, & Ehlert (2007) used the TSST and found that men who exhibited higher levels of perfectionism displayed higher cortisol levels when presented with the TSST than those who did not. Other studies have also replicated the TSST with both minimal and large alterations to the original task and obtained similar results. These studies have included telling participants that the judges are seated behind a one-way mirror (Jansen, Gispen-de Wied, Van der Gaag, Ten Hove, Willemsen-Swinkels, Harteveld, & Van Engeland, 2000), exclusion of the difficult arithmetic task and telling the participant that their speech will be judged for its quality (Klimes-Dougan, Hastings, Granger, Usher, & Zahn-Waxler, 2001), and telling participants that they will be performing a mock job interview (Dawans, Kirschbaum, & Heinrichs, 2011). These studies have all found significant increases in salivary cortisol elevations in response to the manipulations of the TSST despite the variations between tasks.

Another physiological measure of stress that has found to increase in response to the TSST is heart rate. In addition to increase of cortisol in response to the TSST, Dawans et al. (2010) also found an increased in heart rate. The researchers indicated that similar to cortisol, heart rate immediately before and after the TSST task were significantly higher than baseline heart rate. Similar to previous research, this study further illustrated Cannon's flight or fight response, by demonstrating that heart rate increased in response to a public speaking stressor task. Ollendick, Allen, Benoit, & Cowart (2011) found that when participants were presented with a behavioral approach test (BAT) which similar to the TSST acted as a stressor that interbeat interval (IBI) significantly increased. This literature reinforced that heart rate can be used as another physiological measure in response to a stressor task.

In addition to physiological indicators of stress, a self-report measure of perceived stress called subjective unit of distress (SUDS) has been widely used to measure stress. Previous literature has shown that SUDS correlated with physiological markers of stress. Ollendick et al. (2011) go on to express that in the BAT test participants' SUDS, which were rated on a scale of 0-8, correlated with IBI. When the BAT caused significant distress the participants' SUDS and IBIS increased. This finding suggested that a self-report measure of SUDS can share some interdependent relationship with physiological responses to stress. Similar to this research, Stevens, Gerlach, Cludius, Silkens, Craske, & Hermann (2011) found that socially anxious participants' heart rate perception correlated to their actual heart rate when taken before and after giving a speech. This study further supports the literature that self-perceived measures can be an accurate indicator of the physiological symptoms associated with stress.

These physiological and self-perceived indicators of stress can have negative implications on an individual's health if left untreated. McEwin (1988) suggests that a phenomenon called

allostatic load can occur when the physiological system is consistently overused. He goes on to elaborate that when the physiological system is overly active that memory loss in the hippocampus can occur as well as an increase susceptibility to viral respiratory infections. In addition, cortisol can alter levels of cytokines, ultimately inhibiting the immune system (Kemeney, 2003). The researcher goes on to suggest that when the immune system is affected this can alter an individual's psychological state because the body can imitate sickness and depression. These factors can have a negative impact on social engagement and change sleep patterns. Therefore, further research in treatment efficacy for anxiety and stress related tasks is critical to prevent these negative health implications from occurring.

One treatment that was found to be significantly effective in decreasing public speaking anxiety is exposure therapy. Chorpita (2007) suggests that when people experience a feared stimulus they often encounter symptoms of panic such as increased adrenaline. In many cases the individual leaves the feared situation before they have time to realize this response may have been a false alarm and the situation may have not been dangerous. Exposure therapy, however, uses systematic desensitization to allow the individual to experience the feared situation for a long enough duration to learn that the stimulus that they had originally feared is not likely to harm them. Exposure therapy has been found effective to decrease both physiological symptoms and perceived anxiety. One study examined the effects of a two-day cognitive-behavioral intervention with soldiers suffering from specific phobia of protective masks. The study found that having the soldiers repeat exposures with the protective masks decreased the soldiers protective mask phobia and reduced perceived trait and state anxiety and levels of cortisol secretion (Brand, Annen, Holsboer-Trachsler, & Blaser, 2011). Pull (2012) goes on to illustrate that exposure can be a useful treatment for public speaking anxiety as well. The researcher goes

on to express that exposure to a live audience or the imagination of an audience decreased public speaking anxiety. In one study, participants practiced giving a speech to a virtual audience before giving a speech in front of an actual audience. The researchers reported significantly decreased levels in self-reported measures of anxiety compared to the control condition (Anderson, Zimand, Hodges, & Rothbaum, 2005). Based on the previous literature, exposure may serve as an effective therapy for reducing both the physiological and self-perceived measures of stress.

Mindfulness meditation is another treatment that has been found effective in significantly decreasing the physiological and self-perceived symptoms associated with anxiety. One study found that increased attention and self-regulation can be improved through simple mindfulness meditation instructions. The researchers suggest one way participants can accomplish this is by focusing on the sensations of breathing such as the nostrils and diaphragm movement. If the participants' attention begins to wander they direct it back to the sensations of breathing (Moore, Gruber, Derose, & Malinowski, 2012). Also, one study found that when participants practiced both transcendental meditation and mindfulness meditation that there was a significant decrease in negative affect and perceived stress (Schoormans & Nyklicek, 2011). In addition to perceived stress, mindfulness meditation research has also illustrated decreased physiological symptoms. Galantino, Blaine, Maguire, Szapary, & Farrar (2005) found that when participants received long-term weekly-guided mindfulness meditation sessions and then practiced these techniques individually for eight weeks that their cortisol secretion significantly decreased. Mindfulness meditation has also been found to decrease physiological stress responses when used short-term. Zeidan, Johnson, Gordon, & Goolkasian (2010) found that when Vipassana meditation skills were taught to participants for 20 minutes over 3 consecutive days that participants' heart rates

significantly decreased and participants' self-regulation were improved. Participants, however, who received either a fake meditation or no meditation were unaffected. Henceforth, mindfulness meditation may also act as an effective treatment for decreasing both physiological responses and self-perceived measures of stress.

Method

Participants

Participants consisted of nineteen students from a small, liberal arts university in the upper Midwest region. The sample was a convenience sample collected from an online Psychology Research in Action (PRIA) enrollment web base. PRIA consisted of students enrolled in Introduction to Psychology 111 who were asked to participate in ongoing studies to receive a PRIA credit. Participants were divided into three groups: a control group, a mindfulness meditation group, and an exposure group through block randomization. There were 5 participants in the control condition, 7 participants in the mindfulness meditation condition, and 7 participants in the exposure condition. One participant in the control condition dropped out.

Physiological Measures

Cortisol was collected using Salimetrics collection tubes and cotton swabs. Participants completed this by putting a cotton swab under their tongue for one minute and placing the swab into a test tube. Cortisol samples were collected 15 minutes after a relaxation CD to establish baseline levels prior to the stressor and 15 minutes after the stressor. The samples were analyzed using Salimetric Assay kits. 38 samples were analyzed in duplicates and the average cortisol concentration of the duplicates were assessed. Samples were frozen at -80° until the samples were ready to be analyzed.

Heart rate was recorded in beats per minutes using EKG electrodes and a pulse oximeter finger clip. Participants were asked to wipe off their arms using alcohol swabs and let them air dry for 30 seconds. They were then asked to place the electrodes on the appropriate positions on their arms and rest them out on the table with their palms facing up. The researcher hit the collect button while participants had their arms in a resting position with their palms facing up for 30 seconds. Their beats per minute were recorded on a questionnaire at baseline, prior to the stressor for time 2, and following the stressor for time 3. This value was determined by taking 60 seconds divided by the average seconds of three beats to calculate a BPM value. A second measure of heart rate was used to verify validity using a Pulse Oximeter finger clip. Participants were asked to place their index finger in a Pulse Oximeter finger clip for 30 seconds and record the BPM value on the questionnaire at baseline, prior to the stressor for time 2, and following the stressor for time 3.

Psychological Measures

Participants rated their perceived stress on a scale of 0-8 with 8 indicating most stressed. Subjective Units of Distress were recorded on the questionnaires at baseline, prior to the stressor for time 2, and immediately following the stressor for time 3.

Procedure

Participants were asked to record their PRIA numbers on Time 1 and Time 2 test tubes and Time 1, Time 2, and Time 3 questionnaires. Participants were then asked to place all material aside for later except for the Time 1 questionnaire. Participants recorded their SUDS and the date on the Time 1 questionnaire. Participants' heart rates were determined using EKG electrodes and a Pulse Oximeter finger clip. Their BPMs were recorded on the Time 1

questionnaire. There were three conditions: a control condition, a mindfulness meditation condition, and an exposure condition.

Control Condition

Participants who were assigned to the control condition were told not to complete any preparation before Time 1 or Time 2.

Mindfulness Meditation Condition

Participants assigned to the mindfulness meditation condition were provided with an informal breathing mindfulness meditation exercise illustrated by Kabat-Zinn (1990). This consisted of directions indicating statements such as “Every time you notice that your mind has wandered off the breath, notice what it was that took you away and then gently bring your attention back to your belly and the feeling of the breath coming in and out”. The goal of the exercise was for participants to practice regulating their attention for 5 minutes.

Exposure Therapy Condition

Participants assigned to the exposure therapy condition were given a prompt asking “Why did you choose to attend the College of St. Benedict and St. John’s University over other universities?” They were asked to practice answering this question in front of a mirror as if they were given an impromptu speech. Participants were also asked to try to talk for the whole 5 minutes.

All participants were asked to return for Time 2 and Time 3 within 5 to 8 days later. For Time 2 Participants were instructed to listen to a song called Tiny Rain Drops on a relaxing harp CD for 5 minutes to establish baseline self-perceived and physiological levels of stress. Participants recorded their SUDS and the date on the Time 2 questionnaire. Participants’ heart rates were determined using EKG electrodes and a Pulse Oximeter finger clip and their BPMs

were recorded on the Time 2 questionnaire. There was then a 15 minute wait period. After the wait period participants provided a cortisol sample by putting a cotton swab under their tongue for one minute and then placing the sample into a test tube.

Participants in the mindfulness meditation and exposure conditions were then asked to practice their exercise for 5 minutes while the researcher left the room. The control condition completed no preparation. The researcher knocked and reentered the room and participants were given 5 minutes to prepare a 5 minute speech.

The speech consisted of 5 self-evaluating behavioral interview questions and participants were instructed to try to answer all the questions. Participants were told their speech would be recorded and that they would be judged for the quality of their speech by career services. The researcher exited the room and knocked and reentered after time had elapsed, turned the video camera on, and left the room again. After 5 minutes had passed the researcher knocked and reentered the room.

Participants recorded their SUDS and the date on the Time 3 questionnaire. Participants' heart rates were determined using EKG electrodes and a Pulse Oximeter finger clip and their BPMs were recorded on the Time 3 questionnaire. There was then a 15 minute wait period. After the wait period participants provided a cortisol sample by putting a cotton swab under their tongue for one minute and then placing the swab into a test tube. Participants were then debriefed.

Cortisol concentration was determined using an Expanded Range High Sensitivity Salivary Cortisol Enzyme Immunoassay Kit from Salimetrics. On the day of the Assay, the researcher thawed the saliva samples and brought all reagents to room temperature. The researcher centrifuged the samples at 1500 x g (@3000 rpm) for 15 minutes. The samples and

reagents were distributed across the wells of the plate using a micropipette and multichannel micropipette. There were several wash and incubation periods throughout the assay procedure. The amount of cortisol present was calculated by a plate reader that determined an optimal density value for each sample. This raw data was then computed with a 4-Parameter Sigmoid Minus Curve Fit using a Salimetrics web based program which determined the amount of cortisol present in each sample.

Results

In order to determine whether the control, mindfulness meditation, and exposure therapy groups were similar at Baseline a one-way analysis of variance (ANOVA) was conducted across the three dependent variables: EKG heart rate, Pulse Oximeter heart rate, and SUDS. There were no significant differences in EKG heart rate, Pulse Oximeter heart rate, and SUDS across the three groups at baseline. The means of the control, mindfulness meditation, and exposure therapy groups for EKG heart rate were 70.33 ($SD = .18.89$), 70.15 ($SD = 17.44$), and 76.52 ($SD = 11.89$), respectively. The means of the control, mindfulness meditation, and exposure therapy groups for Pulse Oximeter heart rate were 73.67 ($SD = 10.58$), 66.50 ($SD = 15.71$), and 76.14 ($SD = 8.86$), respectively. The means of the control, mindfulness meditation, and exposure therapy groups for SUDS were 3.33 ($SD = 1.75$), 3.17 ($SD = 1.33$), and 2.86 ($SD = 2.19$), respectively.

In order to see if there were significant differences in EKG heart rate, Pulse Oximeter heart rate, SUDS, and cortisol concentration before and after the stressor across the three groups a one-way ANOVA was also computed with the change scores between Time 2 and Time 3. A significant difference $F(2,16) = 4.70, p < .05$ was found for the SUDS variable between the

control and exposure conditions.

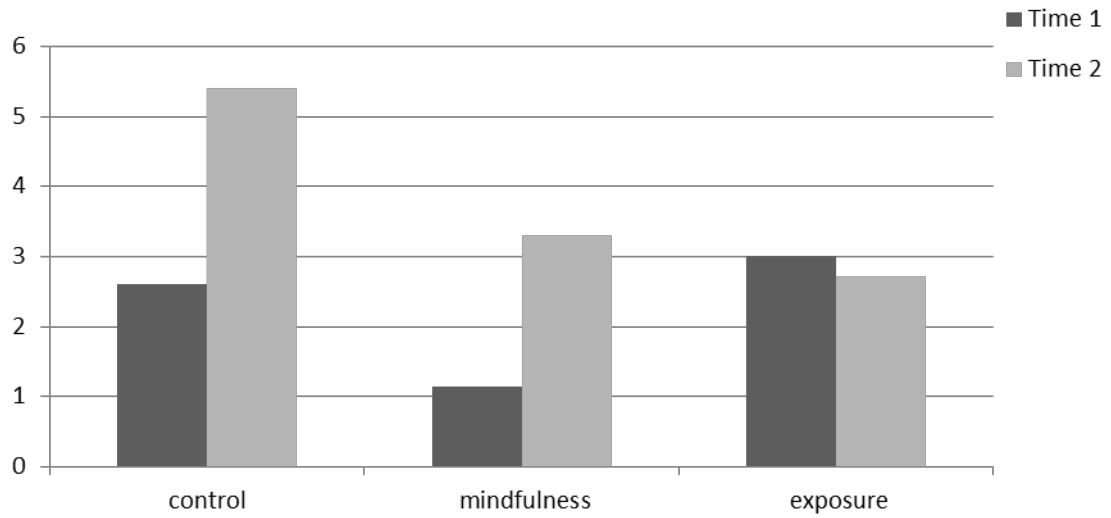


Figure 1. Effect of Public-speaking between before and after the stressor task (Time 1 and Time 2) on Subjective Units of Distress.

Bonferroni post-hoc comparisons indicate that the exposure condition ($M = -.29$) had significantly lower SUDS change scores than the control condition ($M = 2.80$) at $p < .05$. The 95% CI for the exposure condition ranged from (-2.11ll) to (1.54ul). The 95% CI for the control condition ranged from (1.44ll) to (4.16ul), $p < .05$. Comparisons between the mindfulness meditation ($M = 2.14$) and the other two groups were not statistically significant at $p < .05$. The 94% CI ranged from (.11ll) to (4.17ul). There were no significant differences in EKG heart rate and Pulse Oximeter heart rate change scores across the three groups. The means of the control, mindfulness meditation, and exposure therapy groups for EKG heart rate change scores were 4.59 ($SD = 5.37$), -1.86 ($SD = 7.84$), and -.20 ($SD = 5.49$), respectively. The means of the control, mindfulness meditation, and exposure therapy groups for Pulse Oximeter heart rate change scores were 2.80 ($SD = 8.01$), -3.14 ($SD = 5.37$), and -.1.29 ($SD = 5.47$), respectively. There were no significant difference in cortisol concentration change scores across the three groups. The means of the control, mindfulness meditation, and exposure therapy groups for

cortisol concentration change scores were $-.0125$ ($SD = .1209$), $-.0110$ ($SD = .1934$), and $-.1031$ ($SD = .2332$), respectively.

Correlations among EKG heart rate, Pulse Oximeter heart rate, and SUDS were computed across the three conditions for baseline, before the stressor, and after the stressor. Pulse Oximeter heart rate correlated strongly with EKG heart rate at baseline $r(17) = .74$, $p < .05$ and SUDS $r(17) = .54$, $p < .05$. Pulse Oximeter heart rate also correlated strongly with EKG heart rate at Time 2 $r(17) = .89$, $p < .05$ and Time 3 $r(17) = .92$, $p < .05$.

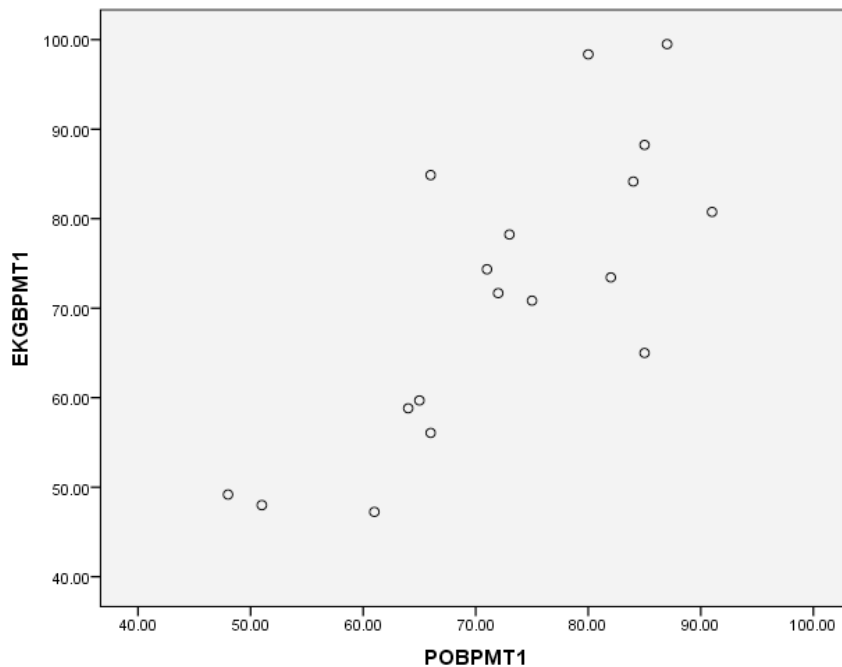


Figure 2. The correlation of EKG Logger Pro Heart Rate Time 1 and Pulse Oximeter Heart Rate Time 1

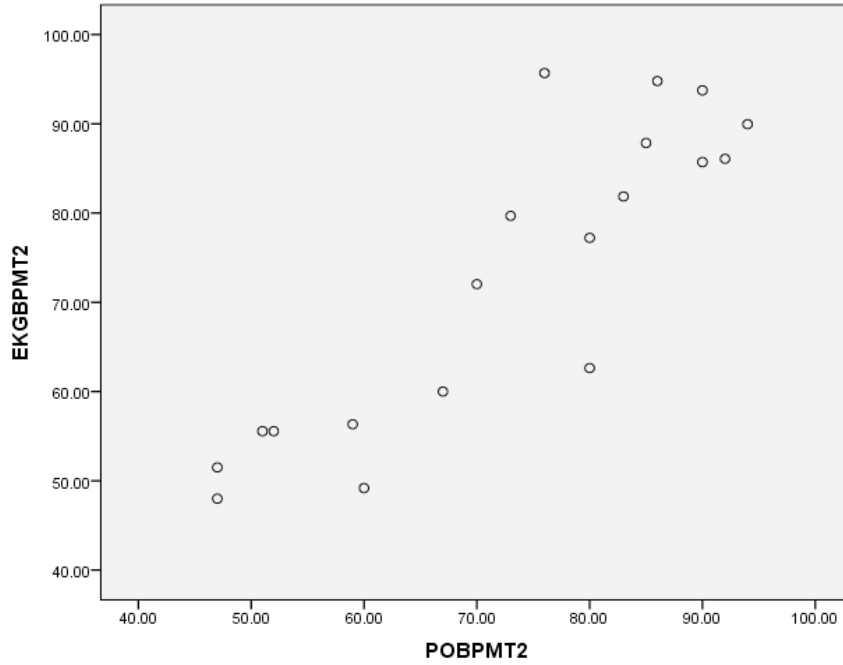


Figure 3. The correlation of EKG Logger Pro Heart Rate Time 2 and Pulse Oximeter Heart Rate Time 2

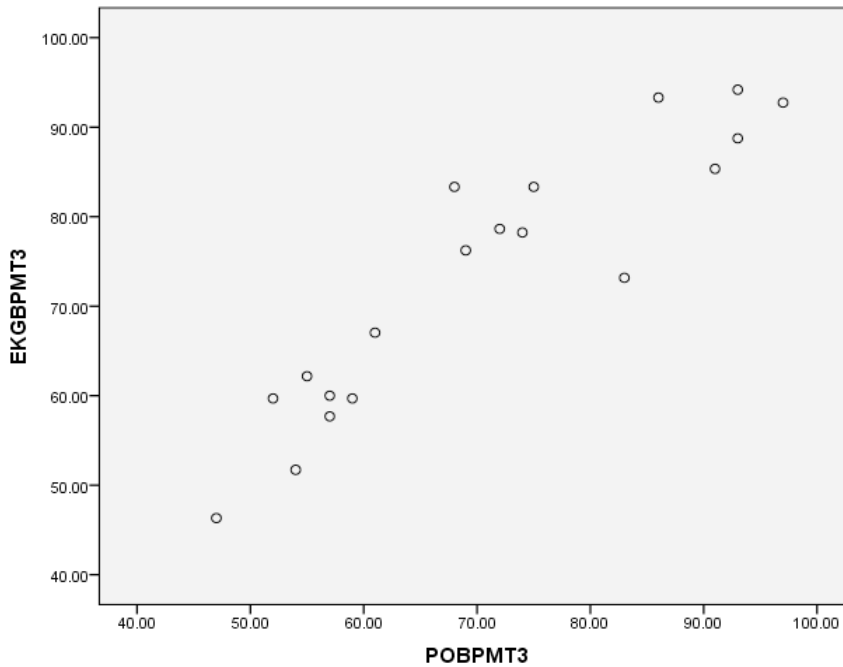


Figure 4. The correlation of EKG Logger Pro Heart Rate Time 1 and Pulse Oximeter Heart Rate Time 1

Correlations among EKG heart rate, Pulse Oximeter heart rate, SUDS, and cortisol concentration change scores were also computed across the three conditions. EKG heart rate and Pulse Oximeter heart rate change scores strongly correlated $r(17) = .58, p < .05$. SUDS and cortisol concentration change scores also strongly correlated $r(17) = .576, p < .05$.

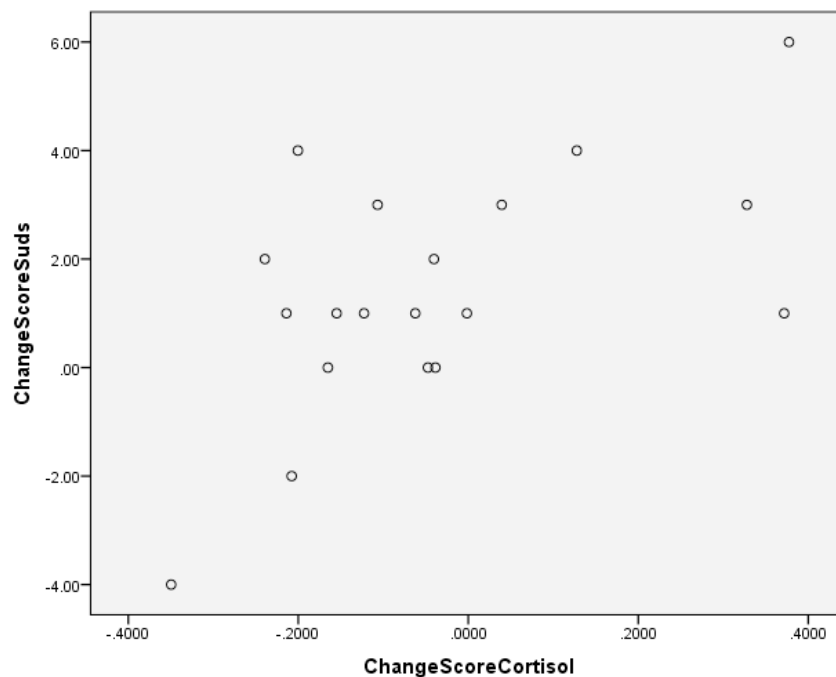


Figure 5. The correlation of Subjective Units of Distress Change Scores and Cortisol Change Scores from the effects of public speaking between Time 1 and Time 2

Discussion

This study aimed to analyze the effects of a basic mindfulness meditation exercise and an exposure exercise on the physiological and perceived measures of stress after completing a public speaking task. The findings of this study that subjective units of distress change scores are lower when having been exposed to a similar stressor stimulus is consistent with previous research. Also, the findings of this study that perceived stress can serve as a predictor of cortisol levels is consistent with previous research. The current study extended these findings by

including two treatment conditions: a mindfulness meditation group and an exposure group. In addition, this study incorporated multiple indicators of stress including perceived stress, two measures of heart rate, and cortisol.

The results show that there were no significant differences in EKG Heart Rate or Pulse Oximeter heart rate for Baseline, Time 1, and Time 2. This indicates strong validity in both the EKG and Pulse Oximeter heart rate machines because participants' heart rates stayed relatively the same for each collection time. Also, the EKG and Pulse Oximeter heart rate machines highly correlated with each other at all three collections times which suggests that the machines gave accurate measurements. Pulse Oximeter heart rate also correlated with SUDS at baseline and not EKG heart rate. This suggests that perceived stress may be a good representative of heart rate at baseline. However, there may have not enough power for the results to show a correlation between EKG heart rate and SUDS. Future studies may want to include more participants and equal groups to increase power and the likelihood of getting a correlation between SUDS and heart rate.

Similar to previous research, the results show that the SUDS change scores were significantly higher in the control condition than the exposure condition. The means of the control condition were significantly higher from Time 1 to Time 2 than the means of the exposure condition. The means of the exposure condition actually decreased from Time 1 to Time 2. Pull (2012) completed a review examining current findings on public speaking anxiety and found that individuals with Seasonal Affective Disorder who exhibited higher levels of public speaking anxiety decreased in anxiety levels when exposed to a live audience or imaginative audience. Also, Anderson et al. (2005) found significant decreased levels in self-report measures of anxiety when participant practiced giving a speech to a virtual audience

before giving a speech in front of an actual audience compared to the control condition. The researchers reported significant decreased levels in self-reported measures of anxiety compared to the control condition.

Similar to previous research, the results illustrated a correlation between SUDS and cortisol concentration change scores. Participants with more positive SUDS change scores had less negative cortisol change scores. Consistent with previous research this finding indicates that peoples' perceived stress may be an accurate predictor of their physiological stress. Wirtz et al. (2007) used the TSST task on adult men and found that men who exhibited higher levels of perfectionism on a questionnaire displayed higher cortisol levels when presented with the TSST stressor task than those who did not. This could suggest that higher self-evaluative behavior is associated with higher levels of cortisol in response to a stressor task. Participants who ranked their SUDS scores higher may have been more self-evaluative, therefore maintaining higher levels of cortisol.

Limitations

There was strong validity across all three conditions for both EKG and Pulse Oximeter measures of heart rate. This indicates that the absence of heart rate change could be due to other factors such as the collection time or the video camera failing to serve as a significant stressor task. Andrews, Wadiwalla, Juster, Lord, Lupien, & Pruessner (2007) performed an adapted version of the TSST task by having participants randomly assigned to four conditions: panel outside with two judges, panel outside with one judge, panel inside with two judges, and panel inside with one judge. The researchers found no significant effects for time when collecting heart rate samples 7 times: 20 minutes before the stressor, 10 minutes before the stressor, 1 minute before the stressor, 1 minute after the stressor, 10 minutes after the stressor, 20 minutes after the

stressor, and 30 minutes after the stressor. However, the researchers found that when measuring blood pressure, baseline measures (Time 1 and Time 2) were significantly lower as opposed to reactive measures (Time 3 and Time 4). In future studies, it could be beneficial to include more physiological measures to draw more comparisons across results.

All three conditions had a decrease in cortisol levels from Time 1 to Time 2 and most participants had negative change scores. This contradicts previous research because the Trier Social Stress Test (TSST) public speaking task is designed to spike cortisol levels. This could be due to the average rate of decline throughout the day of the diurnal cycle. Andrews et al. (2007) also collected cortisol at each time period that they collected heart rate and found a significant increase in the reactive phases. However, the researchers tested their participants between 1400 and 1800 hours to avoid the daily rate of decline of cortisol in the diurnal cycle. Due to time constraints for the current study, cortisol was collected between 1100 and 1400 hours during the decline of the diurnal cycle. Also, since cortisol levels vary so much between individuals, it is difficult to compare the current results to an average rate of decline throughout the diurnal cycle.

Also, Andrews et al. (2008) collected cortisol samples a total of 7 times: 20 minutes before the stressor, 10 minutes before the stressor, 1 minute before the stressor, 1 minute after the stressor, 10 minutes after the stressor, 20 minutes after the stressor, and 30 minutes after the stressor. This consisted of three baseline collection phases, three reactive collection phases, and one recovery collection phase. Due to financial restrictions for the present study, cortisol was only collected two times: 15 minutes after the relaxing harp CD to establish a baseline level and 15 minutes after the adapted TSST stressor task. Since participants knew they were giving a speech prior to coming in for Time 2, the baseline may have acted as an anticipation phase. Also, since cortisol samples were only collected once, 15 minutes after the TSST stressor task, this

collection period may have acted as a recovery phase which would elicit a decrease in cortisol. Andrews et al. (2008) also found significant higher cortisol levels during Time 4, Time 5, and Time 6 after the stressor task as opposed to Time 7 which was the recovery phase. Future studies may want to include more collection times throughout baseline phases, reactive phases, and recovery phases to elicit better results. In addition, participants may have adapted to the stress of being in an experimental situation, therefore lowering their cortisol levels.

Although the mindfulness meditation group did not show a significant difference in ANOVA change scores compared to the other groups, the means of the mindfulness meditation group change scores were still smaller than the means of the control group change scores from Time 1 to Time 2. This indicates there was a greater increase in perceived stress of the control condition compared to the mindfulness meditation even though the results were not significantly different. Future studies would want to include more participants and equal groups to increase power and the likelihood of acquiring significant results. In addition, there is not as much literature that provides evidence that supports the positive effects of short term mindfulness meditation as opposed to long term mindless meditation. Zeidan (2010) had found short term meditation practices regulated heart rate and improved self-regulation. However, this technique was practiced over 20 minutes over 3 consecutive days. The present study could not have participants longer than one hour due to logistical reasons. Also, there was higher variance found in both of the experimental conditions. Since the participants were expected to complete their practice exercise independently, some participants may have practiced while others did not. However, this variance could be because the experimental conditions had two more participants than the control conditions. In addition, participants were asked to practice their exercise 3 times and return 5 to 8 days later. Some participants may have practiced within smaller intervals

between practice times and closer to the experiment, whereas others may have practiced throughout the week. Again, future studies may want to include more participants to increase power and implement the exercise in a controlled experimental setting.

This study demonstrates how exposure to a stressor stimulus can decrease perceived anxiety in response to a stressor task. This adds to the existing literature on treatment efficacy studies and supports the importance of continuing research in this area. In a clinical setting, studying the perceived anxiety of the client to gain a better understanding of how effective the treatment is can highlight areas that need to be adjusted or discarded. Also, it is important for health care professionals to implement these treatment strategies that are effective as a preventative measure. Stress can lead to chronic health diseases as the individual ages. It is important to be proactive when implementing effective treatment methods to prevent major health complications and improve the client's well-being.

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Appendix A

Public Speaking Task

Please prepare a 5 minute speech by answering the following interview questions to the best of your ability. You may use the scratch paper provided for you to outline your speech. Please try and get through all the questions.

1. Tell me about a time when you made a mistake, and what actions you took to rectify it?
2. Tell me about a time when you were frustrated with the performance of a group that you were involved in. What did you do? What was the outcome?
3. Competition is tough for these positions. What separates you from the rest of the pool of candidates?
4. Describe a time when you utilized your leadership ability to gain support for an idea that initially had strong opposition?
5. Tell me about a time when you had to present complex information to a customer or peer. How did you ensure that the other person understood?

Appendix B

Mindfulness Meditation Exercise

Please read the following directions and practice this exercise for the next 5 minutes.
Kabata-Zinn, J. (1990). *Full Catastrophe Living*. New York: Random House, Inc.

1. Assume a comfortable posture lying on your back or sitting. If you are sitting, keep the spine straight and let your shoulders drop.
2. Close your eyes if it feels comfortable.
3. Bring your attention to your belly, feeling it rise or expand gently on the inbreath and fall or recede on the outbreath.
4. Keep the focus on your breathing, “being with” each inbreath for its full duration and with each outbreath for its full duration, as if you were riding the waves of your own breathing.
5. Every time you notice that your mind has wandered off the breath, notice what it was that took you away and then gently bring your attention back to your belly and the feeling of the breath coming in and out.
6. If your mind wanders away from the breath a thousand times, then your “job” is simply to bring it back to the breath every time, no matter what it becomes preoccupied with.
7. Practice this exercise for (5) minutes at a convenient time every day, whether you feel like it or not, for one week and see how it feels to incorporate a disciplined meditation practice into your life. Be aware of how it feels to spend some time each day just being with your breath without having to do anything.

Please complete this exercise for 3 times 5 minutes each time throughout the week before your second time slot.

Appendix C

Exposure Exercise

Please read the following prompt and practice responding to it in the mirror provided for you for the next 5 minutes.

Why did you decide to attend The College of St. Benedict and St. John's Universities over other private or public institutions?

Please complete this exercise for 3 times 5 minutes each time throughout the week in front of a mirror before your second time slot.