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Adverse Childhood Experiences and Resilience: The Mediating and Moderating Role of Sleep

by

Madisen Julia Hillebrant-Openshaw

A thesis

submitted in partial fulfillment

of the requirements for the degree of

Master of Science in the Department of Psychology

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Committee Approval

To the Graduate Faculty:

The members of the committee appointed to examine the thesis of Madisen Julia Hillebrant-Openshaw find it satisfactory and recommend that it be accepted.

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Human Subjects Committee Approval

September 10, 2020

Madisen Hillebrant-Openshaw
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RE: Study Number IRB-FY2021-22: Childhood Experiences, Sleep, and Wellbeing

Dear Ms. Hillebrant-Openshaw:

Thank you for your responses to a full-board review of the study listed above. Your responses are eligible for expedited review under FDA and DHHS (OHRP) regulations. This is to confirm that I have approved your application.

Notify the HSC of any adverse events. Serious, unexpected adverse events must be reported in writing within 10 business days.

You may conduct your study as described in your application effective immediately. The study is subject to renewal on or before September 10, 2021, unless closed before that date.

Please note that any changes to the study as approved must be promptly reported and approved. Some changes may be approved by expedited review; others require full board review. Contact Tom Bailey (208-282-2179; email humsubj@isu.edu) if you have any questions or require further information.

Sincerely,

Ralph Baergen, PhD, MPH, CIP
Human Subjects Chair

Acknowledgments

I would like to express my extensive gratitude towards my mentor Dr. Maria M. Wong for her never-ending support during the time it has taken to complete this project. She has put in many hours towards my education and career goals, and I am very honored to call her my mentor and my friend.

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Adverse Childhood Experiences and Resilience: The Mediating and Moderating Role of Sleep

Thesis Abstract--Idaho State University 2021

Adverse childhood experiences (ACEs) have been linked to many negative outcomes in prior psychological research. Previous studies have shown that ACEs are related to sleep problems and sleep problems are related to resilience outcomes, but there are fewer studies that examine sleep as a mediator or moderator of the relationship between ACEs and resilience. Therefore, the purpose of the current study was to analyze the mediating and moderating role of sleep on the relationship between ACEs and resilience. Participants were recruited via Mechanical Turk and the ISU SONA research pool. Participants completed a group of questionnaires and online versions of the Stroop and the Go-No-Go tasks. Resilience was determined using measures of psychological wellbeing, life satisfaction, social wellbeing, subjective effortful control, and objective measures of effortful control. Insomnia symptoms mediated the relationship between ACEs and objective measures of resilience. Sleep quality moderated the relationship between ACEs and effortful control.

Key Words: Resilience, Sleep, Adverse Childhood Experiences

Chapter 1: Introduction

The transition from childhood to adulthood can be challenging for many reasons. Determining the factors which increase or decrease a child's propensity to grow into a happy and healthy adult is important for our understanding of lifespan development. Children who experience adversities in their childhood are at risk for negative outcomes in adulthood such as low psychological well-being, social well-being, life satisfaction (Mosley-Johnson et al., 2019) and effortful control (Lackner et al., 2018). Understanding what factors may decrease the likelihood of these negative outcomes may allow researchers to promote positive outcomes in adults who experienced adversity as children. The purpose of the current study was to analyze adults who had experienced childhood adversity and determine if different aspects of sleep could increase the likelihood that they experience positive adaptions despite these adversities.

Definitions

Adverse childhood experiences (ACEs) are negative experiences that an individual has been exposed to during their childhood. More specifically, ACEs can be defined as "experiences that are likely to require significant adaption by an average child, and that represent a deviation from the expectable environment" (McLaughlin, 2016). This definition suggests that ACEs are associated with environments that do not support normal developmental needs, and children must compensate for these adversities in order to maintain normal developmental outcomes in adulthood. Examples of childhood adversities can include experiences such as physical abuse, sexual abuse, emotional abuse, neglect, parental divorce, living with a mentally ill individual, or living with someone who abuses addictive substances, etc. (Jia & Lubetkin, 2020). Prior research has shown that ACEs are quite prevalent in the United States. In one study, Felitti et al. (1998) invited participants who had obtained care from the Kaiser Permanente's San Diego Health

Appraisal Clinic to complete the ACE study questionnaire. The researchers found that 52.1% of participants (N = 9,508) reported at least one type of ACE (Felitti et al., 1998). This study shows the staggering number of individuals who experience ACEs and the need for researchers to find factors that can promote positive outcome.

Resilience is one's ability to positively adapt despite experiencing adversities (Luthar et al., 2000; Masten & Curtis, 2000). Individuals who are considered resilient tend to show positive adaptions which allow them to respond to situations in ways that do not further increase the negative impacts of these experiences (Rutter, 1985). As the above definition of ACEs suggests, resilience can serve as an adaption that individuals need to compensate for growing up in an environment that deviates from the norm. These adaptions would then increase the likelihood of positive developmental outcomes for these individuals despite their experienced adversity.

Sleep difficulties refers to insomnia symptoms. These symptoms may include difficulties falling asleep, difficulties staying asleep, and waking up feeling tired, etc. In addition to sleep difficulties, the current study focuses on positive sleep qualities such as subjective sleep quality, sleep duration and regular sleep schedule. The National Sleep Foundation recommends that adults obtain between 7-9 hours of sleep each night (Hirshkowitz et al., 2015), and the American Academy of Sleep Medicine recommends maintaining a regular wake and bedtime on both weekends and weekdays (American Academy of Sleep Medicine, 2020).

Emerging adulthood refers to the developmental period between the ages of 18 to 25. At this period, individuals in the U.S. begin to expand their social relationships and actively explore and develop their identity in these contexts (Arnett, 2000). Arnett (2000) suggests that this period is especially important for the transition into adulthood as emerging adults learn to become independent. In fact, one important aspect of emerging adulthood is independent decision

making as individuals begin to make more decisions without the help of their parents (Arnett, 1997). As decision making is an important aspect in this developmental period, we would expect a resilient emerging adult to show effortful control abilities which would aid in their decision making.

Although emerging adults are learning to be more independent, they are also expanding their social relationships (Guarnieri et al., 2015). These relationships have been shown to be important in supporting the well-being of the individual (O'Connor et al., 2011), and have been associated with positive developmental factors such as effortful control and life satisfaction (Hawkins et al., 2009) in this culture. Therefore, we would expect an emerging adult to show positive social relationships if they were to be considered resilient.

In addition to social well-being, psychological well-being has often been studied in connection with resilience (Harms et al., 2018). Psychological wellbeing encompasses sub-factors such as autonomy, which is one's ability to direct their goals and choices, and self-acceptance, a term used to describe one's unconditional acceptance of themselves despite their flaws or mistakes, both of which have been associated with resilience (Chamberlain & Haaga, 2001; Wong, 2008). Additionally, psychological wellbeing has been associated with positive emotions. Past research has shown that resilient individuals tend to have more positive emotions and life satisfaction (Cohn et al., 2009; Ong et al., 2006). Therefore, resilient individuals in this culture would be expected to have high levels of psychological well-being and life satisfaction despite adversity.

As emerging adulthood is an important developmental period, it is important to understand what factors can contribute to resilience in the emerging adult's life which may allow them to better transition to later adulthood. In the current study, resilience was operationalized by

psychological wellbeing, life satisfaction, social wellbeing, and effortful control in spite of adverse childhood experiences.

ACEs and Resilience

Previous research has shown associations between ACEs and a number of negative outcomes. For example, Mosley-Johnson et al. (2019) performed a 19-year longitudinal study in which they found that adults between the ages of 20 to 75 (n = 6,325) who had adverse childhood experiences were more likely to have lower psychological well-being, social well-being, and life satisfaction than individuals who did not have adverse childhood experiences. Additionally, Lackner et al. (2019) captured participant's number of ACEs by having parents complete the Childhood Trust Events Survey in which they reported the number of ACEs their adolescent offspring (ages 12-15, n = 92) had experienced. The researchers found that number of ACEs in these adolescents was associated with parental report of lower effortful control abilities as measured by the Behavior Rating Inventory of Executive Function (Lackner et al., 2018). Kim and Cicchetti (2010) also found that maltreatment, such as physical, emotional, and sexual abuse, in children ages 6 -12 (n = 421), as measured by the Maltreatment Classification System, was associated with lower emotion regulation skills on the Emotion Regulation Checklist. Similarly, Gould et al. (2012) found that ACEs measured with the Childhood Trauma Questionnaire were associated with lower inhibitory skills on the Affective Go No Go task in adults between the ages of 18-45 (n = 93).

Prior research has shown a strong relationship between ACEs and negative outcomes; however, the literature has recently begun to address factors that may promote an individual's resilience towards these experiences. A study conducted in 2014 used the Behavioral Risk Factor Surveillance System in the state of Washington to administer multiple questionnaires including

an ACE survey, and measures to assess life satisfaction and socio-emotional support in participants (n = 19,333) between the ages of 18-79 (Logan-Greene et al., 2014). The researchers found that life satisfaction and social support moderated the relationship between ACEs and poor physical and mental health, such that higher life satisfaction and more social support reduced poor physical and mental health (Logan-Greene et al., 2014). Not only can life satisfaction and social support increase an individual's resilience to the negative outcomes of ACEs, but the perception of an individual's social support has also been shown to moderate this relationship. Cheong et al. (2017) conducted a study on adults between the ages of 50-69 from the Living Health Clinic in Ireland. The researchers administered the ACE questionnaire, the Oslo Social Support Scale which measured perceived social support, and the CES-D questionnaire which measured depressive symptoms. The researchers found that perceived social support moderated the relationship between ACEs and depressive symptoms such that if an individual perceived that they had a high level of social support, they tended to show fewer depressive symptoms despite having ACEs (Cheong et al., 2017).

Although the current literature seems to be leaning in the direction of researching factors that can promote resilience to ACEs like those mentioned above, sleep has been under researched in the current field relating to ACEs and protective factors. Therefore, the current study examined sleep as a contributing factor to resilience against negative behavioral outcomes that are associated with ACEs.

ACEs and Sleep

The current literature on ACEs and sleep mainly emphasizes that ACEs tend to increase sleep problems. For example, Chapman et al. (2011) conducted a cross sectional study in which they found that adults who had experienced ACEs were more likely to have sleep disturbances,

operationalized by feeling tired after a night's sleep, trouble falling asleep, or trouble staying asleep. In fact, Sullivan et al. (2019) conducted a longitudinal study using data from the Behavioral Risk Factor Surveillance System in which they found that adults over the age of 18 (M_{age} = 46.66, n = 22,403) tended to have a shorter sleep duration if they had a higher number of ACE's and these sleep patterns did not improve until the participants were 60 years old.

Additionally, ACEs have been associated with negative sleep quality such as nightmares and sleep spindle abnormalities (Nielsen et al., 2019). Nielsen et al. (2019) conducted a study in which adults between the ages of 18-50 completed the Traumatic Antecedents Questionnaire, the Nightmare Distress Questionnaire, and took part in polysomnography (PSG) testing. The researchers found that individuals who had experienced more traumas in their childhood, were more likely to experience nightmares, and tended to show lower sleep spindle density in their PSG waves compared to controls. Sleep spindles are bursts of neural oscillatory activity during sleep. Although their function is still unclear, recent studies have found that sleep spindles isolate the brain from environmental disturbances during sleep (Lüthi, 2013) and are associated with memory consolidation (Holz et al., 2012). Thus the presence of fewer sleep spindles may affect sleep stability and quality (Dang - Vu et al., 2010) as well as adversely affect memory performance in the future.

As individuals with ACEs tend to show sleep abnormalities, it was expected that insomnia symptoms would mediate the relationship between ACEs and negative behavioral outcomes such that insomnia symptoms could explain the relationship between ACEs and a lower propensity for resilience to negative outcomes. Additionally, those with ACEs who had slept well (e.g., better sleep quality, adequate sleep duration, maintain a regular sleep schedule)

may show resilience to their experienced adversities. Therefore, the current study examined if sleeping well could increase an individual's propensity to be resilient to their experienced ACEs.

Sleep and Resilience

Sleep has been shown to have many positive effects on health and well-being including better cognitive functioning (Sadeh et al., 2002), and a lower likelihood of depression among those with a genetic risk for the mental disorder (Silk et al., 2007). In a study by Silk et al. (2007), children between the ages of 6-11 (n = 22) were tested annually into adulthood for depressive symptoms using the Kiddie Schedule for Affective Disorders and Schizophrenia-Epidemiological Version, and the K-SADS (6-18 Years)-Present Episode Version. They also underwent three nights of PSG testing. Participants were required to have one or more first degree relatives and one or more second degree relatives with a lifetime history of depression. Children in the study with a genetic risk for depression were less likely to have depressive symptoms if they had shorter sleep onset latency and a higher quality of deep sleep, suggesting that sleep quality and sleep onset latency can serve to protect against depressive symptoms despite a genetic risk (Silk et al., 2007).

Another study conducted by Wong et al. (2018) gathered longitudinal data on children of alcoholics and controls (n = 715) every 3 years beginning from the age of 3-5 until the age of 24-26. Participants were given the Dimensions of Temperament Survey and the Child Behavior Checklist to measure sleep rhythmicity (i.e., sleeping and waking at the same time) and absence of sleep difficulties. Behavioral control was assessed using the California Child Q-sort and the California Adult Q-sort. Participants were also given the Diagnostic Interview Schedule-Version 4 and the Drinking and other Drug Use History Questionnaire to measure alcohol use disorder and substance use disorders respectively. The researchers found that sleep rhythmicity and

absence of sleep difficulties were associated with better behavioral control at the age of 9-17, and a lower likelihood of substance use disorders at the age of 21-26 in both children of alcoholics and controls (Wong et al., 2018). This suggests that positive sleep parameters can serve to protect against negative outcomes in children despite the adversity of having a parent who abuses alcohol.

Lastly, sleep quality has been shown to have a positive relationship with quality of life and life satisfaction in individuals with schizophrenia (Ritsner et al., 2004). Schizophrenic patients (n = 145, ages 19-59) took part in a study in which their sleep quality was measured using the Pittsburgh Sleep Quality Index, and their quality of life and life satisfaction was measured using the Quality of Life Enjoyment and Satisfaction Questionnaire (Ritsner et al., 2004). Researchers found that sleep quality had a positive relationship with quality of life and life satisfaction in participants with schizophrenia (Ritsner et al., 2004). These results show that despite having psychopathologies that might hinder resilience, individuals may still show resilience to these psychopathologies when they obtain a high quality of sleep.

As there is ample evidence that sleep can promote positive resilience outcomes, it was expected that sleeping well would moderate the relationship between ACEs and behavioral outcomes such that sleeping well would serve to protect against negative outcomes due to ACEs and contribute to the resilience of the participants in the current study.

Sleep as a Mediator or Moderator

Many studies have investigated the negative impact that ACEs can have on lifetime outcomes, but fewer articles have examined specific moderators and mediators in these models, though there seems to be an increasing number in recent years (Conway et al., 2020; Kentner et al., 2019; Kwong & Hayes, 2017). However, when moderators are used, researchers often tend to

describe how these factors may increase the negative outcomes for the individual rather than increase their resilience toward these adversities (Fuller-Thomson et al., 2016; Gershon et al., 2013; Wong et al., 2018). As there seems to be a gap in the literature concerning factors that can promote resilience to ACEs, one aim of the current study was to examine positive outcomes and their correlates with sleep.

To the current researcher's knowledge, there are few studies that have looked at the mediating or moderating role of sleep on the relationship between adverse child experiences and behavioral outcomes. For example, Rojo-Wissar et al. (2019) used the Adverse Childhood Experience survey, the Short Form Health Survey, the Pittsburgh Sleep Quality Index, the Patient Heath Questionairre-9, and the Generalized Anxiety Disorder-7 questionnaire to measure ACEs, health perceptions, sleep quality, depression, and anxiety respectively in adults between the ages of 18-30 (n = 399). The researchers found that higher ACE scores were associated with lower sleep quality, which was associated with lower general health perceptions, more depressive symptoms, and more anxiety symptoms. The researchers also found that lower sleep quality mediated the relationship between child adversity and general health perceptions, depressive symptoms, and anxiety symptoms (Rojo-Wissar et al., 2019).

Another study used the Computerized Diagnostic Interview Schedule for Children, the Childhood Trauma Questionnaire, the Conflict Tactics Scale, and the Sleep Habits Survey on children between the ages of 10-12 (n = 529) (Calhoun et al., 2019). They examined the relationship that child maltreatment and harsh parenting have with psychiatric symptoms with sleep analyzed as a moderator (Calhoun et al., 2019). The researchers found that sleep problems were associated with more psychiatric symptoms in these children, and a significant interaction was found between sleep onset latency and childhood trauma on psychiatric symptoms (Calhoun

et al., 2019). Specifically, the researchers found that participants with ACEs had more psychiatric symptoms when they also experienced sleep problems. However, the researchers found that the interaction effect was not quite summative when both child maltreatment and harsh parenting were experienced together compared to when they were experienced separately (Calhoun et al., 2019). Meaning that individuals with both high sleep onset latency and childhood trauma, scored high on psychiatric symptoms, but not as high as those with only high sleep onset latency and those with only childhood trauma combined. Due to the small number of studies in this area, more work should be done to understand whether and how different sleep variables may mediate or moderate the relationships between childhood adversity and resilience.

Like previous research, the two studies stated above analyze negative outcomes of child adversity. More studies are still needed to determine if sleeping well can serve as a protective factor and promote positive outcomes in adults who have experienced adversity as children. The present study aimed to fill this gap in the literature by measuring the mediating and moderating role of sleep in the relationship between ACEs and behavioral outcomes.

Hypotheses

First, prior research has shown that ACEs are associated with lower sleep quality (Chapman et al., 2011; Nielsen et al., 2019; Sullivan et al., 2019) as well as negative behavioral outcomes (Gould et al., 2012; Kim & Cicchetti, 2010; Lackner et al., 2018; Mosley-Johnson et al., 2019). These results suggest that negative sleep factors may be explaining the relationship between ACEs and negative behavioral outcomes. Additionally, Rojo-Wisser et al. (2019) has shown that sleep can play a mediating role between child adversity and mental health outcomes. As ACEs are associated with negative outcomes, and sleep has also been associated with these negative outcomes, the first hypothesis of this study was that sleep problems (insomnia

symptoms) would mediate the relationship between ACEs and resilience outcomes such that the path between adversity and low resilience outcomes would be due to insomnia symptoms (Figure 1).

Second, the current literature on resilience has shown that certain factors can promote resilience to ACEs (Cheong et al., 2017; Logan-Greene et al., 2014), and some sleep parameters have been shown to be positively associated with resilience outcomes (Sadeh et al., 2002; Silk et al., 2007; Wong et al., 2018). Additionally, Calhoun et al. (2019) found that sleep can play a moderating role in the relationship between ACEs and psychiatric issues. Due to previous research in these areas, this study's second hypothesis was that positive sleep variables such as higher sleep quality, longer sleep duration, and regular sleep schedule would moderate the relationship between ACEs and resilience outcomes such that these positive sleep variables would weaken the relationship between ACE and negative outcomes and serve to increase an individual's resilience to negative outcomes due to ACEs (Figure 2).

Figure 1

The Mediation Model of Insomnia Symptoms on Adverse Childhood Experiences to Resilience Outcomes

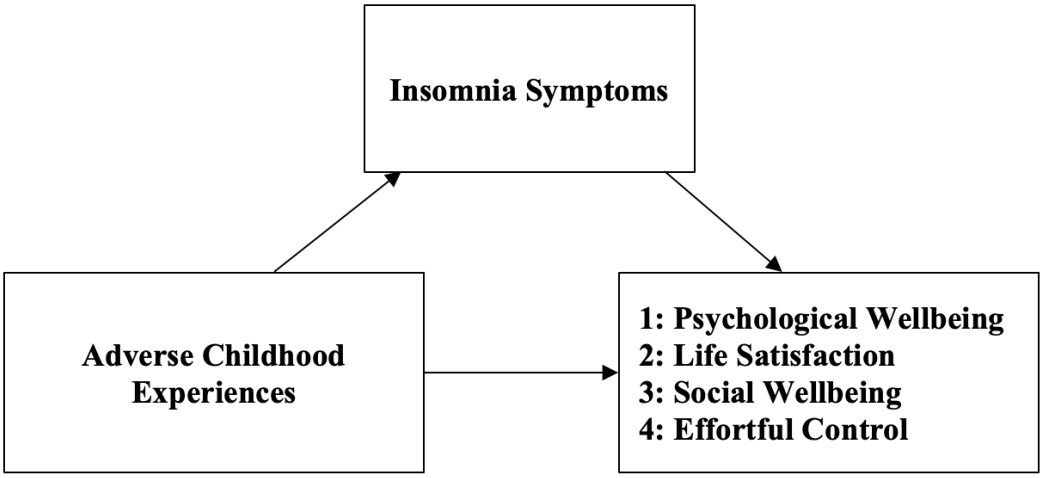
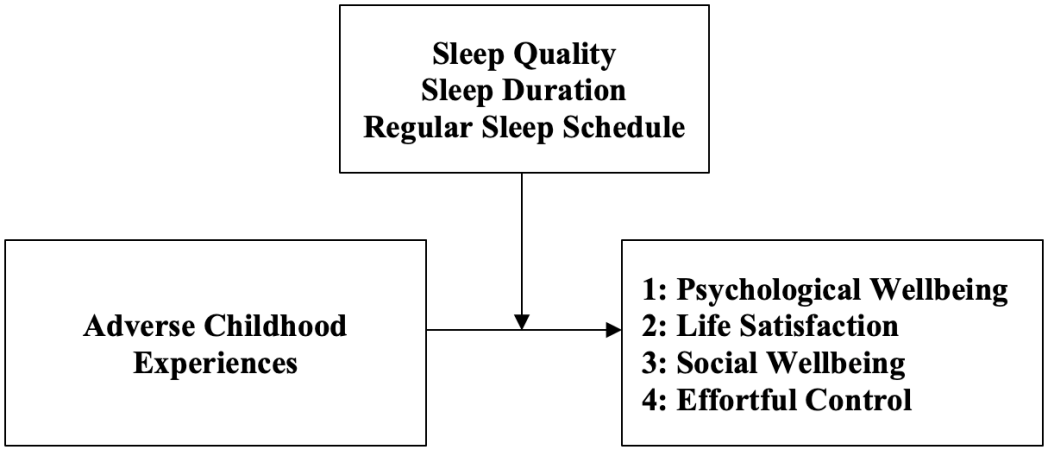


Figure 2

The Moderation Model of Positive Sleep Variables on The Relationship Between Adverse Childhood Experiences and Resilience Outcomes



Chapter 2: Methods

Participants

Young adults (n = 501) between the ages of 18-25 (158 males, 331 females, 12 others, M_{age} = 21.8 years) were recruited via Amazon's Mechanical Turk (n = 243) and the Idaho State University (ISU) SONA student research pool (n = 258). 75.0% of participants identified themselves as White, and 76.4% identified as Heterosexual. All participants were collected between the time period of September 12, 2020, through January 3, 2021. It is important to note that this period of time was during the COVID-19 pandemic. Additional participant demographic information can be found in Table 1.

Table 1

Demographics

		ISU	MTurk	Total
n		258	243	501
Age *M(SD)*		19.9(2.1)	23.9(1.5)	21.8(2.7)
Gender (%)	Male	28.7	34.6	31.5
	Female	70.5	61.3	66.1
	Transgender Male	0.0	1.2	0.6
	Transgender Female	0.0	0.0	0.0
	Gender Nonconforming	0.8	2.9	1.8
Ethnicity (%)	White	77.1	72.8	75.0
	Hispanic	17.1	7.4	12.4
	Asian	2.7	8.6	5.6
	African American	1.6	7.4	4.4
	American Indian/Alaskan Native	1.6	2.1	1.8
	Native Hawaiian/Pacific Islander	0.0	1.2	0.6
	Other	0.0	0.4	0.2
Sexual Orientation (%)	Heterosexual	87.2	65.0	76.4
	Bisexual	8.9	29.2	18.8
	Lesbian	1.2	2.1	1.6
	Gay	1.6	.8	1.2
	Other	1.2	2.9	2.0

Highest Level of Education (%)	Less than high school diploma	0.0	.4	0.2
	High school graduate or equivalent (GED)	11.6	11.1	11.4
	College freshman	48.8	4.9	27.5
	College junior	27.1	6.6	17.2
	College senior	7.0	7.8	7.4
	Bachelor's degree	1.6	48.1	24.2
	Master's degree	.4	16.5	8.2
	Doctorate degree	.4	.8	0.6
	Other	3.1	3.7	3.4
State (%)	Idaho	94.2	.4	48.7
	Other	5.8	99.6	51.3

Participants were required to be between the ages 18-25, be fluent in English, and be able to read and write English at least at a 6th grade level. Participants were excluded if they did not meet these criteria. Human Subjects Committee approval was obtained from Idaho State University and the study was then made available to participants.

Power analysis

A power analysis was conducted to determine the number of participants needed to analyze the data. Six predictors were assumed in the power analyses, ACEs, sleep, the interaction term and three demographic variables, gender, age, and ethnicity. As power is a function of sample size, effect size, and alpha level, a sample size of 500, with an alpha level ($\alpha = .05$), and six predictors was calculated to produce enough power (> .81) to find an effect size as small as $f^2 = .03$. If the effect size of the relationship is larger than $f^2 = .03$, power would increase and the likelihood of finding statistically significant results, if there is indeed a relationship between the variables, would also increase. As prior research in this area suggests that effect sizes are typically small to moderate ($f^2 \approx .06$) in size, the current sample of 501 participants was expected to produce enough power to analyze the data.

Measures

ACEs

Adverse childhood experiences were measured using the Behavioral Adverse Childhood Experience (ACE) Module (Center for Disease Control and Prevention, 2009). This questionnaire asks 11 questions about adversity that an individual experienced when they were growing up prior to the age of 18. Prior ACE measures, such as the commonly used Adverse Childhood Experience (ACE) Questionnaire (Felitti et al., 1998), include 10 questions about adversity. However, the Behavioral Adverse Childhood Experience (ACE) Module is an updated questionnaire which includes 11 questions pertaining to adversity and expands on the types of sexual traumas that individuals may have experienced in childhood. Participants give yes or no answers as to whether or not they have experienced each adversity. Scores range from 0 to 11 with higher scores indicating more adverse childhood experiences. This measure was found to be reliable with a Cronbach's $\alpha = .809$.

Psychological Well-being

Psychological wellbeing was be measured using the Ryff's Psychological Well-Being Scale (Ryff, 1989). The scale consists of 42 questions which are divided into 6 subscales that measure autonomy, environmental mastery, personal growth, positive relations, purpose in life, and self-acceptance. Responses are given on a 6-point Likert's scale ranging from (1) strongly disagree, to (6) strongly agree. Composite scores range from 42 to 252 with higher scores indicating greater psychological wellbeing. This measure had high internal reliability (Cronbach's $\alpha = .910$).

Life Satisfaction

Life satisfaction was measured using the Satisfaction with Life Scale (Diener et al., 1985) which includes 5 items on a 7-point Likert's scale ranging from (1) strongly disagree to (7) strongly agree. Items on this scale include questions such as "I am satisfied with my life" and "The conditions of my life are excellent." Composite Scores range from 5 to 35 with higher scores indicating greater life satisfaction. This scale showed an internal reliability of Cronbach's $\alpha = .880$).

Social Well-being

Social wellbeing was measured using the Social Well-being Scale (Keyes, 1998). This scale consists of 33 items on a 6-point Likert's scale ranging from (1) strongly disagree to (6) strongly agree. The scale is broken into 5 subscales which measure social integration, social acceptance, social contribution, social actualization, and social coherence. Items from this scale include questions such as "society isn't improving for people like me" and "you feel that people are not trustworthy." Composite scores range from 48 to 288 with higher scores indicating greater social wellbeing. This measure had a Cronbach's $\alpha = .934$.

Effortful Control

Effortful control was measured using the Adult Temperament Questionnaire short form (Evans & Rothbart, 2007). This scale contains multiple subscales, but for the purpose of this study only the effortful control subscale was used. The effortful control subscale contains 19 questions measuring attentional control, inhibitory control, and activation control. Questions are on a 7-point Likert's scale ranging from (1) extremely untrue of you to (7) extremely true of you. Items from this subscale include "When I am trying to focus my attention, I am easily distracted" and "I usually have trouble resisting my cravings for food, drink, etc." Scores ranged from 37 to

133 with higher scores indicating more effortful control. The subscale used from this questionnaire was internally reliable (Cronbach's $\alpha = .748$).

Additionally, to objectively measure effortful control, both the Stroop task (Stroop, 1935) and the Go-No Go task (Donders, 1969) were used. Both tasks were conducted using PsyToolkit (Stoet, 2010, 2017), a free electronic toolkit for conducting cognitive tests. During the Stroop task, the participants were shown the name of a color in which the font color may or may not have correspond to the name of the color on the screen. The participant was asked to ignore the name of the color on the screen and respond with the font color of the word by pressing the corresponding button on the keyboard for that color: r for red, g for green, b for blue, and y for yellow. For example, if the screen displayed the word "yellow", but the font color of the word was red the participant would press "r" for red. Effortful control was determined by subtracting the average response time on compatible trials from the average response time on incompatible trials (MacLeod, 1991). Smaller scores indicated more effortful control on this task. Participants completed a practice block containing 20 trials before completing the measured task. They then completed 2 blocks of 100 trials each for a total of 200 measured trials.

When completing the Go-No-Go task, participants were asked to press the space bar when they were shown a green oval with the word "GO" in the middle, or to press no key when they were shown a red oval with the words "NO GO" in the middle. Go and no-go trials were presented at different intervals to determine if the participant could inhibit their go response to a no-go trial after having multiple go trials prior to the no go trial. Commission errors (pressing the key when "NO GO" is presented on the screen) were calculated to determine how well the participant was able to inhibit their response to a task that had become automated and thus how skilled they were at inhibitory control. Therefore, smaller scores indicated fewer commission

errors and more effortful control. Participants completed a practice block containing 20 trials before completing the measured task. They then complete 2 blocks of 100 trials each for a total of 200 measures trials.

Sleep

Sleep was measured using three different scales. First, to measure insomnia symptoms, the Insomnia Severity Index (Bastien et al., 2001) was used. The measure consists of 7 questions that measure sleep problems related to insomnia on a 5-point Likert's scale from non (0) none or not at all to (4) very severe or very much. Composite scores range from 0 to 28 with higher scores representing higher insomnia severity. This measure was internally reliable (Cronbach's $\alpha = .835$).

Second, the Sleep Timing Questionnaire (Monk et al., 2003) (Cronbach's $\alpha = .71$) was used to assess sleep duration and regular sleep schedule. The measure consists of 18 total questions in which 12 questions ask about the participant's earliest, latest, and usual "good night time" and "good morning time" on both weekends and weekdays. For these questions, participants responded with the time of day that best fit the question. Sleep duration was calculated using the participant's "good night" and "good morning" times. The measure also contains 4 questions which ask about the stability of the participant's "good night" and "good morning" times. These questions are on an 11-point Likert's scale ranging from 0-15 minutes (1) to over 4 hours. (11). Lower scores on these questions indicate a more regular sleep schedule.

Lastly, the Sleep Quality Scale (Snyder et al., 2018) was used to assess sleep quality. The scale consists of one item which asks, "during the past 7 days, how would you rate your sleep quality overall?" The item is on a 10-point Likert's scale ranging from terrible (0) to excellent

(10). Higher scores indicate better sleep quality. This scale has been shown to have a high correlation with the regularly used Pittsburg Sleep Quality index sleep quality item (r = -.92).

Demographic Variables

Participants completed a demographics questionnaire that gathered information on their age, gender, ethnicity, sexual orientation, education level, state of residence and if they were participating through the ISU SONA system or Mechanical Turk. Categorical demographic variables were either dichotomized or dummy coded to allow for multiple regression analyses. The demographic variables were coded as follows: gender (0 = female, 1 = male), ethnicity (0 = not white, 1 = white), sexual orientation (0 = not heterosexual, 1 = heterosexual), state residence (0 = Idaho, 1 = other states), and group (0 = ISU, 1= Mechanical Turk). Education level was dummy coded into four separate levels (d0 = no high school diploma, d1 = high school diploma, d2 = some college, d3 = post-secondary degree). 12 participants identified as having a non-binary gender and could not be included in the dichotomous gender variable.

Procedure

Participants were recruited through Amazon's Mechanical Turk, and through the ISU SONA research pool. Once participants decided to take part in the study, they were given a link to the study and completed an online informed consent page. Participants then completed the online Stroop and Go No Go tasks which were randomized to reduce order effect. After completing these tasks, the participants completed the questionnaires in random order. Once the participants had completed the study, they were given a debrief page. If the participant took part in the study through Mechanical Turk, they were given $0.50 for their participation. If the participant took part through the ISU SONA research pool, they were given two research credits

for their participation. Participants who complete the study were also entered into a drawing to win a 20-dollar gift card.

Five attention checks were placed throughout the study in order to ensure that participants were paying attention and that they were not using programmed bots to participate for them. The first and fifth attention checks asked participants to answer a question that was imbedded in an image on their screen. Unless highly advanced, programmed computer bots cannot read the information in the image, which reduces the likelihood that they will provide a coherent answer to the question. However, human participants should easily be able to answer these questions. Checks 2 and 3 required participants to choose a specific option or options listed. This reduced the ability for participants to complete the study without reading the questions. Attention check 4 used the manipulation check developed by Oppenheimer et al. (2009). This required participants to read a paragraph, and then answer a question about which sports they often take part in. However, if the participant fully reads the paragraph, they are told to skip the sports question and move on to the next page. Participants who answered the sports question were considered to be non-compliant on this attention check. Participants were required to correctly complete at least 80% of these attention checks in order for their data to be accepted.

Plan of Analysis

Each hypothesis was examined using multiple linear regression. Mediation analyses were used to examine hypothesis 1 and moderation analyses were used to examine hypothesis 2. All analyses controlled for the following demographics variables: age, gender, ethnicity, sexual, orientation, education level, state of residence, and group (ISU or Mechanical Turk). Mediation and moderation analyses were conducted using the PROCESS v 3.5 macro in SPSS v 23.0 (IBM Corp, 2015).

Hypothesis 1 examined whether insomnia symptoms mediated the relationship between ACEs and each resilience variable. For each of these resilience variables, two regression models were analyzed. The first regression model examined whether ACEs predicted insomnia symptoms (*a* path). The second regression model examined whether insomnia symptoms predicted resilience (*b* path) while controlling for ACEs (*c'* path). Bootstrapping confidence intervals (CI) were used to evaluate the significance of the mediated effect (*a* * *b*). If the 95% bootstrapping CI did not include 0, the mediated effect was considered significant.

Hypothesis 2 examined whether each sleep variable (sleep duration, regular sleep time, regular wake time, sleep quality) predicted the relationship between ACEs and each resilience variable. Therefore, four multiple regression models were analyzed for each resilience variable. Interaction terms were created by multiplying ACEs and each sleep variable. The main effects and the interaction term were entered simultaneously into each multiple regression model. If the interaction term was significant, it was concluded that the sleep variable within the interaction term significantly moderated the relationship between ACEs and a particular resilience variable.

Chapter 3: Results

Descriptive Analyses

Normality of continuous variables was determined by assessing skewness and comparing variable distributions to a normal curve. Variables that were not normal were transformed using either square root or logarithmic transformations depending on the extremity of their skew. Analyses were then conducted on variables with and without these transformations to determine if the transformed variables impacted the results. No significant differences were found between the analyses with and without the transformed variables. Therefore, the untransformed variables were used in all the analyses to allow for ease of explaining variable relationships.

Participants reported experiencing an average of 3.46 ACEs prior to the age of 18. This is high in comparison to prior studies which have used the same 11 item ACE questionnaire. For example, Giano et al. (2020) analyzed data from the Center for Disease Control's Behavioral Risk Factor Surveillance System, which included 211,376 participants, and found an average ACE rate of 1.91 for young adults between the ages of 18-24. The high rate of ACEs in our study, in comparison to the study by Giano and colleagues, indicates that we can meaningfully analyze relationships between ACEs and main variables in the analyses.

Additionally, participants reported obtaining an average of 8.63 hours of sleep per night. This sleep duration falls within the National Sleep Foundations' recommendation (7-9 hours) for this age group (18-25 years). Means and standard deviations of other major variables can be found in Table 3.

Independent samples *t* tests were performed to compare the means of participants collected through the ISU Sona System and through MTurk. There were significant differences between the groups on a number of variables. Mechanical Turk participants were older ($t(499) =$

-24.865, $p < .001$), less likely to be straight ($t(499) = 5.986$, $p < .001$), reported more ACEs ($t(499) = -6.224$, $p < .001$), had more insomnia symptoms ($t(499) = -4.294$, $p < .001$), slept longer ($t(499) = -2.453$, $p < .05$), had lower psychological wellbeing ($t(499) = 9.555$, $p < .001$), lower social wellbeing ($t(499) = 6.341$, $p < .001$), and less subjective effortful control ($t(499) = 2.434$, $p < .05$) compared to ISU participants.

Zero order correlations were first conducted between demographic variables and all other variables. Increases in age were significantly correlated with more ACEs, more insomnia symptoms, reduced psychological wellbeing, reduced social wellbeing, increased effortful control on the Stroop task, and more commission errors, or lower effortful control, on the Go No Go task. Those that were males tended to have higher sleep quality and those that identified as white tended to have higher life satisfaction. Sexual orientation was significantly correlated with all variables except scores on the Go No Go task. For example, being straight was correlated with fewer ACEs, fewer insomnia symptoms, shorter sleep duration, more regular sleep and wake times, higher sleep quality, higher psychological wellbeing, higher life satisfaction, higher social wellbeing, higher subjective effortful control, and lower effortful control on the Stroop task. Idaho residency was correlated with fewer ACEs, fewer insomnia symptoms, shorter sleep duration, higher psychological wellbeing, higher social wellbeing, higher subjective effortful control, higher effortful control scores on the Stroop task, and fewer perseverative errors on the Go No Go task or more effortful control on said task in comparison to residency on other states. Lastly, ISU affiliation was correlated with fewer ACEs, fewer insomnia symptoms, shorter sleep duration, higher psychological wellbeing, higher social wellbeing, higher subjective effortful control, lower effortful control on the Stroop task, and fewer perseverative errors or more effortful control on the Go No Go task. Correlations are shown in Table 2.

As all demographic variables except education significantly correlated with at least one variable in the main analyses, all demographic variables were controlled for in the mediation and moderation models. Removing insignificant demographic variables in the regression models did not produce significant differences. Therefore, all demographic variables were kept in the models.

Zero order correlations were also conducted between the main variables in the analyses and can be found in Table 3. Strong correlations were found between ACEs and sleep as well as resilience outcomes. For example, ACEs were negatively correlated with sleep quality, such that more ACEs were associated with lower sleep quality. Additionally, ACEs were positively correlated with insomnia symptoms, regular wake time, and sleep duration, such that more ACEs were associated with more insomnia symptoms, higher irregularity of wake times, and longer sleep duration. ACEs also showed strong correlations with resilience outcomes. ACEs were negatively correlated with psychological wellbeing, life satisfaction, social wellbeing, and subjective effortful control. These relationships signify that more ACEs were associated with lower scores on these resilience variables.

Additionally, sleep variables were correlated with resilience outcomes. Higher sleep quality, and more regular sleep and wake times significantly related to higher psychological wellbeing, social wellbeing, life satisfaction and effortful control. Furthermore, higher sleep duration was related to lower psychological wellbeing which coincides with ACE's relationship to sleep duration. Scores on the Stroop and Go No Go tasks had little to no correlation with ACEs, sleep variables, or other resilience outcome variables.

Table 2

Zero Order Correlations Between Demographic and Main Variables

Variables	Age	Gender (0) Female (1) Male	Ethnicity (0) Not White (1) White	Sexual Orientation (0) Not Straight (1) Straight	State (0) Not Idaho (1) Idaho	Group (0) ISU (1) MTurk	d0 (0) Other (1) No High School	d1 (0) Other (1) High School	d2 (0) Other (1) College	d3 (0) Other (1) Post-Secondary
ACE	**.236*****	-.001	.037	**-.264*****	**-.244*****	**.270*****	.058	-.030	.037	-.029
Insomnia	**.169*****	-.008	.078	**-.149*****	**-.197*****	**.189*****	.058	-.050	.009	.034*
Sleep Duration	.082	-.031	.027	**-.150*****	**-.107***	**.110***	.020	.057	-.038	-.012
Regular Wake Time	-.006	.038	-.034	**-.143*****	-.064	.076	-.002	-.021	.053	-.051
Regular Sleep Time	-.005	.030	-.065	**-.090***	-.023	.023	-.032	-.038	.053	-.027
Sleep Quality	.009	**.093***	-.009	**.140****	.009	.010	.025	-.033	.057	-.048
Psychological Wellbeing	**-.275*****	-.074	-.034	**.200*****	**.371*****	**-.393*****	-.035	.062	-.066	.030
Life Satisfaction	-.044	.039	**.103***	**.169*****	.068	-.086	.035	.062	-.068	.022
Social Wellbeing	**-.239****	.001	-.017	**.206*****	**.247*****	**-.272*****	-.025	-.011	-.011	.032
Effortful control	-.059	-.007	-.058	**.192*****	**.111***	**-.108***	-.035	.037	-.051	.036
Stroop	**-.183*****	.048	-.014	**.100***	**.216*****	**-.211*****	-.004	.055	-.074	.045
Go No Go	**.093***	.070	.044	.044	**-.156*****	**.161*****	-.014	-.013	.054	-.061

Note: Point biserial correlations were run between dichotomous and continuous variables
* p ≤ .05, ** p ≤ .01, *** p ≤ .001

Table 3

Zero Order Correlations Between Main Variables

Variables	ACE	Insomnia	Sleep Duration	Regular Wake Time	Regular Sleep Time	Sleep Quality	Psychological Wellbeing	Life Satisfaction	Social Wellbeing	Effortful Control	Stroop
M	3.46	10.53	8.63	4.14	5.12	6.81	169.09	23.45	178.40	80.95	122.41
(SD)	(2.75)	(5.76)	(1.98)	(2.92)	(2.96)	(2.13)	(27.15)	(7.03)	(33.52)	(13.87)	(69.97)
Insomnia	**.379*****										
Sleep Duration	**.136****	.040									
Regular Wake Time	**.120****	**.193*****	**.122****								
Regular Sleep Time	.057	**.176*****	.022	**.639*****							
Sleep Quality	**-.167*****	**-.569*****	.044	**-.153*****	**-.200*****						
Psychological Wellbeing	**-.332*****	**-.379*****	**-.095***	**-.194*****	**-.175*****	**.217*****					
Life Satisfaction	**-.119****	**-.265*****	.03	**-.160*****	**-.242*****	**.382*****	**.487*****				
Social Wellbeing	**-.350*****	**-.352*****	-.061	**-.149*****	**-.182*****	**.262*****	**.694*****	**.487*****			
Effortful control	**-.260*****	**-.349*****	-.109*	**-.208*****	**-.180*****	**.240*****	**.548*****	**.297*****	**.430*****		
Stroop	-.080	-.055	-.031	-.013	.003	-.060	**.100***	-.009	.058	-.013	
Go No Go	.054	.049	**.091***	-.004	-.028	.036	**-.104***	.062	-.045	-.076	.009

Note: Results are given as Pearson's r
* p ≤ .05, ** p ≤ .01, *** p ≤ .001

Mediation Analyses

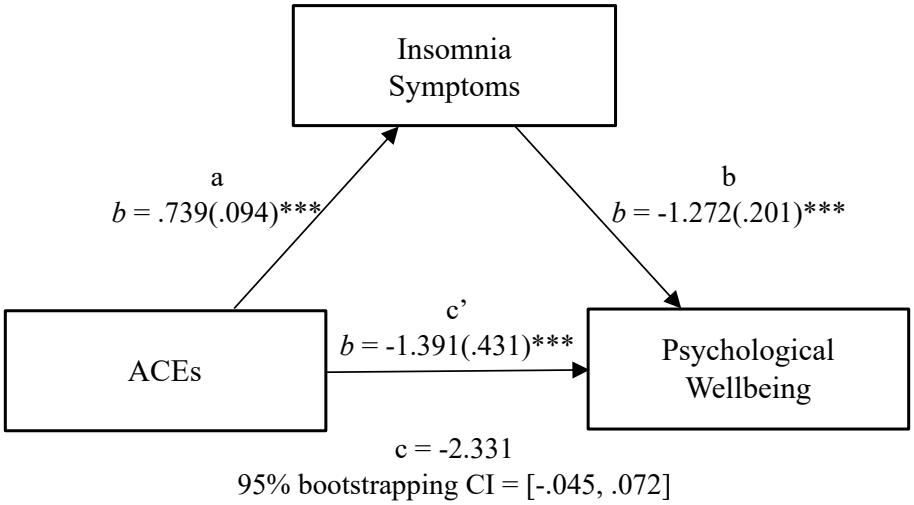
When conducting the first regression model to analyze the *a* path, ACEs significantly predicted number of insomnia symptoms ($B = .739(.094)$, $p < .001$), such that as ACEs increased by one unit, insomnia symptoms increased by .739 units. For every mediation model, the *a* path analysis was the same, as all the mediation models included ACEs as the independent variable, and insomnia symptoms as the mediator.

Psychological Wellbeing

When analyzing psychological wellbeing as the dependent variable, a second regression model was conducted to analyze the *b* path. Controlling for ACEs and demographic variables, insomnia significantly predicted psychological wellbeing. As insomnia symptoms increased by one-unit, psychological wellbeing decreased by 1.272 units. Additionally, there was a significant indirect effect of ACEs on psychological wellbeing through insomnia symptoms. The indirect

Figure 3

Mediating relationship of Insomnia symptoms on ACEs to Psychological Wellbeing



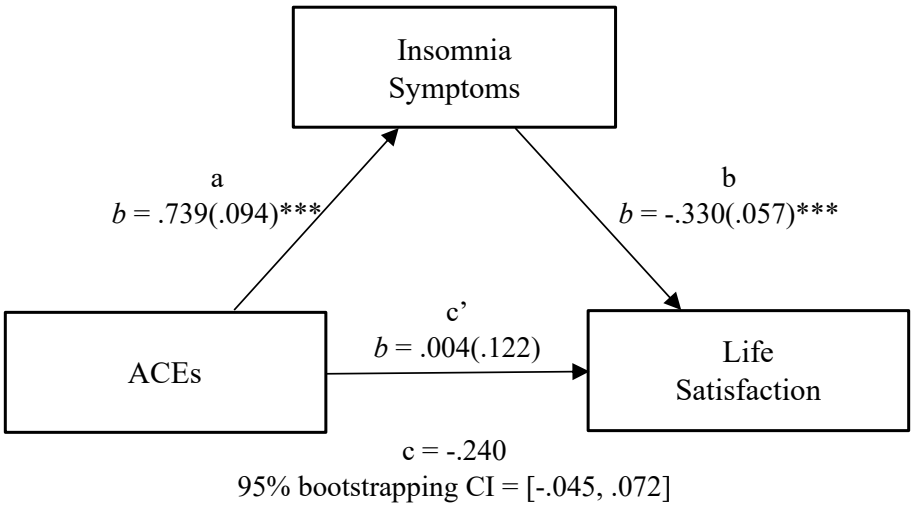
effect [*a* * *b* = -.940(SE=.203)] indicates that as ACEs increased by one-unit, psychological wellbeing decreased by .940 units through insomnia symptoms. The bootstrapping confidence interval did not contain zero, suggesting that the relationship between ACEs and lower psychological wellbeing can partially be explained by insomnia symptoms. These relationships are shown in Figure 3.

Life Satisfaction

Life satisfaction was then analyzed as the dependent variable in the mediation model. A significant indirect effect of ACEs on life satisfaction [*a* * *b* = -.330(SE=.057)] was found such that, as ACEs increased by one unit, life satisfaction decreased by .330 units through insomnia symptoms. This model did not show a significant direct effect of ACEs on life satisfaction after controlling for insomnia symptoms, suggesting that ACEs is not directly related to life satisfaction, but ACEs and life satisfaction are related through insomnia symptoms. This mediation model is shown in Figure 4.

Figure 4

Mediating relationship of Insomnia symptoms on ACEs to Life Satisfaction

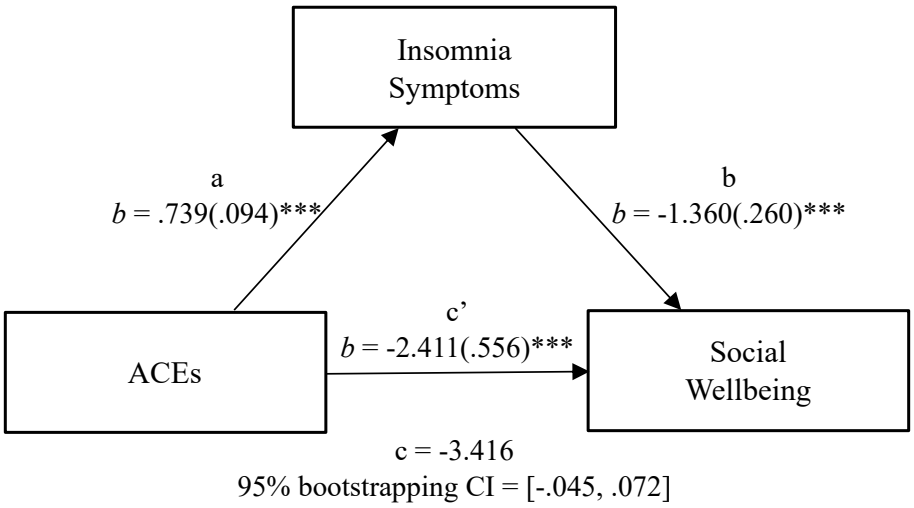


Social Wellbeing

When analyzing social wellbeing as the dependent variable a significant indirect effect was found [*a* * *b* = -1.005(SE=.243)] as the bootstrapping confidence interval did not contain zero. As ACEs increased by one-unit, social wellbeing decreased by .1.005 units. Additionally, a significant *c'* path was found showing that ACEs were directly related to decreases in social wellbeing even when controlling for insomnia symptoms. These results suggest that although insomnia symptoms can help explain the relationship between ACEs and resilience outcomes, additional variables may mediate this relationship. This mediation model can be found in Figure 5.

Figure 5

Mediating relationship of Insomnia symptoms on ACEs to Social Wellbeing



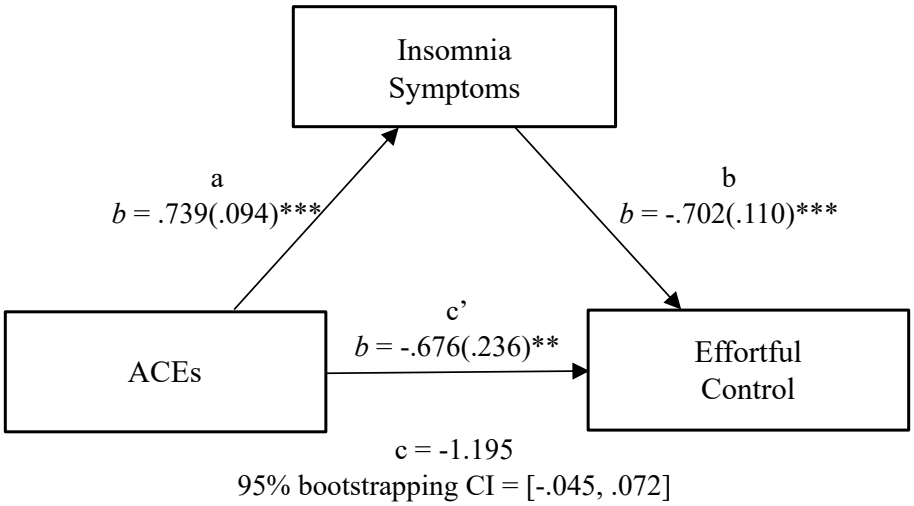
Effortful control

Mediation analyses show that both the indirect and direct effects of ACEs were significant when analyzing effortful control as the dependant varible. ACEs significantly predicted insomnia symptoms and insomnia symptoms significantly predicted lower effortful control. The indirect effect [*a* * *b* = -.519(SE=.112)] was significant, as the 95% bootstrapped CI

did not include zero. Controlling for insomnia symptoms, ACE still significantly predicted effortful control. These results are shown in the mediation model in Figure 6.

Figure 6

Mediating relationship of Insomnia symptoms on ACEs to Effortful control



Stroop and Go No Go

Significant *b* paths were not found when analyzing either Stroop or Go No Go scores as dependent variables after controlling for ACEs. Additionally, significant interactions were not found for either dependent variable. Results from the mediation analyses can be found in Figure 7 and 8.

Figure 7

Mediating relationship of Insomnia symptoms on ACEs to Stroop scores

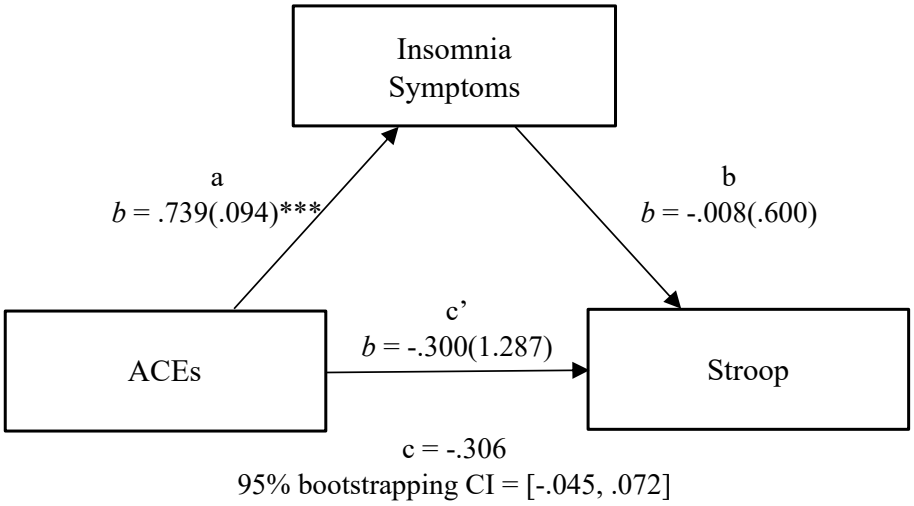


Figure 8

Mediating relationship of Insomnia symptoms on ACEs to Go No Go scores

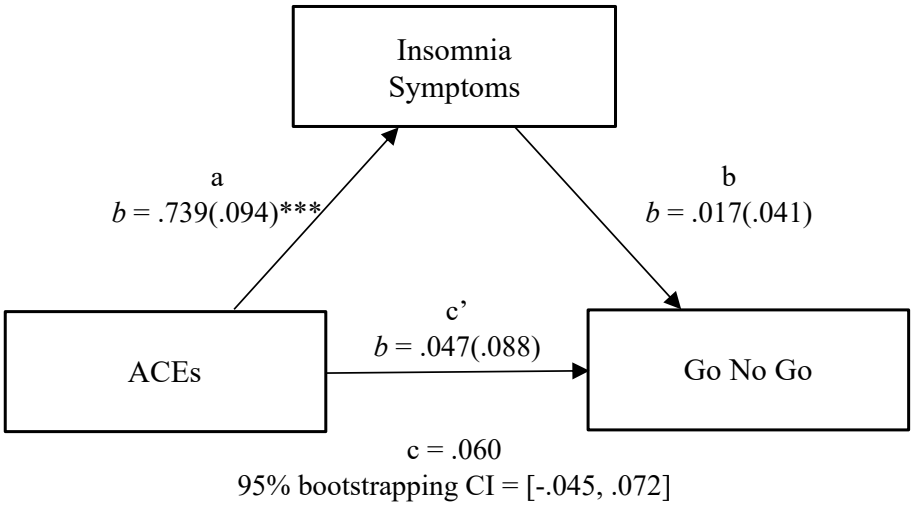


Table 4

Multiple Regression Mediation Analyses

Variable	Insomnia Symptoms	Psychological Wellbeing	Life Satisfaction	Social Wellbeing	Effortful Control	Stroop	Go No Go
R^2	.174	.284	.105	.211	.164	.058	.048
ACE	**.739***** (.094)	**-1.391**** (.431)	.044 (.122)	**-2.411***** (.556)	**-.676**** (.236)	-.300 (1.287)	0.047 (.088)
Insomnia Symptoms		**-1.272***** (.201)	**-.330***** (.057)	**-1.360***** (.260)	**-.702***** (.110)	-.008 (.600)	.017 (.041)
Group	-1.628 (1.470)	**-18.043**** (6.465)	-3.030 (1.831)	-14.426 (8.352)	-.157 (3.541)	-3.558 (19.316)	1.694 (1.315)
Age	.079 (.133)	.554 (.584)	.149 (.165)	-,717 (.755)	.369 (.320)	-1.589 (1.745)	-.134 (.119)
Ethnicity	.973 (.557)	-1.863 (2.454)	**2.220**** (.695)	.751 (3.170)	-.817 (1.344)	-2.603 (7.331)	.662 (.499)
Gender	-.118 (.519)	3.236 (2.277)	.621 (.645)	.819 (2.942)	-.468 (1.247)	10.262 (6.803)	.627 (.463)
Sexual Orientation	-.351 (.614)	1.865 (2.695)	1.383 (.763)	4.631 (3.483)	**3.212*** (1.476)	7.700 (8.054)	.957 (.548)
Location	-2.458 (1.367)	.413 (6.023)	-2.727 (1.705)	-6.786 (7.780)	1.144 (3.298)	18.339 (17.992)	-.583 (1.225)
d1 High School	-5.027 (5,384)	-4.627 (23.666)	-6.021*** (6.702)	-5.145 (30.576)	3.224 (12.962)	15.422 (70.710)	4.075 (4.815)
d2 College	-4.611 (5.336)	-6.387 (23.450)	-7.091*** (6.641)	-.748 (30.296)	2.109 (12.843)	2.515 (70.064)	4.087 (4.771)
d3 Post-Secondary	-3.620 (5.400)	-2.392 (23.714)	-5.658 (6.716)	2.641 (30.638)	3.510 (12.988)	16.661* (70.853)	3.229 (4.824)

Note: Results are given as: unstandardized beta (standard error)
* p ≤ .05, ** p ≤ .01, *** p ≤ .001

Moderation Analyses

Sleep duration, regular sleep time, regular wake time, and sleep quality were examined as possible moderators of the relationship between ACEs and each resilience variable. Therefore, 4 moderation models were conducted for every resilience outcome (24 models in all). In each regression model, the main effects of ACEs and sleep variables as well as their interaction terms were computed. All analyses controlled for demographics variables (age, gender, ethnicity, sexual orientation, education, state, group). The results are shown in Tables 5-8.

Psychological well being

Moderation models explained 22.6% to 26.2% of the variance in psychological wellbeing suggesting medium to large effect sizes (Cohen, 1998). Group (ISU, or MTurk) was consistently a significant covariate, such that participation through ISU predicted higher psychological wellbeing after controlling for other variables in the analyses. There were significant negative effects of ACEs on psychological wellbeing after separately controlling for sleep duration, regular wake times and regular sleep times. These results indicate that higher ACE scores tended to predict lower psychological wellbeing regardless of sleep variables. Additionally, there were significant main effects of sleep quality, regular sleep time, and regular wake time, such that higher sleep quality, and more regular sleep and wake times tended to predict higher psychological wellbeing. There was not a significant main effect of sleep duration on psychological wellbeing. When analyzing the interaction between ACEs and each sleep variable on psychological wellbeing, no significant interactions were found.

Life Satisfaction

Small to medium effect sizes were found when analyzing life satisfaction as the dependent variable (R^2 = .048 - .175). ACEs did not predict life satisfaction after controlling for

sleep variables. Higher sleep quality and more regular sleep times predicted higher life satisfaction, but no other main effects of sleep were found. Additionally, no interactions between ACEs and sleep variables significantly predicted to life satisfaction. Ethnicity was consistently a significant covariate, such that being white predicted higher life satisfaction after controlling for all other variables.

Social well being

Similar to the prior psychological wellbeing results, more ACEs significantly predicted lower social wellbeing after controlling for sleep duration, regular sleep time, and regular wake time, but not when controlling for sleep quality. Additionally, higher sleep quality, and more regular sleep and wake times predicted higher social wellbeing after controlling for ACEs. No main effects of sleep duration were found on social wellbeing and no interaction effects were found to be significant. Medium effect sizes were found such that models could explain 16.8% to 21.1% of the variance in social wellbeing.

Table 5

*Multiple Regression Analyses with ACE * Sleep Quality interaction*

Variable	Psychological Wellbeing	Life Satisfaction	Social Wellbeing	Effortful Control	Stroop	Go No Go
R^2	.262	.175	.211	.139	.064	.048
ACE	-.279 (1.253)	-.463 (.336)	-1.030 (1.595)	.318 (.686)	1,322 (3.677)	-.049 (.251)
Sleep Quality	**3.367***** (.812)	**.976***** (.217)	**4.359***** (1.033)	**2.013***** (.445)	-1.429 (2.381)	-.023 (.163)
ACE * Sleep Quality	-.252 (.172)	.062 (.046)	-.284 (.219)	**-.195*** (.094)	-.285 (.506)	.017 (.035)
Group	**-18.560**** (6.583)	**-3.516*** (1.763)	-15.646 (8.379)	-.469 (3.605)	1.653 (19.314)	1.654 (1.319)
Age	.489 (.534)	.103 (.159)	-.825 (.756)	.324 (.325)	-1.529 (1.742)	-.135 (.119)
Ethnicity	-3.011 (2.487)	**1.843**** (.666)	-.482 (3.166)	-1.420 (1.362)	-2.409 (7.298)	.669 (.498)
Gender	-3.598 (2.748)	.195 (.624)	.218 (2.964)	-.585 (1.275)	-11.402 (6.832)	.593 (.467)
Sexual Orientation	1.270 (2.748)	.952 (.736)	3.683 (3.498)	2.918 (1.505)	8.856 (8.064)	.931 (.551)
Location	1.766 (6.110)	-2.616 (1.636)	-5.796 (7.776)	1.873 (3.346)	19.650 (17.569)	-.533 (1.224)
d1 High School	-3.993 (24.053)	-2.446 (6.442)	4.971 (30.614)	7.661 (13.171)	10.806 (70.569)	4.114 (4.819)
d2 College	1.076 (23.831)	-4.001 (6.383)	7.939 (30.332)	5.934 (13.050)	-1.353 (69.919)	4.119 (4.775)
d3 Post-Secondary	4.703 (24.111)	-2.462 (6.458)	11.189 (30.689)	7.114 (13.204)	11.899 (70.742)	3.291 (4.832)

Note: Results are given as: unstandardized beta (standard error)
* p ≤ .05, ** p ≤ .01, *** p ≤ .001

Table 6

*Multiple Regression Analyses with ACE * Sleep Duration interaction*

Variable	Psychological Wellbeing	Life Satisfaction	Social Wellbeing	Effortful Control	Stroop	Go No Go
R^2	.226	.048	.168	.100	.059	.057
ACE	**-3.644*** (1.683)	-.528 (.473)	**-5.635*** (2.125)	**-2.313**** (.920)	-2.607 (4.835)	-.265 (.328)
Sleep Duration	-1.073 (1.041)	.086 (.292)	1.037 (1.328)	-1.082 (.569)	-1.332 (2.988)	.049 (.203)
ACE * Sleep Duration	.153 (.187)	.036 (.052)	.253 (.238)	.132 (.102)	.264 (.536)	.036 (.036)
Group	**-15.578*** (6.734)	-2.481 (1.891)	-11.732 (8.592)	1.364 (3.680)	-2.985 (19.341)	1.688 (1.311)
Age	.445 (.608)	.123 (.171)	-.835 (.776)	.304 (.332)	-1.605 (1.747)	-.133 (.118)
Ethnicity	-3.168 (2.550)	**1.850*** (.716)	-.756 (3.254)	-1.543 (1.393)	-2.779 (7.324)	.633 (.496)
Gender	3.329 (2.384)	.639 (.670)	.658 (3.042)	-.611 (1.303)	9.899 (6.849)	.600 (.464)
Sexual Orientation	2.176 (2.819)	**1.628*** (.791)	5.238 (3.597)	**3.266*** (1.540)	7.728 (8.096)	1.063 (.549)
Location	3.899 (6.266)	-1.807 (1.760)	-2.791 (7.995)	3.168 (3.424)	19.109 (17.997)	-.518 (1.220)
d1 High School	1.522 (24.618)	-4.310 (6.913)	1.533 (31.411)	6.493 (13.331)	15.213 (70.705)	4.031 (4.792)
d2 College	-.788 (24.397)	-5.403 (6.852)	5.589 (31.130)	5.011 (13.331)	2.449 (70.073)	4.151 (4.749)
d3 Post-Secondary	2.014 (24.680)	-4.290 (6.931)	7.721 (31.490)	5.778 (13.485)	16.690 (70.884)	3.317 (4.804)

Note: Results are given as: unstandardized beta (standard error)
* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

Table 7

*Multiple Regression Analyses with ACE * Regular Sleep Time*

Variable	Psychological Wellbeing	Life Satisfaction	Social Wellbeing	Effortful Control	Stroop	Go No Go
R^2	.249	.095	.193	.122	.059	.049
ACE	**-2.961***** (.818)	.056 (.227)	**-3.326**** (1.044)	**-1.648***** (.448)	-1.522 (2.385)	.091 (.162)
Regular Sleep Time	**-1.826**** (.567)	**-.379*** (.158)	**-1.849*** (.724)	**-1.059***** (.311)	-.448 (1.654)	.030 (.113)
ACE * Regular Sleep Time	.131 (.133)	-.044 (.037)	-.001 (.167)	.092 (.073)	.227 (.388)	-.006 (.026)
Group	**-15.446*** (6.629)	-2.512 (1.842)	-11.919 (8.457)	1.321 (3.632)	-3.067 (19.325)	1.662 (1.316)
Age	.394 (.600)	-.084 (.167)	-.935 (.765)	.285 (.329)	-1.532 (1.748)	-.136 (.119)
Ethnicity	-3.868 (2.520)	**1.742*** (.700)	-1.345 (3.215)	-1.946 (1.381)	-2.805 (7.345)	.666 (.500)
Gender	-2.723 (2.337)	.745 (.650)	1.367 (2.982)	-.177 (1.281)	10.323 (6.814)	.632 (.464)
Sexual Orientation	1.525 (2.773)	1.159 (.771)	3.981 (3.538)	**3.042*** (1.519)	7.989 (8.084)	.919 (.551)
Location	3.844 (6.162)	-2.008 (1.713)	-3.426 (7.861)	3.083 (3.376)	18.857 (17.963)	-.637 (1.223)
d1 High School	3.411 (24.300)	-2.789 (6.754)	5.677 (31.003)	7.430 (13.314)	12.487 (70.839)	4.148 (4.824)
d2 College	1.726 (24.075)	-3.904 (6.691)	10.056 (30.716)	6.380 (13.191)	-.183 (70.185)	4.174 (4.780)
d3 Post-Secondary	1.736 (24.352)	-2.995 (6.768)	11.298 (31.069)	6.700 (13.342)	13.937 (70.991)	3.315 (4.835)

Note: Results are given as: unstandardized beta (standard error)
* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

Table 8

*Multiple Regression Analyses with ACE * Regular Wake Time*

Variable	Psychological Wellbeing	Life Satisfaction	Social Wellbeing	Effortful Control	Stroop	Go No Go
R^2	.245	.058	.178	.125	.060	.048
ACE	**-2.916***** (.742)	-.179 (.210)	**-3.960***** (.954)	**-1.616***** (.405)	1.232 (2.158)	.065 (.147)
Regular Wake Time	**-1.808**** (.591)	-.231 (.167)	**-1.663*** (.759)	**-1.166***** (.322)	1.218 (1.717)	-.022 (.117)
ACE * Regular Wake Time	.163 (.142)	-.022 (.040)	.151 (.183)	.114 (.078)	-.358 (.414)	.001 (.028)
Group	**-14.284*** (6.657)	-2.177 (1.882)	-10.661 (8.550)	2.053 (3.632)	-4.096 (19.345)	1.693 (1.318)
Age	.259 (.603)	.076 (.171)	-1.004 (.775)	.192 (.329)	-1.584 (1.754)	-.136 (.120)
Ethnicity	-3.452 (2.517)	**1.825*** (.719)	-.894 (3.233)	-1.721 (1.374)	-2.544 (7.315)	.672 (.499)
Gender	-2.837 (2.345)	-755 (.663)	1.208 (3.012)	-.238 (1.280)	10.466 (6.816)	.632 (.465)
Sexual Orientation	1.451 (2.789)	1.245 (.789)	4.321 (3.583)	2.936 (1.522)	7.448 (8.106)	.932 (.552)
Location	4.358 (6.178)	-1.820 (1.747)	-2.690 (7.935)	3.401 (3.371)	17.756 (17.954)	-.619 (1.224)
d1 High School	2.496 (24.102)	-3.981 (6.878)	2.356 (31.243)	7.162 (13.152)	16.656 (70.688)	4.016 (4.817)
d2 College	.522 (24.102)	-5.188 (6.816)	6.477 (30.958)	5.967 (13.152)	3.295 (70.044)	4.037 (4.774)
d3 Post-Secondary	2.471 (24.378)	-4.264 (6.894)	7.797 (31.313)	6.183 (13.302)	17.488 (70.846)	3.181 (4.828)

Note: Results are given as: unstandardized beta (standard error)
* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

Effortful Control

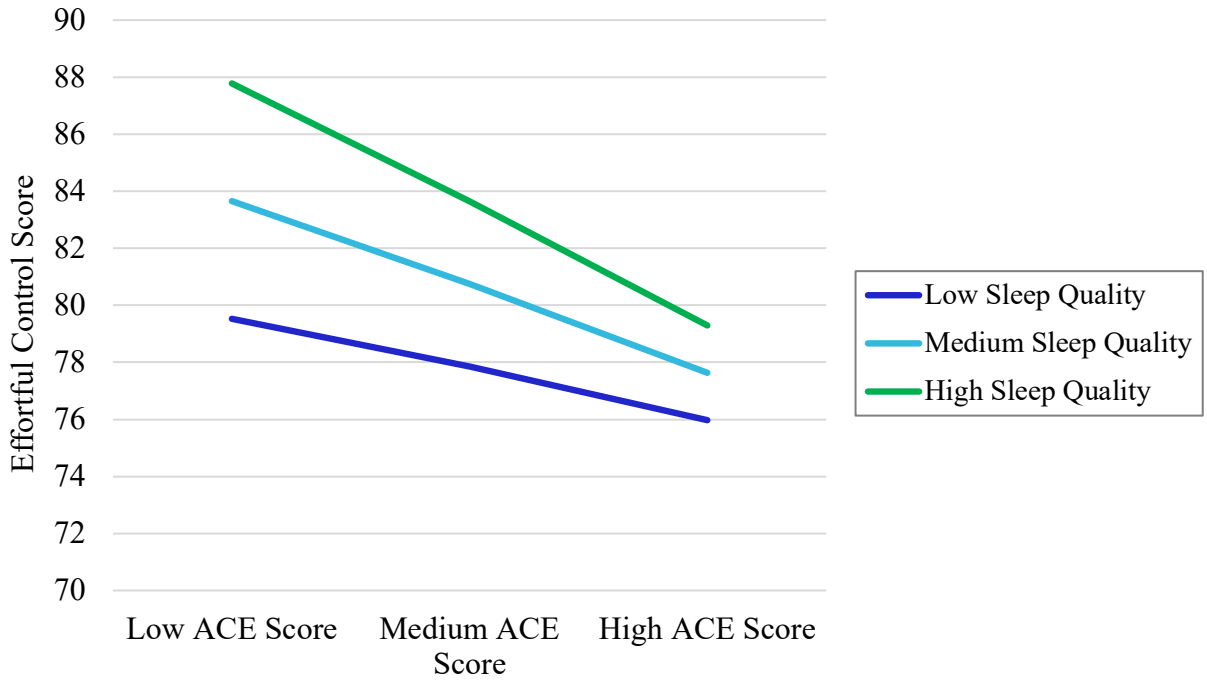
Small to medium effect sizes were found for models including effortful control as the outcome variable (R^2 = .100 - .139). Main effects of ACEs on effortful control were found when controlling for sleep duration, regular sleep and wake times, but not sleep quality. Furthermore, higher sleep quality and more regular sleep and wake times predict more effortful control after controlling for ACEs. When analyzing the interaction effect, a significant interaction was found between ACEs and sleep quality on effortful control. This interaction was graphed and is shown in Figure 7. The interaction indicates that sleep quality significantly moderated the relationship between ACEs and effortful control. Regardless of sleep quality, ACEs is negatively related to effortful control. In other words, higher ACEs is associated with lower effortful control. However, this relationship is strongest among those with high sleep quality. Sleep quality protects against lower effortful control due to ACEs. The protective effect of sleep quality is strongest among those who have high sleep quality. No other interactions were found in the analyses involving effortful control as the dependent variable. Sexual orientation was a significant covariate in two of the four analyses suggesting that being straight predicted higher subjective effortful control.

Stroop and Go No Go

After controlling for each sleep variable in separate models, no significant main effects of ACEs or sleep variables were found on the Stroop or the Go-No-Go task, and no significant interactions were found. Small effect sizes were found for models containing either Stroop (R^2 = .059 - .064) or Go No Go (R^2 = .048 - .057) as outcomes.

Figure 9

*ACE * Sleep Quality Interaction on Effortful Control*



Note. This figure shows the significant interaction between ACE * sleep quality on effortful control scores. The figure indicates that participants with high ACE scores had higher effortful control scores when also indicating high sleep quality. These effortful control scores were similar to participants who had no ACEs and low sleep quality.

Chapter 4: Discussion

Prior research has shown many links between ACEs and negative outcomes (Kim & Cicchetti, 2010; Lackner et al., 2018; Mosley-Johnson et al., 2019), but fewer studies have analyzed mediators and moderators of the relationship between ACEs and resilience. The current study analyzed insomnia symptoms as a possible mediator of the relationship between ACEs and resilience outcomes, and positive sleep factors such as sleep duration, sleep quality, and regularity of sleep schedule as moderators of this relationship.

The current study's results are in line with prior literature indicating that individuals with ACEs tend to have lower levels of resilience (Kim & Cicchetti, 2010; Lackner et al., 2018; Mosley-Johnson et al., 2019). Additionally, the results from this study support prior research indicating that sleep quality and sleep regularity correlate with higher resilience (Arbinaga, 2018; Sano et al., 2017). Surprisingly, ACEs were correlated with longer sleep duration, and longer sleep duration was correlated with lower psychological wellbeing. Although there is research to suggest that ACEs are often associated with shorter sleep duration across the lifespan (Sullivan et al., 2019), longer sleep duration may be associated with hypersomnia, which is a symptom of some psychological disorders such as depression and bipolar disorder (Kaplan et al., 2015; Lopez et al., 2017). These psychological disorders are common in individuals who have experienced ACEs (Waite & Shewokis, 2012), but the current literature on hypersomnia is scarce in comparison to the literature on insomnia.

The mediation results of the current study support prior research indicating that insomnia symptoms may help explain the relationship between ACEs and lower resilience. The results indicate that the number of ACEs participants have been exposed to, is predictive of how many insomnia symptoms they report. Prior studies have shown this same significant relationship

between ACEs and insomnia symptoms (Bader et al., 2007; Kajeepeta et al., 2015; Sinha, 2016), and this relationship may be explained in part by the effect of stress on neurobiological processes in the body. Individuals who experience high levels of stress, such as children who have experienced adversity, go through neurobiological processes which can illicit hyperarousal (Perry & Pollard, 1998). This hyperarousal could eventually lead to insomnia symptoms such as trouble falling and staying asleep.

The present study also found significant relationships between insomnia symptoms and lower resilience outcomes as indicated in prior studies. (Palagini et al., 2018; Roberts et al., 2008). Sleep deprivation has been shown to be related with lower emotion regulation (Kauffman et al., 2018), and emotion regulation has been linked to general wellbeing (Kraiss et al., 2020). Therefore, one reason that participants who report more insomnia symptoms may be experiencing lower resilience outcomes could be due to a reduction in the ability to regulate emotions.

Although prior research has shown evidence for the relationships between ACEs and insomnia symptoms and between insomnia symptoms and resilience, fewer studies have analyzed the mediating role of insomnia symptoms on the relationship between ACEs and resilience. For example, Rojo-Wisser et al., (2019) found that sleep quality helped to explain why individuals with ACEs had lower perceptions of health, and more recently, Conway et al. (2020) found an indirect effect of ACEs on mental health outcomes due to sleep disruptions in a sample of United States soldiers (Conway et al., 2020). As the literature on this mediation effect is limited, the current study expanded the field's understanding of this relationship.

The current study's mediated results support the first proposed hypothesis that insomnia symptoms mediate the relationship between ACEs and resilience outcome. The results also

provide additional evidence for sleep as a mediator in the relationship between ACEs and resilience by including outcome variables (psychological wellbeing, life satisfaction, social wellbeing, effortful control) not used in prior studies. As prior research indicates that ACEs predict insomnia symptoms and insomnia symptoms predict resilience outcomes, these directions were hypothesized. However, the current study is cross-sectional and did not use experimental manipulations. Therefore, we do not know the direction of causal relations among the variables. It is possible that ACEs cause more hyperarousal, which leads to insomnia symptoms. These symptoms of insomnia could lower emotion regulation leading to lower resilience. Nevertheless, other causal pathways may explain these results. ACEs themselves could cause lower resilience and lower resilience could in turn be causing individuals to experience insomnia symptoms. Although we do not know the causal directions of the relationships in this study, the results do add to our current understanding of these phenomenon.

The significant mediating effect of insomnia symptoms on the relationship between ACEs and resilience outcomes indicates that insomnia is one variable which can help explain why individuals with ACEs tend to have lower resilience outcomes. These findings have important implications for preventing low resilience in individuals with ACEs. In this population, it may be important to use methods which target the reduction of insomnia symptoms in order to reduce the likelihood of these individuals developing low levels of resilience. For example, public health organizations could focus on informing the public about ways to prevent and reduce insomnia symptoms. For example, the National Sleep Foundation (2020) recently created an accessible article which highlights what types of symptoms may indicate insomnia and potential risk factors for developing insomnia. Articles such as this may help prevent insomnia symptoms and reduce the likelihood of low resilience in individuals with ACEs.

Little evidence was found to support hypothesis two, that positive sleep factors (sleep duration, sleep quality, regular sleep schedule) moderate the relationship between ACEs and resilience variables. Twenty-four moderation models were analyzed, and a significant interaction term was found in only one of these models, specifically the moderation of sleep quality on the relationship between ACEs and effortful control. It is important to note that the number of models analyzed increases the chance of a Type I error in which the null hypothesis is rejected when in fact the null hypothesis should have been accepted. Therefore, the significant moderation model should be interpreted with caution and future studies should attempt to replicate this finding to reduce the likelihood that significance was found due to a Type I error.

The one significant finding indicates that the protective effect of sleep quality against reductions of effortful control due to ACEs was highest in participants who had high sleep quality. Additionally, individuals with a high number of ACEs were protected against a reduction in effortful control when they had high sleep quality. Prior research has shown that poor sleep quality is associated with lower effortful control in young adults (Lukowski & Milojevich, 2015), and the current study expands on these findings by suggesting that this relationship may be more complex than previously understood. These results show that levels of sleep quality have differential effects on effortful control depending on the number of ACEs. For example, it is more difficult for individuals to have large benefits on effortful control due to high sleep quality when these individuals also have a higher number of ACEs. Whereas those with a lower number of ACEs have a much larger increase in effortful control when their sleep quality changes from low to high. This indicates that all individuals may experience some protective effects of sleep quality on effortful control, but individuals with ACEs may have difficulty in experiencing large benefits from high sleep quality.

Additionally, 23 of the moderation models were not significant. This suggests that positive sleep variables may not change the relationship between ACEs and resilience. However, prior research has shown that self-reported measure of sleep have little agreement with objective reports of sleep, such as actigraphy (Girschik et al., 2012). Therefore, the current insignificant results could be due to the subjective measures in this study not being sensitive enough to capture these relationships.

Limitations

The current study sought to expand the field's understanding of how sleep mediates and moderates the relationship between ACEs and resilience, but there were limitations. For example, the study was conducted online which allowed for the collection of a large number of participants. However, conducting the study online required the use of online resources to gather participants and collect objective measures of effortful control. Although online resources such as PsyToolkit have been validated (Kim et al., 2019), the lack of correlations between scores on the Stroop, Go No Go task and ACEs is unexpected. Prior research has shown correlations between ACEs and scores on the Stroop and the Go No Go tasks when not using PsyToolkit (Hawkins et al., 2020), suggesting something about the measures on PsyToolkit may have created insignificant results.

Second, as the current study collects correlational data using a cross-sectional design, the current study does not allow for an interpretation of the directionality or the causal relationships of variables. Although this is a limitation, the results from this study do provide a broader understanding of the relationships analyzed compared to what is found in the current literature.

Third, the significant moderation model should be interpreted with caution as many moderation models were conducted and found to be insignificant. Although a power analysis was

conducted to determine the number of participants needed to find a small effect size, it could be that more participants were needed to find significant moderated effects (Cohen, 1988; Shieh, 2009).

Lastly, data collection occurred during the COVID-19 pandemic. Results from this study could contain cohort effects which could impact the number of ACEs participants experienced in part due to increasing rates of domestic violence during times of stay-at-home orders (Has & Henke, 2021). Additionally, levels of resilience could be lower than normal given that psychological distress has increased during the pandemic (Villani et al., 2021). Therefore, it may be difficult to generalize these results to times outside of the pandemic.

Future Directions

To address the limitations of the current study, additional research can be conducted. Future studies could collect a large number of participants to ensure more power in statistical analyses. As a higher number of participants increases statistical power if other conditions remain the same, this could potentially produce significant interaction effects which were not found in the current study.

Young adult participants will be screened and selected if they currently do not report sleep problems. The participants will then take part in a longitudinal study. Conducting a longitudinal study allows the researchers to determine the directional relationship between ACEs and sleep problems which was a limitation of the current study. At Time 1 participants will complete a measure of ACEs. A year later at Time 2, these participants will then be given subjective and objective measures of sleep. For example, the participants will complete subjective measures of insomnia, sleep quality, and sleep duration, and will be given an actigraphy device to objectively measure their sleep for a week. The actigraphy device allows the

researchers to measure more than just perceptions of sleep as was measured in the current study. Additionally, symptoms of hypersomnia could be analyzed, as the current study indicates that hypersomnia symptoms may be associated with ACEs in young adults. At Time 2, researchers could analyze the relationship between number of ACEs at Time 1 and sleep measures at Time 2. It is expected that individuals with more ACEs at Time 1 will have a higher likelihood of experiencing sleep problems at Time 2 compared to individuals with fewer ACEs at Time 1.

The second part of the study could include a sleep manipulation. After completing the first portion of the study, participants will fill out a measure of affect, which has been shown to be impacted by sleep manipulations spanning only a few days (Talbot et al., 2010). This measure of affect will serve as the resilience metric, as affect has been shown to be a proxy for both physical health, as well as coping and social wellbeing (Cameron et al., 2015). Participants will then be randomly assigned to two sleep groups: a sleep restriction group, and a control group. To reduce the potential confound of sleep restriction with pre-existing sleep problems, an equal number of participants with and without preexisting sleep problems will be assigned to each group. Participants in the sleep restriction group will be asked to sleep for 6 hours a night for 5 days, and participants in the control group will be asked to sleep normally for 5 days. This sleep manipulation has been used in prior research on young adults and has been shown to be effective at producing feelings of sleepiness (Jiang et al., 2011). After the sleep manipulation, participants will complete the resilience measures a second time to determine how sleep causes differences in resilience. It is anticipated that participants in the sleep restriction group will have a greater reduction in resilience from pre-manipulation to post-manipulation compared to those in the control group.

Lastly, mediation and moderation models of sleep on the relationship between ACEs and resilience could then be analyzed. Due to the longitudinal component of part 1 of this study, and the experimental component of part 2, directionality, and causation of the variables in these models could be determined. The results from these analyses are expected to show that there is a significant mediated path between ACEs and resilience outcomes due to sleep restriction. The directionality from ACEs to sleep to resilience could be determined in this model. Additionally, positive sleep variables could then be analyzed as moderators between ACEs and resilience outcomes to support or oppose the results of the current study that indicates sleep quality may moderate the relationship between ACEs and effortful control. Additionally, analyses could be run to determine if other moderating relationships are found to be significant.

Conclusions

Altogether, the current study demonstrates that insomnia is one variable which can help explain the relationship between ACEs and lower resilience. Future studies should be conducted using longitudinal and experimental designs to ensure directionality and causation of these variables and their relationships with one another. Although there was not strong evidence to support the theory that positive sleep variables protect against lower resilience due to ACEs, future studies should collect larger numbers of participants and use objective measures of sleep to determine if these relationships exist.

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Appendix

Demographics

Please complete the following questions about yourself.

Are you fluent in English?

- Yes
- No

Can you read and write English at least at a 6th grade level?

- Yes
- No

Are you and a student at Idaho State University?

- Yes
- No

If so, what is your SONA ID? (This can be found on the "My Profile" link on SONA)

What is your age?

What state do you reside in?

What is your ethnicity? (Choose all that apply)

- Hispanic or Latino
- American Indian or Alaska Native
- Native Hawaiian or Pacific Islander
- Black or African American
- Asian
- White
- Other Race

What is your gender identity?

- Male
- Female
- Trans Male
- Trans Female
- Genderqueer/Gender Nonconforming
- Other gender identity

What is your sexual orientation?

- Heterosexual or straight
- Gay
- Lesbian
- Bisexual
- Other sexual orientation

What is your highest level of education?

- Less than high school diploma
- Highschool graduate or equivalent (GED)
- College freshman
- College sophomore
- College junior
- College senior
- Bachelor’s degree
- Master’s degree
- Doctorate
- Other

BRFSS Adverse Childhood Experience (ACE) Module

Prologue: I'd like to ask you some questions about events that happened during your childhood. This information will allow us to better understand problems that may occur early in life, and may help others in the future. This is a sensitive topic and some people may feel uncomfortable with these questions. At the end of this section, I will give you a phone number for an organization that can provide information and referral for these issues. Please keep in mind that you can ask me to skip any question you do not want to answer. All questions refer to the time period before you were 18 years of age. Now, looking back before you were 18 years of age---.

1) Did you live with anyone who was depressed, mentally ill, or suicidal?

2) Did you live with anyone who was a problem drinker or alcoholic?

3) Did you live with anyone who used illegal street drugs or who abused prescription medications?

4) Did you live with anyone who served time or was sentenced to serve time in a prison, jail, or other correctional facility?

5) Were your parents separated or divorced?

6) How often did your parents or adults in your home ever slap, hit, kick, punch or beat each other up?

7) Before age 18, how often did a parent or adult in your home ever hit, beat, kick, or physically hurt you in any way? Do not include spanking. Would you say—

8) How often did a parent or adult in your home ever swear at you, insult you, or put you down?

9) How often did anyone at least 5 years older than you or an adult, ever touch you sexually?

10) How often did anyone at least 5 years older than you or an adult, try to make you touch sexually?

11) How often did anyone at least 5 years older than you or an adult, force you to have sex?

Response Options

Questions 1-4	Question 5	Questions 6-11
1=Yes	1=Yes	1=Never
2=No	2=No	2=Once
7=DK/NS	8=Parents not married	3=More than once
9=Refused	7=DK/NS	7=DK/NS
	9=Refused	9=Refused

Insomnia Severity Index

The Insomnia Severity Index has seven questions. The seven answers are added up to get a total score. When you have your total score, look at the 'Guidelines for Scoring/Interpretation' below to see where your sleep difficulty fits.

For each question, please CIRCLE the number that best describes your answer.

Please rate the CURRENT (i.e. LAST 2 WEEKS) SEVERITY of your insomnia problem(s).

Insomnia Problem	None	Mild	Moderate	Severe	Very Severe
1. Difficulty falling asleep	0	1	2	3	4
2. Difficulty staying asleep	0	1	2	3	4
3. Problems waking up too early	0	1	2	3	4

4. How SATISFIED/DISSATISFIED are you with your CURRENT sleep pattern?

Very Satisfied	Satisfied	Moderately Satisfied	Dissatisfied	Very Dissatisfied
0	1	2	3	4

5. How NOTICEABLE to others do you think your sleep problem is in terms of impairing the quality of your life?

Not at all Noticeable	A Little	Somewhat	Much	Very Much Noticeable
0	1	2	3	4

6. How WORRIED/DISTRESSED are you about your current sleep problem?

Not at all Worried	A Little	Somewhat	Much	Very Much Worried
0	1	2	3	4

7. To what extent do you consider your sleep problem to INTERFERE with your daily functioning (e.g. daytime fatigue, mood, ability to function at work/daily chores, concentration, memory, mood, etc.) CURRENTLY?

Not at all Interfering	A Little	Somewhat	Much	Very Much Interfering
0	1	2	3	4

Guidelines for Scoring/Interpretation:

Add the scores for all seven items (questions 1 + 2 + 3 + 4 + 5 +6 + 7) = _____ your total score

Total score categories:
0–7 = No clinically significant insomnia
8–14 = Subthreshold insomnia
15–21 = Clinical insomnia (moderate severity)
22–28 = Clinical insomnia (severe)

SLEEP TIMING QUESTIONNAIRE (STQ)

Name_____

ID#_____

Date_____

SLEEP TIMING QUESTIONNAIRE (STQ)

This questionnaire asks about when you normally sleep. We are interested in getting as accurate a picture as we can of the times when you normally go to bed and get up. Please think carefully before giving your answers and be as accurate and as specific as you can be. **Please answer in terms of a recent "normal average week," not one in which you traveled, vacationed or had family crises. Thanks.**

Please think of GOOD NIGHT TIME as the time at which you are finally in bed and trying to fall asleep.

On the night before a work day or school day,
what is your **earliest** GOOD NIGHT TIME ?____:____ pm/am
On the night before a work day or school day,
what is your **latest** GOOD NIGHT TIME ?____:____ pm/am

On the night before a work day or school day,
what is your **usual** GOOD NIGHT TIME ?____:____ pm/am

How stable (i.e., similar each night) are your GOOD NIGHT TIMES before a work day or school day? *(circle one)*

0-15mins.	16-30mins.	31-45mins.	46-60mins.
61-75mins.	76-90mins.	91-105mins	106-120mins.
2-3hours	3-4hours	over 4hours	

On a night before a day off (e.g. a weekend),
what is your **earliest** GOOD NIGHT TIME ?____:____ pm/am

On a night before a day off (e.g. a weekend),
what is your **latest** GOOD NIGHT TIME ?____:____ pm/am

On a night before a day off (e.g. a weekend),
what is your **usual** GOOD NIGHT TIME ?___:____ pm/am

How stable (i.e., similar each night) are your GOOD NIGHT TIMES on a night before a day off (e.g. a weekend)? *(circle one)*

0-15mins.	16-30mins.	31-45mins.	46-60mins.
61-75mins.	76-90mins.	91-105mins	106-120mins.
2-3hours	3-4hours	over 4hours	

Please think of GOOD MORNING TIME as the time at which you finally get out of bed and start your day.

Before a work day or school day,
what is your **earliest** GOOD MORNING TIME ?____:____ am/pm

Before a work day or school day,
what is your **latest** GOOD MORNING TIME ?____:____ am/pm

Before a work day or school day,
what is your **usual** GOOD MORNING TIME ?____:____ am/pm

How stable (i.e., similar each night) are your GOOD MORNING TIMES before a work day or school day? *(circle one)*

0-15mins.	16-30mins.	31-45mins.	46-60mins.
61-75mins.	76-90mins.	91-105mins	106-120mins.
2-3hours	3-4hours	over 4hours	

Before a day off (e.g. a weekend),
what is your **earliest** GOOD MORNING TIME ?____:____ am/pm

Before a day off (e.g. a weekend),
what is your **latest** GOOD MORNING TIME ?____:____ am/pm

Before a day off (e.g. a weekend),
what is your **usual** GOOD MORNING TIME ?____:____ am/pm

How stable (i.e., similar each night) are your GOOD MORNING TIMES on a night before a day off (e.g. a weekend)? *(circle one)*

0-15mins.	16-30mins.	31-45mins.	46-60mins.
61-75mins.	76-90mins.	91-105mins	106-120mins.
2-3hours	3-4hours	over 4hours	

These questions are about how much sleep you lose to unwanted wakefulness:

On most nights, how long, on average does it take you to fall asleep after you start trying?
_____minutes

On most nights, how much sleep do you lose, on average, from waking up during the night (e.g. to go to the bathroom)?

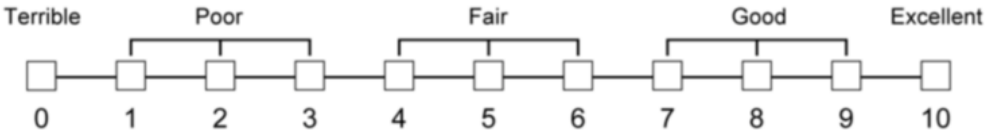
_____minutes

Sleep Quality Scale

INSTRUCTIONS:

- *The following question refers to your overall sleep quality for the **majority** of nights in the **past 7 days ONLY**.*
- *Please think about the quality of your sleep **overall**, such as how many hours of sleep you got, how easily you fell asleep, how often you woke up during the night (except to go to the bathroom), how often you woke up earlier than you had to in the morning, and how refreshing your sleep was.*

1. During the **past 7 days**, how would you rate your sleep quality overall?
*(Please mark only **1** box)*



3. Ryff's Psychological Well-Being Scales (PWB), 42 Item version

Please indicate your degree of agreement (using a score ranging from 1-6) to the following sentences.

		Strongly disagree					Strongly agree
1.	I am not afraid to voice my opinions, even when they are in opposition to the opinions of most people.	1	2	3	4	5	6
2.	In general, I feel I am in charge of the situation in which I live.	1	2	3	4	5	6
3.	I am not interested in activities that will expand my horizons.	1	2	3	4	5	6
4.	Most people see me as loving and affectionate.	1	2	3	4	5	6
5.	I live life one day at a time and don't really think about the future.	1	2	3	4	5	6
6.	When I look at the story of my life, I am pleased with how things have turned out.	1	2	3	4	5	6
7.	My decisions are not usually influenced by what everyone else is doing.	1	2	3	4	5	6
8.	The demands of everyday life often get me down.	1	2	3	4	5	6
9.	I think it is important to have new experiences that challenge how you think about yourself and the world.	1	2	3	4	5	6
10.	Maintaining close relationships has been difficult and frustrating for me.	1	2	3	4	5	6
11.	I have a sense of direction and purpose in life.	1	2	3	4	5	6
12.	In general, I feel confident and positive about myself.	1	2	3	4	5	6
13.	I tend to worry about what other people think of me.	1	2	3	4	5	6
14.	I do not fit very well with the people and the community around me.	1	2	3	4	5	6
15.	When I think about it, I haven't really improved much as a person over the years.	1	2	3	4	5	6
16.	I often feel lonely because I have few close friends with whom to share my concerns.	1	2	3	4	5	6
17.	My daily activities often seem trivial and unimportant to me.	1	2	3	4	5	6
18.	I feel like many of the people I know have gotten more out of life than I have.	1	2	3	4	5	6
19.	I tend to be influenced by people with strong opinions.	1	2	3	4	5	6
20.	I am quite good at managing the many responsibilities of my daily life.	1	2	3	4	5	6
21.	I have the sense that I have developed a lot as a person over time.	1	2	3	4	5	6

22.	I enjoy personal and mutual conversations with family members or friends.	1	2	3	4	5	6
23.	I don't have a good sense of what it is I'm trying to accomplish in life.	1	2	3	4	5	6
24.	I like most aspects of my personality.	1	2	3	4	5	6
25.	I have confidence in my opinions, even if they are contrary to the general consensus.	1	2	3	4	5	6
26.	I often feel overwhelmed by my responsibilities	1	2	3	4	5	6
27.	I do not enjoy being in new situations that require me to change my old familiar ways of doing things.	1	2	3	4	5	6
28.	People would describe me as a giving person, willing to share my time with others.	1	2	3	4	5	6
29.	I enjoy making plans for the future and working to make them a reality.	1	2	3	4	5	6
30.	In many ways, I feel disappointed about my achievements in life.	1	2	3	4	5	6
31.	It's difficult for me to voice my own opinions on controversial matters.	1	2	3	4	5	6
32.	I have difficulty arranging my life in a way that is satisfying to me.	1	2	3	4	5	6
33.	For me, life has been a continuous process of learning, changing, and growth.	1	2	3	4	5	6
34.	I have not experienced many warm and trusting relationships with others.	1	2	3	4	5	6
35.	Some people wander aimlessly through life, but I am not one of them	1	2	3	4	5	6
36.	My attitude about myself is probably not as positive as most people feel about themselves.	1	2	3	4	5	6
37.	I judge myself by what I think is important, not by the values of what others think is important.	1	2	3	4	5	6
38.	I have been able to build a home and a lifestyle for myself that is much to my liking.	1	2	3	4	5	6
39.	I gave up trying to make big improvements or changes in my life a long time ago.	1	2	3	4	5	6
40.	I know that I can trust my friends, and they know they can trust me.	1	2	3	4	5	6
41.	I sometimes feel as if I've done all there is to do in life.	1	2	3	4	5	6
42.	When I compare myself to friends and acquaintances, it makes me feel good about who I am.	1	2	3	4	5	6

Life Satisfaction Scale

Scale:

Instructions: Below are five statements that you may agree or disagree with. Using the 1 - 7 scale below, indicate your agreement with each item by placing the appropriate number on the line preceding that item. Please be open and honest in your responding.

- 7 - Strongly agree
- 6 - Agree
- 5 - Slightly agree
- 4 - Neither agree nor disagree
- 3 - Slightly disagree
- 2 - Disagree
- 1 - Strongly disagree

____ In most ways my life is close to my ideal.

____ The conditions of my life are excellent.

____ I am satisfied with my life.

____ So far I have gotten the important things I want in life.

____ If I could live my life over, I would change almost nothing.

Scoring:

Though scoring should be kept continuous (sum up scores on each item), here are some cut-offs to be used as benchmarks.

- 31 - 35 Extremely satisfied
- 26 - 30 Satisfied
- 21 - 25 Slightly satisfied
- 20 Neutral
- 15 - 19 Slightly dissatisfied
- 10 - 14 Dissatisfied
- 5 - 9 Extremely dissatisfied

Social Wellbeing

Response options range from strongly (1), moderately(2), or slightly disagree(3) to slightly(4), moderately(5), or strongly agree(6).

1. You don't feel you belong to anything you'd call a community	1	2	3	4	5	6
2. You feel like you're an important part of your community	1	2	3	4	5	6
3. If you had something to say, you believe people in your community would listen to you	1	2	3	4	5	6
4. You feel close to other people in your community	1	2	3	4	5	6
5. You see your community as a source of comfort	1	2	3	4	5	6
6. If you had something to say, you don't think your community would take you seriously	1	2	3	4	5	6
7. You believe other people in society value you as a person	1	2	3	4	5	6
8. I don't feel I belong to anything I'd call a community	1	2	3	4	5	6
9. I feel close to other people in my community	1	2	3	4	5	6
10. My community is a source of comfort	1	2	3	4	5	6
11. You think that other people are unreliable	1	2	3	4	5	6
12. You believe that people are kind	1	2	3	4	5	6
13. You believe that people are self-centered	1	2	3	4	5	6
14. You feel that people are not trustworthy	1	2	3	4	5	6
15. You think that people live only for themselves	1	2	3	4	5	6
16. You believe that people are more and more dishonest these days	1	2	3	4	5	6
17. You think that people care about other people's problems	1	2	3	4	5	6
18. People who do a favor expect nothing in return	1	2	3	4	5	6
19. People do not care about other people's problems	1	2	3	4	5	6
20. I believe that people are kind	1	2	3	4	5	6
21. Your behavior has some impact on other people in your community	1	2	3	4	5	6
22. You think you have something valuable to give to the world	1	2	3	4	5	6
23. Your daily activities do not produce anything worthwhile for your community	1	2	3	4	5	6
24. You don't have the time or energy to give anything to your community	1	2	3	4	5	6
25. You think that your work provides an important product for society	1	2	3	4	5	6
26. You feel you have nothing important to contribute to society	1	2	3	4	5	6
27. I have something valuable to give to the world	1	2	3	4	5	6
28. My daily activities do not produce anything worthwhile for my community	1	2	3	4	5	6
29. I have nothing important to contribute to society	1	2	3	4	5	6
30. You believe that society has stopped making progress	1	2	3	4	5	6

31. Society isn't improving for people like you	1	2	3	4	5	6
32. You don't think social institutions like law and government make your life better	1	2	3	4	5	6
33. You see society as continually evolving	1	2	3	4	5	6
34. You think our society is a productive place for people to live in	1	2	3	4	5	6
35. For you there's no such thing as social progress	1	2	3	4	5	6
36. You think the world is becoming a better place for everyone	1	2	3	4	5	6
37. The world is becoming a better place for everyone	1	2	3	4	5	6
38. Society has stopped making progress	1	2	3	4	5	6
39. Society isn't improving for people like me	1	2	3	4	5	6
40. The world is too complex for you	1	2	3	4	5	6
41. Scientists are the only people who can understand how the world works	1	2	3	4	5	6
42. You cannot make sense of what's going on in the world	1	2	3	4	5	6
43. Most cultures are so strange that you cannot understand them	1	2	3	4	5	6
44. You think it's worthwhile to understand the world you live in	1	2	3	4	5	6
45. You find it hard to predict what will happen next in society	1	2	3	4	5	6
46. The world is too complex for me	1	2	3	4	5	6
47. I cannot make sense of what's going on in the world	1	2	3	4	5	6
48. I find it easy to predict what will happen next in society	1	2	3	4	5	6

ADULT TEMPERAMENT QUESTIONNAIRE (VERSION 1.3)

Directions

On the following pages you will find a series of statements that individuals can use to describe themselves. There are no correct or incorrect responses. All people are unique and different, and it is these differences which we are trying to learn about. Please read each statement carefully and give your best estimate of how well it describes you. Circle the appropriate number below to indicate how well a given statement describes you.

circle #:	if the statement is:
1	extremely untrue of you
2	quite untrue of you
3	slightly untrue of you
4	neither true nor false of you
5	slightly true of you
6	quite true of you
7	extremely true of you

If one of the statements does not apply to you (for example, if it involves driving a car and you don't drive), then circle "X" (not applicable). Check to make sure that you have answered every item.

1. I am often late for appointments.
   1 2 3 4 5 6 7
2. I often make plans that I do not follow through with.
   1 2 3 4 5 6 7
3. I can keep performing a task even when I would rather not do it.
   1 2 3 4 5 6 7
4. I can make myself work on a difficult task even when I don't feel like trying.
   1 2 3 4 5 6 7
5. If I think of something that needs to be done, I usually get right to work on it.
   1 2 3 4 5 6 7
6. I usually finish doing things before they are actually due (for example, paying bills, finishing homework, etc.).
   1 2 3 4 5 6 7

7. When I am afraid of how a situation might turn out, I usually avoid dealing with it.

1 2 3 4 5 6 7

8. It's often hard for me to alternate between two different tasks.

1 2 3 4 5 6 7

9. When I am trying to focus my attention, I am easily distracted.

1 2 3 4 5 6 7

10. When interrupted or distracted, I usually can easily shift my attention back to whatever I was doing before.

1 2 3 4 5 6 7

11. It is very hard for me to focus my attention when I am distressed.

1 2 3 4 5 6 7

12. When I am happy and excited about an upcoming event, I have a hard time focusing my attention on tasks that require concentration.

1 2 3 4 5 6 7

13. Even when I feel energized, I can usually sit still without much trouble if it's necessary.

1 2 3 4 5 6 7

14. It is easy for me to hold back my laughter in a situation when laughter wouldn't be appropriate.

1 2 3 4 5 6 7

15. I can easily resist talking out of turn, even when I'm excited and want to express an idea.

1 2 3 4 5 6 7

16. I often have trouble resisting my cravings for food drink, etc.

1 2 3 4 5 6 7

17. When I'm excited about something, it's usually hard for me to resist jumping right into it before I've considered the possible consequences.

1 2 3 4 5 6 7

18. When I see an attractive item in a store, it's usually very hard for me to resist buying it.

1 2 3 4 5 6 7

19. It is easy for me to inhibit fun behavior that would be inappropriate.

1 2 3 4 5 6 7