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The moderating role of mindful awareness in the associations of adverse childhood experiences and coronavirus exposure with sleep patterns

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MINDFULNESS, ADVERSE EXPERIENCES, COVID-19, AND SLEEP

THE MODERATING ROLE OF MINDFUL AWARENESS IN THE ASSOCIATIONS OF
ADVERSE CHILDHOOD EXPERIENCES AND CORONAVIRUS EXPOSURE WITH
SLEEP PATTERNS

A Thesis Submitted
in Partial Fulfillment
of the Requirements for the Designation
University Honors

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May 2021

MINDFULNESS, ADVERSE EXPERIENCES, COVID-19, AND SLEEP

This Study by: Shyanne F. Sporrer

Entitled: The Moderating Role of Mindful Awareness in the Associations of Adverse Childhood Experiences and Coronavirus Exposure with Sleep Patterns

has been approved as meeting the thesis or project requirement for the Designation University Honors

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Abstract

Although many studies have focused on the associations between adverse childhood experiences (ACE) and sleep outcomes (Chapman et al., 2011; Kajeepeta et al., 2015), the role of mindful awareness has not been explored in this interaction. Additionally, few studies have explored the impact of COVID-19 on sleep outcomes. The current study worked to bridge these gaps in the current literature. Data in this study was collected by asking students at the University of Northern Iowa to self-report their current sleep patterns, exposure to COVID-19, and mindful awareness while retrospectively reporting their past ACEs ($N = 143$). Past literature in this field has shown a connection between ACE score and lowered sleep quality, partially consistent with the results of this study (Koskenvuo et al., 2010). Findings indicated experiencing one or more ACE factor was associated with higher rates of sleep complaints affecting daytime functioning, increased factors inducing sleep (e.g. light and temperature of sleeping environment), poorer overall sleep quantity and quality (indicated by the PSQI sleep measure), and increased daytime sleepiness. Additionally, results indicated that with low levels of mindful awareness, there were increases in sleep disturbances, including nightmares, insomnia, sleep-inducing factors, sleep complaints affecting daily functioning, troubles sleeping, daytime sleepiness, and sleep quality. Thus, greater levels of mindful awareness were linked with lower levels of these sleep disturbances. A majority of the results did not support associations between COVID-19 and sleep outcomes. Furthermore, at low levels of mindful awareness, participants with high exposure to ACE reported increased trouble sleeping. Finally, at low and medium levels of mindful awareness, participants who were exposed to COVID-19 reported higher rates of daytime sleepiness.

Keywords: sleep, ACE score, Coronavirus (COVID-19), mindful awareness

The Moderating Role of Mindful Awareness in the Associations of Adverse Childhood Experiences and Coronavirus Exposure with Sleep Patterns

Adverse childhood experiences (ACE) are prior stressors in life that are associated with an increased risk of later-onset adult health issues (Felitti et al., 1998). Prior research has shown a significant increase in the chance of experiencing health issues such as heart disease, cancer, lung disease, and skeletal fractures when the individual has an ACE score of four or more (Felitti et al., 1998). Additionally, along with physical health problems later on in life, higher exposure to ACE factors in childhood can be associated with mental health disorders such as depressive symptoms, antisocial behavior (Schilling et al., 2007), and an increased risk of suicide (Dube et al., 2001). Higher levels of ACE have been associated with other physical health problems, such as sleep disturbances (Chapman et al., 2011). Additionally, the Coronavirus pandemic has impacted mental health outcomes based on preliminary research (Pfefferbaum & North, 2020). However, there is a need for research on familiarity with patients with COVID-19 and sleep patterns. There is a need to explore the impact of prior stressors (in the form of ACE factors) and current pandemic stressors (COVID-19) on sleep patterns during the pandemic.

Furthermore, I expand on the role of mindfulness and mindful awareness in these associations. The current study expands on past literature by analyzing the associations between past and current stressors (ACE and COVID-19) with the outcomes of sleep disturbances and determines if mindful awareness plays a role in this interaction. There is a need to examine possible resiliency factors that could lead to better sleep outcomes to improve the sleep of individuals who face past and current stressors. Prior research addressed in the following sections, led researchers to analyze four main hypotheses for this study.

Adverse Childhood Experiences (ACE) Factors

Having at least one ACE factor was shown to increase an individual's risk of being diagnosed with depression in adulthood (Schilling et al., 2017). In order to study a range of experiences children may face from ages zero to eighteen, many studies ask individuals to retrospectively self-report if they have been exposed to any of the three categories of child maltreatment, including household dysfunction, neglect, and abuse.

Household Dysfunction

Household dysfunction in the early years of life can have behavioral effects on individuals later on in life (Felitti et al., 1998). This broad category covers many components of a household that a child may experience in the first eighteen years of life. ACE studies have shown that indicators of household dysfunction such as a battered mother, mental illness in the home, substance abuse in the home, parental separation, and incarcerated parent can all have detrimental impacts on the children in the home and lead to health problems later in life (Dong et al., 2003; Poole et al., 2017; Schilling et al., 2007).

Abuse

Three main categories of abuse include sexual abuse, physical abuse, and emotional abuse. The literature on child abuse has shown that a biological difference in gene production in children who have faced stress in critical periods of development early in life makes them more vulnerable to adult disorders such as depression (Heim et al., 2010). Physically abused children as preschoolers displayed more anger when faced with a challenging situation than their peers (Hildyard & Wolfe, 2002). Children experiencing sexual abuse face adjustment difficulties, inappropriate behavioral episodes, and mental health disorders (Dong et al., 2003). Specifically, Dong and colleagues (2003) found that sexually abused children tend to experience

psychological and emotional abuse and other forms of maltreatment that later affect their mental and physical health in the future.

Neglect

Childhood neglect occurs when a child is not cared for with adequate nurturing and when there is a failure to meet the physical or emotional needs of the child. According to Hildyard and Wolfe (2002), neglect can have similar consequences and long-term outcomes in children, as with abuse. Children who are neglected face attachment issues in future relationships, have negative self-representations, display social and behavioral problems, and lack emotional development (Hildyard & Wolfe, 2002). Findings show that these adverse experiences can impact the child's overall well-being and lead to health problems as an adult (Dong et al., 2003).

Associations between ACE Factors and Sleep Patterns

Past studies have shown a positive relationship between ACE factors and self-reported sleep disturbances, such as trouble falling asleep and tiredness once awake (Chapman et al., 2011; Kajeepeta et al., 2015) with more reported awakenings and movement in insomniacs (Bader et al., 2007). Even when controlling for other risk factors of poor sleep, such as the use of alcohol, lack of adequate physical exercise, and recent stressful life events, adverse experiences in early life and poor parental relationships were significantly related to lowered sleep quality in adult life (Koskenvuo et al., 2010). There was a positive association between sleep quality and ACE factors; specifically, the higher the ACE score, the greater the likelihood of poor self-reported sleep quality (Chapman et al., 2011; Koskenvuo et al., 2010).

Lack of sleep quality is associated with developing major health problems, such as cardiovascular disease, obesity, diabetes, and certain types of cancers (Luyster et al., 2012), similar to risks associated with recent studies on ACE scores (Felitti et al., 1998). Sleep quality

was found to be one of the strongest mediators between ACE score and health in later life, while depression and anxiety significantly mediated the relationship between sleep quality and ACE scores (Rojo-Wissar et al., 2019). Research by Rojo-Wissar and colleagues suggests these variables of ACE score, sleep quality, and depression or anxiety may be related.

Coronavirus 2019 (COVID-19) Exposure

As the global pandemic, COVID-19 began to spread in the later months of 2019 and early months of 2020, a concern for the mental health of people during these months arose in China (Xiang et al., 2020). Health providers suspect, based on communication with patients, that those diagnosed with COVID-19 tend to have feelings of boredom, loneliness, fear, depression, and anger related to the uncertainty of the virus (Xiang et al., 2020). To combat the mental health crisis that could stem from the pandemic, China initiated ways to support individuals affected by COVID-19 through online counseling and programs (Xiang et al., 2020). With the uncertainty of the virus and lack of social contact with the individuals, studies done to assess the helpfulness of these online support programs showed that half of the COVID-19 patients did not find the online programs helpful (Bo et al., 2020). Bo and colleges in early 2020 found that over 95% of survivors of COVID-19 in their study reported experiencing significant symptoms of posttraumatic stress. A need for additional methods of mental health care is needed for those impacted by COVID-19, both in the short-term and long-term (Xiang et al., 2020). In the early stages of transmission of the virus in China, a significant number of individuals self-reported moderate to severe depressive symptoms, anxiety symptoms, and stress levels (Wang et al., 2020). More specifically, females, students, and people with preexisting health issues were at higher risk of experiencing more psychological distress (Wang et al., 2020). Other stressors, such as a change in routine, parental financial instability, and school delays, were associated with

levels of anxiety reported by college students during the outbreak (Cao et al., 2020). Thus, the adverse mental health outcomes due to exposure to COVID-19 may affect other daily functions.

COVID-19 Exposure and Sleep

Research in the area of COVID-19 exposure and familiarity and overall sleep quality is limited, although past research shows a bidirectional relationship between sleep quality and stress (Reeth et al., 2000). The hypothalamic–pituitary–adrenal (HPA) axis secretes hormones such as cortisol and adrenocorticotropin, which play a role in sleep cycles and help us manage stressful situations (Reeth et al., 2000). Thus, the amount of daily stress or cortisol in the brain can affect sleep. Additionally, the release of the adrenocorticotrophic hormone is also found to affect the timing of awakening from sleep (Reeth et al., 2000). Older adults and people diagnosed with stress-related disorders such as PTSD (Dietch et al., 2019), depression, and acute insomnia may experience sleep disturbances or oversleep (Reeth et al., 2000). In the limited research done on COVID-19 survivors, results point to the conclusion that individuals who had COVID-19 display symptoms of PTSD, which has been shown to lead to sleep disturbances in that population (Bo et al., 2020). Therefore, it is expected that greater exposure and familiarity with COVID-19 (either having experienced it or having a family or close contact with the coronavirus) may be associated with increased sleep disturbances. Recent research on stress coping strategies for sleep disturbances suggests the role of mindfulness as an effective method (Black et al., 2015)

Mindful Awareness

Mindful awareness is defined by Kabat-Zinn as "the 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). In elementary classroom settings,

mindfulness training programs have been associated with improvement in grades (Bakosh et al., 2015), overall behavior (Bakosh et al., 2015; Flook et al., 2010), and executive functioning (Flook et al., 2010). Mindfulness has been associated with mental and physical health benefits (Grossman et al., 2010; Yamada & Victor, 2012). Mental benefits include a decrease in rumination and anxiety (Yamada & Victor, 2012), decreased symptoms of depression, and an increase in coping skills (Grossman et al., 2010). A meta-analysis of mindful-based interventions found that mindfulness improves physical symptoms of sensory pain, physical impairment, and functional quality of life (Grossman et al., 2010). Mindful awareness has many benefits to cognitive functions. Therefore, it is expected that mindful awareness will affect mental health and sleep patterns.

Mindful Awareness and COVID-19 Exposure

Although limited research has been conducted to determine if mindfulness affects an individual's mental health during the COVID-19 pandemic, the past decade has provided many examples of the benefits of mindfulness in relation to stress. Mindfulness is associated with increased rational coping skills (Grossman et al., 2009) and less perceived stress (Palmer & Rodger, 2009). Emotional regulation was found to increase with mindfulness interventions, which significantly affected the academic performance and perceived stress of an individual with posttraumatic stress disorder (PTSD; Cherry & Wilcox, 2020). Thus, mindful awareness is expected to be a coping mechanism for those with high rates of exposure to COVID-19.

Mindful Awareness and Sleep

A review of past literature shows that greater mindful awareness can lead to improved adaptability when sleeping, thus enhancing sleep quality (Howell et al., 2010). Mindful awareness reduces cognitive-distortion and arousal-producing processes in the brain, which

generate sleep disruptions (Howell et al., 2010). Specifically, mindful awareness has been linked to the improvement of sleep disturbances in PTSD patients (Nagy et al., 2020) and overall sleep quality in college students (Caldwell et al., 2010). Therefore, mindful awareness is predicted to lessen sleep disturbances.

Current Study

ACE factors have been associated with an increased risk of health problems in the future (Felitti et al., 1998). Exposure to COVID-19 is a current stressor to many individuals dealing with the coronavirus pandemic. The current study addressed ACE scores and COVID-19 exposure related to sleep disturbances and the role mindful awareness plays in relation to these variables. Due to the novel nature of COVID-19, limited research is available about the psychological effects of living with the threat of COVID-19. The available research is localized in areas where COVID-19 first was declared a health crisis (Bo et al., 2020; Wang et al., 2020; Xiang et al., 2020). The current study addressed this gap in research by expanding the knowledge base of the impact of COVID-19 exposure of college-aged students during the pandemic. The current study analyzed the relationship between COVID-19 exposure and sleep disturbances.

Mindfulness is a broad concept consisting of many behaviors. Therefore, mindful awareness may look and feel different for each participant (Kabat-Zinn, 2003). Though this idea goes back to the teachings of the Buddha (Kabat-Zinn, 2003), mindfulness is a novel topic of modern research. The current study intended to limit the confounding variables associated with teaching mindfulness by focusing on one's overall mindful awareness. Studies indicate that mindfulness plays a role in decreasing perceived stress (Palmer & Rodger, 2009) and improving sleep quality (Caldwell et al., 2010). However, more research is needed to strengthen these results as modern mindfulness practices are novel in the scientific realm.

Hypotheses

H1: A prior history of adverse childhood experiences (ACE) will be associated with increased sleep disturbances (e.g., sleep onset latency, nightmares, insomnia, sleep-inducing factors, sleep complaints affecting daily functioning, troubles sleeping, daytime sleepiness, sleep quality, sleep efficiency, and sleep duration).

H2: Exposure to COVID-19 will be associated with increased sleep disturbances.

H3: Mindful awareness moderates the association between ACE factors and sleep. Specifically, at low levels of mindful awareness, there would be a significant relationship between ACE factors and sleep disturbances. At high levels of mindful awareness, there would be a weak relationship between ACE factors and sleep disturbances.

H4: Mindful awareness is a moderating factor in the association between COVID-19 exposure and sleep disturbances. Specifically, at low levels of mindful awareness, there would be a strong association between COVID-19 exposure and sleep disturbances. At high levels of mindful awareness, there would be a weak association between COVID-19 exposure and sleep disturbances.

Method

Participants

Data for this study was obtained from college students enrolled at the University of Northern Iowa (UNI) in the 2020-2021 academic year using online surveys sent to students from the UNI Institutional Research & Effectiveness Office and the Participant Pool in the psychology department. A total number of 187 participants completed the survey. After eliminating participants with missing data, there were a total of 143 responses. Participants completed the survey in one sitting lasting approximately 30-45 minutes. Additionally, participants who were

18 years of age or older were included in the study. Students at UNI were randomly selected through Listserv and received an email from the UNI Institutional Research & Effectiveness Office. Participants from the Listserv were entered for a chance to win a \$25 gift card. Participants from the Participant Pool received 0.5-course credit for their participation.

Procedure

Data collection began once approval was granted from the Institutional Review Board (IRB) at UNI. Data were collected in the Fall of 2020 and the Spring of 2021. To participate in the study, students filled out surveys sent to their UNI school accounts from UNI Institutional Research & Effectiveness Office or through the participant pool (SONA) in the psychology department at UNI. No participant was allowed to complete the survey more than once. The computer-based survey using Qualtrics consisted of multiple questionnaires to assess the participants' ACE factor, sleep disturbances (e.g., sleep onset latency, awakenings, nightmares, insomnia, daytime sleepiness, sleep quality, and sleep quantity), COVID-19 exposure, and mindful awareness. Participants were asked to self-report on their sleep patterns, COVID-19 exposure and familiarity, and mindful awareness at the time of the survey. Participants were asked to provide retrospective reports of their exposure to ACE factors when completing this portion of the survey to get a score that reported their experiences before the age of eighteen. Data from each participant was compiled over the course of the research period using Qualtrics. Once data collection was complete, data were analyzed using SPSS and the PROCESS macro in SPSS.

Measures

ACE Score

The Adverse Childhood Experiences Scale was used to measure an individual's exposure to ACE factors retrospectively. The ACE Scale was developed by Felitti and colleagues in 1998 and has been used in many studies with a diverse population (Felitti et al., 1998). The measure is designed to assess three forms of adverse childhood experiences, including abuse, neglect, and household dysfunction, in a ten-item self-report survey. Participants must select either "yes" or "no" to determine if they were ever exposed to each category of maltreatment as a child. Three items evaluate exposure to physical, sexual, and emotional abuse. For instance, *"Did a parent or other adult in the household often or very often push, grab, slap, or throw something at you?"* Two items on the survey were used to test for emotional or physical neglect in childhood. For instance, *"Did you often or very often feel that no one in your family loved you or thought you were important or special?"* The remaining five questions assessed exposure to household dysfunction such as substance abuse, a parent with mental illness, parental divorce, etc. For instance, *"Did a household member go to prison?"*

Each "yes" response by a participant adds one point to their overall ACE score. Scores can range from 0 (exposure to no ACE) to 10 (exposure to all ACE). The questionnaire has been shown to have good internal consistency (Cronbach's alpha= .88; Murphy et al. 2014). The current study reported good internal consistency with the current sample (Cronbach's alpha= .77).

COVID-19 Exposure

Participants were asked a series of questions to assess their current exposure to COVID-19. The Level of Familiarity scale developed by Corrigan and colleagues (2003) has been adapted to measure the participants' exposure to COVID-19. This measure was originally designed to measure the level of familiarity you have with someone with mental illness.

Participants self-reported their current exposure to COVID-19 by answering 11 questions (yes = 1; no = 0). For example, "*I have tested positive for COVID-19.*" The questions were analyzed as individual variables to test the associations. Due to the novel nature of COVID-19, the reliability of each question used together had not been tested. Researchers chose to use the variables "*I have tested positive for COVID-19,*" "*My job involves treating patients who have tested positive for COVID-19 in a healthcare setting,*" and "*I cared for someone in my household who had tested positive for COVID-19.*"

Sleep Disturbances

The Pittsburgh Sleep Quality Index (PSQI) was used to assess sleep quality in the study participants. The self-report questionnaire uses a Likert-type scale and open-ended questions to assess sleep disturbances and overall sleep quality. Each scaled question has four options for the participant to choose based on the rate of occurrence ranging from "*Not during the past month*" to "*Three or more times a week.*" Some other four-scale questions ask participants to rate the quality of sleep from very good to very bad. Open-ended questions ask participants to briefly explain factors such as sleep duration and sleep onset. In patients with insomnia, test-retest reliability was high ($\alpha=0.87$) with sufficient internal consistency (Cronbach's $\alpha=.85$; Backhaus et al., 2002). In the current sample, internal consistency was good (Cronbach's $\alpha=.71$).

The Sleep-50 Questionnaire was used to assess indicators of sleep-in participants such as insomnia, nightmares, factors inducing sleep, and the impact of sleep complaints on daily functioning (Spoormaker et al., 2005). Questions were drawn from the original Sleep-50 questionnaire relevant to the area of the current study (Spoormaker., 2005). The survey uses a Likert-type scale as participants reported how applicable on a scale of 1 to 4 (1 = not at all; 4 =

very much) each statement applied to them in the previous four weeks. For example, "*I have difficulty falling asleep.*" Each of the four sections of questions (including insomnia, nightmares, factors inducing sleep, and the impact of sleep complaints on daily functioning) assess a different variable of sleep, and scores from each section were calculated by the mean score of each statement by the participant. Spoormaker and colleagues (2005) reported a high internal consistency (Cronbach's $\alpha = 0.85$; Spoormaker et al., 2005).

The Sleep Habits Survey had a Sleepiness Scale which was used to assess sleepiness during the daytime for participants in the past two weeks (Wolfson & Carskadon, 1998). The survey gives participants a behavior (e.g., in a face-to-face conversation with another person) and asks them to rate the level of sleepiness experienced during that behavior on a scale of 0 to 3 (0 = never; 3 = both struggled to fall asleep and fell asleep). Scores on the survey are totaled and range from 0 to 30 with Cronbach's $\alpha = .70$ (Wolfson & Carskadon, 1998).

A demographic questionnaire on sleep was used to understand each participant's typical sleep habits in the month prior to taking the survey. The questionnaire has questions where participants are asked to report sleep latency (i.e., time taken to fall asleep), bedtime, and wake time on typical days of the week and weekend. Example items included "*What time do you go to bed on weekdays?*", "*On weekends, after you go to bed at night, about how long does it usually take to fall asleep?*". The survey also has information on participant's nap schedules, diagnosed sleep disorders, and awakenings during the night.

Mindful Awareness

Participants' overall state of mindful awareness was assessed with the self-reported 15-item Mindful Attention Awareness Scale (MAAS) (Brown & Ryan, 2003). Each item uses a scale with six options based on a frequency ranging from "*almost always*" to "*almost never*." Items in

the survey assessed the participants' self-awareness in everyday life with items such as *"I find myself listening to someone with one ear, doing something else at the same time."* Scores were averaged, and higher scores indicate lower states of mindful awareness. This measure has good validity and reliability (Cronbach's $\alpha = .89$; Mackillop & Anderson, 2007). The current study had great internal consistency (Cronbach's $\alpha = .91$).

Design

The study employed a multivariate correlational design. The goal of the study was to examine the relationship between ACE factors and COVID-19 exposure with sleep quality among young adults in a university setting. Furthermore, the role of mindful awareness was analyzed as possible moderating variables in these associations. All measures were compiled into an online survey, and participants were asked to complete the entire questionnaire to get data in each category.

Ethics

The Institutional Research Board at the University of Northern Iowa approved this study before compiling data. We expected that participants would experience little to no harm during this study. Since participants were asked in the ACE factor measure to recall adverse experiences in their childhood, we suspected that some participants might become emotional. This was addressed with a disclaimer at the beginning of the survey, and mental health resources were provided for participants at the end of the survey. Participants were asked to give their consent before completing the survey and reminded that they have the right to stop or withdraw from the study at any time. The surveys were anonymous, and no identifying information was linked with the data of each individual participant.

Validity

Each measure was a separate page of the survey, so clear instructions were given prior to each measure to decrease the risk of participant error and thereby to ensure the validity of the current study. Participants were informed that their responses are anonymous to help prevent them from adjusting their responses to fit. The survey was randomly sent to UNI students by an outside source to prevent selection bias.

Results

All models were analyzed using SPSS version 24 and the PROCESS macro version 3.5. For the models, mean ACE score and COVID-19 exposure (e.g., testing positive for COVID-19, caring for a loved one with COVID-19, or having a member in the household with COVID-19) were the predictors. Sleep disturbances (e.g., sleep onset latency, nightmares, insomnia, sleep-inducing factors, sleep complaints affecting daily functioning, trouble sleeping, daytime sleepiness, sleep quality, sleep efficiency, and sleep duration) were the outcomes in the models. Finally, mindful awareness was the moderating factor in the models. Of the twenty-four models analyzed, one showed significant moderating effects of mindful awareness in the association between ACE score and sleep. Additionally, in the twenty-four models analyzed, only one showed significant moderating effects of mindful awareness in the association between COVID-19 exposure and sleep. Descriptive statistics and bivariate correlations were examined among all study measures.

Analysis Plan

Independent Samples T-tests

For Hypothesis 1, prior research suggested that there would be a positive relationship between ACE factors and sleep disturbances. Specifically, those with higher scores would also have higher sleep disturbances. For this study, a new ACE variable was computed where 1= any

type of ACE exposure and 0= no exposure to ACE. This new variable, rather than a sum of ACE scores, was used in the analysis for the current study. An independent sample t-test was used to determine the relationship between these variables. We expected those with any exposure to ACE to have a significantly higher number of sleep disturbances.

Hypothesis 2 was tested using an independent samples t-test between the COVID-19 exposure and measures of sleep disturbances. We hypothesized that those with higher levels of COVID-19 exposure would have more sleep disturbances.

Moderated regression analysis

Moderation was tested using the PROCESS macro in SPSS. For Hypothesis 3, a moderated regression analysis was used to determine if mindful awareness significantly interacted with ACE scores in the prediction of sleep disturbances. Specifically, we examined the moderating role of mindful awareness in the association between exposure to any form of ACE as a child and sleep outcomes. We predicted that the association between ACE score and sleep disturbances would weaken when levels of mindfulness are high.

Hypothesis 4 was tested using a moderated regression analysis to determine if mindful awareness significantly moderated the links of COVID-19 exposure with sleep disturbances. Specifically, we examined the moderating role of mindful awareness in the association between specific COVID-19 exposures (e.g., testing positive for COVID-19, caring for a member of the household diagnosed with COVID-19, and a member of the household positive for COVID-19) and sleep outcomes. We predicted that when factoring in mindful awareness, the relationship between COVID-19 exposure and sleep disturbances would weaken when levels of mindfulness are high.

Hypothesis 1: The association between ACE score and sleep disturbances

Hypothesis 1 was partially supported based on the data collected for certain measures of sleep disturbances when analyzed with participants who reported having at least one form of ACE (see table 1). Across the twelve sleep outcomes, five outcomes showed significant differences in mean sleep scores across those who were exposed to at least one form of ACE as compared to those who were not exposed to ACE factors. As seen in Table 1, there was a statistically significant difference in factors inducing sleep (e.g. substance use, sleeping environment, etc.) across individuals that experienced any form of ACE compared to individuals who had no reported experience with ACEs ($t=4.068$, $df=141$, $p<.001$). Specifically, those who experienced any ACEs had a higher level of factors inducing sleep ($m=1.56$) than those with no ACEs ($m=1.32$). Additionally, there was a statistically significant difference in the impacts of sleep complaints on daytime functioning (e.g. difficulty concentrating, increased feelings of irritation) across individuals that experienced any form of ACE compared to individuals who had no reported experience with ACEs ($t=3.138$, $df=141$, $p<.01$). Specifically, those who experienced any ACEs reported higher impacts of sleep complaints on daytime functioning ($m=2.39$) than those with no ACEs ($m=2.06$). Furthermore, there was a statistically significant difference in total PSQI score (measuring sleep quality and sleep disturbances) across individuals that experienced any form of ACE compared to individuals who had no reported experience with ACEs ($t=2.251$, $df=141$, $p<.05$). Specifically, those who experienced any ACEs reported higher levels of sleep disturbances and lowered sleep quality ($m=8.57$) than those with no ACEs ($m=7.39$). Also, there was a statistically significant difference in total PSQI daytime sleepiness across individuals that experienced any form of ACE compared to individuals who had no reported experience with ACEs ($t=2.075$, $df=141$, $p<.05$). Specifically, those who experienced any ACEs reported higher levels of sleepiness ($m=2.22$) than those with no ACEs ($m=2.00$).

Finally, there was a statistically significant difference in sleep quality across individuals that experienced any form of ACE compared to individuals who had no reported experience with ACEs ($t=3.70$, $df=141$, $p<.01$). Specifically, those who experienced any ACEs reported lower sleep quality ($m=1.47$) than those with no ACEs ($m=1.07$). A higher score on PSQI sleep quality indicated poor sleep quality.

Hypothesis 2: The association between COVID-19 exposure and sleep disturbances

Hypothesis 2 was partially supported by the data collected from this sample. The sample did not include high levels of exposure to COVID-19; therefore more data may need to be collected to gain sufficient support. As seen in table 2, the findings indicated two statistically significant associations between COVID-19 exposures and sleep disturbances. As seen in Table 2, there was a statistically significant difference in the factors inducing sleep (lighting, background sound, substance use, etc.) across individuals that experienced any form of exposure to COVID-19 compared to individuals who had no reported exposure to COVID-19 ($t=-8.26$, $df=139$, $p<.001$). These results were not expected as those who experienced any exposure to COVID-19 reported significantly lower rates of factors inducing sleep ($m=1.46$) than those with no exposure ($m=1.71$). Furthermore, there was a statistically significant difference in PSQI daytime sleepiness score across individuals who experienced any form of exposure to COVID-19 compared to individuals who had no reported exposure to COVID-19 ($t=2.52$, $df=139$, $p<.05$). Specifically, those who experienced any exposure to COVID-19 reported higher rates of experiencing daytime sleepiness ($m=2.136$) than those with no exposure to COVID-19 ($m=2.00$). In both of these significant associations, equal variances were not assumed. Due to the unreliability of the COVID-19 measure, each item was analyzed in separate regressions, but no associations were found to be significant.

Hypothesis 3: The moderating role of mindful awareness in the association between ACE score and sleep disturbances

The current study did not support a strong moderation of mindful awareness in the association between ACEs and sleep disturbances. The outcomes of sleep disturbances used in the analysis were levels of sleep onset latency, nightmares, insomnia, sleep inducing factors, sleep complaints affecting daily functioning, troubles sleeping, daytime sleepiness, sleep quality, sleep efficiency, and sleep duration. Across the twenty-four models ran in the study, only one model was statistically significant. As noted in table 7, there was a statistically significant interaction between ACE score and mindfulness in the prediction of trouble sleeping ($\beta = -3.26$ $p < .05$, $ULCI = -.0188$, $LLCI = -6.499$). As seen in Figure 2, at low levels of mindful awareness, ACE score was positively associated with trouble sleeping. The total model R-squared was .29, ($p < .01$) and the interaction R-squared was .03 ($p < .05$). However, at mean and high levels of mindful awareness there was no association.

Across the twelve models that analyzed mindful awareness as a moderating variable in the association between ACE score and sleep outcomes, five models had statistically significant main effects in the association between ACE score and sleep outcomes. The models that showed significant main effects were insomnia, factors inducing sleep, daytime sleepiness, PSQI score, and sleep quality. The other sleep outcomes were not associated with ACE factors. Thus, findings show that ACE factors predict insomnia, difficulty falling asleep, daytime sleepiness, overall disruptions in sleep quality and quantity.

Hypothesis 3 was not supported when analyzing the moderating role of mindful awareness in the association between ACE and sleep disturbances. For the first set of models, a sum score of each ACE item was used. Another categorical variable was created to indicate if a

participant had experienced any of the ten forms of ACE. As shown in table 8, no models were statistically significant when analyzing the relationship between experiencing any form of ACE, mindful awareness, and sleep disturbances. Across the twelve models, four sleep outcomes were associated with experiencing any form of ACE. These four models showed a statistically significant association between factors inducing sleep, sleep complaints effecting daytime functioning, daytime sleepiness, sleep quality, and any exposure to ACE.

Hypothesis 4: The moderating role of mindful awareness in the association between COVID-19 exposure and sleep disturbances

The current study did not support a strong moderation of mindful awareness in the association between COVID-19 exposures and sleep disturbances. The outcomes of sleep disturbances used in the analysis were levels of sleep onset latency, nightmares, insomnia, sleep inducing factors, sleep complaints affecting daily functioning, troubles sleeping, daytime sleepiness, sleep quality, sleep efficiency, and sleep duration. Across the twenty-four models tested in the study, only one model was statistically significant. As noted in table 5, there was a statistically significant interaction between COVID exposure and mindful awareness in the prediction of PSQI sleepiness ($\beta = -.3813$, $p < .05$, $ULCI = -.0513$, $LLCI = -.7113$). As seen in Figure 1, at low and mean levels of mindful awareness, COVID-19 exposure (specifically, testing positive for COVID-19, caring for a loved one diagnosed with COVID-19, and living in a house with someone who tested positive for COVID-19), was positively associated with daytime sleepiness. The total model R-squared was .5, ($p < .001$) and the interaction R-squared was .03 ($p < .05$). However, at high levels of mindful awareness there was no association.

Across twelve models that analyzed the moderating effects of mindful awareness in the association between someone reporting having tested positive for COVID-19, cared for someone

with COVID-19 in the household, or had a member of the household test positive for COVID-19 and sleep disturbances, nine models showed a significant main effect between mindful awareness and sleep outcome. In these models, mindful awareness was not associated with sleep duration, sleep onset latency, and sleep efficiency. One out of these twelve models showed a statistically significant association between the three COVID-19 exposures of the participant reporting having tested positive for COVID-19, cared for someone with COVID-19 in household, or had a member of the household test positive for COVID-19 and daytime sleepiness.

Hypothesis 4 was not supported when analyzing the moderating role of mindful awareness in the association between the sum of COVID-19 exposures and sleep disturbances (except for the model of COVID exposure and PSQI sleepiness). As shown in substantive examples in table 6, no model interactions were statistically significant.

Discussion

Summary of Findings

A large body of research has shown a relationship between ACE and later health outcomes (Felitti et al., 1998; Poole et al., 2017; Schilling et al., 2007), including an increase in sleep disturbances (Chapman et al., 2011), partially consistent with our findings. A new field of research aims to find approaches that act as resiliency factors such as mindfulness to mitigate the effects of ACEs. Prior research suggests a bidirectional relationship between ACE scores and sleep quality impacting later health outcomes. For example, sleep quality was one of the strongest mediators between ACE score and health in later life. At the same time, depression and anxiety significantly mediated the links between sleep quality and ACE scores (Rojo-Wissar et al., 2019). Due to the evolving conditions around the world because of the COVID-19 pandemic, many individuals are reporting increased feelings of stress and anxiety (Cao et al., 2020; Wang et

al., 2020). Based on past literature on the association between stress and sleep outcomes (Reeth et al., 2000), we predicted that exposure to COVID-19 to be related to increased sleep disturbances in our sample, which may be moderated by the participant's mindful awareness.

The current study added to the literature on ACE scores associations with negative outcomes by examining the links between ACE scores and sleep patterns. Findings indicated partial support for the first hypothesis, which stated that there would be an association between ACE factors and sleep outcomes. Experiencing one or more ACE factors was significantly associated with sleep complaints affecting daytime functioning, increased factors inducing sleep (e.g. light and temperature of sleeping environment), poorer overall sleep quantity and quality (indicated by the PSQI sleep measure), and increased daytime sleepiness, consistent with past studies (Chapman et al., 2011; Koskenvuo et al., 2010).

Findings indicated a significant association between mindful awareness and sleep outcomes, consistent with studies done in the past (Nagy et al., 2020). Specifically, results showed negative associations between mindful awareness and the sleep outcomes of nightmares, insomnia, sleep-inducing factors, sleep complaints affecting daily functioning, troubles sleeping, daytime sleepiness, and sleep quality. Thus, greater levels of mindful awareness were linked with lower levels of these sleep disturbances. The current study identified a gap in the research on these factors and examined mindful awareness as a potential moderating variable that was predicted to mitigate the strength between ACE score and sleep outcomes. The results of the study did not indicate a strong moderating effect of mindfulness in this association between ACE factors and sleep outcomes, except for the association between ACE score and trouble sleeping. Findings indicated that at low levels of mindful awareness, ACE score was positively associated with trouble sleeping. Thus, the link between ACE score and trouble sleeping was only

significant when the individual reported low levels of mindful awareness. Thus, findings indicate that adverse experiences back in childhood may have long-term effects on sleep disturbances as indicated by later sleep onset time, awakenings, using the bathroom often at night, disrupted breathing, feeling too hot or cold, nightmares, or pain. However, a higher level of mindful awareness serves as a protective factor in this connection. Specifically, when individuals have moderate to high levels of mindful awareness, there is not an association between prior ACE factors and trouble sleeping. Nevertheless, when mindful awareness is lower, prior adverse experiences can be detrimental to sleep. This limited support for hypothesis 3, suggests a need for further research to examine the role mindful awareness may play in these associations and which strategies result in adequate levels of mindful awareness.

Findings showed partial support for the second hypothesis, which stated that exposure to COVID would be associated with sleep outcomes. Due to the novel nature of the pandemic, the study lacked a reliable measure of COVID-19 exposure, thus affecting the results. Specifically, results showed that getting exposed to COVID-19 was significantly associated with factors inducing sleep (e.g. light and temperature of sleeping environment) and daytime sleepiness. The results in the relationship between exposure to COVID-19 and factors inducing sleep and daytime sleepiness were unexpected as those who were exposed experienced lower levels of factors inducing sleep than those who had not been exposed. Additionally, the sample included a broad population of college students, which showed only small amounts of exposure to COVID-19. The small sample of people exposed to COVID-19 at the time of data collection reduced variability in the exposure to COVID variable. The reduced variability of the exposure to COVID measure could account for the lack of support of the hypotheses. Results indicated that participants were likely to report all three of these items if they reported “yes” for one of them:

personally testing positive for COVID-19, caring for a member of the household who had COVID-19, and having a member in your household test positive for COVID-19.

Findings were inconsistent with the third hypothesis, which predicted mindful awareness would moderate the association between COVID-19 exposure and sleep outcomes. A strong moderating effect was not found in the links between COVID-19 exposure and sleep patterns except for at low and mean levels of mindful awareness between COVID-19 exposure defined as personally testing positive for COVID-19, caring for a member of the household who had COVID-19, and having a member in your household test positive for COVID-19 with daytime sleepiness. This finding is not sufficient in predicting the moderating effect of mindful awareness in the links between exposure to COVID-19 and sleep outcomes. However, findings suggest that high levels of mindful awareness serve as a buffering factor that protects individuals who may have been exposed to COVID-19 (positive test for self or household member or caregiving for a family member) from daytime sleepiness. Specifically, those who had high mindful awareness showed low scores of daytime sleepiness regardless of the level of exposure to COVID-19.

Strengths

The current study explored a field of research that has not previously been widely examined. Due to the novel nature of the Coronavirus pandemic, there is little research on the role of exposure to COVID-19 on sleep patterns. The goal of this study was to examine the impact of COVID-19 by having participants report their levels of exposure to specific experiences throughout the pandemic. Additionally, the goal of the study was to analyze the role of mindful awareness in the relationship between COVID-19 exposure, ACE Factors, and sleep patterns. This reduces a gap in the literature as mindful awareness is still a new area of research.

Another strength of this study was the use of a randomized email list generated by an outside party to send the survey to limit randomization bias and selection bias by the research team. The study used measures of sleep patterns and mindful awareness that had previously been used and displayed high levels of reliability.

Limitations

After cleaning data samples by removing missing information from the initial data set of 187 samples, only 143 samples remained. When this study was designed, there was no known reliable measure for COVID-19 exposure or stress levels. Due to this, the study adapted a pre-existing measure Level of Familiarity measure to test for COVID-19 exposure. The items used in the current study were not found to be reliable when coded together. The COVID-19 exposure and ACE score measures were not reliable when all the items were taken together, which may have impacted the findings. The study employed subjective self-reports to measure each participant's current experience with sleep patterns, ACE factors, COVID-19 exposure, and mindful awareness, which posed an increased risk of common method bias or participant bias.

Additionally, the ACE measure included high-risk variables, which may have led to dishonest answers from participants. The study included participants from the University of Northern Iowa's student body, so the results cannot be generalized to other groups. A larger sample size with a more diverse demographic would allow for better analysis. Additionally, the study used a correlational design. Future research could use experimental designs may be used to shed light on the role of meditation practices on sleep disturbances for those exposed to COVID-19 stressors and adverse childhood experiences.

Directions for Future Research

The associations between ACE factors and sleep quality could have implications for later health outcomes that may be associated with ACE factors or sleep quality. The finding showing the protective role of mindful awareness indicates that when individuals have a prior history of adverse childhood experiences, they are at risk for various disturbances in sleep such as insomnia, multiple awakenings, disrupted breathing, feeling too hot or cold, nightmares, or pain. As expected, mindful awareness is protective such that at high and moderate levels of mindful awareness, individuals are protected from these sleep disturbances regardless of the exposure to ACE factors. Findings have implications for behavioral-based interventions that use mindfulness meditation practices for individuals with mental health conditions due to adverse family experiences in childhood. Additionally, further research in this area is needed to determine the nature of this relationship to better inform doctors tasked to find solutions to health outcomes such as heart disease, cancer, and more. The results of this study showed a relationship between some measures of sleep quality and ACE scores. Further efforts should focus on what ways we can mitigate these effects with resiliency tools. With improved ACE measures, additional research can look at the role mindful awareness plays in these associations.

The findings in the current study showing the protective role of mindful awareness in the COVID-19 exposure - daytime sleepiness links indicate that mindful awareness may protect against the stressors associated with the pandemic. The results may have implications for future work on how cultivating mindfulness practices in our daily lives may serve to increase mindful awareness. Findings may also have implications for interventions on sleep disturbances that may be associated with COVID-19 related stressors. Regarding the COVID-19 pandemic, more research is needed to better understand how COVID-19 is affecting people around the world. In order to examine these questions, more reliable measures will need to be developed to test an

individual's exposure levels to factors relating to COVID. This can improve testing in the behavioral sciences that aim to predict how exposure to COVID is affecting the well-being of people around the world. Mindfulness has been shown to decrease symptoms of depression and increase coping skills (Grossman et al., 2010). With more knowledge on the impacts of the COVID-19 pandemic, mindfulness may be a tool that can help improve the lives of those experiencing increased levels of stress, depression, or anxiety due to COVID-19.

Conclusion

Experiencing past and current stressors is associated with increased sleep disturbances. This study looked at the possible resiliency factor of mindful awareness in this interaction. ACEs throughout childhood can put individuals at an elevated risk of major health problems later in life. A growing body of research has addressed these issues, but more research is needed to better understand the relationship between ACE and sleep. It can be concluded that ACE scores are associated with sleep disturbances for college students. This study provides support for the moderating role of mindful awareness between ACE and trouble sleeping. No other model held a significant moderating effect of mindful awareness between ACE and sleep disturbances. There could be multiple reasons for this lack of effect, such as the small sample size, the use of high-risk variables in the ACE measure, or the lack of reliability and variability provided by subjective measures of each variable. Given the limitations of the COVID-19 exposure measure used in this study, the relationship between COVID-19 exposure and sleep was only partially supported. Mindful awareness moderated the relationship between COVID-19 exposure and daytime sleepiness. Despite the lack of support for the moderating role of mindful awareness with each sleep disturbances and these stressors, the main effect of mindful awareness and sleep was found. This shows that mindful awareness plays a protective role in improving sleep

outcomes. Nevertheless, more research on protective factors in ACE scores, COVID-19, and other life stressors can lead to discoveries that improve the lives of many individuals.

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Table 1*Independent Samples T-Test in the Association of Adverse Childhood Experiences and Sleep Patterns*

				Levene's Test for Equality of Variances							95% Confidence Interval of the Difference	
		Mean Exposed	Mean Not Exposed	F	Sig.	t	df	t-test for Equality of Means Sig. (2- tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Insomnia	Equal variances assumed	2.267	2.0724	1.911	.169	1.787	141	.076	.19030	.10649	-.02022	.40082
	Equal variances not assumed					1.849	132.748	.067	.19030	.10294	-.01332	.39392
Nightmares	Equal variances assumed	1.8395	1.6947	1.135	.289	1.138	141	.257	.14480	.12729	-.10684	.39644
	Equal variances not assumed					1.173	131.769	.243	.14480	.12342	-.09934	.38894
Factors Inducing Sleep	Equal variances assumed	1.5581	1.3158	2.445	.120	4.068	141	.000	.24235	.05958	.12456	.36014
	Equal variances not assumed					4.176	130.199	.000	.24235	.05804	.12753	.35717
Daily Functioning	Equal variances assumed	2.3904	2.0618	.368	.545	3.138	141	.002	.32854	.10469	.12157	.53552
	Equal variances not assumed					3.173	124.481	.002	.32854	.10355	.12359	.53350

		Mean Exposed	Mean Not Exposed	F	Sig.	t	df	Sig. (2- tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Sleepiness	Equal variances assumed	1.4438	1.4947	1.767	.186	-.768	141	.444	-.05094	.06633	-.18207	.08019
	Equal variances not assumed					-.736	102.565	.463	-.05094	.06920	-.18818	.08630
PSQI Score	Equal variances assumed	8.5698	7.3860	.892	.347	2.251	141	.026	1.18380	.52586	.14421	2.22339
	Equal variances not assumed					2.298	128.173	.023	1.18380	.51512	.16456	2.20305
Total Amount of Sleep (in minutes)	Equal variances assumed	507.139	520.614	.134	.714	-.483	141	.630	-13.474	27.87959	-68.590	41.64154
	Equal variances not assumed					-.493	127.984	.623	-13.474	27.32429	-67.540	40.59134
Trouble Sleeping	Equal variances assumed	14.4651	14.2632	1.791	.183	.317	141	.752	.20196	.63752	-1.0583	1.46229
	Equal variances not assumed					.308	107.737	.759	.20196	.65672	-1.0998	1.50373
Sleep Latency	Equal variances assumed	2.9419	2.4561	1.856	.175	1.530	141	.128	.48572	.31737	-.14170	1.11314
	Equal variances not assumed					1.506	113.357	.135	.48572	.32255	-.15329	1.12473

		Mean Exposed	Mean Not Exposed	F	Sig.	t	df	Sig. (2- tailed)	Mean Difference	Std. Error Difference	Lower	Upper
PSQI Sleepiness	Equal variances assumed	2.2209	2.0000	2.943	.088	2.075	141	.040	.22093	.10648	.01042	.43144
	Equal variances not assumed					2.071	119.332	.041	.22093	.10667	.00971	.43215
Sleep Quality	Equal variances assumed	1.4651	1.0702	9.806	.002	3.699	141	.000	.39494	.10678	.18384	.60605
	Equal variances not assumed					3.762	126.847	.000	.39494	.10498	.18721	.60267
Sleep Efficiency	Equal variances assumed	.3875	.4909	.916	.340	-.685	133	.494	-.10341	.15092	-.40192	.19510
	Equal variances not assumed					-.676	110.325	.501	-.10341	.15307	-.40674	.19992

Table 2***Independent Samples T-Test in the Association of COVID-19 Exposure and Sleep Patterns***

		Mean Exposed	Mean Not Exposed	Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
				F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Insomnia	Equal variances assumed	2.1837	2.3333	.908	.342	-.407	141	.685	-.14966	.36768	-.87653	.57721
	Equal variances not assumed					-.660	2.242	.571	-.14966	.22688	-1.0313	.73207
Nightmares	Equal variances assumed	1.7743	2.1333	.993	.321	-.824	141	.411	-.35905	.43581	-1.2206	.50251
	Equal variances not assumed					-1.00	2.131	.416	-.35905	.35840	-1.8139	1.09580
Factors Inducing Sleep	Equal variances assumed	1.4561	1.7143	6.132	.014	-1.20	141	.230	-.25816	.21406	-.68134	.16501
	Equal variances not assumed					-8.26	139.000	.000	-.25816	.03123	-.31990	-.19642
Daily Functioning	Equal variances assumed	2.2558	2.4286	1.430	.234	-.467	141	.641	-.17279	.36966	-.90359	.55801
	Equal variances not assumed					-.289	2.032	.799	-.17279	.59711	-2.7038	2.35825

		Mean Exposed	Mean Not Exposed	F	Sig.	t	df	Sig. (2- tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Sleepiness	Equal variances assumed	1.4590	1.7000	.045	.833	-1.06	141	.289	-.24095	.22617	-.68807	.20616
	Equal variances not assumed					-.829	2.051	.492	-.24095	.29051	-1.4614	.97951
PSQI Score	Equal variances assumed	8.1000	8.000	3.129	.079	.055	141	.956	.10000	1.82850	-3.5148	3.71483
	Equal variances not assumed					.157	2.942	.885	.10000	.63591	-1.9467	2.14670
Total Amount of Sleep (in minutes)	Equal variances assumed	513.7429	455.00	.712	.400	.617	141	.538	58.74286	95.19677	-129.45	246.94035
	Equal variances not assumed					2.582	5.050	.049	58.74286	22.75426	.42613	117.05958
Trouble Sleeping	Equal variances assumed	14.3500	16.000	3.746	.055	-.759	141	.449	-1.65000	2.17432	-5.9484	2.64848
	Equal variances not assumed					-.407	2.023	.723	-1.65000	4.05326	-18.893	15.59732
Sleep Latency	Equal variances assumed	2.7500	2.6667	.103	.749	.076	141	.939	.08333	1.09320	-2.0778	2.24452
	Equal variances not assumed					.057	2.047	.960	.08333	1.46147	-6.0678	6.23455
PSQI Sleepiness	Equal variances assumed	2.1357	2.0000	4.008	.047	.368	141	.714	.13571	.36911	-.59399	.86542
	Equal variances not assumed					2.520	139.000	.013	.13571	.05385	.02925	.24218

		Mean Exposed	Mean Not Exposed	F	Sig.	t	df	Sig. (2- tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Sleep Quality	Equal variances assumed	1.3000	1.6667	.292	.590	-.963	141	.337	-.36667	.38085	-1.1195	.38624
	Equal variances not assumed					-1.08	2.111	.386	-.36667	.33788	-1.7493	1.01605
Sleep Efficiency	Equal variances assumed	.4318	.3333	.374	.542	.195	133	.845	.09848	.50388	-.89817	1.09514
	Equal variances not assumed					.288	2.210	.798	.09848	.34176	-1.2458	1.44286

Table 3
Correlation between COVID-19 Exposure and Sleep Patterns

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 Any COVID Exposure	1	.												
2 Exposure to COVID	.085	1												
3 Insomnia	-.034	.029	1											
4 Nightmares	-.069	.053	.405***	1										
5 Factors Inducing Sleep	-.101	.048	.450***	.158	1									
6 Sleep Complaints affecting Daytime ing	-.039	.020	.627***	.228***	.577***	1								
7 Sleepiness	-.089	.081	.252***	.115	.317***	.426***	1							
8 PSQI Score	.005	.116	.648***	.315***	.477***	.511***	.316***	1						
9 Sleep Duration	.052	.074	-.016	.115	-.090	-.129	-.110	.213*	1					
10 Troubles Sleeping	-.064	.150	.537***	.498***	.245**	.443***	.320***	.529***	.065	1				
11 Sleep Onset Latency	.006	.051	.560***	.283**	.251**	.395***	.248**	.712***	.077	.412***	1			
12 PSQI Sleepiness	.031	.149	.361***	.206*	.459***	.556***	.456***	.551***	.027	.377***	.322***	1		
13 Sleep Quality	-.081	-.012	.585***	.266**	.432***	.630***	.203*	.656***	-.053	.406***	.550***	.345***	1	
14 Sleep Efficiency	.017	.113	.166	.134	.128	-.010	.010	.521***	.674***	.090	.256**	.095	.155	1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 4
Correlation between ACE and Sleep Patterns

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 ACE Score	1													
2 Any ACE	.701***	1												
3 Insomnia	.327***	.149	1											
4 Nightmares	.157	.095	.405***	1										
5 Factors Inducing Sleep	.334**	.324***	.450***	.158	1									
6 Sleep Complaints affecting Daytime Functioning	.333***	.256**	.627***	.228**	.577***	1								
7 Sleepiness	-.001	-.065	.252**	.115	.317***	.426***	1							
8 PSQI Score	.297***	.186*	.648***	.315***	.477***	.511***	.316***	1						
9 Sleep Duration	-.061	-.041	-.016	.115	-.090	-.129	-.110	.213*	1					
10 Troubles Sleeping	.152	.027	.537***	.498***	.245**	.443***	.320***	.529***	.065	1				
11 Sleep Onset Latency	.247**	.128	.560***	.283**	.251**	.395***	.248**	.712***	.077	.412***	1			
12 PSQI Sleepiness	.204*	.172*	.361***	.206*	.459***	.556***	.456***	.551***	.027	.377***	.322***	1		
13 Sleep Quality	.355***	.297***	.585***	.266**	.432***	.630***	.203*	.656***	-.053	.406***	.550***	.345***	1	
14 Sleep Efficiency	.024	-.059	.166	.134	.128	-.010	.010	.521***	.674***	.090	.256**	.095	.155	1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 5

Model of Mindful Awareness as a Moderator in the Relationship between sleep outcomes and COVID-19 Exposure (defined as: tested positive for COVID, member of household tested positive for COVID, or cared for member of the household who had COVID).

Variables		<i>B (se)</i>	<i>t</i>	<i>LLCI</i>	<i>ULCI</i>	<i>R-Squared</i>
Insomnia	Constant	2.19(.0496)***	44.12	2.089	2.285	.1288***
	COVID-19 Exposure	.073(.1824)	.4013	-.2875	.4339	
	Mindful Awareness	-.214(.048)***	-4.472	-.3096	-.1197	
	Interaction	-.126(.1794)	-.7035	-.4809	.2285	.003
Nightmares	Constant	1.78(.0612)***	29.1	1.661	1.903	.0575
	COVID-19 Exposure	.146(.2253)	.6476	-.2996	.5914	
	Mindful Awareness	-.168(.059)***	-2.8342	-.2853	-.0508	
	Interaction	-.047(.2216)	-.2111	-.4849	.3913	.00
Factors Inducing Sleep	Constant	1.46(.0283)***	51.58	1.405	1.517	.17***
	COVID-19 Exposure	.0676(.1043)	.6480	-.1386	.2738	
	Mindful Awareness	-.143(.027)***	-5.211	-.1972	-.0887	
	Interaction	-.0761(.1026)	-.7418	-.2789	.1267	.003
Sleep Complaints Affecting Daytime Functioning	Constant	2.26(.0452)***	49.98	2.169	2.348	.28***
	COVID-19 Exposure	.0602(.1663)	.3619	-.2687	.3891	
	Mindful Awareness	-.319(.043)***	-7.292	-.4057	-.2326	
	Interaction	-.233(.1636)	-1.425	-.5565	.0904	.01

Variables		<i>B(se)</i>	<i>t</i>	<i>LLCI</i>	<i>ULCI</i>	<i>R-Squared</i>
Daytime Sleepiness	Constant	1.46(.029***)	49.25	1.405	1.523	.18***
	COVID-19 Exposure	.104(.1094)	.9462	-.1128	.3198	
	Mindful Awareness	-.153(.028)***	-5.298	-.2095	-.0956	
	Interaction	.090(.1076)	.8354	-.1229	.3026	.00
PSQI Total Score	Constant	8.10(.2435)***	33.24	7.615	8.578	.15***
	COVID-19 Exposure	1.401(.8963)	1.564	-.3705	3.173	
	Mindful Awareness	-1.14(.235)***	-4.529	-1.534	-.6020	
	Interaction	-1.14(.8815)	-1.292	-2.882	.6036	.01
Sleep Duration	Constant	512.5(13.6)***	37.66	458.6	539.4	.02
	COVID-19 Exposure	45.12(50.09)	.9007	-53.92	144.2	
	Mindful Awareness	19.84(13.18)	1.505	-6.225	45.90	
	Interaction	-6.173(49.26)	-.1253	-103.6	91.23	.00
Troubles Sleeping	Constant	14.4(.3027)***	47.52	13.79	14.98	.073*
	COVID-19 Exposure	2.043(1.114)	1.833	-.1601	4.245	
	Mindful Awareness	-.809(.2932)**	-2.762	-1.389	-.2300	
	Interaction	-.3036(1.096)	-.2771	-2.470	1.863	.00
Sleep Onset Latency	Constant	2.75(.1555)***	17.67	2.441	3.056	.03
	COVID-19 Exposure	.354(.5724)	.6184	-.7778	1.486	
	Mindful Awareness	-.2883(.1506)	-1.914	-.5861	.0095	

Variables		<i>B(se)</i>	<i>t</i>	<i>LLCI</i>	<i>ULCI</i>	<i>R-Squared</i>
PSQI Sleepiness Level	Interaction	-.133(.5630)	-,2369	-1.246	.9797	.06
	Constant	2.13(.0461)***	46.2391	2.0411	2.2235	.5***
	COVID-19 Exposure	.3703(.1697)*	2.1817	.0347	.7059	
	Mindful Awareness	-.274(.044)***	-6.1405	-.3625	-.1859	
Sleep Quality	Interaction	-.3813(.1669)*	-2.2843	-.7113	-.0513	.03*
	Constant	1.31(.0511)***	25.58	1.206	1.408	.142**
	COVID-19 Exposure	-.007(.1880)	-.0343	-.3782	.3653	
	Mindful Awareness	-.222(.049)***	-4.487	-.3298	-.1242	
Sleep Efficiency	Interaction	-.322(.1849)	-1.74	-.6874	.0439	.01
	Constant	.428(.0742)***	5.771	.2815	.5752	.02
	COVID-19 Exposure	.361(.2764)	1.305	-.1860	.9075	
	Mindful Awareness	-.024(.0727)	-.3355	-.1683	.1195	
	Interaction	-.191(.2692)	-.7084	-.7232	.3418	.00

Note. * is significant at the 0.05 level, ** is significant at the .01 level, *** is significant at the .001 level.

Table 6

Model of Mindful Awareness as a Moderator in the Relationship between the sleep outcomes and total amount of COVID-19 Exposure.

Variables		<i>B(se)</i>	<i>t</i>	<i>LLCI</i>	<i>ULCI</i>	<i>R-Squared</i>
Insomnia	Constant	2.19(.0495)***	44.17	2.088	2.284	.13***
	COVID-19 Exposure	.0205(.0237)	.8634	-.0264	.0674	
	Mindful Awareness	-.210(.048)***	-4.364	-.305	-.1148	
	Interaction	-.0157(.0211)	-.7459	-.0574	.026	.0035
Nightmares	Constant	1.78(.0612)***	29.09	1.66	1.902	.06*
	COVID-19 Exposure	.0191(.0294)	.6501	-.0390	.0771	
	Mindful Awareness	-.165(.0595)**	-2.775	-.2829	-.0475	
	Interaction	-.008(.0261)	-.3098	-.0597	.0435	.00
Factors Inducing Sleep	Constant	1.46(.0283)***	51.58	1.405	1.517	.16***
	COVID-19 Exposure	.002(.0136)	.1432	-.0250	.0289	
	Mindful Awareness	-.143(.027)***	-5.171	-.1976	.0252	
	Interaction	.0013(.0121)	.1059	-.0227	.0252	.00
Sleep Complaints Affecting Daytime Functioning	Constant	2.26(.0455)***	49.67	2.169	2.349	.28***
	COVID-19 Exposure	.0121(.0218)	.5552	-.0310	.0552	
	Mindful Awareness	-.316(.044)***	-7.144	-.4032	-.2284	
	Interaction	-.009(.0194)	-.5059	-.0481	.0285	.00

Variables		<i>B(se)</i>	<i>t</i>	<i>LLCI</i>	<i>ULCI</i>	<i>R-Squared</i>
Daytime Sleepiness	Constant	1.47(.0291)***	50.40	1.408	1.523	.21***
	COVID-19 Exposure	.0291(.0139)	2.085	.0015	.0566	
	Mindful Awareness	-.155(.028)***	-5.488	-.2111	-.0993	
	Interaction	.0221(.0124)	1.781	-.0025	.0466	-.02
PSQI Total Score	Constant	8.09(.2453)***	32.99	7.609	8.579	.14***
	COVID-19 Exposure	.1552(.1176)	1.320	-.0773	.3877	
	Mindful Awareness	-1.05(.238)***	-4.386	-1.518	-.5745	
	Interaction	-.051(.1045)	-.4871	-.2576	.1558	.00
Sleep Duration	Constant	512.6(13.66)***	37.53	485.5	539.5	.02
	COVID-19 Exposure	.2402(6.546)	.0367	-12.70	13.18	
	Mindful Awareness	19.74(13.27)	1.487	-6.510	45.99	
	Interaction	.375(5.819)	.0644	-11.88	11.88	.00
Troubles Sleeping	Constant	14.39(.3022)***	47.61	13.79	14.99	.08*
	COVID-19 Exposure	.2749(.1449)	1.898	-.0115	.5613	
	Mindful Awareness	-.8033(.2938)**	-2.734	-1.384	-.2224	
	Interaction	.0573(.1288)	.4446	-.1974	.3119	.00
Sleep Onset Latency	Constant	2.75(.1555)***	17.66	2.438	3.053	.03

Variables		<i>B(se)</i>	<i>t</i>	<i>LLCI</i>	<i>ULCI</i>	<i>R-Squared</i>
PSQI Sleepiness Level	COVID-19 Exposure	.0511(.0745)	.6857	-.0962	.1984	.002
	Mindful Awareness	-.2784(.1511)	-1.842	-.5772	.0204	
	Interaction	-.0366(.0662)	-.5058	-.1646	.0973	
	Constant	2.13(.0467)***	45.65	2.041	2.226	
Sleep Quality	COVID-19 Exposure	.0488(.0224)*	2.180	.0045	.0931	.00
	Mindful Awareness	-.273(.045)***	-5.996	-.3623	-.1826	
	Interaction	.0125(.0199)	.6267	-.0269	.0519	
	Constant	1.305(.051)***	25.51	1.204	1.406	
Sleep Efficiency	COVID-19 Exposure	-.0037(.0245)	-.1502	-.0522	.0448	.02
	Mindful Awareness	-.2144(.048)***	-4.310	-.3127	-.1160	
	Interaction	-.0357(.0218)	-1.637	-.0788	.0074	
	Constant	.430(.0748)***	5.741	.2816	.5777	
	COVID-19 Exposure	-.0176(.0355)	-.4970	-.0878	.0526	.00
	Mindful Awareness	-.0275(.0730)	-.3723	-.1733	.1184	
	Interaction	.0005(.0316)	.0143	-.0621	.0630	

Note. * is significant at the 0.05 level, ** is significant at the .01 level, *** is significant at the .001 level.

Table 7

Model of Mindful Awareness as a Moderator in the Relationship between sleep outcomes and ACE Score.

Variables		<i>B(se)</i>	<i>t</i>	<i>LLCI</i>	<i>ULCI</i>	<i>R-Squared</i>
Insomnia	Constant	2.16(.0512)***	42.09	2.055	2.258	.19***
	ACE Score	.5532(.2479)*	2.145	.0433	1.063	
	Mindful Awareness	-.182(.049)***	-3.650	-.2799	-.0832	
	Interaction	-.4271(.2600)	-1.643	-.9413	.0870	.02
Nightmares	Constant	1.764(.0654)***	26.98	1.635	1.893	.07*
	ACE Score	.2295(.3291)	.6975	-.4211	.8802	
	Mindful Awareness	-.1552(.0635)*	-2.445	-.2807	-.0297	
	Interaction	-.2505(.3318)	-.7550	-.9066	.4055	.00
Factors Inducing Sleep	Constant	1.462(.0296)***	49.30	1.403	1.520	.208***
	ACE Score	.394(.1492)**	2.640	.0990	.6891	
	Mindful Awareness	-.1165(.028)***	-4.048	-.1734	-.0596	
	Interaction	.0007(.1505)	.0045	-.2968	.2982	.00
Sleep Complaints Affecting Daytime Functioning	Constant	2.244(.0477)***	47.05	2.15	2.339	.306***
	ACE Score	.4679(.2401)	1.949	-.0069	.9427	
	Mindful Awareness	-.2893(.046)***	-6.246	-.3809	-.1977	
	Interaction	-.2126(.2421)	-.8779	-.6914	.2662	.004

Variables		<i>B(se)</i>	<i>t</i>	<i>LLCI</i>	<i>ULCI</i>	<i>R-Squared</i>
Daytime Sleepiness	Constant	1.448(.0314)***	46.04	1.385	1.510	.20***
	ACE Score	-.3618(.1583)*	-2.286	-.6748	-.0489	
	Mindful Awareness	-.1794(.030)***	-5.877	-.2398	-.1191	
	Interaction	-.2327(.1596)	-1.458	-.5482	.0829	.01
PSQI Total Score	Constant	8.06(.2590)***	31.124	7.549	8.573	.16***
	ACE Score	2.813(1.304)*	2.158	.2351	5.391	
	Mindful Awareness	-.883(.2515)***	-3.514	-1.381	-.3865	
	Interaction	-.5173(1.315)	-.3935	-3.117	2.082	.00
Sleep Duration	Constant	517(14.60)***	35.42	488.1	545.9	.02
	ACE Score	5.616(73.49)	.0764	-139.7	150.9	
	Mindful Awareness	20.79(14.17)	1.467	-7.238	48.81	
	Interaction	63.104(74.10)	.8516	-83.40	209.6	.01
Troubles Sleeping	Constant	14.15(.3228)***	43.8414	13.5114	14.7909	.29**
	ACE Score	.3731(1.6251)	.2296	-2.8400	3.5861	
	Mindful Awareness	-.8186(.313)**	-2.6116	-1.4384	-.1989	
	Interaction	-3.26(1.6386)*	-1.9887	-6.4985	-.0188	.03*
Sleep Onset Latency	Constant	2.672(.162)***	16.45	2.351	2.993	.08**
	ACE Score	1.545(.8174)	1.890	-.0712	3.161	
	Mindful Awareness	-.196(.1577)	-1.242	-.5075	.1160	

Variables		<i>B(se)</i>	<i>t</i>	<i>LLCI</i>	<i>ULCI</i>	<i>R-Squared</i>
PSQI Sleepiness Level	Interaction	-1.077(.8242)	-1.306	-2.706	.5530	.01
	Constant	2.129(.0509)***	41.80	2.029	2.230	.21***
	ACE Score	.1745(.2565)	.6803	-.3326	.6816	
	Mindful Awareness	-.262(.0495)***	-5.302	-.3601	-.1645	
Sleep Quality	Interaction	-.0449(.2586)	-.1734	-.5562	.4665	.00
	Constant	1.286(.0531)***	24.23	1.181	1.391	.19***
	ACE Score	.7207(.2672)**	2.697	.1924	1.249	
	Mindful Awareness	-.1758(.051)***	-3.411	-.2777	-.0739	
Sleep Efficiency	Interaction	-.3062(.2694)	-1.137	-.8389	.2265	.01
	Constant	.4884(.080)***	6.103	.3301	.6467	.03
	ACE Score	.3778(.4097)	.9221	-.4327	1.188	
	Mindful Awareness	.0074(.0786)	.0943	-.481	.1630	
	Interaction	.7787(.4099)	1.900	-.0322	1.590	.03

Note. * is significant at the 0.05 level, ** is significant at the .01 level, *** is significant at the .001 level.

Table 8

Model of Mindful Awareness as a Moderator in the Relationship between Sleep Outcomes and Any Exposure to ACE.

Variables		<i>B(se)</i>	<i>t</i>	<i>LLCI</i>	<i>ULCI</i>	<i>R-Squared</i>
Insomnia	Constant	2.168(.0502)***	43.15	2.069	2.267	.15***
	Any ACE Exposure	.1134(.1031)	1.101	-.0904	.3173	
	Mindful Awareness	-.2014(.048)***	-4.139	-.2976	-.1052	
	Interaction	-.1708(.1001)	-1.706	-.3688	.0272	.02
Nightmares	Constant	1.779(.0628)***	28.34	1.655	1.904	.06*
	Any ACE Exposure	.0703(.1288)	.5664	-.1817	.3276	
	Mindful Awareness	-.1604(.0608)**	-2.637	-.2806	-.0401	
	Interaction	-.0221(.1251)	-.1765	-.2695	.2253	.00
Factors Inducing Sleep	Constant	1.453(.0279)***	52.06	1.398	1.508	.23***
	Any ACE Exposure	.1931(.0573)***	3.372	.0799	.3064	
	Mindful Awareness	-.1223(.027)***	-4.523	-.1758	-.0688	
	Interaction	-.0766(.0556)	-1.3771	-.1866	.0334	.01
Sleep Complaints Affecting Daytime Functioning	Constant	2.24(.0454)***	49.34	2.150	2.330	.56***
	Any ACE Exposure	.2085(.0931)*	2.239	.0244	.3927	
	Mindful Awareness	-.2957(.044)***	-6.723	-.3826	-.2087	
	Interaction	-.1739(.0905)	-1.922	-.3528	.0050	.02

Variables		<i>B(se)</i>	<i>t</i>	<i>LLCI</i>	<i>ULCI</i>	<i>R-Squared</i>
Daytime Sleepiness	Constant	1.467(.0302)***	48.62	1.408	1.527	.19***
	Any ACE Exposure	-.1305(.0619)*	-2.107	-.2529	-.0081	
	Mindful Awareness	-.1667(.029)***	-5.703	-.2245	-.1089	
	Interaction	.0290(.0601)	.4815	-.0900	.1479	.001
PSQI Total Score	Constant	8.053(.2507)***	32.13	7.557	8.549	.14***
	Any ACE Exposure	.7684(.5142)	1.494	-.2484	1.785	
	Mindful Awareness	-.984(.2428)***	-4.053	-1.464	-.5041	
	Interaction	-.4073(.4996)	-.8154	-1.395	.5804	.00
Sleep Duration	Constant	512.3(13.99)***	36.62	484.6	539.9	.02
	Any ACE Exposure	-4.3844(28.71)	-.1527	-61.14	52.37	
	Mindful Awareness	19.35(13.55)	1.428	-7.445	46.15	
	Interaction	-1.843(27.89)	-.0661	-56.98	53.29	.00
Troubles Sleeping	Constant	14.28(.3114)***	45.86	13.66	14.90	.29**
	Any ACE Exposure	-.0814(.6389)	-.1331	-1.348	1.178	
	Mindful Awareness	-.8139(.3016)**	-2.698	-1.410	-.2175	
	Interaction	-.9426(.6206)	-1.519	-2.169	.2845	.02
Sleep Onset Latency	Constant	2.718(.1585)***	17.15	2.405	3.031	.039
	Any ACE Exposure	.3983(.3252)	1.225	-.2447	1.041	
	Mindful Awareness	-.2452(.1535)	-1.597	-.5488	.0584	

Variables		<i>B(se)</i>	<i>t</i>	<i>LLCI</i>	<i>ULCI</i>	<i>R-Squared</i>
PSQI Sleepiness Level	Interaction	-.2738(.3159)	-.8668	-.8985	.3508	.01
	Constant	2.126(.0486)***	43.77	2.030	2.222	.21***
	Any ACE Exposure	.1062(.0996)	1.066	-.0908	.3032	
	Mindful Awareness	-.262(.0470)***	-5.571	-.3550	-.1690	
Sleep Quality	Interaction	-.0646(.0968)	-.6672	-.2559	.1268	.00
	Constant	1.294(.0511)***	25.32	1.193	1.395	.18***
	Any ACE Exposure	.3201(.1049)**	3.052	.1127	.5275	
	Mindful Awareness	-.1869(.0495)**	-3.775	-.2848	-.0890	
Sleep Efficiency	Interaction	-.1209(.1019)	-1.187	-.3224	.0805	.01
	Constant	.4430(.0766)***	5.780	.2914	.5946	.01
	Any ACE Exposure	-.133(.1567)	-.8543	-.4438	.1761	
	Mindful Awareness	-.042(.0751)	-.5540	-.1902	.1070	
	Interaction	.1141(.1542)	.7398	-.1910	.4191	.00

Note. * is significant at the 0.05 level, ** is significant at the .01 level, *** is significant at the .001 level.

Figure 1.

The moderating effects of mindful awareness on exposure to COVID-19 and daytime sleepiness.

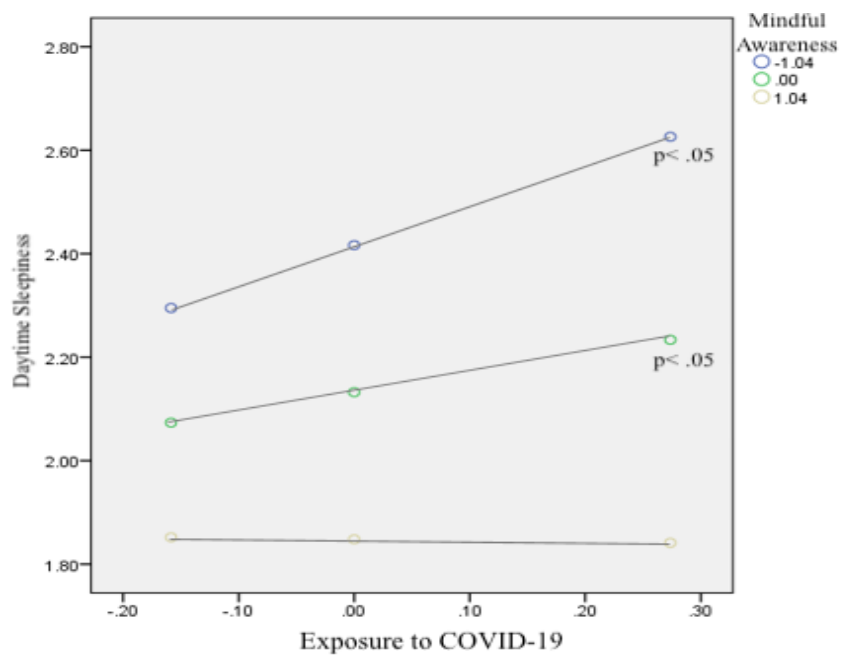
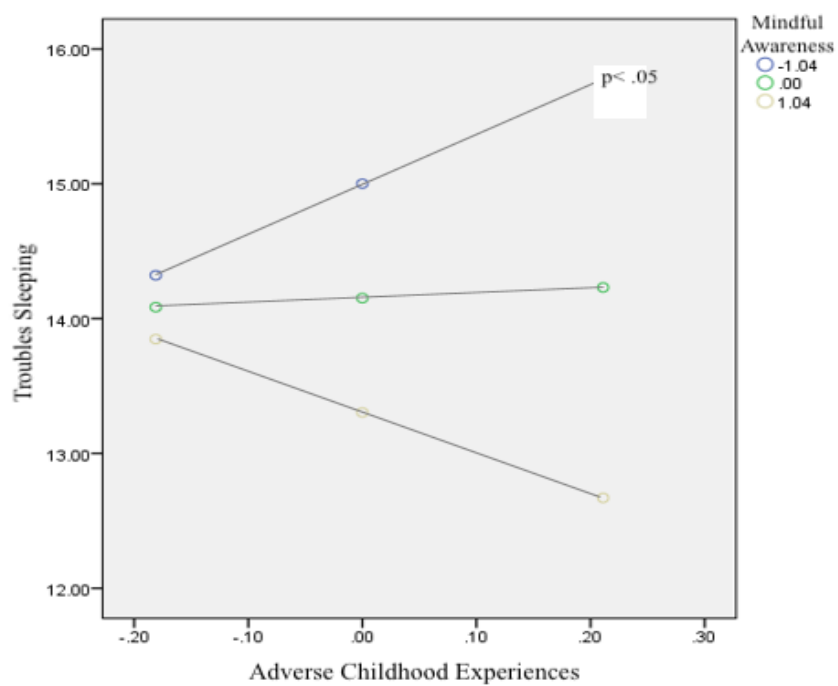


Figure 2.

The moderating effects of mindful awareness on ACE score and trouble sleeping.



Appendix A

Documents of Informed Consent

Participant Pool through SONA.

HUMAN PARTICIPANTS REVIEW INFORMED CONSENT (Participant Pool)

Project Title: The Moderating Role of Mindful Awareness in the Relationship between Adverse Childhood Experience Score and Coronavirus Exposure with Sleep Patterns

Investigators: Dilbur D. Arsiwalla and Shyanne F. Sporrer

Invitation to Participate: We invite you to participate in a study about your sleep patterns, adverse childhood experiences, COVID-19 exposure, and mindful awareness at the University of Northern Iowa. The following information is provided to help you make an informed decision about whether or not to participate. As part of this study, you will complete a 30-minute survey received through your UNI email on any device. Those in the participant pool will receive 1 course credit for your participation. If you have any questions please contact Shyanne Sporrer (sporrers@uni.edu) or Dr. Dilbur Arsiwalla (dilbur.arsiwalla@uni.edu). Thank you for your participation.

Nature and Purpose: The purpose of this study is to examine the relationship between sleep patterns, adverse childhood experiences, COVID-19 exposure, and mindful awareness among undergraduate students at UNI.

Explanation of Procedure: You will be asked to complete one survey that addresses each part of the research. The surveys will contain questions about your sleep habits, past adverse childhood experiences (prior to turning 18 years old), exposure to COVID-19, and current mindful awareness. The survey should take about 30 minutes. Then receive two course credits or compensation for your participation.

Discomfort and Risks: The survey will ask you to recall any adverse childhood experiences. If you have had adverse childhood experiences, while answering these questions, you might feel upset, stressed, uncomfortable, or other negative emotions. Your responses on any of the survey data will not be linked with your direct identifying information. If you feel stressed or upset at any point while completing the surveys, the researchers will provide you with the contact information of counseling or therapeutic services. You are free to withdraw from the study at any point during your participation.

Benefits and Compensation: There are no benefits to your participation. You will be compensated with one SONA research credit for your participation.

Confidentiality: All study data and responses will be completely confidential and will not be provided or accessed by anyone outside the lab. Your email address is requested so that we may provide you with SONA credit for participating in our study. We will not record any personal identifying information other than your name, student number, and email address. Your name, student number, and email will not be linked to the data and not maintained past the completion of data collection nor will it be provided to others. All information and responses will be kept confidential and will not be available to anyone else. Your confidentiality will be maintained to the degree permitted by the technology used. Specifically, no guarantees can be made regarding the interception

of data sent via the Internet by any third parties. The summarized findings with no identifying information may be published in an academic journal or used at a presentation at a research conference.

Right to Refuse or Withdraw: Your participation is completely voluntary. You are free to withdraw from this study, leave out any questions, or choose not to participate without any penalties.

Questions: If you have any questions or wish to have further information about your participation in this study or further information in the study more generally, please contact Dilbur Arsiwalla at the Department of Psychology, University of Northern Iowa, 319-273-7707 <dilbur.arsiwalla@uni.edu>. You can also contact the Office of Research and Sponsored Programs, Director of Research, at 319-273-6148 for answers to questions about rights of research participants and the participant review process. If you are feeling any form of discomfort, please contact the UNI Counseling Center: (319) 273-2676 or the Student Health Clinic: (319) 273-2009.

Agreement: Clicking on the Agree button below indicates that I am fully aware of the nature and extent of my participation in this project as stated above and the possible risks arising from it. I hereby agree to participate in this project. I am 18 years of age or older.

Agreement: Signing your name below indicates that

“I am fully aware of the nature and extent of my participation in this project as stated above and the possible risks arising from it. I hereby agree to participate in this project. I am 18 years of age or older.”

Listserv Email list.

HUMAN PARTICIPANTS REVIEW INFORMED CONSENT (LISTSERV)

Project Title: The Moderating Role of Mindful Awareness in the Relationship between Adverse Childhood Experience Score and Coronavirus Exposure with Sleep Patterns

Investigators: Dilbur D. Arsiwalla and Shyanne F. Sporrer

Invitation to Participate: We invite you to participate in a study about your sleep patterns, adverse childhood experiences, COVID-19 exposure, and mindful awareness at the University of Northern Iowa. The following information is provided to help you make an informed decision about whether or not to participate. As part of this study, you will complete a 30-minute survey received through your UNI email on any device. Each person who completes the survey will have a chance to win one of four \$25 target gift cards. If you have any questions please contact Shyanne Sporrer (sporrers@uni.edu) or Dr. Dilbur Arsiwalla (dilbur.arsiwalla@uni.edu). Thank you for your participation.

Nature and Purpose: The purpose of this study is to examine the relationship between sleep patterns, adverse childhood experiences, COVID-19 exposure, and mindful awareness among undergraduate students at UNI.

Explanation of Procedure: You will be asked to complete one survey that addresses each part of the research. The surveys will contain questions about your sleep habits, past adverse childhood experiences (prior to turning 18 years old), exposure to COVID-19, and current mindful awareness. The survey should take about 30 minutes.

Discomfort and Risks: The survey will ask you to recall any adverse childhood experiences. If you have had adverse childhood experiences, while answering these questions, you might feel upset, stressed, uncomfortable, or other negative emotions. Your responses on any of the survey data will not be linked with your direct identifying information. If you feel stressed or upset at any point while completing the surveys, the researchers will provide you with the contact information of counseling or therapeutic services. You are free to withdraw from the study at any point during your participation.

Benefits and Compensation: There are no benefits to your participation. Each participant will have the chance to win one of the four \$25 target gift cards after completion of the survey.

Confidentiality: All study data and responses will be completely confidential and will not be provided or accessed by anyone outside the lab. Your email address is requested so that we may provide you with SONA credit for participating in our study. We will not record any personal identifying information other than your name, student number, and email address. Your name, student number, and email will not be linked to the data and not maintained past the completion of data collection nor will it be provided to others. All information and responses will be kept confidential and will not be available to anyone else. Your confidentiality will be maintained to the degree permitted by the technology used. Specifically, no guarantees can be made regarding the interception of data sent via the Internet by any third parties. The summarized findings with no identifying information may be published in an academic journal or used at a presentation at a research conference.

Right to Refuse or Withdraw: Your participation is completely voluntary. You are free to withdraw from this study, leave out any questions, or choose not to participate without any penalties.

Questions: If you have any questions or wish to have further information about your participation in this study or further information in the study more generally, please contact Dilbur Arsiwalla at the Department of Psychology, University of Northern Iowa, 319-273-7707 <dilbur.arsiwalla@uni.edu>. You can also contact the Office of Research and Sponsored Programs, Director of Research, at 319-273-6148 for answers to questions about rights of research participants and the participant review process. If you are feeling any form of discomfort, please contact the UNI Counseling Center: (319) 273-2676 or the Student Health Clinic: (319) 273-2009.

Agreement: Clicking on the Agree button below indicates that I am fully aware of the nature and extent of my participation in this project as stated above and the possible risks arising from it. I hereby agree to participate in this project. I am 18 years of age or older.

Agreement: Signing your name below indicates that

“I am fully aware of the nature and extent of my participation in this project as stated above and the possible risks arising from it. I hereby agree to participate in this project. I am 18 years of age or older.”

Appendix B

Study Measures

Prescreening Questions.

1. Are you 18 years of age or older?
 1. If yes, participants will be allowed to continue on to complete the survey.

Demographic Information.

1. What is your age?
2. Racial/ethnic background
 1. White/Caucasian
 2. African American
 3. Hispanic/Latino
 4. Asian/Pacific Islander
 5. Native American
 6. Multiracial (please specify) _____
 7. Other (please specify) _____
2. Height _____/_____ (Feet/Inches)
3. Weight
4. What is your class (year) in college?
5. What is your household income?
6. What is your sex assigned at birth?
7. What gender do you identify with?
8. Do you take any medications?
 1. If yes, please list dosages and name of medications.

Appendix C

Sleep Measures.

Insomnia (SLEEP-50 Questionnaire).

Please respond to what extent a statement (item) has been applicable to you during the past 4 weeks. Score each item on a 4-point scale:

1 (not at all) 2 (somewhat) 3 (rather much) 4 (very much)

Insomnia: Section 1: _____

1. I have difficulty falling asleep. 1 2 3 4
2. Thoughts go through my head and keep me awake. 1 2 3 4
3. I worry and find it hard to relax. 1 2 3 4
4. I wake up during the night. 1 2 3 4
5. After waking up during the night, I fall asleep slowly. 1 2 3 4
6. I wake up early and cannot get back to sleep. 1 2 3 4
7. I sleep lightly. 1 2 3 4
8. I sleep too little. 1 2 3 4

Nightmares: Section 2: _____

9. I have frightening dreams (if not, go to Item 37). 1 2 3 4
10. I wake up from these dreams. 1 2 3 4
11. I remember the content of these dreams. 1 2 3 4
12. I can orientate quickly after these dreams. 1 2 3 4
13. I have physical symptoms during or after these dreams
(e.g., movements, sweating, heart palpitations, shortness of breath). 1 2 3 4

Factors Inducing Sleep: Section 3: _____

14. It is too light in my bedroom during the night. 1 2 3 4
15. It is too noisy in my bedroom during the night. 1 2 3 4
16. I drink alcoholic beverages during the evening. 1 2 3 4
17. I smoke during the evening. 1 2 3 4
18. I use other substances during the evening (e.g., sleeping pills or other medication). 1 2 3 4
19. I feel sad. 1 2 3 4
20. I have no pleasure or interest in daily occupations. 1 2 3 4

Impact of Sleep Complaints on Daily Functioning: Section 4: _____

21. I feel tired at getting up. 1 2 3 4
22. I feel sleepy during the day and struggle to remain awake. 1 2 3 4
23. I would like to have more energy during the day. 1 2 3 4
24. I am told that I am easily irritated. 1 2 3 4
25. I have difficulty in concentrating at work or school. 1 2 3 4
26. I worry whether I sleep enough. 1 2 3 4
27. Generally, I sleep badly. 1 2 3 4

The Pittsburgh Sleep Quality Index.

The following questions relate to your usual sleep habits during the past month *only*. Your answers should indicate the most accurate reply for the *majority* of days and nights in the past month. Please answer all the questions. _____

For each of the remaining questions, check the one best response. Please answer *all* questions.

1. During the past month, how often have you had trouble sleeping because you.....

a. Cannot get to sleep within 30 minutes

Not during the past month _____ Less than once a week _____ Once or twice a week _____ three or more times a week _____

b. Wake up in the middle of the night or early morning

Not during the past month _____ Less than once a week _____ Once or twice a week _____ Three or more times a week _____

c. Have to get up to use the bathroom

Not during the past month _____ Less than once a week _____ Once or twice a week _____ three or more times a week _____

d. Cannot breathe comfortably

Not during the past month _____ Less than once a week _____ Once or twice a week _____ three or more times a week _____

e. Cough or snore loudly

Not during the past month _____ Less than once a week _____ Once or twice a week _____ three or more times a week _____

f. Feel too cold

Not during the past month _____ Less than once a week _____ Once or twice a week _____ three or more times a week _____

g. Feel too hot

Not during the past month _____ Less than once a week _____ Once or twice a week _____ three or more times a week _____

h. Had bad dreams

Not during the past month _____ Less than once a week _____ Once or twice a week _____ three or more times a week _____

i. Have pain

Not during the past month _____ Less than once a week _____ Once or twice a week _____ three or more times a week _____

j. Other reason(s), please describe _____

How often during the past month have you had trouble sleeping because of this?

Not during the past month _____ Less than once a week _____ Once or twice a week _____ three or more times a week _____

1. During the past month, how would you rate your sleep quality overall?

Very good _____

Fairly good _____

Fairly bad _____

Very bad _____

1. During the past month, how often have you taken medicine (prescribed or “over the counter”) to help you sleep?

Not during the past month _____ Less than once a week _____ Once or twice a week _____ three or more times a week _____

past month_____ once a week_____ twice a week_____ times a week

1. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?

Not during the _____ Less than _____ Once or _____ three or more
past month_____ once a week_____ twice a week_____ times a week

1. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?

No problem at all_____

Only a very slight problem____

Somewhat of a problem_____

A very big problem_____

1. Do you have a bed partner or roommate?

No bed partner or roommate _____

Partner/roommate in other room _____

Partner in same room, but not same bed_____

Partner in same bed _____

Has a roommate or bed partner ever told you about the following behaviors? If you are unaware, mark Not sure.

How often in the past month you have had . . .

a) Loud snoring

Not during the _____ Less than _____ Once or _____ three or more
Not sure

past month_____ once a week_____ twice a week_____ times a week

b) Long pauses between breaths while asleep

Not during the _____ Less than _____ Once or _____ three or
more Not sure

past month_____ once a week_____ twice a week_____ times a week

c) Legs twitching or jerking while you sleep

Not during the _____ Less than _____ Once or _____ three or
more Not sure

past month_____ once a week_____ twice a week_____ times a week

d. Episodes of disorientation or confusion during sleep

Not during the _____ Less than _____ Once or _____ three or
more Not sure

past month_____ once a week_____ twice a week_____ times a week

e. Other restlessness while you sleep, please describe: _____

Not during the _____ Less than _____ Once or _____ three or
more Not sure

past month_____ once a week_____ twice a week_____ times a week

Sleep Habits Survey: Sleepiness Scale –Wolfson & Carskadon (1998).

During the last two weeks, have you struggled to stay awake (fought sleep) or fallen asleep in the following situations? (Mark one answer for every item.)

	Never	Struggled to stay awake	Fallen asleep	Both struggled to stay awake and fall asleep
1. In a face-to-face conversation with another person?	0	1	2	3
2. Travelling in a bus, train, plane, or car?	0	1	2	3
3. Attending a performance (movie, concert, play)?	0	1	2	3
4. Watching television or listening to the radio or stereo?	0	1	2	3
5. Reading, studying or doing work/homework?	0	1	2	3
6. During a test or when needing to focus on work?	0	1	2	3
7. In a class at school or a meeting at work?	0	1	2	3
8. While doing work on a computer or typewriter?	0	1	2	3
9. Playing video games?	0	1	2	3
10. Driving a car?	0	1	2	3

Sleep Time.

For the next set of questions, choose the answer that best describes the way your sleep has been in the last two weeks.

- 1) What time do you go to bed on week days? ____ / ____ / ____ Hours/Minutes/AM PM
- 2) What time do you wake up on week days? ____ / ____ / ____ Hours/Minutes/AM PM
- 3) On week days or school days, after you go to bed at night, about how long does it usually take to fall asleep? ____ Minutes
- 4) Figure out how long you usually sleep on a normal week night and fill it in. (Do not include time you spend awake in bed. Remember to mark hours and minutes even if the minutes are zero.)

Sleep time: _____ hours minutes.

- 5) What time do you go to bed on weekends? ____ / ____ / ____ Hours/Minutes/AM PM
- 6) What time do you wake up on weekends? ____ / ____ / ____ Hours/Minutes/AM PM
- 7) On weekends, after you go to bed at night, about how long does it usually take to fall asleep? ____ Minutes
- 8) Some people take naps in the daytime every day, others never do.
- a) Do you nap?
Yes/ No
- b) If yes, how many hours a week do you nap?

- 9) Which of these sleep disorders have you ever been diagnosed with or treated for? (Please check all that apply)
- a. Sleep apnea
- b) Insomnia
- c) Narcolepsy
- d) Restless legs syndrome
- e) Delayed sleep phase syndrome
- f) None
- g) Other _____
- 10) What is the ideal number of hours of sleep at night for you to function at an optimal level during the day? _____
- 11) After falling asleep, how many times do you typically wake up during the night?

- 12) What is the approximate time in minutes that you are awake during these wake episodes?

- 13) How many days out of the school/work week do you typically nap? _____
- 14) How many days on weekends do you typically nap? _____
- 15) When do you nap on week days, how many hours per day are spent napping? _____
- 16) When do you nap on weekends, how many hours per day are spent napping? _____

Appendix D

Mindful Attention Awareness Scale.

Below is a collection of statements about your everyday experience. Using the 1-6 scale below, please indicate how frequently or infrequently you currently have each experience. Please answer according to what really reflects your experience rather than what you think your experience should be. Please treat each item separately from every other item.

1	2	3	4	5	6
Almost Always	Very Frequently	Somewhat Frequently	Somewhat Infrequently	Very Infrequently	Almost Never

I could be experiencing some emotion and not be conscious of it until some time later. 1 2 3 4 5 6

I break or spill things because of carelessness, not paying attention, or thinking of something else. 1 2 3 4 5 6

I find it difficult to stay focused on what's happening in the present. 1 2 3 4 5 6

I tend to walk quickly to get where I'm going without paying attention to what I experience along the way. 1 2 3 4 5 6

I tend not to notice feelings of physical tension or discomforts until they really grab my attention. 1 2 3 4 5 6

I forget a person's name almost as soon as I've been told it for the first time. 1 2 3 4 5 6

It seems I am "running on automatic," without much awareness of what I'm doing. 1 2 3 4 5 6

I rush through activities without being really attentive to them. 1 2 3 4 5 6

I get so focused on the goal I want to achieve that I lose touch with what I'm doing right now to get there. 1 2 3 4 5 6

I do jobs or tasks automatically, without being aware of what I'm doing. 1 2 3 4 5 6

I find myself listening to someone with one ear, doing something else at the same time. 1 2 3 4 5 6

I drive places on "automatic pilot" and then wonder why I went there. 1 2 3 4 5 6

I find myself preoccupied with the future or the past. 1 2 3 4 5 6

I find myself doing things without paying attention. 1 2 3 4 5 6

I snack without being aware that I'm eating. 1 2 3 4 5 6
(Brown & Ryan, 2003)

Appendix E

Adverse Childhood Experience Questionnaire.

While you were growing up, during your first **18 years of life**:

1. Did a parent or other adult in the household 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 ...

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

Try to or actually have oral, anal, or vaginal sex with you?

___Yes ___No

4. Did you 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 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 pushed, grabbed, slapped, or had something thrown at her?

or

Sometimes or 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 F

COVID-19 Exposure Measure.

Level of Familiarity Scale (Corrigan et al., 2003)

Please respond to the following statements. Select yes to indicate if you have experienced the stated situation. Select no to indicate if you have not experienced the stated situation.

1. I have read on social media, watched a news report, or watched a documentary about someone who had COVID-19.
2. My job involves treating patients who have tested positive for COVID-19 in a healthcare setting.

My job involves providing services for the general public that puts me at higher risk of exposure to COVID-19 (not including treatment for COVID-19, grocery store worker, waiter, salesman, mail carrier)
3. I have been around someone who later tested positive for COVID-19.
4. I am regularly around people who have tested positive with COVID-19.
5. I have tested positive for COVID-19.
6. I have worked with someone who later tested positive for COVID-19 at my place of employment.
7. I chose to be around individuals that I was aware had COVID-19.
8. A friend of the family has tested positive for COVID-19.
9. I have a relative who I do not live with who has tested positive for COVID-19.
10. Someone in my household has tested positive for COVID-19 (parent, sibling, grandparents, roommate, etc.)
11. I cared for someone in my household who had tested positive for COVID-19.