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Social Support As A Mitigator Of Trauma Related Stress Reactivity In A College Population

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SOCIAL SUPPORT AS A MITIGATOR OF TRAUMA RELATED STRESS REACTIVITY IN A COLLEGE POPULATION

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ABSTRACT

The present study examined how social support can mitigate the stress reactivity of individuals with childhood trauma. The hypothesis addressed whether individuals with childhood trauma will have the higher stress reactivity compared to individuals without childhood trauma. Having social support will help to reduce the physiological and psychological responses such as lower cortisol and alpha amylase levels, lower heartrate, and a more positive mood. Participants completed the Profile of Mood State Scale (POMS), Childhood Trauma Questionnaire (CTQ), Hassles Scale, and Social Provisions Scale (SPS). Additionally, measures of cortisol, alpha amylase, and heartrate were tested. Data was collected in person from students at a Midwestern University. Results of the current study show there is a significant relationship between level of childhood trauma and decreased cortisol suggesting a muted response in those with high trauma levels. Additionally, higher levels of childhood trauma are correlated with higher heartrate change throughout the study stressor. When looking at the interaction between childhood trauma and social support, there is a statistically significant interaction affect between cortisol and heartrate. There are also statistically significant differences in cortisol and heartrate for those with and without social support. The current study shows how childhood trauma can impact an individuals physiological and psychological responding. This information is pertinent to universities as the individuals with childhood trauma had increased stress responding toward academic stressors, but their stress response is mitigated by having social support present. Understanding these results can help universities better attend to their incoming students and provide social support to the students to help manage the stress they may experience in the academic setting.

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Childhood Trauma

Around 90% of children experience some form of trauma (Heinzelmann & Gill, 2013) such as natural disasters, injuries or severe illness (Horner, 2015). More specifically, in a survey of US adults, the Centers for Disease Control and Prevention (CDC, 2011) reported nearly 61% of adults had experienced at least one type of adverse childhood experience (ACES). Further, the CDC reported about 1 in 6 adults noted they were exposed to four or more types of ACES, defined as psychological abuse, physical abuse, sexual abuse, or verbal abuse (Felitti et al., 1998; Kalmakis & Chandler, 2013). These include things such as scapegoating, conveying unworthiness, hitting, strangling, unwanted sexual activity, and name calling (Gilbert et al., 2009). In addition, ACES can include significant dysfunction in the home, which is the lack of nurturing or support from a parent or guardian (Felitti et al., 1998; Kalmakis & Chandler, 2013).

Some reports estimate 80% of all ACES are most often perpetrated by a parent (Rasmussen et al., 2018). Individuals who are under the poverty line, misuse drugs and alcohol, are a single parent, or were exposed to maltreatment when they were child have a greater likelihood of subjecting their own child to ACEs (Berger, 2005; Gilbert et al., 2009). Further, engaging in control or demanding a sense of power are potential reasons as to why parents or guardians are abusing children (Becker, 1993; Berger, 2005). This is especially impactful when you consider only around 5-8% of children who are abused physically or sexually are helped by child protective services (MacMilan et al., 2003) suggesting many children never receive support in coping with their ACES.

Due to the significant impact of ACES, those affected often experience challenges with functioning and can develop childhood trauma. Studies examining instances of maltreatment reveal most children don't experience just one instance of abuse, but are more likely to

experience continual abuse throughout their childhood (Felitti et al., 1998; Gilbert, 2009) This continuous abuse is classified as childhood trauma (Rasmussen et al., 2018) and is associated with physiological and psychological damage as a result of the repeated physical, sexual, and verbal abuse or dysfunction in the household. Trauma can impact physiological health through the forms of a suppressed immune system which can result in greater chances for illnesses, cardiovascular disease, and autoimmune diseases like diabetes or rheumatoid arthritis (Downey et al., 2017; Horner, 2015; Karatekin, 2017). Further, childhood trauma predicts experiencing later PTSD as well as the onset of depression or anxiety in adulthood (Cloitre et al., 2019). These physiological and psychological consequences of ACES have the potential to significantly impact an individual's ability to function in adulthood.

Research demonstrates specific physiological consequences in adulthood stemming from exposure to ACES. One study examined the impact of adult storytelling about childhood experiences on cortisol, a stress related hormone. Subjects who had experienced childhood trauma had significantly higher cortisol levels compared to a control group before, during, and after storytelling. This suggests individuals with childhood trauma have increased stress responses (Elzinga et al., 2003). Several studies have examined the association between childhood trauma and risks of health complications in adulthood. Deschenes et al. (2018) found trauma was associated with increased risk of cardiovascular dysfunction, such as high blood pressure and glycemic control, and with an increased likelihood of developing Type II diabetes. Significantly, subjects have an 11% increase in odds of developing diabetes for each additional ACEs beyond the first exposure (Deschenes et al., 2018). This suggests that childhood trauma paired with increased medical risks is a potential association that predisposes victims of trauma to an increased likelihood of developing diabetes. These studies suggest childhood trauma can

alter the physiological functioning of an adult and can result in hindrances in day-to-day functioning.

In addition to facing physiological complications, the effects of childhood trauma are also associated with psychological difficulties in adulthood. As previously mentioned, adulthood PTSD is one psychological consequence of childhood trauma. Individuals who were abused in their childhood and were exposed to stories about their abusive past had increased PTSD symptomology, anxiety, and distress (Elzinga et al., 2003). Further, PTSD was associated with dropping out of college by the sophomore year (Boyraz et al., 2013). In addition to the increased likelihood of dropping out associated with PTSD, childhood trauma influences how well a student adjusts to college. Childhood trauma exposure predicts negative academic adjustment, less satisfaction with academic performance, and problems with emotional adjustment for college attendees (Barnyard & Cantor, 2004; Lee et al., 2016). Stress and the potential for PTSD can be associated with the traumatic events faced in childhood. These findings suggest that individuals who experienced childhood trauma were ultimately affected by these events in adulthood.

Stress

For most people, stress, defined as any adverse event that requires one to adapt to their environment (Monroe, 2008), is a very common emotional experience and can affect one's well-being in multiple areas (Thoma et al., 2013). When responding to stressful tasks, one is impacted physiologically and psychologically. Physiologically, continued and persistent exposure to stress can lead to a higher risk for cardiovascular disease, hypertension, increased heartrate and blood pressure (Huang et al., 2013; McLaughlin et al., 2014; Shin & Liberzon, 2010; Williamson et al., 2018). Stress can also have psychological impacts. Modie-Moroka (2014) found chronic stress

negatively impacted one's psychological well-being, with chronic life stressors such as poor relationships, poor care giving, and negative work-related experiences impacting the psychological well-being of participants. Stress exposure had negative consequences for an individual's emotional well-being and predicted their perception of experiencing overwhelming amounts of stress. These findings suggest stress contributes to health and emotional difficulties in adulthood.

While stress is a common human experience, how we respond to stress is highly individual. Our response to stress, stress reactivity, is a biological response originating from the nervous system during intense or overwhelming experiences (Wass et al., 2018). The body becomes more active, more aroused, and behaviors are more erratic. Stress-reactivity may impact individuals both physiologically and psychologically when exposed to stress (Arnsten, 2009). In workers who assess traffic density, when the density of traffic increased, the workers heartrate increased as a result of the increasing stress from the traffic. Traffic density was associated with the time of the day with morning and evening traffic having higher density thus producing more stress which induced a higher heartrate (Fallahi et al., 2016). Regarding psychological impacts, researchers found for participants experiencing stress (minority status), there was a strong negative psychological impact with participants reporting more depressive like symptoms compared to those who were not part of the minority group (Wong et al., 2013).

In adults who have experienced childhood trauma, stress reactivity is associated with physiological responses such as increased production of cortisol and alpha amylase, another hormonal stress indicator. These hormonal measures of stress have been shown to be associated with reactivity of the nervous system and are produced when experiencing stress (Childs et al., 2010; Kuras et al., 2016). Participants who had childhood trauma were more physiologically

affected, having residual increases in alpha amylase during and even after the study stressor was complete (Kuras et al., 2016). In another study, participants who had experienced childhood trauma had generally higher levels of salivary cortisol as measured across the day, compared to those who had not experienced childhood trauma (Faravelli et al., 2017). For those who have experienced childhood trauma, they have greater stress-reactivity as well as generally higher baseline levels of the stress hormone, cortisol. Additionally, individuals under stress experience an increase in heartrate significantly higher compared to control groups (Wemm & Wulfert, 2017) with higher heartrate associated negatively with impacting decision making later in the study suggesting an impact of stress on functioning overall.

Stress reactivity is not only experienced in day-to-day life, but can also be generated in a laboratory setting. One way of producing stress in the lab for research purposes is by using the Trier Social Stress Test (TSST), a stress task involving public speaking and mental arithmetic. Kuras et al., (2016) found that TSST induced a significant increase of alpha amylase in participants with childhood trauma immediately after the test compared to those without childhood trauma. Multiple studies have shown the TSST increases salivary cortisol and alpha amylase production which are correlated with stress reactivity (Giles et al., 2014; Petrakova et al., 2015; Villada et al., 2014). When participants completed the TSST, there was a significant increase in cortisol reactivity compared to baseline and recovery levels within the stress condition and compared to the control condition (Giles et al., 2014; Villada et al., 2014). Additionally, alpha amylase increases due to exposure to the TSST and correlates to plasma cortisol levels. Furthermore, salivary cortisol levels are correlated with plasma levels (Petrakova et al., 2015), suggesting that collection of saliva to test cortisol and alpha amylase is a reliable means of examining physiological stress responses. In addition, multiple studies have found the

TSST demonstrates an influence in heartrate reactivity, shown by an increase in heartrate from baseline time 1 to study time 2 and continuing into recovery time 3. There was a significant increase in heartrate in the experimental groups (TSST groups) compared to the control groups (non-TSST groups) (Childs et al., 2010; Giles et al., 2014; Williamson et al., 2018). Heartrate increase indicates a stronger reaction to the stress, suggesting the participant experienced more stress during the TSST than the control who did not experience the TSST. The TSST causes a stress response in the lab setting, influencing the physiological markers of cortisol, alpha amylase, and heartrate.

Childhood trauma does not just have physiological consequences in adulthood, there are increases in psychological responses of stress reactivity as well. Glaser et al., (2006) found when a participant had a history of childhood trauma, they experienced significantly greater levels of negative affect induced by daily life stressors. This results in more psychological hardships such as anxiety or depression than if the participant had no history of childhood trauma (Glaser et al., 2006). Additionally, individuals with a history of childhood trauma experienced a more intense psychological stress-reactivity compared to participants with no history of trauma (Pierrehumbert et al., 2009), with childhood trauma subjects reporting higher perceived levels of stress as indicated by salivary cortisol production. Childhood trauma not only affects one when they are a child, but can also have psychological consequences in adulthood.

We can measure affective responding to stress reactivity in the lab. When participants self-reported their mood changes before and after the TSST using the Profile of Moods (POMS) measurement scale, there are significant increases in perceived feelings on the subscales of anger and depression, tension, fatigue, and anxiety after the TSST (Childs et al., 2010; Giles et al., 2014). Similarly, Wemm & Wulfert (2017) found when using the PANAs, a measurement of

self-report ratings of positive and negative affect, individuals in the stress condition reported more negative affect/stress than the control condition. These findings demonstrate an impact of stress on mood with an increase in negative mood being commonly experienced under stress. The stress experienced during negative occurrences reflects the feelings and moods one felt not just during the stress experience, but after the event was over as well, suggesting the psychological impact of stress extends beyond the stressful exposure. Taken together, these findings support the argument that one can be affected both physiologically and psychologically by childhood trauma which plays a negative role in daily life, can affect multiple domains critically, and can hinder one's functioning in adulthood.

Social Support

One possible mechanism for reducing stress-reactivity is social support. Social support is the ability to rely on others for assistance in coping through times of stress. Family, friends, acquaintances, or coworkers are sources of social support (Drouin et al., 2018; Gosnell, 2019) and can be used actively or passively. Active support was defined as having support from a friend who would give positive remarks, encouragement, and acknowledgement to the participant (Teoh et al., 2009). For passive support, a friend could be present, but would not be interacting with the participant. One study found active social support received when completing the study helped lower the experienced stress. Those who received active support were more determined and attentive (Teoh et al., 2009). Passive support was shown to have no significant benefits indicating active support is more beneficial in reducing stress-reactivity. Having a friend present who offers encouragement and support can help buffer the effects one experiences when facing times of stress.

Social support can also be used to combat one's perception of the level of stress experienced. McDonough et al. (2014) found cancer survivors who had social support after treatment experienced lower general stress. High social support and the resulting low stress had long lasting impact, correlating with more growth, positive change, and more appreciation in their life after treatment. In another study, Graham & Barnow (2013) found when support from a romantic partner was high, this helped buffer the effects of stress; as support increased, the effects experienced from stress lowered. Having a partner or someone who could offer active support helped with decreasing the effects of stress.

In addition to helping combat the experience one faces when exposed to stress, social support has also been found to have many benefits such as improved positive affect and higher reports of life satisfaction, which both positively relate to psychological well-being (Chao, 2012). Those who had social support, someone to rely on, felt better about themselves and were able to tackle the hardships they were facing. Adults who experienced childhood trauma and reported high social support had a lower risk of developing behavioral problems (Oh et al., 2019). Additionally, individuals who did not have beneficial buffers to combat the effects of chronic stress had more difficulty in maintaining positive psychological well-being and were overwhelmed by stress experiences making them unable to cope (Modie-Moroka, 2014), This suggests social support can have a positive impact on one's functioning and how one can overcome the struggles of childhood trauma.

Regarding college specifically and the stress college students typically experience (e.g. deadlines and time management), social support has benefit for college students experiencing stress. Despite whether the source of support was coming from family or friends, students who had social support available reported a reduction in stress and an increase in psychological well-

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being (Chao, 2012). In another study about support in the college classroom, support from peers increased students' satisfaction with their college experience, made them feel more accepted at their college, and gave the students a better mindset about the course they were taking (Gosnell, 2019). These findings suggest support from peers can impact one's attitudes towards their coursework and college experience.

A way that social support can be implemented in the laboratory setting to decrease stress reactivity and increase positive affect is using a confederate. The use of a confederate involves a member of the research team acting as a source of social support for the participant. One study found when the confederate gave comforting touches to the arm prior to the beginning of a stress test, there was an increase in perceived social support compared to when those in the no touch group (Lewis et al., 1997). Similarly, Lepore and colleagues (1993) reported participants who received words of encouragement or active social support from a confederate during a study stressor had lower blood pressure and higher perceived social support. By having a confederate act as social support source, there is the potential more students can cope more successfully with stressors.

Recently, institutions of higher education have reported a growing need for mental health and counseling services. In an interview with higher education administrators, some common themes reported to explain the increased need for counseling services included an increase in severe mental health problems reported by students and psychosocial changes to the student population (Watkins et al., 2011). Overall, college students are having increased needs for counseling on their campus due to typical challenges like anxiety and stress and more significant disorders like schizophrenia, Tourette's, and Asperger's (Mowbray et al., 2006; Watkins et al., 2011). A way institutions of higher education can address these problems is by using

interventions such as social support or coping skills training in mental health services/ counseling centers. These interventions reduce perceived stress experienced by undergraduate and graduate students (Yusufov et al., 2019), suggesting coping mechanisms have a positive impact on stress reactivity.

Specifically, regarding stress and stress-reactivity, social support may mitigate the interaction. Research on college students who received social support from friends suggests social support mitigates the relationship between stress and the psychological response of feeling alone. Participants who had greater support from friends experienced lower feelings of both stress and loneliness compared to those with low levels of support (Lee et al., 2019). When there is strong familial support, family social support mitigates both stress and depressive symptoms, and the support positively relates to the physical health of the individuals (Lee & Dik, 2016). Additionally, social support mitigates the relationship between stress and well-being in that college students who believe themselves to have higher social support experience less stress (Chao, 2012). These studies demonstrate that social support can serve as a mitigator for the relationship between stress and well-being. Having a person or group to rely on can help buffer both the physiological and psychological stress-reactivity.

Purpose of the Present Study

Social Support as a Mitigator

The experiment will investigate what impact social support has on participants when engaging in the stressful tasks. While we have established that childhood trauma influences stress, and that stress impacts well-being and social support mitigates the effect of stress, we are interested in whether social support uniquely mitigates both the perceived and actual stress-reactivity experienced when under stress for participants with childhood trauma. When victims

of childhood trauma experience stress, generally the person reports greater stress-reactivity and more negative affect when completing stress tasks (Chao, 2010; Cristobal-Naravaez,et al. 2016; Pierrehumbert et al., 2009; Wemm & Wulfert, 2017). We are proposing social support as a unique mitigator of stress and stress-reactivity in the population of college students who have experienced childhood trauma. The current study will assess how social support mitigates the impact of stress reactivity in adults who have experienced childhood trauma. This can provide a model for institutions of higher education to help students with a history of childhood trauma function more successfully in an academic setting.

Previous research has shown the benefits of social support and the effects it has on stress-reactivity. Several studies have found social support does help with stress reduction (Chao, 2012; Graham & Barnow, 2013; Lee et al., 2019; McDonough et al., 2014; Yusufov et al., 2019). Not only does it help with stress reduction, but social support is helping with overall physiological and psychological well-being. Both physiological measures of heartrate and cortisol and alpha-amylase and psychological outcomes of positive affect are associated with social support (Chao, 2012; Kong, 2015; Oh et al., 2019). Social support has been specifically shown to lower the levels of perceived stress and is associated with more positive mood and/or affect after stress (Gosnell, 2019; McDonough et al., 2014; Yusufov et al., 2019)

The current study will contribute to our knowledge of college-aged participants and how they cope with the stresses associated with higher education. Most previous research examining the association of trauma and stress-reactivity focuses primarily on older adults or young adults who are out of college (Dong et al., 2004; Felitti et al., 1998; Kalmakis & Chandler, 2013; Pierrehumbert et al., 2009), generally, ages 18-65. One purpose of the current study is to focus on the academic stress college students experience. This is an age group that needs to be looked

at further as the start of a variety of disorders, especially anxiety and depression, are more likely to be experienced as young people transition to independence and lose easy access to familial and long-stand peer support networks (Mowbray et al., 2006; Watkins et al., 2011). The current study will also contribute to our body of knowledge regarding men as previous studies focused primarily on women (Cristobal-Narvaez et al., 2016; Lee, et al., 2019; Pierrehumbert et al., 2009). Additionally, there will be a focus on childhood trauma instead of PTSD. Previous research focused primarily on PTSD as many veterans returned to school, but today universities are enrolling students with mental disorders previously not overtly present in the student population, and more students than ever are using medication to treat mental health conditions. In addition to new disorders, the severity of disorders is increasing as well (Watkins et al., 2011). Students are trying to deal effectively with the disorder itself all while experiencing new stressors such as due dates, attendance, time management, and organization challenges (Mowbray et al. 2006). Additionally, this is potentially the first time these young people have been on their own and they are faced with developing new ways of coping with the new stress. Because of these new challenges, contributing work on how social support acts as a mitigator for childhood trauma and stress-reactivity is an important area of research that needs to be more thoroughly explored.

The present study is examining the effect of social support on stress-reactivity in a population of individuals who have experienced childhood trauma. Based on previous research, we are focusing on social support as a mitigator of the relationship between childhood trauma and stress-reactivity. We hypothesize that social support will mitigate the effects of stress reactivity overall, such that college students who have a history of childhood trauma who have social support will have lower stress reactivity compared to college students with a history of

childhood trauma who do not have social support. Specifically, individuals with social support will have lower cortisol and alpha amylase response, lower heartrate, and more positive affect.

Method

Sample

Undergraduates enrolled at a mid-sized public Midwestern University were recruited for participation via SONA. Those who participated in the study needed to be 18 years or older. Forty-nine total people were recruited for the study. The final assigned sex sample consisted of 39 females (79.6%) and 10 males (20.4%). One participant identified their current gender as other (2.0%). For age, 12 participants were 18 (24.5%), 14 were 19 (28.6%), 6 were 21 (12.2%), 6 were 22 (12.2%), 2 were 23 (4.1%), 1 was 24 (2.0%), 3 were 25 (6.1%), 1 was 27 (2.0%), and 1 was 46 (2.0%). For year in school, 22 participants were freshman (44.9%), 10 were sophomores (20.4%), 5 were juniors (10.2%), 8 were seniors (16.3%), and 4 were other (8.2%). For ethnic group, 28 participants were white/Caucasian (57.1%) and 21 were minorities (42.9%). For marital status, 2 participants were married (4.1%), 21 were single (42.9%), 25 were dating (51.0%), and 1 was other (2.0%).

In the current study, the demographics were representative of the University population. According to the president's council on inclusive excellence, Fall 2020 enrollment by race/ethnicity showed 70% of students were white, 16% of students were black, and the remaining 14% of students encompassed Hispanics, Hawaiian or pacific islander, Asian, American Indian, and more (Office of Equity, Diversity and Inclusion, 2020). Additionally, the study was primarily composed of females which supports what is typically found in research, specifically research on childhood trauma (Cristobal-Narvaez et al., 2016; Lee, et al., 2019; Pierrehumbert et al., 2009). There was also a small range of ages falling between 18-27 with an

outlier at 46. This sample is representative as the focus of the study was looking at college-aged students with and without childhood trauma and their physiological and psychological responding to stressful activities and reflects current literature (Downey et al., 2017; Glaser et al., 2006; Kong et al., 2015; Kuras et al., 2016).

Instruments

Demographic Questionnaire. This form is designed to gather information on the participants. Information included items such as age, year in school, race/ethnicity, gender assigned at birth, current gender identity, marital status, family structure, and relation to social support (See Appendix A).

Trier Social Stress Test (TSST). The TSST (Kirschbaum et al., 1993) is a verbal and arithmetic task designed to induce stress in the lab setting. The verbal task is public speaking in which participants are asked to give a 3-minute speech as to why they are the most qualified for their dream job. They are given three minutes to prepare for the speech using writing notes and then must give a speech without the notes. The speech will be given in front of two researchers and subjects will be told it will be recorded for later analysis. The second portion of the test is mental math in which participants are to subtract 13 from 1022. Responses will be verbally spoken to the researchers, and the participants have 90 seconds to count backwards as far as they can. If participants make an error, they will be asked to start over at 1022. The scale has good validity as the TSST is eliciting cortisol responses and a change in heartrate by showing there is an increase in production of cortisol and an increase in heartrate after the completion of the TSST.

Abbreviated Profile of Mood States (POMS). The POMS scale (Grove & Prapavessis, 1992) is a 40-adjective measure of mood and affect. The scale measures distinct mood states

using seven subscales: tension, depression, fatigue, vigor, confusion, anger, and esteem-related affect. For the specific study, tension, depression, anger, and esteem-related affect will be measured. Participants respond on a Likert-scale from 0-4 with 0 meaning "not at all" to 4 meaning "extremely" to adjectives such as *"tense"*. The subscales have good reliability with a Cronbach's alpha ranging from 0.66 to 0.95 with a mean of 0.80. The scale has good validity as the subscales produced significant differences in mood. (See Appendix B).

Childhood Trauma Questionnaire (CTQ). The CTQ-short form (Bernstein et al., 1994) is a 28-question measure asking questions about experiences while growing up. The questionnaire is broken down into subscales detailing five types of maltreatment: emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect. Participants respond on a Likert scale from 1-5 with 1 being *"never true"* to 5 being *"very often true"*. An example of the question is *"When I was growing up, I didn't have enough to eat"*. High scores on the scale represent experiences that happened more often. The scale has high reliability with a Cronbach's alpha of .95. The scale also has high construct validity. (See Appendix C)

Hassles Scale. The Hassles scale (Kohn et al.,1990) is a 49-question measurement of items and how much this specific experience has been a part of one's life for the past month. Participants respond on a Likert-scale from 1-4 with 1 meaning *"not at all"* to 4 meaning *"very"*. An example of a question is *"conflicts with boyfriend's/girlfriend's/spouse's family"*. High scores on this measure means one's well-being can suffer and feel the effects of tension, anxiety, sadness, or fatigue. The scale has high reliability with a Cronbach's alpha of 0.94 Also, the scale has good validity. (See Appendix D).

Cortisol and Alpha Amylase. Salivary cortisol and alpha amylase (two indicators of the stress response) will be collected with Sarstedtâ cortisol salivettes and stored below freezing

before being shipped to Clemens Kirschbaum's research laboratory at the Technical University of Dresden to be assayed. This lab uses a time-resolved immunoassay with flurometric endpoint detection (for a review, see Dressendörfer, Kirschbaum, Rohde, Stahl, & Strasburger, 1992). The unit of measurement for the analyte is nmol/l. The IBL-International CLIA (i.e., international clinical laboratory certification) for cortisol and alpha amylase has very good performance characteristics (Miller, Plessow, Rauh, Gröschl, & Kirschbaum, 2013). Both the intra- and inter-assay coefficients of variation are below 5% and the lower sensitivity of the assay is 0.2 nmol/l. For my research, three samples will be collected per participant.

Concentration of alpha-amylase in saliva was measured by an enzyme kinetic method: Saliva was processed on a GenesisRSP8/150 liquid handling system(Tecan, Crailsheim, Germany). First, saliva was diluted 1:625 with double-distilled water by the liquid handling system. Twenty microliters of diluted saliva and standard were then transferred into standard transparent 96-well microplates (Roth, Karlsruhe, Germany). The standard was prepared from ''Calibrator f.a.s.'' solution (Roche Diagnostics,Mannheim, Germany) with concentrations of 326, 163, 81.5, 40.75, 20.38, 10.19, and 5.01 U/l alpha-amylase, respectively, and bidest water as zero standard. After that, 80 ml of substrate reagent (a-amylase EPS Sys; Roche Diagnostics, Mannheim, Germany) were pipetted into each well using a multichannel pipette. The microplate containing sample and substrate was then warmed to 37 degrees C by incubation in a waterbath for 90 s. Immediately afterward, a first interference measurement was obtained at a wavelength of 405 nm using a standard ELISA reader (Anthos Labtech HT2, Anthos, Krefeld, Germany). The plate was then incubated for another 5 min at 371C in the waterbath before a second measurement at 405 nm was taken. Increases in absorbance were calculated for unknowns and standards. Increases of absorbance of diluted samples were transformed to alpha-amylase

concentrations using a linear regression calculated for each microplate (Graphpad Prism 4.0c for MacOSX,Graphpad Software, San Diego, CA). The intra and interassay coefficients for amylase were below x% and x%. (Taken from: Rohleder et al. (2006), Psychophysiology 43:645-652)

Saliva samples were frozen and stored at -20 degrees C until analysis. After thawing, salivettes were centrifuged at 3,000 rpm for 5 min, which resulted in a clear supernatant of low viscosity. Salivary concentrations were measured using commercially available chemiluminescence immunoassay with high sensitivity (IBL International, Hamburg, Germany). The intra and inter assay coefficients for cortisol were below x% and x%.

Heartrate. Heartrate is measured using a Contec Pulse Oximeter edition CMS50D+. Participants will wear the device on the middle finger of their non-dominant hand to get a measurement of oxygen level and beats per minute. Heartrate change will be determined by subtracting baseline from maximum heartrate during the verbal and arithmetic task.

Design

The study compared measurements of people experiencing a mild stressor either with or without social support. Subjects arrived at a room with 2-3 people: 2 researchers in the “no social support” condition and 2 researchers and a confederate, in the “social support” condition. A researcher reviewed the informed consent with the participant and explained the study and risks and benefits of participating (See Appendix F). After consent was obtained, the participant provided the first saliva sample (baseline) and an oximeter was placed on the finger for heartrate measurement. The confederate, who was a predetermined member of the research team present during randomly assigned visits, was used to provide social support to the subject. During the social support condition, the confederate was introduced to the subject who was told the confederate was there to offer the subject support for the duration of the study. The researcher

then asked the participant to complete the first questionnaire, the POMs. This was a pretest or a baseline measurement to be compared with the posttest POMs taken at the end of the study.

After the subject completed the POMs, the subject engaged in the Trier Social Stress Test. If the subject had social support, the confederate was seated near the subject and gave social support in the form of words of encouragement (See Appendix G). After the TSST was complete, the confederate and researcher #2 left the room leaving only the participant and researcher #1.

At this time, the second saliva sample (Time1, post TSST) was administered to the participant by researcher #1. After the sample was taken, the participant completed the remaining questionnaires. The questionnaires were in a fixed order starting with POMS #2 then moving onto the demographic questionnaire, Hassles Scale, Social Provisions Scale, and Childhood Trauma Questionnaire. The questionnaires took roughly 20-30 minutes to complete. While the participant was filling out the questionnaires, a 15-minute timer was set to alert researcher #1 when to administer the third and final saliva sample (Time2, Recovery). Once the subject had completed the questionnaires, the researcher gave the subject a debriefing statement that discussed the true nature of the study (See Appendix H). The purpose of the study was acknowledged, the subject was thanked for their participation, and they were granted course-credit.

Data analysis was completed on descriptive statistics for all variables to check for potential outliers and no outliers were found. Demographics were correlated with variables of interest using a Pearson's *r* correlation coefficient or Spearman's rho as appropriate. Results suggested there were no significant correlations between demographics and predictor and outcome variables. Finally, the Daily Hassles Scale was used to measure potential confounds

that might account for both physiological and psychological reasons for elevated measures and no correlations were found.

Results

Correlations of the predictors with outcomes

To test the correlations between the predictors and outcomes, a Pearson's *r* correlation coefficient was calculated. Results indicated that there were no significant correlations between the predictors of childhood trauma, social support, and mood and the outcome variables cortisol, alpha amylase, and heartrate, suggesting childhood trauma and social support do not correlate with physiological or psychological outcomes overall.

Effect of Childhood Trauma

To test the hypothesis that individuals with childhood trauma will have a lower cortisol and alpha amylase response, lower heartrate, and more positive affect, a Pearson correlation coefficient was calculated. Childhood trauma was split by low and high levels of trauma based on previous research (Glasemer, 2016) stating a score of 10 or less on the Childhood Trauma Questionnaire indicated low levels of trauma. While results of the correlations showed no significant relationship between childhood trauma and alpha amylase, there was a significant relationship between childhood trauma and cortisol with participants with lower levels of childhood trauma experiencing a decrease in cortisol reactivity at Time 2, ($r(25) = -.51$, $p = .01$), Time 3, ($r(25) = -.40$, $p = .05$), and overall, ($r(25) = -.45$, $p = .02$). In addition, for the group with lower levels of trauma, there was no significant influence on heartrate at Time 1 (post verbal), but as the stressor progressed, there was a significant increase at Time 2 (post-math), and a marginal significance at Time 3 (recovery), ($r(16) = .48$, $p = .06$). Conversely, individuals with high levels of trauma showed no significant influence on cortisol, alpha amylase, or heartrate

overall (See Table 1). When testing the psychological impact on childhood trauma, positive mood was investigated. There was no significant influence on positive mood for individuals with low levels of trauma as well as high levels of trauma.

Effect of Childhood Trauma and Social Support on Reactivity

To test the hypothesis that individuals with social support will have lower cortisol and alpha amylase response, lower heartrate, and more positive affect, a Pearson's correlation coefficient was calculated. Overall, social support had no significant relationship with alpha amylase or cortisol, but did have a significant correlation with heartrate. Subjects with social support and higher levels of childhood trauma experienced a significant increase in heartrate at Time 2, ($r(13) = .67$, $p = .01$), and a marginally higher increase at recovery, ($r(13) = .51$, $p = .077$).

To determine if social support and childhood trauma together affected cortisol, a logistic regression path analysis was run (Hayes, 2017). There are no statistically significant differences in cortisol for those with low or high levels of childhood trauma ($p = .08$), but there are significant statistical differences in cortisol for those with and without social support ($p = .03$) (See Table 2). The results demonstrate that social support and childhood trauma interact to affect cortisol in that we have a statistically significant interaction at the $p = .05$ level (see Figure 1).

To determine if social support and childhood trauma together affected heartrate, a logistic regression path analysis was run (Hayes, 2017). There is a marginally significant difference in heartrate for those with low compared to high levels of childhood trauma ($p = .07$), and there is a statistically significant difference in heartrate for those with and without social support ($p = .01$) (see Table 3). The results demonstrate that social support and childhood trauma interact to affect heartrate in that we have a statistically significant interaction at the $p = .02$ level (see Figure 2).

Finally, we explored the effect of childhood trauma on positive mood. A logistic regression path analysis was run (Hayes, 2017). There is no significant difference in positive mood for those with and without social support, (p = .18) and with low and high levels of childhood trauma, (p = .49). The results also demonstrate no significant interaction between social support and childhood trauma to affect positive mood, (p = .35) (see Figure 3).

Discussion

When looking at the predictors and the outcomes, childhood trauma does not correlate with physiological or psychological measures of reactivity. Trauma and support do not impact positive mood, heartrate, cortisol or alpha amylase in the current study. This suggests that an individual with childhood trauma does not necessarily experience physiological and psychological responding unique from those without childhood trauma.

The predictor variable social support had little effect on cortisol and alpha amylase, but did significantly influence heartrate in individuals with high levels of trauma. The social support increased their heartrate which could possibly mean having the confederate present could increase the level of stress the individual is feeling during the TSST. Continuing, heartrate was influenced when social support or no social support was interacting with childhood trauma suggesting there is a mitigating effect occurring during the current study.

Results of positive mood and responding show that when an individual is provided social support, their physiological responding will not necessarily decrease (Lee et al., 2016; Lee et al.., 2019). Cortisol, alpha amylase, and heartrate were not correlated with a change in positive mood suggesting psychological responding is not influenced by the physiological changes. Additionally, responding was not influenced by the presence of social support or not.

When looking at the psychological responding or the change in mood from the pretest to posttest mood questionnaire, there was no significant change in positive mood. There was no difference in mood before or after the study stressor in both individuals with social support and no social support. This shows mood is not affected by the study stressor and is not affected by if social support is present or not.

An important note about the current study is lost data and a small sample size. Early heartrate data was lost for 14 subjects due to a technical computer problem resulting in the restarting of the laptop which thus wiped the data that was previously collected. Additionally, two cortisol samples and four alpha amylase samples were unable to be extracted for testing as there was not enough saliva present to be tested for cortisol levels. With missing data and the small sample size, the number of participants meet the criteria for the current study, but bring into question the contradictory lack of findings.

Our hypothesis was college students who have a history of childhood trauma who have social support will have lower stress reactivity compared to college students with a history of childhood trauma who do not have social support. Individuals with social support will have lower cortisol and alpha amylase response, lower heartrate, and more positive affect. In the current study, individuals with high levels of childhood trauma and no social support experienced a decrease in cortisol responding and those with low trauma showed no changes regardless of social support. This reflects the current research showing individuals who have a history of childhood trauma had no cortisol responding (Carpenter et al., 2011; Kuras et al., 2017; Seitz et al., 2019). One explanation of this finding would be blunted or muted responding in the individuals with high levels of childhood trauma. This means there is very little reaction to stressful circumstances and the responding is the opposite of what is typically expected. In the

current study, the expected cortisol responding was an increase in reactivity, but instead there was a decrease. A possible consequence for this type of blunted responding is the individual is immune to potentially stressful events because of their previous maltreatment in early life that results in a dampening in responding. This type of responding could hinder the individual's ability to respond to stress in a healthy and beneficial way.

Individuals with even low levels of childhood trauma without social support experienced a marginal increase in heartrate as the TSST progressed, suggesting the stressor impacted individuals with even a small history of trauma. More significantly, individuals with high levels of trauma and no social support had a higher increase in heartrate showing how important it is to have some form of social support. Their lack of support increased their stress responding. These results match the current literature showing childhood trauma is correlated with an increase in heartrate after a stressful event (Childs et al., 2010; Giles et al., 2014; Williamson et al., 2018). This means individuals who are experiencing high levels of trauma need to have constant social support. There needs to be an individual who can aid and support during stressful matters as there is an increase in stress responding. Social support can help individuals with childhood trauma build up resilience to stress and enable them to maintain positive physiological health. What does this mean for individuals with childhood trauma -

Furthermore, individuals with social support still experienced a significant increase in heartrate, but far less than those without. This suggests the positive impact of social support for those impacted by childhood trauma. In addition, individuals with low levels of childhood trauma still benefited from social support in terms of physiological responding (lower heart rate change), further demonstrating the importance of social support.

The results support an interaction occurring, with childhood trauma and social support influencing participants' responses. Childhood trauma on its own did not affect cortisol or heartrate responding significantly, but is marginally related to an increase in responding when there is an interaction with social support. Individuals with high levels of trauma were significantly affected by the study stressor in terms of an increase in cortisol and heartrate, but when given social support, their response was significantly less than those without social support. Conversely, social support mitigated the effects of cortisol and heartrate responding by itself and when combined with trauma. Social support decreased cortisol and heartrate changes, and made a more significant difference in the responding of those with trauma. These results help support the hypothesis that social support is mitigating the effects of the study stressor and support the current literature stating active social support, such as the words of encouragement used in the present study, can decrease physiological responding (Chao, 2010; Drouin et al., 2018; Teoh et al., 2009) (See Table 4).

One potential reason there were no significant results for alpha amylase could be because alpha amylase is pivotal in gustatory responding, such as enzyme breakdown, and aids in the digestion of foods (Nater et al., 2004). Since alpha amylase breaks down enzymes in a continual process, not finding significant results could be explained by this reasoning of being an ongoing response that can happen at any time and may not necessarily be triggered during stressful events. Further, the study stressor was short in the current study so the limited amount of time the participant was stressed could have been a factor into no results. A longer amount of stress may impact the alpha amylase levels and create a significant result for future studies.

Based on the results of the study and the relationship between social support and physiological responding, universities should be paying more attention to incoming freshman

who report a history of trauma as the academic setting could be a trigger for increased physiological responding. These individuals should be given social support to help guide them throughout their four years at university. An individual with a history of childhood trauma who had social support showed a difference in his/her cortisol and heartrate responding with social support decreasing their stress response. By allowing for social support, the transition into college would become easier regarding physiological responding when there is someone for these individuals to reach out to. Previous literature has found there is an increase in mental health conditions in college students and suggests there needs to be changes made to the facilities and services on college campuses that can provide support to students (Mowbray et al., 2006; Watkins et al., 2011). Understanding how stress reactivity is impacted by social support gives universities another tool to help college students to be better equipped to handle stress and get the social support that will help them respond more effectively to the stress of college.

Further examination of the findings suggests the TSST was a good measure of stress. There were significant results in terms of physiological responding for those with higher levels of childhood trauma. Higher levels of trauma in childhood are correlated with an increase in heartrate during academic challenges such as math or speeches when presented with no social support. Additionally, individuals with low levels of trauma were impacted by the TSST as there was a marginal increase in heartrate for those without social support. The study results suggest social support mitigates this stress response, potentially reducing the impact of stress on the individual.

For future research, there should be further investigation of sex differences between males and females, as females have dominated the childhood trauma literature. By having a focus on male participants, research can be expanded to more clearly explain how childhood

trauma can impact stress reactivity in males during college. Analyses of male and female differences in the current study were not possible as the male sample was quite small.

Further investigation can be completed to see if alpha amylase may respond in a variety of settings to see if it produces a significant result. Alpha amylase shows benefits to responding with digestion and glucose and starch breakdown to provide energy to the body. Longer-term stressors may require more energy to cope with the stressor and result in changes in alpha amylase responding.

The last topic that should be addressed in further research is increasing the sample size. The small sample size in the current study did limit some statistical testing that could be run as well as being more representative of the population. Although the sample represented the study population, the ability to generalize the results to the public is limited. Increasing the sample size may allow for further testing and allow for greater generalizability.

Overall, the current study provided useful information on how the variables of childhood trauma and social support can predict physiological and psychological stress response. The current study suggests academic institutions should provide social support to help mitigate the effects of stress reactivity, specifically academic stress, in college students who have experienced higher levels of childhood trauma.

References

Arnsten, A. F. T. (2009). Stress signaling pathways that impair prefrontal cortex structure and function. *Nature Reviews Neuroscience, 10*(6), 410-422. doi: 10.1038/nrn2648

Barnyard, V. L., & Cantor, E. N. (2004). Adjustment to college among trauma survivors: An exploratory study of resilience. *Journal of College Development, 45*(2), 207-221. doi: 10.1353/csd.2004.0017

Becker, G. S. (1993). Nobel lecture: The economic way of looking at behavior. *Journal of Political Economy*, *101*(3), 385–409. doi:

Berger, L. M. (2005). Income, family characteristics, and physical violence toward children. *Child Abuse & Neglect, 29*(2), 107-133. doi: 10.1016/j.chiabu.2004.02.006

Bernstein, D. P., Fink, L., Handelsman, L., Foote, J., Lovejoy, M., Wenzel, K., Sapareto, E., & Ruggiero, J. (1994). Initial reliability and validity of a new retrospective measure of child abuse and neglect. *The American Journal of Psychiatry, 151*(8), 1132-1136. doi: 10.1176/ajp.151.8.1132

Boyraz, G., Horne, S. G., Owens, A. C., & Armstrong, A. P. (2013). Academic achievement and college persistence of African American students with trauma exposure. *Journal of Counseling Psychology, 60*(4), 582-592. doi: 10.1037/a0033672

Carpenter, L. L., Shattuck, T. T., Tyrka, A. R., Geracioti, T. D., & Price, L. H. (2011). Effect of childhood physical abuse on cortisol stress response. *Psychopharmacology, 214*(1), 367-375. doi: 10.1007/s00213-010-2007-4

Centers for Disease Control and Prevention. (2011). *Adverse Childhood Experiences.* Retrieved from https://www.cdc.gov/violenceprevention/childabuseandneglect/acestudy/index.html

Chao, R. C. L. (2010). Managing stress and maintaining well-being: Social support, problem-focused coping, and avoidant coping. *Journal of Counseling and Development, 89*(3), 338-348. doi: 10.1002/j.1556-6678.2011.tb00098.x

Chao, R. C. L. (2012). Managing perceived stress among college students: The roles of social support and dysfunctional coping. *Journal of College Counseling, 15*(1)*,* 5-21. doi: 10.1002/j.2161-1882.2012.00002.x

Childs, E., Dlugos, A., & De Wit, H. (2010). Cardiovascular, hormonal, and emotional responses to the TSST in relation to sex and menstrual cycle phase. *Psychophysiology, 47*(), 550-559. doi: 10.1111/j.1469-8986.2009.00961.x

Cloitre, M., Khan, C., Mackintosh, M. A., Garvert, D. W., Henn-Haase, C. M., Falvey, E. C., & Saito, J. (2019). Emotion regulation mediates the relationship between ACES and physical and mental health. *Psychological Trauma: Research, Practice, and Policy, 11*(1), 82-89. doi: 10.1037/tra0000374

Cristobal-Narvaez, P., Sheinbaum, T., Ballespi, S., Mitjavila, M., Myin-Germeys, I., Kwapil, T. R., & Barrantes-Vidal, N. (2016). Impact of adverse childhood experiences on psychotic-like symptoms and stress reactivity in daily life in nonclinical young adults. *PLoS One, 11*(4), 1-15. doi: 10.1371/journal.pone.0153557

Deschenes, S. S., Graham, E., Kivimaki, M., & Schmitz, N. (2018). Adverse childhood experiences and the risk of diabetes: Examining the roles of depressive symptoms and cardiometabolic dysregulations in the Whitehall II cohort study. *Diabetes Care, 41*, 2120-2126. https://doi.org/10.2337/dc18-0932

Dong, M., Anda, R. F., Felitti, V. J., Dube, S. R., Williamson, D. F., Thompson, T. J., Loo, C. M., & Giles, W. H. (2004). The interrelatedness of multiple forms of childhood abuse, neglect, and household dysfunction. *Child Abuse and Neglect, 28*(7), 771-784. doi: 10.1016/j.chiabu.2004.01.008

Downey, J. C., Gudmunson, C. G., Pang, Y. C., & Lee, K. (2017). Adverse childhood experiences affect health risk behaviors and chronic health in Iowans. *Journal of Family Violence, 32*(6)*,* 557-564. doi: 10.1007/s10896-017-9909-4

Dressendorfer, R. A., Kirschbaum, C., Rohde, W., Stahl, F., & Strasburger, C. J. (1992). Synthesis of a cortisol-biotin conjugate and evaluation as a tracer in an immunoassay for salivary cortisol measurement. Journal of Steroid Biochemistry and Molecular Biology, 43, 683-692

Drouin, M., Reining, L., Flanagan, M., Carpenter, M., & Toscos, T. (2018). College students in distress: Can social media be a source of social support? *College Student Journal, 52*(4), 494-504. doi: 10.1037/t06168-000

Elzinga, B. M., Schmahl, C. G., Vermetten, E., van Dyck, R., & Bremner, J. D. (2003). Higher cortisol levels following exposure to traumatic reminders in abuse-related PTSD. *Neuropsychopharmocology, 28*(9), 1656-1665. doi: 10.1038/sj.npp.1300226

Fallahi, M., Motamedzade, M., Heidarimoghadam, R., Soltanian, A. R., & Miyake, S. (2016). Effects of mental workload on physiological and subjective responses during traffic density monitoring: A field study. *Applied Ergonomics, 52*, 95-103. doi: 10.1016/j.apergo.2015.07.009

Faravelli, C., Mansueto, G., Palmieri, S., Lo Sauro, C., Rotella, F., Pietrini, F., & Fioravanti, G. (2017). Childhood adversity, cortisol levels, and psychosis: A retrospective investigation. *The Journal of Nervous and Mental Disease, 205*(7), 574-579. doi: 10.1097/NMD.0000000000000699

Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., Koss, M. P., & Marks, J. S. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The Adverse Childhood Experiences (ACE) Study. *American Journal of Preventive Medicine, 14*(4), 245-258. doi: 10.1016/s0749-3797(98)00017-8

Gilbert R, Widom C. S., Browne K., Fergusson D., & Webb E., & Janson, S. (2009) Burden and consequences of child maltreatment in high-income countries. *Lancet, 373,* 68–81. doi: 10.1016/s0140-6736(08)61706-7

Giles, G. E., Mahoney, C. R., Brunye, T. T., Taylor, H. A., & Kanarek, R. B. (2014). Autonomic response: Comparison of three psychosocial stress paradigms. *PLoS One, 9*(12), 1-19. doi: 10.1371/journal.pone.0113618

Glaesmer, H. (2016). Assessing childhood maltreatment on the population level in Germany: Findings and methodological challenges. *Child and Adolescent Psychiatry and Mental Health, 10*(15). doi: 10.1186/s13034-016-0104-9

Glaser, J. P., van Os., J., Portegijs, P. J. M., Myin-Germeys, I. (2006). Childhood trauma and emotional reactivity to daily life stress in adult frequent attenders of general practitioners. *Journal of Psychosomatic Research, 61*, 229-236. doi: 10.1016/j.jpsychores.2006.04.014

3

Gosnell, C. L. (2019). Receiving quality positive event support from peers may enhance student connection and the learning environment. *Scholarship of Teaching and Learning in Psychology.* doi: http://dx.doi.org/10.1037/stl0000178

Graham, J. M., & Barnow, Z. B. (2013). Stress and social support in gay, lesbian, and heterosexual couples: Direct effects and buffering models. *Journal of Family Psychology, 27*(4), 569-578. doi: 10.1037/a0033420

Grove, J. R., & Prapavessis, H. (1992). Preliminary evidence for the reliability and validity of an abbreviated profile of mood states. *International Journal of Sport Psychology, 23,* 93-109.

Hayes, A. (2017). Introduction to mediation, moderation, and conditional process analysis.

Heinzelmann, M., & Gill, J. (2013). Epigenetic mechanisms shape the biological response to trauma and risk for PTSD: A critical review. *Nursing and Research Practice, 2013.* doi: 10.1155/2013/417010

Horner, G. (2015). Childhood trauma exposure and toxic stress: What the PNP needs to know. *Journal of Pediatric Health Care, 29*(2), 191-198. doi: 10.1016/j.pedhc.2014.09.006

Huang, C. J., Webb, H. E., Zourdos, M. C., & Acevedo, E. O. (2013). Cardiovascular reactivity, stress, and physical activity. *Frontiers in Physiology, 4*(314), 1-13. doi: 10.3389/phys.2013.00314

Kalmakis, K. A., & Chandler, G. E. (2013). Adverse childhood experiences: Towards a clear conceptual meaning. *Journal of Advanced Nursing, 70*(7), 1489-1501. doi: 10.1111/jan.12329

Karatekin, C. (2017). Adverse childhood experience (ACEs), stress and mental health in college students. *Stress and Health, 34*(1)*,* 36-45. doi:10.1002/smi.2761

Kirschbaum, C., Pirke, K.M., & Hellhammer, D. H. (1993). The 'Trier Social Stress Test'-A tool for investigating psychobiological stress response in a laboratory setting. *Neuropsychobiology, 28*, 76-81. doi: 10.1159/000119004

Kohn, P. M., Lafreniere, K., & Gurevich, M. (1990). The inventory of college students' recent life experiences: A decontaminated hassles scale for a special population. *Journal of Behavioral Medicine, 13*(6), 619-630. doi: 10.1007/bf00844738

Kong, F., Ding, K., & Zhao, J. (2015). The relationships among gratitude, self-esteem, social support, and life satisfaction among undergraduate students. *Journal of Happiness Studies, 16*(2), 477-489. doi: 10.1007/s10902-014-9519-2

Kuras, Y. I., McInnis, C. M., Thoma, M. V., Chen, X., Hanlin, L., Gianferante, D., & Rohleder, N. (2016). Increased alpha-amylase response to an acute psychosocial stress challenge in healthy adults with childhood adversity. *Developmental Psychobiology, 59*, 91-98. doi:10.1002/dev.21470

Kuras, Y. I., Assaf, N., Thoma, M. V., Gianferante, D., Hanlin, L., Chen, S., Fiksdal, A., & Rohleder, N. (2017). Blunted diurnal cortisol activity in healthy adults with childhood adversity. *Frontiers in Human Neuroscience, 11*(574). doi: 10.3389/fnhum.2017.00574

Lee, C. S., Anderson, J. R., & Klimes-Dougan, B. (2016). Potentially traumatic experiences, academic performance, and psychological distress: The role of shame. *Journal of Counseling and Development, 94*(1)*,* 41-50. doi:10.1002/jcad.12060

Lee, C. S., & Dik, B. J., (2016). Associations among stress, gender, sources of social support and health in emerging adults. *Stress and Health, 33*(4)*,* 378-388. doi: 10.1002/smi.2722

Lee, C. S., Goldstein, S. E., Dik, B. J., & Rodas, J. M. (2019). Sources of social support and gender in perceived stress and individual adjustment among Latina/o college-attending emerging adults. *Cultural Diversity and Ethnic Minority Psychology.* doi: 10.1037/cdp0000279

Lepore, S. J., Allen, K. A. M., & Evans, G. W. (1993). Social support lowers cardiovascular reactivity to an acute stressor. *Psychosomatic Medicine, 55*(6)*,* 518-524. doi: 10.1097/00006842-199311000-00007

Lewis, R. J., Derlega, V. J., Shankar, A., Cochard, E., & Finkel, L. (1997). Nonverbal correlates of confederate's touch: Confounds in touch research. *Journal of Social Behavior and Personality, 12*(3), 821-830. doi:

MacMilan, H. L., Jamieson, E., Walsh, C. A. (2003). Reported contact with child protection services among those reporting child physical and sexual abuse; Results from a community survey. *Child Abuse & Neglect, 27*, 1397-1408. doi: 10.1016/j.chiabu.2003.06.003

McDonough, M. H., Sabiston, C. M., & Wrosch, C. (2014). Predicting changes in posttraumatic growth and subjective well-being among breast cancer survivors: The role of social support and stress. *Psycho-oncology, 23*(1), 114-120. doi: 10.1002/pon.3380

McLaughlin, K. A., Sheridan, M. A., Alves, S., & Mendes, W. B. (2014). Child maltreatment and autonomic nervous system reactivity: Identifying dysregulated stress reactivity patterns using the biopsychosocial model of challenge and threat. *Psychosomatic Medicine, 76*(7), 538-546. doi: 10.1097/PSY.0000000000000098

Miller, R., Plessow, F., Rauh, M., Groschl, M., & Kirschbaum, C. (2013). Comparison of salivary cortisol as measured by different immunoassays and tandem mass spectrometry. Psychoneuroendocrinology, 38, 50–57

Modie-Moroka, T. (2014). Stress, social relationships and health outcomes in low-income Francistown, Botswana. *Social Psychiatry and Psychiatric Epidemiology, 49*(8), 1269-1277. doi: 10.1007/s00127-013-0806-8

Monroe, S. M. (2008). Modern approaches to conceptualizing and measuring human life stress. *Annual Review of Clinical Psychology, 4*(1). 33-52. doi: 10.1146/annurev.clinpsy.4.022007.141207

Mowbray, C. T., Megivern, D., Mandiberg, J. M., Strauss, S., Stein, C. H., Collins, K., Kopels, S., Curlin, C., & Lett, R. (2006). Campus mental health services: Recommendations for change. *American Journal of Orthopsychiatry, 76*(2), 226-237. doi: 10.1037/0002-9432.76.2.226

Nater, U. M., Rohleder, N., Gaab, J., Berger, S., Jud, A., Kirschbaum, C., & Ehlert, U. (2004). Human salivary alpha-amylase reactivity in a psychosocial stress paradigm. *International Journal of Psychophysiology, 55*. doi: 10.1016/j.ijpsycho.2004.09.009

Oh, A., Han, M., Choi, Y., Lau, S., & Shum, M. S. W. (2019). Exploring relationship among child maltreatment experience in childhood and behavior problems as young adults: Role of social support among college students in Hong Kong. *International Social Work, 62*(2), 1011-1024. doi: 10.1177/0020872818762718

Office of Equity, Diversity, and Inclusion (2020). President's council on inclusive excellence annual report.

Olver, J. S., Pinney, M., Maruff, P., & Norman, T. R. (2015). Impairments of spatial working memory and attention following acute psychosocial stress. *Stress & Health, 31*(2), 115-123. doi: 10.1002/smi.2533

Petrakova, L., Doering, B. K., Vits, S., Engler, H., Rief, W., Schedlowski, M., & Grigoleit, J. S. (2015). Psychosocial stress increases salivary alpha-amylase activity independently from plasma noradrenaline levels. *PLoS ONE, 10*(8), 1-9. doi: 10.1371/journal.pone.0134561

Pierrehumbert, B., Torrisi, R., Glatz, N., Dimitrova, N., Heinrichs, M., & Halfon, O. (2009). The influence of attachment on perceived stress and cortisol response to acute stress in women sexually abused in childhood or adolescence. *Psychoneuroendocrinology, 34*(6), 924-938. doi: 10.1016/j.psyneuen.2009.01.006

Rasmussen, I. S., Arefjord, K., Winje, D., Dovran, A. (2018). Childhood maltreatment trauma: A comparison between patients in treatment for substance use disorders and patients in mental health treatment. *European Journal of Psychotraumatology, 9*(1). doi: 10.1080/20008198.2018.1492835

Rohleder, N., Wolf, J. M., Maldonado, E. F., & Kirschbaum, C. (2006). The psychosocial stress-induced increase in salivary alpha-amylase is independent of saliva flow rate. Psychophysiology, 43, 645-652

Seitz, R., Vracotas, N., Bechard-Evans, L., King, S., Abadi, S., Joober, R., Shah, J. L., Malla, A. K., & Pruessner, M. (2019). The Trier Social Stress Test in first episode psychosis patients: Impact of perceived stress, protective factors and childhood trauma. *Psychoneuroendocrinology , 105*, 155-163. doi: 10.1016/j.psyneuen.2019.01.010

Shin, L. M., & Liberzon, I. (2010). The neurocircuitry of fear, stress and anxiety disorders. *Neuropsychopharmacology, 35*(1), 169-191. doi: 10.1038/npp.2009.104

Teoh, A. N., Chia, M. S. C., & Mohanraj, V. (2009). The comparison between active and passive types of social support: The emotional response. *Journal of Applied Biobehavioral Research, 14*(2), 90-102. doi: 10.1111/j.1751-9861.2009.00042.x

Thoma, M. V., La Marca, R., Bronnimann, R., Finkel, L., Ehlert, U., & Nater, U. M. (2013). The effect of music on the human stress response. *PLoS One, 8*(8). doi: 10.1371/journal.pone.0070156

Villada, C., Hidalgo, V., Almela, M., & Salvador, A. (2014). Individual differences in the psychobiological response to psychosocial stress (Trier Social Stress Test): The relevance of trait anxiety and coping styles.

Wass, S. V., Barbaro, K., Clackson, K., & Leong, V. (2018). New meanings of thin-skinned: The contrasting attentional profiles of typical 12-month-olds who show high, and low, stress reactivity. *Developmental Psychology, 54*(5), 816-828. doi: https://doi.org/10.1037/dev0000428

Watkins, D. C., Hunt, J. B., & Eisenberg, D. (2011). Increased demand for mental health services on college campuses: Perspective from administrators. *Qualitative Social Work, 11*(3), 319-337. doi: 10.1177/1473325011401468

Wemm, S. E., & Wulfert, E. (2017). Effects of acute stress on decision making. *Applied Psychophysiology Biofeedback, 42*(1), 1-12. doi: 10.1007/s10484-016-9347-8

Williamson, T. J., Thomas, K. S., Eisenberger, N. I., & Stanton, A. L. (2018). Effects of Social Exclusion on Cardiovascular and Affective Reactivity to Socially Evaluative Stressor. *International Journal of Behavioral Medicine, 25*(4), 410-420. doi: 10.1007/s12529-9720-5

Wong, C. F., Schrager, S. M., Holloway, I. W., Meyer, I. H., & Kipke, M. D. (2013). Minority stress experiences and psychological well-being: The impact of support from and connection to social networks from within the Los Angeles House and Ball communities. *Prevention Science, 15*(), 44-55. doi: 10.1007/s11121-012-0348-4

Yusufov, M., Nicoloro-SantaBarbara, J., Grey, N. E., Moyer, A., & Lobel, M. (2019). Meta-analytic evaluation of stress reduction interventions for undergraduate and graduate students. *International Journal of Stress Management, 26*(2), 132-145. doi: 10.1037/str0000099

Appendix A
Demographic Questionnaire

1. What is your age? _____ years (must be 18 or older)
2. Please indicate your year in school:
a.) Freshman
b.) Sophomore
c.) Junior
d.) Senior
e.) Other (please specify) _____

3. Which of the following race or ethnic categories describes you best?
a.) White/Caucasian
b.) Hispanic/Latinx
c.) Asian/Asian American
d.) Black/African American
e.) Native American/American Indian
f.) Middle Eastern
g.) Multiracial (please specify) _____
h.) Other (please specify) _____

4. What sex were you assigned at birth?
a). Female
b). Male

5. What is your current gender identity?
a.) Female
b.) Male
c.) Transgender
d.) Genderqueer, neither exclusively male nor female
e.) Other (please specify) _____

6. What is marital status?
a.) Married
b.) Divorced
c.) Single
d.) Dating
e.) Other (please specify) _____

7.) What was your family structure during the majority of your childhood?
a.) Parents married
b.) Parents divorced (specify which parent you lived with primarily) _____
c.) Single parent household
d.) Grandparents
e.) Other (please specify) _____

8.) How would you classify yourself in terms of religious faith or spirituality?
a.) Atheist
b.) Buddhist
c.) Hindu
d.) Jehovah's Witness
e.) Jewish
f.) LDS
g.) Muslim
h.) New Age
i.) Lutheran
j.) Roman Catholic
k.) Episcopalian
l.) Methodist
m.) Presbyterian
n.) Christian
o.) Baptist
p.) Pentecostal
q.) Adventist
r.) Taoist
s.) Unitarian
t.) Other or none of the above

Appendix B
Profile of Mood States Questionnaire (POMS)

Below is a list of words that describe feelings people have. Circle the number that best describes how you feel *right now*. Please rate on a scale from 0-5 with 0 being "not at all" to 5 being "extremely".

0	1	2	3	4
Not at all	A little	Moderately	Quite a lot	Extremely

1. Tense
   0 1 2 3 4

2. Angry
   0 1 2 3 4

3. Worn out
   0 1 2 3 4

4. Unhappy
   0 1 2 3 4

5. Proud
   0 1 2 3 4

6. Lively
   0 1 2 3 4

7. Confused
   0 1 2 3 4

8. Sad
   0 1 2 3 4

9. Active
   0 1 2 3 4

10. On-edge
    0 1 2 3 4

11. Grouchy
    0 1 2 3 4

12. Ashamed
    0 1 2 3 4

13. Energetic
0 1 2 3 4

14. Hopeless
0 1 2 3 4

15. Uneasy
0 1 2 3 4

16. Restless
0 1 2 3 4

17. Unable to concentrate
0 1 2 3 4

18. Fatigued
0 1 2 3 4

19. Competent
0 1 2 3 4

20. Annoyed
0 1 2 3 4

21. Discouraged
0 1 2 3 4

22. Resentful
0 1 2 3 4

23. Nervous
0 1 2 3 4

24. Miserable
0 1 2 3 4

25. Confident
0 1 2 3 4

26. Bitter
0 1 2 3 4

27. Exhausted
0 1 2 3 4

28. Anxious
0 1 2 3 4

29. Helpless
0 1 2 3 4

30. Weary
0 1 2 3 4

31. Satisfied
0 1 2 3 4

32. Bewildered
0 1 2 3 4

33. Furious
0 1 2 3 4

34. Full of pep
0 1 2 3 4

35. Worthless
0 1 2 3 4

36. Forgetful
0 1 2 3 4

37. Vigorous
0 1 2 3 4

38. Uncertain about things
0 1 2 3 4

39. Bushed
0 1 2 3 4

40. Embarrassed
0 1 2 3 4

5

Appendix C
Childhood Trauma Questionnaire (CTQ)

These questions ask about some of your experiences growing up as a child and a teenager. For each question, circle the number that best describes how you feel on a Likert scale from 1-5 with 1 meaning "never true" to 5 meaning "very often true". Although some of these questions are of a personal nature, please try to answer as honestly as you can. Your answers will be kept confidential.

1	2	3	4	5
Never true	Rarely true	Sometimes true	Often true	Very often true

When I was growing up, …

1. I didn't have enough to eat
   1 2 3 4 5

2. I knew that there was someone to take care of me and protect me
   1 2 3 4 5

3. People in my family called me things like "stupid", "lazy", or "ugly"
   1 2 3 4 5

4. My parents were too drunk or high to take care of the family
   1 2 3 4 5

5. There was someone in my family who helped me feel important or special
   1 2 3 4 5

When I was growing up, …

6. I had to wear dirty clothes
   1 2 3 4 5

7. I felt loved
   1 2 3 4 5

8. I thought that my parents wished I had never been born
   1 2 3 4 5

9. I got hit so hard by someone in my family that I had to see a doctor or go to the hospital
   1 2 3 4 5

10. There was nothing I wanted to change about my family
    1 2 3 4 5

CHILDHOOD TRAUMA QUESTIONNAIRE (CTQ)

When I was growing up, …

11. People in my family hit me so hard that it left me with bruises or marks

1 2 3 4 5

12. I was punished with a belt, a board, a cord (or some other hard object)

1 2 3 4 5

13. People in my family looked out for each other

1 2 3 4 5

14. People in my family said hurtful or insulting things to me

1 2 3 4 5

15. I believe that I was physically abused

1 2 3 4 5

When I was growing up, …

16. I had the perfect childhood

1 2 3 4 5

17. I got hit or beaten so badly that it was noticed by someone like a teacher, neighbor, or doctor

1 2 3 4 5

18. Someone in my family hated me

1 2 3 4 5

19. People in my family felt close to each other

1 2 3 4 5

20. Someone tried to touch me in a sexual way or tired to make me touch them

1 2 3 4 5

When I was growing up, …

21. Someone threatened to hurt me or tell lies about me unless I did something sexual with them

1 2 3 4 5

22. I had the best family in the world

1 2 3 4 5

CHILDHOOD TRAUMA QUESTIONNAIRE (CTQ)

23. Someone tried to make me do sexual things or watch sexual things

1 2 3 4 5

24. Someone molested me (took advantage of me sexually)

1 2 3 4 5

25. I believe that I was emotionally abused

1 2 3 4 5

When I was growing up, …

26. There was someone to take me to the doctor if I needed it

1 2 3 4 5

27. I believe that I was sexually abused

1 2 3 4 5

28. My family was a source of strength and support

1 2 3 4 5

Appendix D

Hassles Scale

Using one of the response choices listed, indicate for each experience how much it has been a part of your life *over the past month*. For each question, circle the number that best describes much this hassle has been a part of your life with 1 being "not at all" to 4 being "very much"

1	2	3	4
Not at all	Only slightly	Distinctly	Very much

1. Conflicts with boyfriend's/girlfriend's/spouse's family

   1 2 3 4

2. Being let down or disappointed by friends

   1 2 3 4

3. Conflict with professor(s)/instructor(s)

   1 2 3 4

4. Social rejections

   1 2 3 4

5. Too many things to do at once

   1 2 3 4

6. Being taken for granted

   1 2 3 4

7. Financial conflicts with family members

   1 2 3 4

8. Having your trust betrayed by a friend

   1 2 3 4

9. Separation from people you care about

   1 2 3 4

10. Having your contributions overlooked

    1 2 3 4

11. Struggling to meet your own academic standards

    1 2 3 4

12. Being taken advantage of

    1 2 3 4

13. Not enough leisure time

    1 2 3 4

14. Struggling to meet the academic standards of others

    1 2 3 4

15. A lot of responsibilities

    1 2 3 4

16. Dissatisfaction with school

    1 2 3 4

17. Decisions about intimate relationship(s)

    1 2 3 4

18. Not enough time to meet your obligations

    1 2 3 4

19. Dissatisfaction with your mathematical ability

    1 2 3 4

20. Important decisions about your future career

    1 2 3 4

21. Financial burdens

1 2 3 4

22. Dissatisfaction with your reading ability

1 2 3 4

23. Important decisions about your education

1 2 3 4

24. Loneliness

1 2 3 4

25. Lower grades than you hoped for

1 2 3 4

26. Conflict with teaching assistant(s)

1 2 3 4

27. Not enough time for sleep

1 2 3 4

28. Conflicts with your family

1 2 3 4

29. Heavy demands from extracurricular activities

1 2 3 4

30. Finding courses too demanding

1 2 3 4

31. Conflicts with friends

1 2 3 4

32. Hard effort to get ahead

1 2 3 4

33. Poor health of a friend

1 2 3 4

34. Disliking your studies

1 2 3 4

35. Getting “ripped off” or cheated in the purchase of services

1 2 3 4

36. Social conflicts over smoking

1 2 3 4

37. Difficulties with transportation

1 2 3 4

38. Disliking fellow student(s)

1 2 3 4

39. Conflicts with boyfriend/girlfriend/spouse

1 2 3 4

40. Dissatisfaction with your ability at written expression

1 2 3 4

41. Interruptions of your schoolwork

1 2 3 4

42. Social isolation

1 2 3 4

43. Long waits to get service (e.g., at banks or stores)

1 2 3 4

44. Being ignored

1 2 3 4

45. Dissatisfaction with your physical appearance

1 2 3 4

46. Finding course(s) uninteresting

1 2 3 4

47. Gossip concerning someone you care about

1 2 3 4

48. Failing to get expected job

1 2 3 4

49. Dissatisfaction with your athletic skills

1 2 3 4

Appendix E
Informed Consent

You are being asked to participate in a research study. This study aims to investigate the associations between adverse childhood experiences, stress reactivity, and social support of college students. This document will help you decide if you want to participate in this research by providing information about the study and what you are asked to do. You will be asked to complete questionnaires about your experience with adverse childhood experiences, stress reactivity, and social support. Additionally, you will provide physiological samples consisting of heartrate and saliva samples, to measure stress reactivity.

One reason you might want to participate in this research is that you will be able to share your experiences about with adverse childhood experiences as many people experience some form of trauma. We are interested in your participation even if you do not feel you have experienced any adverse childhood experiences. Additionally, information about your experiences with social support and the stressors you may experience today, and the impact of adverse childhood experiences on your coping can help psychologists aid, maintain, and/or improve the psychological well-being of individuals with adverse childhood experiences. In addition, another reason you may want to participate in this study is that you might learn more about your past and current experiences as a result of any adverse childhood experiences and how those experiences have influenced or may influence your psychological well-being. One reason you may not want to participate in this research includes distress you may feel when recalling past experiences from your childhood which may be difficult and/or painful.

This study asks you to agree to completing questionnaires regarding our variables of interest as well as providing three saliva samples and a measure of heartrate. Since this study is experimental, you may or may not be provided with social support from a member of the research team as this is a variable of interest in our study examining whether or not social support impacts stress levels in college students. Agreement to participation involves having had no food or drink consumption including caffeine and not having exercised in the last hour. After agreeing to participate, you will then complete a variety of questionnaires related to background characteristics (e.g., age, gender identity, sexual orientation, religious affiliation, race/ethnicity, and attachment), childhood trauma, adverse childhood experiences, stress scales, and perceived social support. Additionally, you will provide saliva samples and a measure of heartrate. Completion of the surveys should take about 30 minutes. The entire study will take about an hour. To participate in this study, you must be at least 18 years old. You have been asked to participate in this research because you are a current student at Indiana State University.

The choice to participate or not is yours; participation is entirely voluntary. You can decline provide physiological measures and complete questionnaires or you may withdraw at any time. If you decide not to participate, to decline some activities, or withdraw, you will not lose any benefits which you may otherwise be entitled to receive.

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Every effort will be made to protect your confidentiality through the use of anonymous results. No identifying information will be obtained on the surveys, such as name, student identification number, birth date, or other personal identification. All data will be stored on a password protected computer hard drive and thumb drive and only the researchers will have access to the data.

There are some potential risks to this study. These include the possibility that you may experience some mild stress and anxiety when completing some of the questions due to recalling your own adversities and stress. For example, some of the items ask about prior negative experiences you may have encountered in your childhood or any post-traumatic stress experienced recently. An additional risk is that anonymity cannot be guaranteed. Every precaution has been taken to reduce the risk, and risks of participation are minimal and not expected to be greater than what you encounter in everyday activities.

It is unlikely that you will benefit directly by participating in this study, but the research may allow you to learn about scientific psychological research and give you a chance to evaluate some of your beliefs. In addition, the benefits to society include the contribution to our understanding of effects of adverse childhood experiences and stress and the role social support may play in these two variables. The research may benefit psychologists and others who work with individuals who have faced adverse childhood experiences by providing information on what factors contribute to their psychological well-being.

If you have any questions or concerns about this research, please contact the principal investigator, Erin Murphy, Department of Psychology, Indiana State University, Terre Haute, IN 47809, by email at emurphy11@sycamores.indstate.edu. You can also contact the faculty sponsor, Dr. Michelle Abraham, Department of Psychology, Indiana State University, Terre Haute, IN 47809, by phone at 812-237-2446, or by email at michelle.abraham@indstate.edu.

If you have any questions about your rights as a research subject or if you feel you have been placed at risk, you may contact the Indiana State University Institutional Review Board (IRB) by mail at Indiana State University, Office of Sponsored Programs, Terre Haute, IN 47809, by phone at 812-237-3088, or by email at irb@indstate.edu.

I understand the procedures described above. My questions have been answered to my satisfaction, and I agree to participate in this study.

PRINTED NAME: _____

SIGNATURE: _____

Date:_____

Appendix F
Active Support Outline

While the participant is prepping their speech for the TSST:

That sounds like a really good idea that you have got going.

You are going to do good presenting your speech.

That is a cool dream job.

You look very prepared for your speech. You are going to rock it.

I cannot wait to hear about your dream job. It sounds very interesting.

If the participant pauses during the speech:

It's okay. Keep up the good work.

You're doing good so far.

Do not worry. You are almost done.

Just remember I am still here for you even if you are having some difficulties.

No worries on stopping. Just try to remember your notes and let's finish this up.

After the speech is over:

That was really good.

Awesome speech.

I think you did well with your speech.

Way to go. You should be pleased with yourself.

Nice job! That was sweet.

Before the arithmetic task of the TSST:

You got this.

Try your best.

Keep up the hard work.

If the participant messes up during the arithmetic task:

It's alright. You've done this already.

You know what to do. You're doing good.

Keep trying. I know this is hard, but I am here for you.

You are doing well. Mistakes happen and that is okay.

After the completion of the TSST:

Way to go! Awesome job completing the tasks.

You did amazing.

That was good effort you put forth.

I am glad I could support you through this part of the study. Enjoy the remainder of the study.

Appendix G
Debriefing Form

In this study we are interested in how childhood experiences relate to coping with stress. We are particularly interested in how coping abilities of participants in a college setting are influenced by adverse childhood experiences. We wanted to see if the use of social support can help college students who have faced adversity better deal with academic and social stressors. Research has shown providing active social support in the form of encouraging words can help reduce the amount of stress felt by participants. Additionally, social support is beneficial to individuals who have experienced adverse childhood experiences. If you are interested, please see:

Oh, A., Han, M., Choi, Y., Lau, S., & Shum, M. S. W. (2019). Exploring relationship among child maltreatment experience in childhood and behavior problems as young adults: Role of social support among college students in Hong Kong. *International Social Work, 62*(2), 1011-1024. doi: 10.1177/0020872818762718

Teoh, A. N., Chia, M. S. C., & Mohanraj, V. (2009). The comparison between active and passive types of social support: The emotional response. *Journal of Applied Biobehavioral Research, 14*(2), 90-102. doi: 10.1111/j.1751-9861.2009.00042.x

During the study stressor, you were not being evaluated or video-taped at all. It was merely a part of the stress set-up. You are told you are being recorded during your speech to elicit a stress response.. To be clear, no video or audio material was recorded. The study stressor, the Trier Social Stress Test, is used in psychological research. Verbal and cognitive tasks are standard mechanisms used in these types of tests.

Hellhammer J, Schubert M (2012) The physiological response to trier social stress test relates to subjective measures of stress during but not before or after the test. Psychoneuroendocrinology 37: 119–124. 12

Kirschbaum, C., Pirke, K. M., & Hellhammer, D. H. (1993). The "Trier Social Stress Test": A tool for investigating psychobiological responses in a laboratory setting. Neuropsychobiology, 28, 76–81.

We recognize that completing these questionnaires may cause personal distress and encourage you to contact either the Indiana State University Student Counseling Center at (812) 237-3939 or the Indiana State University Psychology Clinic at (812) 237-3317. Additional support can be found at the following links: http://www.mentalhealthamerica.net/ or https://findtreatment.samhsa.gov.

Thank you for your participation in this study. You are helping us to understand how Universities might help students to deal with the stress of college life. If you have any questions or if you are interested in the results of the study, please contact Dr. Michelle Abraham, Department of Psychology, (812) 237-2446 or michelle.abraham@indstate.edu

Finally, please do not discuss this study with your friends because they may be participating in the future. Again, thank you!

Figure 1

Interaction between Social Support and Childhood Trauma Affecting Cortisol Reactivity

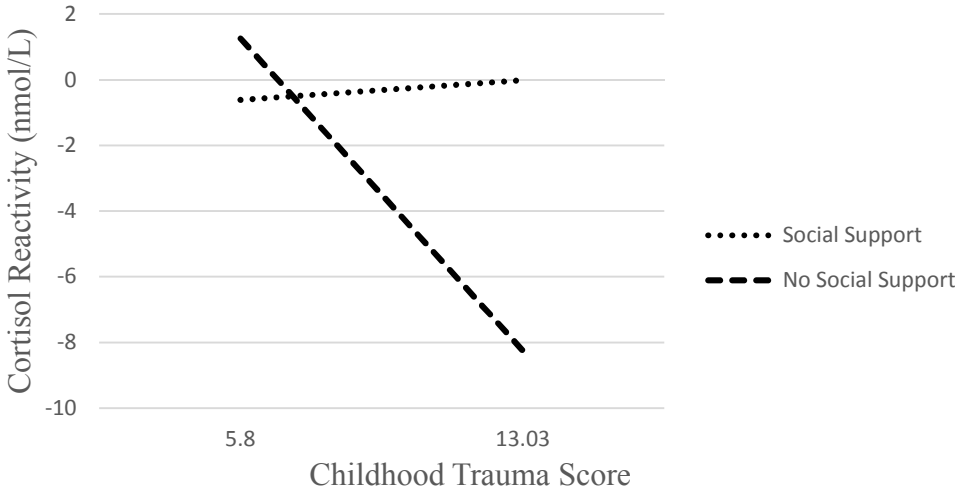

Figure 2

Interaction between Social Support and Childhood Trauma Affecting Heartrate Reactivity

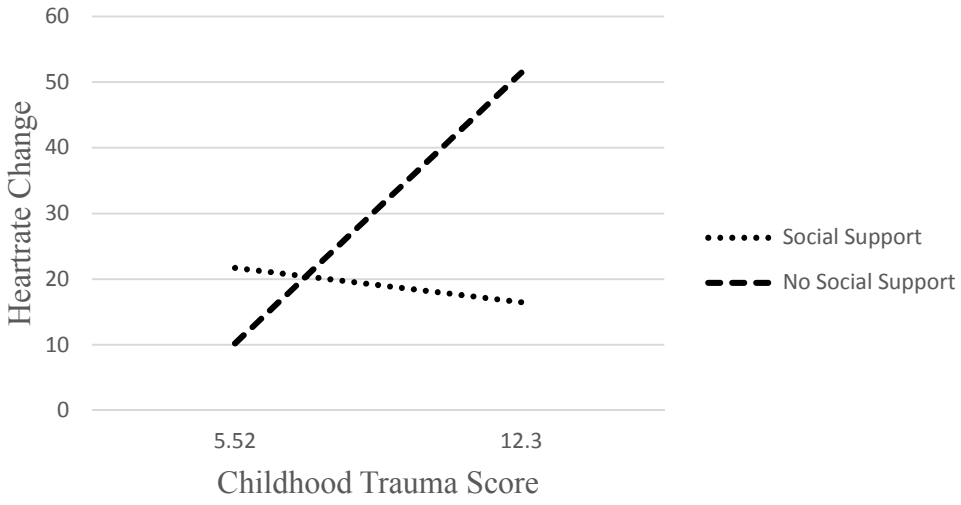

Table 1

Intercorrelations for Study Variables Disaggregated by Level of Trauma

Variable	1	2	3	4	5
1. CTQ Score	-	-.506**	-.014	.604**	-.220
2. Cortisol T2-T1	.168	-	-.210	-.250	.221
3. Alpha Am. T2-T1	.036	.208	-	-.035	.227
4. HR T2+T3+T4/3-T1	.108	-.577*	.060	-	-.299
5. Post-PrePos	.056	-.033	.006	.513	-

Note. The results for the low childhood trauma sample (n= 26) are shown above the diagonal. The results for the high childhood trauma sample (n= 23) are shown below the diagonal.

*$p < .05$. ** $p < .001$.

Table 2

Model: Interaction between Social Support and Childhood Trauma Predicting Cortisol Change

				95% CI		
Effect	Coeff	*SE*	*t*	LL	UL	*p*
Constant	3.8988	2.2067	1.7668	-.5485	8.3461	.08
Social Support	-4.9922	2.2067	-2.2623	-9.4395	-.5448	.03
Childhood Trauma Score	-.6165	.3403	-1.8119	-1.3022	.0692	.08
Interaction SSxCT	.6996	.3403	2.0562	.0139	1.3854	.05

Table 3

Model: Interaction Between Social Support and Childhood Trauma Predicting Heartrate Change

				95% CI		
Effect	Coeff	*SE*	*t*	LL	UL	*p*
Constant	1.1429	9.9023	.1154	-19.0534	21.3393	.91
Social Support	24.8893	9.9023	2.5135	4.6929	45.0856	.02
Childhood Trauma Score	2.6706	1.4108	1.8930	-.2067	5.5480	.07
Interaction SSxCT	-3.4463	1.4108	-2.4429	-6.3237	-.5690	.02

Table 4

Model: Means and Standard Deviations of Cortisol and Heartrate Split by Social Support

Cortisol and Heartrate		Mean	N	SD	Minimum	Maximum
Cortisol	Social Support	.83	19	2.77	-5.32	4.68
	No Social Support	-.17	29	2.12	-5.36	6.80
Heartrate	Social Support	14.31	18	6.97	5.00	28.33
	No Social Support	17.63	17	13.46	4.67	61.33