HEART'S SYMPHONY: EXPLORING DAILY SOCIAL SUPPORT, STRESS, AND HRV USING MODERN WATCHES

by

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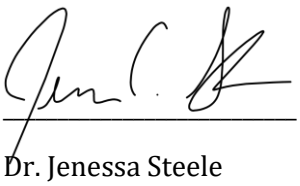

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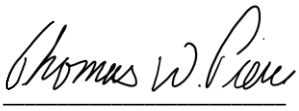

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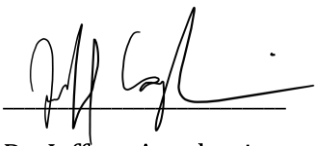

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Abstract

Social support has been shown to buffer stress (Szkody et al., 2019), and stress has been shown to influence physical health (Kara, 2021). Recent research has focused on perceived stress during and after the pandemic, indicating the need for new findings to reassess the current perspectives of the younger generation (Gewalt et al., 2022; Grey et al., 2020; Traino et al., 2021; Velez et al., 2023). Therefore, this study aims to better understand the perspectives of emerging adults on social support by evaluating their perceptions of close relationships when dealing with stress. It is hypothesized that perceived social support, perceived stress, and physical health are correlated. Physical health is assessed through heart rate variability, self-rated health, and somatic symptoms. Additionally, it is hypothesized that social support moderates the relationship between stress and physical health. There were 25 Radford University students who participated in a 6-day study, reporting daily social support and daily stress, while wearing a Garmin activity watch that tracked heart rate variability. The pattern of results was the opposite of the pattern predicted and does not support the hypothesis that social support buffered associations between stress and parasympathetic deactivation. However, with some adjustments to the study's methodology, significant results may be achievable. The study's strength lies in the acceptable reliability of the Daily Social Support scale, but there were numerous limitations. These limitations should be considered in future research when measuring social support, stress, and physical health simultaneously.

Keywords: social support, heart rate variability, stress, psychological arousal, and relaxation

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Chapter 1 – Introduction

In 2019, the World Health Organization announced the COVID-19 pandemic had emerged and in March of 2020 ordered immediate restrictions on individuals' social interaction through social distancing and isolation (Grey et al., 2020). Individuals who experience crises, new transitions, or encounter new environments have different methods of managing stress. During the pandemic, higher levels of social support were related to lower self-reported scores for anxiety, depression, loneliness, and irritability (Grey et al., 2020). The United States reported there was an over 70% increase in stress and anxiety during the pandemic from learning environments drastically shifting, resulting in barriers when connecting with others (Wang et al., 2020). Young adults' coping skills, emotions, relationships, and duration of physical activities were altered by the demands of pandemic restrictions. Additionally, young adults were forced to go into isolation without having a traditional prom, graduation, or first-year college experience (Wang et al., 2020). Findings suggest that COVID-19 contributed to higher rates of poor mental health (Buizza et al., 2022) and indirectly impacted physical health by restricting access to physical activity (Gewalt et al., 2022). Most individuals experienced inadequate engagement in physical activities during COVID-19 restrictions, leading to detrimental effects on their mental and physical well-being (Gewalt et al., 2022). Stress and physical inactivity are one of the potential causes for mental health disorders, such as depression and anxiety (Burtscher et al., 2020; Gewalt et al., 2022). After COVID-19, it has become difficult for students to adapt to college environments that are stress inducing and fast paced (Grey et al., 2020). There is a lack of resources in psychological health, and limited access to physical activities for young adults can lead to hard transitions (Shidhaye, 2023). However, social support provides this buffer when dealing with stressful transitions and has shown a positive impact on students' academic success

(McLean et al., 2022). Emphasized in the literature review, numerous students throughout the world have shown that social support has a positive effect on individuals' stress and health.

The current study investigates the role of perceived social support in moderating the relationship between perceived stress and physical health among college students. This builds upon an existing model by implementing modern devices tracking individual health data relating to psychological variables, relevant physiological changes (heart rate variability and somatic symptoms).

Literature Review

Stress: Defined and Measuring in Emerging Adults

One's inability to regulate chronic stress can be the trigger that initiates mental health disorders, such as anxiety and depression (Burns, 1992). Stressful life events, such as COVID-19, have been shown to negatively impact emerging adults' psychological and physical health (Grey et al., 2020). Emerging adults are no longer considered adolescents but have yet to reach full adulthood (Arnett, 2000). While the majority of emerging adults transition into college, they are faced with changes in their social roles and networks (Arnett, 2000). Emerging adults are individuals leaving adolescence and gaining independence for the first time (Arnett, 2000), their stress may heighten because of new responsibilities such as their loads of schoolwork, work schedules, relationships, and managing most of their finances (Bland et al., 2010; Brougham et al., 2009; Traino et al., 2021; Velez et al., 2023). When moving into the college environment, emerging adults are forced to reassess their social roles in the context of new peers, new professors, new roommates, new co-workers, and family members (Traino et al., 2021; Velez et al., 2023). Additionally, emerging adults are expected to meet more academic demands than the high school curriculum requires, such as: completing assignments on tight deadlines, multiple

examinations back-to-back, performing various assignments at once, and gathering materials needed to complete projects (Onuoha & Idemudia, 2020; Regheb & McKinney, 1993). As a potentially unique population, emerging adults have limited personal traits and skills aiding in stress resistance to accomplish demanding academic tasks, and they struggle to manage stress which can lead to poor psychological health (Hobfoll, 1989; Onuoha & Idemudia, 2020). Exposure to stressors is an ongoing factor that influences students' ability to handle challenges, so it is important to understand how perceived stress is related to physiological biomarkers (Joshi & Nagpal, 2018).

Joshi and Nagpal (2018) investigated the relationship between perceived stress and salivary cortisol samples in postgraduate medical students from their first year compared to their third year. Cortisol samples are biomarkers used to measure the stress response of the sympathetic nervous system, related to psychological arousal, within the hypothalamic-pituitary-adrenal axis (Advokat et al., 2018; Joshi & Nagpal, 2018; Pinel & Barnes, 2018). The Perceived Stress Scale (PSS; Cohen et al., 1983) was used by Joshi and Nagpal (2018) study to assess individuals' perception of life stress. PSS scores were directly correlated with cortisol levels, demonstrating that individuals' life stress related to physical responses to their environment (Joshi & Nagpal, 2018). Additionally, the link between cortisol samples and perceived stress showed a strong relationship, indicating that an individual's perspective of their stress very strongly predicted physiological response via cortisol levels among postgraduate medical students (Joshi & Nagpal, 2018). Overall, Joshi and Nagpal (2018) emphasize the importance of good health by managing stress through balancing academics, personal stress factors, and psychosocial factors (e.g., social support) and coping strategies.

Managing problems by seeking aid from others can also differ between individuals and can impact academic performance. For example, Graves et al. (2021) investigated whether perceived stress, coping mechanisms, and gender influenced stress levels (via PSS) and examined the impact of coping strategies among college students. They showed that female college students reported significantly higher levels of perceived stress than their male counterparts. Additionally, when managing stress, female college students were utilizing coping strategies more than male college students (Graves et al., 2021).

Female students also tend to have higher perceived stress (Savage et al., 2020). Savage et al. (2020) focused on the effect of stress on mental wellbeing, physical activity, and sedentary behavior. Additionally, Savage et al. (2020) investigated mental health and perceived stress in the beginning of the lockdown in comparison to five weeks later during lockdown (Savage et al., 2020). During five-week period, female college students reported higher perceived stress and lower levels of mental health (Savage et al., 2020). However, gender differences were not significant in relation to either mental health or perceived stress over time. There was not a statistically significant main effect of gender on sedentary behavior, but males tended to show more reduction of physical activity than females. Overall, there was a significant increase of time in sedentary behavior from the first week in comparison to the fifth week of the study (Savage et al., 2020). Within this literature, there are mixed results on gender differences among perceived stress in college students during and after the pandemic. Gender needs to be reassessed with the current generation of college students to understand if perceived stress has improved or worsened after a worldwide event, the COVID-19 pandemic.

College students are a unique population who need more resources, such as stress management, for a better quality of life (Graves et al., 2021). Additionally, emerging adults have

a greater chance of successful transition into college environments by finding clarity in their sense of self and through close relationships within their new environment (Azmitia et al., 2013; Velez et al., 2023).

Park and Yoon (2019) explored how perceived stress, cognitive stress, and somatization affected heart rate variability (HRV), represented as the standard deviation of the NN interval (SDNN), in Korean undergraduate students. The PSS and cognitive stress scales were used to gain insight into levels of stress among undergraduate students (Park & Yoon, 2019). HRV was recorded with a pulse wave analyzer for short-term HRV during a five-minute test. The results of the study indicated that perceived stress was not correlated with HRV, but cognitive stress response had a small negative correlation. Also, this current research reveals that the sympathetic nervous system is more active than the parasympathetic nervous system. Therefore, future research should consider age and gender for the link between cognitive stress and HRV. However, the limitations for the study design provide insight into the non-significant results of the study. One of the limitations was participants' amount of alcohol and caffeine consumption was not measured when analyzing HRV recordings (Park & Yoon, 2019). Additionally, Park and Yoon's (2019) research used a different method for HRV frequency for only short periods of time. Martinez et al. (2022) focused on the link between perceived stress and HRV frequencies, which found a small and significant correlation. Perceived stress was associated with HRV (low frequency to high frequency ratio) in laboratory settings (Martinez et al., 2022) and provides insight into the future research concerning perceived stress with HRV.

Social Support: Defined and Measuring in Emerging Adults

"Social support is defined by the relative presence or absence of psychosocial support resources from significant others" (Kaplan et al., 1977, p. 50). Social support is availability or

access to one's close relationships during a time of need, which may include psychological, material, emotional, informational, or other resources (Eagle et al., 2018; House, 1981; Onuoha & Idemudia, 2020; Sarason et al., 1987). Daily social support has influenced individuals' longevity, and research is needed to continue exploring the qualitative and quantitative correlates social support (Holt-Lunstad et al., 2010). College students' perspective of social networks is shifting towards motivation to gain social connections, which is opposite to that shown in socioemotional selectivity theory (SST; Carstensen, 1991). SST states that individuals in young adults tend to be less motivated to make new social connections and more driven to obtain novel knowledge (Carstensen, 1991; Carstensen, 2006). The SST model shows that younger adults seek knowledge to further their long-term goals, such as developing their careers, and numerous individuals form their social network as information sources (Carstensen, 1991; Carstensen, 2006). The SST model refers to older adults benefiting more by seeking fewer and closer social connections that provide emotional balance. Lang and Carstensen (2002) implied that older adults are motivated to find positive emotional connections because of the shorter amount of time they have left in their lives. Additionally, Carstensen (1991) states that individuals who perceive themselves as more socially active, engaged, and supported by others tend to have better mental and physical health than isolated individuals. An individual's perception of their social support network can influence whether their interpersonal relationships could be a predictor in buffering stressful situations.

During the pandemic, emerging adults may have changed their perspective in valuing closer relationships, due to being isolated and missing milestone life events (Grey et al., 2020). Emerging adults may have shown a shift in their priorities by becoming more motivated to find positive-emotional connections due to the experience of the pandemic (Velez et al., 2023).

Interviews focus on young adults' narratives of their identity being impacted and how they viewed their social networks from the pandemic (Velez et al., 2023). After the first year of the pandemic, emerging adults have developed new social identities, personal growth, coping skills and approaches for how they handle new stressors in educational settings. Emerging adults' perspectives on friends and peer relationships have changed because of their personal experiences of limited in-person socialization and virtual school settings (Velez et al., 2023). Also, emerging adults learned to enjoy being alone and independent, while becoming aware that having only a few special friendships was more valuable than having lots of interactions with peers in a school-based, face-to-face setting (Velez et al., 2023). Additionally, young adults realized that they found more value with family relationships and formed positive bonds with family members. As demonstrated in the Velez et al. (2023) study, there may be a shift in emerging adults' perception of relationships and values towards their social networks, consisting of close relationships with family and a few friends. Velez et al.'s (2023) results showed young adults are motivated to seek social connections that provide positive impact, which are similar to those of older adults in the SST model (Carstensen, 1991; Carstensen, 2006). In light of the evidence provided by Velez et al. (2023), there is a need to explore the shift in sources of perceived social support for today's emerging adults.

Physical Health: Defined and Measured in Emerging Adults

Health is not focused on the absence of diseases, but, rather, health is defined as one's state of complete physical, mental, and social well-being (World Health Organization, 2023). The World Health Organization's (2023) definition of health recognizes that mental health is linked to physical health. Perceived physical health is defined as the physical strain producing somatic symptoms which indicate whether the body is experiencing major or minor life-

threatening conditions (Schat et al., 2005; Spence et al., 1987). Perceived physical health maybe operationalized through response on the Physical Health Questionnaire (PHQ) to assess somatic symptoms, such as headaches, sleep disturbances, potential respiratory infections, and digestive problems (Schat et al., 2005). In multiple research studies, there is an increasing awareness of the relationship between mental health and somatic symptoms, such as stress, indicating that stressors impact sympathetic nervous system activation (Cohen, 1996; Clark & Beck, 2010; Schat et al., 2005). Somatic symptoms, such as muscle tension, respiratory irritation, diarrhea, and sweatiness are responses to psychological arousal and emotional states (Clark & Beck, 2010). There is a limited amount of research in college student populations considering somatic symptoms, which indicates a need for more research of physical health measured by somatic symptoms.

Additionally, perceived physical health can be operationalized through the Self-Rated Health Questionnaire (SRHQ) where individuals can indicate if their health is between excellent and poor (Ware & Sherbourne, 1992) and is linked with morbidity and mortality. Perceived health is impacted by many factors (current health conditions, socioeconomic status, health behavior, etc.) in numerous samples (DeSalvo et al., 2006; Idler & Benyamini, 1997; Jones & Schreier, 2021; Mossey & Shapiro, 1982; Ware & Sherbourne, 1992). Better perceived health is associated with successful school achievement, higher self-esteem, and the presence of fewer risky health behaviors (Jones & Schreier, 2021; Wade et al., 2000). Kara's (2021) research focused on Turkish undergraduate health professional students' levels of perceived stress and possible correlates (perceived health, sleep duration, sleep problems, age, marital status, year in school, living arrangement, etc.) during COVID-19. The Perceived Stress Scale (Cohen, 1996) was used to measure perceived stress in the Turkish undergraduate students and the SRHQ was

used to gage perceived health (Kara, 2021). The findings suggest that the significant determinants of perceived stress are perceived health, sleep problems, life satisfaction, and coping strategies, etc. (Kara, 2021). Ninety-eight percent of the undergraduate student sample reported moderate to high levels of perceived stress (Kara, 2021). Additionally, Kara (2021) showed students with poor SRH scores tend to report higher levels of perceived stress. Further research is needed to reassess college students' perspectives in the post pandemic era.

Heart Rate Variability

The observable physical health measure in the current study assesses heart rate variability (HRV) which measures the variation of the time between heartbeats, known as inter-beat intervals (IBI) (Natarajan et al., 2020). HRV provides a measure of autonomic nervous system activity and its regulation throughout the day (Bertsch et al., 2012; Kvadsheim et al., 2022; Natarajan et al., 2020; Tarkiainen et al., 2005; Thayer et al., 2012; Thayer et al., 2008). The peripheral nervous system is divided into two systems: the somatic nervous system and the autonomic nervous system which regulates communication between internal organs and the central nervous system (Pinel & Barnes, 2018). In addition, the autonomic nervous system divides into sympathetic and parasympathetic nervous systems (Pinel & Barnes, 2018). The sympathetic nervous system is referred as a "fight-or-flight" response (Pinel & Barnes, 2018) characterized by its influence on the thyroid and adrenal gland, such as the release of epinephrine (adrenaline) and cortisol (Bauduin, 2022). Thus, the sympathetic nervous system aids in preparing the body for stressors within the environment know as psychological arousal (Bauduin, 2022; Pinel & Barnes, 2018). The parasympathetic nervous system produces a "rest-and-digest" response, indicating psychological relaxation (Pinel & Barnes, 2018). The autonomic nervous

system activation can be seen through heart rate, heart rate variability, blood pressure and plasma levels of catecholamines.

HRV is a consistent measure of the heart's response to environmental events and psychological processes, such as mental distress, exercise, sleep, metabolic changes (Bertsch et al., 2012; Kim et al., 2017; Natarajan et al., 2020; Thayer et al., 2008). There are a variety of method of quantifying HRV. Current measurement of HRV recordings is based on both a time-domain and frequency-domain indicines, (Kim et al., 2017; Kleiger et al., 2005). Time-domain indices measure the variation of heart rate over time and measures the intervals between the cardiac cycles. Regarding heart rate, the time-domain analysis recordings are calculating the mean of normal-to-normal (NN) intervals and the standard deviation of the NN interval (SDNN) (Kim et al., 2017; Kleiger et al., 2005). The NN-intervals represent the normal R-peaks, meaning the calculations focus on regular peaks and ignores abnormal ones to avoid any distortion in the statistical. When HRV is composited of large value, such as the SDNN, then increases indicating that psychological response is resilience to stress (Kim et al., 2017). In another way to understand HRV, higher values for SDNN indicate that the parasympathetic nervous system is more active than the sympathetic nervous system.

Time-frequency indices are short-term measurements providing how the power and activity between sympathetic and parasympathetic nervous system is distributed (Kim et al., 2017). The high frequency band is associated with the activation mostly from the parasympathetic nervous system (Kim et al., 2017) and identified by measuring recordings between 0.15 to 0.40 Hertz (Kleiger et al., 2005). In contrast, the low frequency band is associated with most activation of the sympathetic nervous system (Kim et al., 2017) and identified by measuring recordings between 0.04 to 0.15 Hertz (Kleiger et al., 2005). Higher

values of the ratio of low frequency to high frequency indicate that there is dominance of the sympathetic nervous system (Kleiger et al., 2005; Shaffer & Ginsberg, 2017). In contrast, lower values of the ratio of low frequency to high frequency showing a decrease, indicates the dominance from the parasympathetic nervous system (Kleiger et al., 2005; Shaffer & Ginsberg, 2017).

HRV is a physical indicator of the body's response to perceived threat or challenge within the environment and is associated with physical health concerning cardiovascular disease. Thayer et al. (2007) stated that lower HRV is associated with increased risk of mortality. Individuals with higher HRV, are less likely to experience stress-related illness throughout their day (Thayer et al., 2007). Diabetes, mellitus, inflammation, and immune disfunction and other diseases are associated with decreased HRV (Thayer et al., 2007). Overall, Thayer et al.'s (2007) review recognized the imbalance of the autonomic nervous system and how decreased parasympathetic nervous system activity is indirectly associated with poor lifestyles, numerous diseases, increased morbidity, and mortality. Individual difference factors influence HRV and affect physical health through the body's response to stimulus. Natarajan et al.'s (2020) findings highlight how physical health is closely associated with autonomic nervous system activity. Young adults' parasympathetic function, as assessed using HRV data, has been shown to be higher than older age groups. Overall, Natarajan et al. (2020) emphasizes that physical activity and increased HRV are correlated with each other. This needs to be considered when looking at college student adaptability to stressor in a fast-paced environment.

Social Support and It's Relation to Stress

Individuals who receive social support during challenging times are less likely to display depressive symptoms (Eagle et al., 2018; Ogińska-Bulik & Michalska 2020; Wu et al., 2016).

The lack of social support can affect individuals' adaptability and resilience to stress (Ozbay et al., 2007). Perceived social support plays a significant role in mental health and academic stress (Onuoha & Idemudia, 2020). The Onuoha and Idemudia (2020) study investigated social support as a moderator of the relationship between perceived academic stress and mental health in college students who have full-time jobs. It was found that perceived academic stress (weak relation) and social support (moderate relation) were negatively correlated with mental health (Onuoha & Idemudia, 2020). Additionally, the findings suggested that perceived social support moderated the relationship between mental health and academic stress. Onuoha and Idemudia (2020) concluded that students with low social support displayed a stronger relationship between stress and poor mental health conversely with students' high social support displayed a weaker relationship between high academic stress and poor mental health. Overall, the Onuoha and Idemudia (2020) study reinforced the view that supportive social networks improve individuals' psychological health, competence, and academic success.

Perceived social support differs among social environments; for example, the pandemics' regulation of self-isolation/social distancing impacted the ability to adjust to or handle stressors. Szkody et al. (2019) investigated amounts of self-isolation, perceived social support, received social support, engagement with worrying about COVID-19, and psychological health. The social support received consisted of individuals interacting with their support network and reporting whether their well-being improved after the interaction. Additionally, well-being, social support behaviors, stress, and self-isolation were measured to assess the pandemic's influence on the population. The results indicated that individuals who stayed in self-isolation reported more worries, received less social support from others, and had worse psychological health. Individuals with higher levels of perceived social support reported higher scores on

psychological health (Szkody et al., 2019). However, the results of Szkody et al. (2019) provided insight that individuals' days in isolation did not correlate with perceived social support but were correlated partially with received social support. Additionally, Szkody et al. (2019) concluded that social support did not buffer the relationship between worry about COVID-19 and psychological health. However, it was found that perceived social support served as a buffer between worry about COVID-19 and psychological health only when days in self-isolation were lower and worry about COVID-19 was higher. Szkody et al. (2019) noted that higher levels of received or perceived social support was protective against other variables and should be considered for future research.

To further bolster the idea that social support can provide better outcomes for psychological health and stress, current research is generalizable to young adults enrolled in various universities. Alsubaie et al. (2019) investigated sources of social support influencing depressive symptoms and well-being in medical university students. Perceived social support measures consisted of the amount of supportive contact with friends, family members, and significant others. The researchers concluded that there is a negative correlation between sources of social support and depressive symptoms in college students. The study found that friends had the strongest effect among the sources of social support. The role of social support in college students' transition helped college students persevere during their time in college and feel more valued within their social networks. The overall conclusion of this study was that the proximity of these two groups of social support (family members and friends) influence better outcomes for depressive symptoms.

Female's levels of social support verses males' level of social support vary, which impacts managing stress, handling transitions, and being resilient to stressors. Gender differences

among emerging adults suggest that there are dissimilar social support needs and sources (McLean et al., 2022). It was found that both genders self-report moderate levels of social support, but females report higher levels of social support and stress than male (McLean et al., 2022). When first transitioning into universities, females have been shown to report higher amounts of stress and suggest that females need more help throughout this process (McLean et al., 2022). However, males and females in research studies are not usually equally distributed, so gender differences need to be assessed to better aid emerging adults. Social support not only impacts efforts to promote psychological health, such as stress management but has a tremendous effect on physical health outcomes.

Social Support's Relation to Physical Health

Somatic symptoms that may be induced by continuous stress can be indicators of increased cardiovascular risk and higher mortality rates (Scharp & Hall, 2017; Schat et al., 2005; Sherman et al., 1994; Thayer et al., 2012; Thayer et al., 2008). Scharp and Hall's (2017) study aimed to better understand how parenting and academic stress influence the link between somatic symptoms and support-seeking factors. The support-seeking factors included seeking communication of social presence support, such as asking how much their support networks would state: "I am here for you" (Scharp & Hall 2017). Also, seeking support communications was measured by providing statements, such as "I would doubt my ability," that participants agreed with (Scharp & Hall 2017). The results indicated that higher levels of parenting stress and academic stress are associated with increased reports of somatic symptoms indicative of higher levels of stress. Further research suggests that social support has a negative relationship with somatic symptoms, whereby persons with fewer social support connections report having more somatic symptoms (headaches, breathing issues, aching stomach, and waking up continuously)

(Schat et al., 2005). Individuals who have more social support are shown to have greater resilience to stress and are less likely to experience illness (Ozbay et al., 2007).

HRV is a biomarker that is associated with social support (Kvadsheim et al., 2022; Santarpia et al., 2023; Taylor et al., 2000). The current research predicts that biological sex has an association with social support and HRV during stressful events. According to Kvadsheim et al.'s (2022) research, HRV reflects lower stress vulnerability and is associated with higher perceived social support. The Kvadsheim et al. (2022) study aimed to understand how stress and biological sex moderate the relationship between perceived social support and HRV. The study found that the relationship between social support and HRV was stronger in females, while no relationship between social support and HRV existed for males within this sample (Kvadsheim et al., 2022). It was found that perceived stress did moderate the link between HRV and social support indicating higher levels of stress moderated the relation between HRV and social support in females but not males. Lower levels of stress did not moderate the relation between HRV and social support (Kvadsheim et al., 2022). In comparison to Kvadsheim et al. (2022), Santarpia et al. (2023) had different results concerning sex differences for HRV. Kvadsheim et al. (2022) showed that higher levels of perceived stress showed a significant moderation for social support and HRV in females, while Santarpia et al. (2023) results indicated that HRV and social support in men showed a stronger relation than in women. Santarpia et al. (2023) investigated the relationship between HRV and work-related social support between employees and supervisors. The results showed that perceiving more social support between supervisors and employees was associated with higher levels of HRV in employees (Santarpia et al., 2023). The relationships between HRV and social support for these individuals was stronger in men than in women, due to employee's attachment behaviors in relationships towards their supervisors. Overall, Santarpia

et al. (2023) state the relation between HRV and social support was moderated by sex differences and concluded that social support does enable employees to psychologically adjust during stressful moments at work.

The current literature indicates that social support is associated with higher levels HRV, and a lower ratio of sympathetic to parasympathetic activity, but there are mixed results for biological sex within different samples. For the current study, gender differences were not considered for data analyses because current sample was predominantly female. The current study focused on how physical health is impacted by exposure to a stress-inducing environment, such as attending a university. In the current study, physical health is assessed through observation (heart rate variability) and perceptions of physical health (self-report of somatic symptoms and self-rated health). Previous research has employed smaller increments of time for HRV using different watch devices, but the current study explored HRV on a larger scale by measuring 24-hour increments. Also, limitations in the Park and Yoon (2023) did not account for alcohol and caffeine consumption, which was addressed in the current study. In addition, exercise activity was evaluated to identify any outliers of vigorous exercise by participant's self-report. To emphasize daily perceived physical health, the current study evaluated the link between perceived stress with self-rated health to provide insight on how these findings may apply to American undergraduates at Radford University. The study's purpose was to better understand the current generation of emerging adults and how their social support networks shifted by evaluating their perceptions of close relationships when dealing with stress. These young adults are transitioning from isolation to social interactions within their environments, so it this important to understand how these individuals can manage stress. SST states that young individuals are motivated to seek novel knowledge (Carstensen, 1991), but it is unclear whether

the current population of college students still follows this model. The current research study aims to investigate how perceived social support moderates the relationship between perceived stress and physical health in college students.

Primary Hypotheses

Based on past literature, the following hypotheses were developed to predict the relationships among perceived stress, perceived social support, and physical health.

Hypothesis 1: It was hypothesized that perceived stress would be significantly, negatively associated with SDNN recordings, self-rated health, and perceived social support.

Hypothesis 2: It was hypothesized that perceived stress would be significantly, positively associated with the number of reported somatic symptoms and low to high frequency ratio (HRV).

Hypothesis 3: It was hypothesized that perceived social support would be significantly, positively associated with SDNN recordings (HRV) and self-rated health.

Hypothesis 4: It was hypothesized that perceived social support would be significantly, negatively associated with somatic symptoms and low to high frequency ratio (HRV).

Hypothesis 5: It was expected that perceived social support moderates the relationship between perceived stress and measures of physical health (i.e., SDNN, LF/HF ratio, self-rated health, and somatic symptoms).

Design

The current study was a non-experimental/correlational design with repeated measures (within-groups) measurements. The within-group measures consist of daily perceived social support, daily stress, daily HRV, daily self-rated health, and somatic symptoms. Researchers

gathered data from each participant on a daily basis across all measures. The data analyses included 126 cases, with responses from 21 participants collected over 6 days on each measure.

Chapter 2 - Method

Participants

Refer to Table 1.0 for demographics. The participants from the study were comprised of emerging adults from Radford University. There were 25 participants who were recruited through the SONA system. The qualifications for participants were based on enrollment at Radford University, between the ages of 18 to 25 years old, an undergraduate, and have no medical diagnosis of cardiovascular diseases or illnesses. The reasoning for these requirements was to ensure that the sample consisted of emerging adults transitioning to a new environment, and that no heart-health illness would skew results. The sample comprised of 24% males, 72% females, and 4% non-binary. Biological sex was recorded where the sample showed 76% female and 24% males in the current study. The total sample participants identified as White (60%), African American/Black (32%), Asian (8%), Hispanic or Latino (12%), Native Hawaiian or Other Pacific Islander (4%), identified as other (2%), and Identified More Than One Race (8%). Also, the sample of the current study showed a variety of education levels – Freshman (52%), Sophomore (5%), Junior (12%), Senior (16%). All the participants in the sample were full-time students and had no dependents. In terms of relationship status, 96% of participants identified as single/unmarried, 4% as married, and no participants identified as divorced, widowed, or separated. Participant employment status varied: full-time employee (4%), part-time employee (40%), work-study (16%), and unemployed (36%). The household income of participants was less than $25,000 (36%), $25,000-$49,999 (16%), $75,000-$99,999 (8%), $100,000-$149,999 (4%), $150,000 or more (16%), and Prefer not to say (20%).

Participants were compensated through extra credit for their psychology-related course. Participants who complete the whole study were placed into a drawing to receive a $30 Amazon

gift card. The drawing was randomized, with at least one participant out of every five being selected. All participant in the study voluntary contributed to the current study. Before participants volunteered, they completed the informed consent form, refer to Appendix B.

Measures

Initial Assessment

The Perceived Stress Scale (PSS; Cohen et al., 1983). The PSS has 14 items rated on a 5-point rating scale ranging from "never" (0) to "very often" (4). There are seven items (4, 5, 6, 7, 9, 10, 13) that are reverse scored to indicate individuals' stress based on these positive statements. Total scores for the 14-item PSS means range from 1 to 5, and higher scores on the PSS indicate higher perceived stress (Cohen et al., 1983). An example of an item is "In the last week, how often have you felt confident about your ability to handle your personal problems?" (Cohen et al., 1983, pg.394). To calculate the overall total score of the scale, the sum of item responses was divided by the total number items, resulting in the mean score. The sample as a whole showed relatively low levels of perceived stress (M = 2.07, SD = 0.51). The study's Cronbach's Alpha was considered acceptable reliability, $\alpha = 0.82$. Refer to Table 2.0.

The Multi-Dimensional Scale of Perceived Social Support (MSPSS; Zimet et al., 1988). The MSPSS was used to examine perceived social support. The MSPSS has 12 items rated on a 7-point Likert scale ranging from "strongly disagree" (1) to "strongly agree" (7) (Zimet et al., 1988). To calculate the overall total score of the scale, the sum of item responses was obtained and divided by the total number of items in the scale, resulting in the mean score (Zimet et al., 1988). The mean scores indicate the level of perceived social support as a continuous score. Two examples of items within the MSPSS are "There is a special person in my life who cares about my feelings" and "There is a special person who is around when I am in

need" (Zimet et al., 1988, pg.35). The sample as a whole showed relatively moderate to high levels of perceived social support (M =5.97, SD = 0.74). The study's Cronbach's Alpha was considered acceptable reliability, $\alpha = 0.82$. Refer to Table 2.0 and Appendix C.

The Physical Health Questionnaire (PHQ; Schat et al., 2005). Physical health was assessed using the PHQ, which has 14 items rated on a 7-point Likert scale (Schat et al., 2005) for the initial assessment. Items 1-11 have responses ranging from "not at all" (1) to "all the time" (7), items 12-13 ranging from "0 Times" to "7+ Times", and item 14 ranging from "1 Day" to "7+ Days." The PHQ consists of four subscales: sleep disturbances, headaches, gastrointestinal problems, and respiratory infections. The PHQ assesses somatic symptoms by asking "How often have you experienced headaches," or "How often have you woken up during the night?" (Schat et al., 2005, pg. 367). The scores of physical health were calculated by the sum of items and divided by the total number of items in the scale, resulting in the mean score. Higher scores of somatic symptoms indicate poor perceived physical health, while lower score of somatic symptoms indicate good perceived physical health. The current measure of somatic symptoms was adjusted for a daily scale, which is explained in the daily measures. The sample as a whole showed relatively moderate to high scores for somatic symptoms (M = 3.60, SD = 0.71). The study's Cronbach's Alpha was considered unacceptable reliability, $\alpha = 0.49$. Refer to Table 2.0.

Demographic Survey. The last section of the initial assessment included 10 items relating to biological sex, gender, ethnicity, race, year in school, enrollment status, employment status, household income, relationship status, and dependents. See Appendix C for more details.

Daily Measures

In addition to completing the initial assessment at the beginning of the study to get a baseline, participants also completed a shortened version of all the scales each day.

Daily Stress. The item for daily stress developed by researchers was "To what extent did you feel stress today" which was rated on a 5-point rating scale of "Not at all" (0) to "Extremely" (4) (Cohen et al., 1983). The one item created by the researchers will be included in the daily perceived stress score. The shortened version of the PSS (item 2, 4, 5, and 10) has the same method of scoring as the 10-item scale (Cohen et al., 1983). Scores for the shortened version of the PSS was that higher mean scores indicated higher levels of perceived stress, and lower scores indicated lower levels of perceived stress. Therefore, the daily stress scale is comprised of the shortened version of the PSS and the one item created by the researchers. Thus, mean scores for the daily stress scale will range from 1 to 5, and higher scores indicate more perceived stress (Cohen et al., 1983). To determine the daily overall total score for the scale, the sum of item responses was divided by the total number of items, resulting in the mean score. Also, each day was displayed as separate variables in the analyses. The sample as a whole showed relatively low to moderate levels of perceived stress (M = 2.43, SD = 0.96). The calculation for the Cronbach's Alpha combined the data across days for all participants together for each item. The study's Cronbach's Alpha was considered acceptable reliability, $\alpha = 0.84$. Refer to Table 2.0.

Daily Social Support. The researchers created three items evaluating daily social support, which were based on previous literature from Sarason et al. (1987), Kahn and Antonucci (1980), and Zimet et al. (1988). An example of the daily social support items is "Today, how frequently did you interact with the people closest to you." Other items can be seen in Appendix C. Items from the daily social support scale are rated on a 5-point rating scale of 1 "not at all" to

5 “extremely”. The daily social support scale for calculating the mean scores ranging from 1 to 5, where a higher score shows stronger levels of social support. To determine the daily overall total score for the scale, the sum of item responses was divided by the total number of items, resulting in the mean score. Also, each day was displayed as separate variables in the analyses. The sample as a whole showed relatively moderate to high levels of perceived social support (*M* =3.8, *SD* = 0.78). The calculation for the Cronbach’s Alpha combined the data across days for all participants together for each item. The current study’s Cronbach’s Alpha for daily social support was acceptable reliability, $\alpha = 0.71$. Refer to Table 2.0 and Appendix C for more details.

Self-Rated Health. The daily measure for perceived physical health is the Self-Rate Health Questionnaire (SRH; Ware & Sherbourne, 1992). The measure for SRH consists of “In general, would you say your physical health is poor, fair, good, very good or excellent?”. Refer to Appendix C. The SRH was rated on a 5-point rating scale of “poor” to “excellent”. To determine the daily overall total score for the scale, the sum of item response was between 1 to 5. The SRH scores indicate higher scores show better perceived heath related and lower scores show worsen perceived health related to other measures. Also, each day was displayed as separate variables in the analyses. The sample as a whole showed relatively good perceived physical health (*M* =3.31, *SD* = 1.08).

Somatic Symptoms Checklist. The daily measure of the physical health is the Somatic Symptoms Checklist. The measure for somatic symptoms consists of “Today, have you experienced any of these symptoms,” with specific symptoms. This one-item question is based on the PHQ (Schat et al., 2005). To determine the daily overall total score for the scale, the sum of item responses was used to reflect the level of symptoms experienced, resulting in the total score. Higher sum scores of somatic symptoms indicate poor perceived physical health and lower

scores of somatic symptoms led to good physical health. Also, each day was displayed as separate variables in the analyses. The sample as a whole showed relatively lower scores of somatic symptoms (*M* =1.09, *SD* = 1.37). See Appendix C for more details.

Heart Rate Variability. The biomarker, HRV, used to show sympathetic and parasympathetic activation, will be extracted from Garmin Viviosmart 5 watches. The HRV is based on the intervals between heartbeats (interbeat intervals) for every second in a 24-hour cycle for 6 days. Higher levels of spectral power in the high frequency bands of interbeat intervals indicate greater influence of the parasympathetic nervous system (more psychologically relaxed; Akselrod et al., 1981; Malliani et al., 1991; Pinel & Barnes, 2018). Additionally, higher levels of spectral power in the lower frequency bands of interbeat intervals indicate greater influence by the sympathetic nervous system (resulting from higher levels of psychological arousal; Malliani et al., 1991; Pinel & Barnes, 2018). The study identifies biomarkers for psychological arousal and psychological relaxation from participants within high-stress environments, i.e., academics. The Garmin Vivosmart 5 watches provided data based the means of the frequency bands for each day. Percentages of spectral power present in frequency bands ranging from very low to very high were used to define the relative contributions of sympathetic and parasympathetic activity. Additionally, time-domain analyses are utilized by using SDNN recordings for each day. To further understand HRV recordings, low SDNN indicates more activation from the sympathetic nervous system and high SDNN indicate more activation from the parasympathetic nervous system. The SDNN values indicated that the parasympathetic nervous system was more active, relative to the activity level sympathetic nervous system (*M* =148.75, *SD* = 44.24). LF/HF values indicated the parasympathetic nervous system was more active, relative to the activity level of the sympathetic nervous system (*M* =1.44, *SD* = 0.56).

To promote the use of valid data for the HRV component, the researchers created five items assessing sleep, alcohol consumption, and exercise. An example of these items is “How would you rate your sleep?” on a rating scale of 1 to 10 indicating higher score shows better sleep quality. Please refer to Appendix C. If participants’ response were the highest score on these items, then researchers would investigate their data by seeing if any of their daily scale response were outliers. At the end of the daily survey, participants will be asked “Did you synchronize the Garmin watch with the Fitrockr Mobile App?” with yes/no as a reminder link to link the watch and platform.

Procedure

The study and procedures were approved by the Radford University Institutional Review Board. The procedures of the present study were approved by the Radford University Institutional Review Board . Participants met researchers in-person to set up devices and were informed of study requirements. For the opening session, participants proceeded to provide their informed consent (see Appendix B) and were screened for heart-related illness. Participants were asked “Do you have any medical heart-related illness? Such as irregular heartbeat?” Participants informed the researcher if they did or did not have heart-related illness and then decided to participate in the study. Participants were handed an identification code for confidentiality when using the Fitrockr, Remind, and Qualtrics systems. Afterwards, participants did the initial assessment on Qualtrics, which included support networks (assessing support from the people closest to them), MSPSS (assessing perceived social support), PSS (assessing perceived stress), and PHQ (assessing somatic symptoms). Once participants finish the initial survey, they gave their devices to researchers to download the Fitrockr app. Participants waited patiently while researchers entered the participant’s identification code and scanned the QR code to link the

Garmin watch, participant's device, Fitrockr app, and Fitrockr platform. Afterwards, participants were instructed to go about their day as usual. Participants were given the opportunity to contact researchers if needed or if an issue arose with the Garmin Watch. Additionally, participants did the daily surveys concerning their stress, social support, and their perceived physical health in the evenings. Participants were sent daily notifications through Remind text messages or emails to complete daily surveys that were linked to Qualtrics. Participants spent five to ten minutes answering questions from the daily survey every day in the evening.

Once the participants finished the 6-day study, they attended the closing session where they were debriefed on the study's purpose, disconnected the Garmin watch, and deleted apps from personal devices. Participants' debriefing consisted of researchers reiterating the reason for each component of the study and thanked participants for their time. Participants were given extra credit through the SONA system based on their contribution to the study. Participants who completed at least 5 days of data were entered into the drawling for an Amazon gift card. If participants missed more than two days of data, they were excluded from receiving Amazon gift cards, but were still eligible to received partial extra credit for their courses. At the end of the overall study, participants were given their amazon gift card, via email.

Chapter 3 – Results

Data Cleaning

Once data are collected from participants, researchers complied Qualtrics responses and HRV recordings into one SPSS file. The process of data cleaning was completed, such as researchers replacing missing data with means for the variable, organizing data by participants, deleting participant data that were missing two or more days of data, and examining any potential outliers for each variable. The researchers examined from participants whose reported poor sleep, consumed four or more servings of alcohol or caffeine to determine if the survey and HRV results indicated any outliers for data analyses. No outliers were indicated for data analyses. Researchers reverse scored items according to each measurement's original method of calculating mean scores. The Cronbach's Alpha was calculated for the three items of the daily social support measure and the 5-items of daily stress measure. Afterward, descriptive statistics were obtained for each measurement: Daily Perceived Stress, Daily Perceived Social Support, Somatic Symptoms Checklist, and Daily HRV recordings. The means, standard deviations, and ranges of each measurement was calculated for each measurement averaged over all cases. The initial assessment was correlated with each measurement to determine validity within the daily scales.

Statistical Analyses

The study was conducted to examine the effects of perceived stress on physical health (via HRV, self-rated health, somatic symptoms) and how perceived social support might influence this relationship in a sample of 25 participants. Four participants' data were removed due to three watches' malfunctioning, and one participant did not complete daily survey data. Five hypotheses were proposed: (a) high scores of perceived stress would be significantly

negatively correlated with SDNN recordings, self-rated health scores, and scores for perceived social support; (b) that perceived stress would be significantly positively related to the number of reported somatic symptoms; (c) perceived social support would be significantly, positively related to SDNN scores (HRV) and self-rated health scores; (d) perceived social support would be significantly, negatively related to somatic symptoms and low to high frequency ratio (HRV); and (e) perceived social support would moderate the relationship between perceived stress and measures of physical health (i.e., heart rate variability, self-rated health, and somatic symptoms).

The reliability of each scale was examined to determine its internal consistency within the sample. The three-item perceived social support daily measure demonstrated acceptable internal consistency, $\alpha = 0.71$. Daily social support showed reliability but did not show convergent validity with initial assessment. The MSPSS was not correlated with daily social support and did not provide evidence of measuring the same social support. The Cronbach's Alpha for the MSPSS was considered good reliability in measuring perceived social support, $\alpha = 0.82$. For details, refer to Table 2.0 and Appendix C.

The five-item perceived stress daily measure included five items which did not demonstrate acceptable internal consistency, $\alpha = 0.69$. Therefore, further analyses were needed to determine the reliability of daily perceived stress because it's considered questionable reliability. Each item of daily perceived stress was examined through deleting items and reassessing reliability. Two items were deleted to assess the Cronbach's Alpha, and three items were used for daily perceived stress, which showed an improvement in reliability, $\alpha = 0.84$. Statistical analyses using modified three-item daily perceived stress scores were used to test hypotheses 1 through 5. Daily stress showed reliability but did not demonstrate convergent validity with initial assessment. The PSS was not correlated with daily stress and did not provide

evidence of measuring the same stress, see Table 4.0. The Cronbach's Alpha for the PSS was considered good reliability in measuring perceived stress, $\alpha = 0.82$. For details, refer to Table 2.0 and Appendix C.

Tests of Hypothesis 1

The first hypothesis was partially support. Perceived stress was not significantly, negatively correlated with SDNN recordings, $r(124) = -0.02$, $p = 0.87$. However, perceived stress was significantly, negatively correlated with self-rated health questionnaire scores, $r(124) = -0.45$, $p < .001$. Also, perceived stress was significantly, negatively correlated with perceived social support, $r(124) = -0.29$, $p < .001$. Refer to Table 3.0.

Tests of Hypothesis 2

The second hypothesis was partially supported. Perceived stress was significantly, positively related to the number of reported somatic symptoms, $r(124) = 0.27$, $p < .05$. Additionally, perceived stress was not significantly, positively correlated the LF/HF ratio, $r(124) = -0.10$, $p = 0.25$. Refer to Table 3.0.

Tests of Hypothesis 3

The third hypothesis was not supported. Perceived social support was not significantly, positively correlated with SDNN recordings. Instead, findings indicate perceived social support was negatively correlated with SDNN recordings, $r(124) = -0.32$, $p < .001$. Also, perceived social support was not significantly, positively related to self-rated health questionnaire scores, $r(124) = 0.03$, $p = 0.73$. Refer to Table 3.0.

Tests of Hypothesis 4

The fourth hypothesis was not supported. Perceived social support was not significantly, negatively correlated to somatic symptoms, $r(124) = -0.02$, $p = 0.81$. Also, perceived social

support was not significantly, negatively correlated to the LF/HF ratio. Instead, findings indicated perceived social support was positively correlated with LF/HF recordings, $r(124) = 0.19$, $p < .05$. Refer to Table 3.0.

Tests of Hypothesis 5

For testing the final hypothesis of moderation effects, we used the SPSS macro-Process version 4.0 (*https://processmacro.org/download.html*; Hayes, 2018). In moderation the independent variable and moderating variable are both centered so that the Mean is zero for each. Then an error term is created by multiplying the two centered predictors together. The regression was conducted where the center predictors are entered, then the interaction term was entered. The analysis examined whether social support moderated the relationship between perceived stress and physical health.

The fifth hypothesis that social support moderated the relationship between perceived stress and HRV (SDNN and LF/HF ratio) was partially supported. Refer to Table 5.1. The moderating effect of social support on the relationship between perceived stress and SDNN scores was marginally significant $F(1, 122) = 3.2$, $p = 0.076$. The interaction term accounted 2.26% of the variance in SDNN scores over and above what the two main effects explained, $\Delta R^2 = 0.02$. The two main effect terms and the interaction term jointly explained a significant amount of variance (13.71%), $R^2 = .14$, $F(3, 122) = 6.46$, $p < .001$. Overall, there was significant no evidence that social support moderated the relationship between perceived stress and SDNN scores. In contrast, the results indicate that there was a significant main effect for perceived social support, $t(124) = -3.21$, $p < .05$. The analyses shows that the mean ratings of social support were decreasing by 41.06 for every one-point increase in daily score SDNN scores, $b = -41.06$, 95% CI [-66.38, -15.73]. Then, there was a significant main effect for perceived stress, b

= -34.51, $t(124) = -2.06$, $p < .05$. The analyses shows that the mean score ratings of stress decreased by 34.51 points for every one unit increase in daily scores of SDNN recordings, b = -34.51, 95% CI [-67.67, -1.35]. As seen in Figure 2, Perceived stress and heart rate variability showed a trend towards being moderated by perceived social support, approaching statistical significance. The x-axis was perceived stress, the y-axis was HRV using the SDNN recordings, and the z-axis was perceived social support. The three lines represent the levels of perceived social support, such as high, moderate, and low perceived social support. High perceived social support's regression line shows the difference from low social support's regression line. However, the moderate perceived social support line shows very small difference from low social support's regression line. The physical health variable of HRV (SDNN recordings) was the only moderation approaching statistical significance. Refer to Figure 3, perceived stress and SDNN recordings showed a trend towards being moderated by perceived social support, approaching statistical significance. Each point in the 3D figure is displayed in a scatter, which shows variability between individuals across multiple days among the daily measures. However, there is approaching statistical analyses indicated trend towards of perceived stress and SDNN recordings being moderated by perceived social support.

It was hypothesized that social support moderated the relationship between perceived stress and LF/HF ratio. Refer to Table 6.1. The findings of the study showed that the moderation effect of social support on the relationship between perceived stress and LF/HF ratio was not significant, $F(1, 122) = 0.01$, $p = 0.92$. The interaction term did not add a significant amount of variance (.01%) in LF/HF ratio over and above what two main effects explained, $\Delta R^2 = 0.0001$. The two main effect terms and the interaction term did not jointly explain a significant amount of variance (3.86%), $R^2 = 0.038$, $F(3, 122) = 1.63$, $p = 0.19$. Additionally, the results indicate there

was not a significant main effect for perceived social support, $t(124) = 0.82$, $p = 0.41$. The analyses shows that the mean score ratings of social support were increasing by 0.14 for every daily score of LF/HF ratio, $b = 0.139$, 95% CI [-0.20, 0.47]. Then, there was no significant main effect for perceived stress, $b = -.009$, $t(124) = -0.04$, $p = 0.97$. The analyses shows that the mean score ratings of stress were decreasing by 0.009 for every daily score of LF/HF ratio, $b = -0.009$, 95% CI [-0.45, 0.43].

Also, it was hypothesized that social support would moderate the relationship between perceived stress and Self-Rated Health Questionnaire (SRH). Refer to Table 7.1. The findings of the study showed that social support did not moderate the relationship between of social support and perceived stress, $F(1, 122) = 2.02$, $p = 0.16$. The interaction term did not add a significant amount of variance (1.28%) in SRH over and above what two main effects explained, $\Delta R^2 = 0.012$. The two main effect terms and the interaction term jointly explained a significant amount of variance (22.7%), $R^2 = 0.227$, $F(3, 122) = 11.94$, $p < .001$. Also, the results indicate there was no significant main effect for perceived social support, $t(124) = -1.83$, $p = 0.07$. The analyses shows that the mean score ratings of social support were decreasing by 0.54 for every daily score of SRH, $b = -.54$, 95% CI [-1.13, 0.05]. There was a significant main effect for perceived stress, $b = -1.08$, $t(124) = -2.78$, $p = 0.006$. The analyses shows that the mean score ratings of stress were decreasing by 1.08 points for every one unit increase in daily scores of self-rated health, $b = -1.08$, 95% CI [-1.84, -0.31].

It was hypothesized that social support moderated the relationship between perceived stress and somatic symptoms. Refer to Table 8.1. Though, the findings of the study showed that social support did not moderate the relationship between perceived stress and somatic symptoms, $F(1, 120) = 1.35$, $p = 0.25$. The interaction term did not add a significant amount of variance

(1.03 %) in somatic symptoms over and above what two main effects explained, $\Delta R^2 = 0.010$. The two main effect terms and the interaction term jointly explained a significant amount (8.77%) of variance, $R^2 = 0.087$, $F(3, 120) = 3.85$, $p = 0.011$. Also, the results indicate that was not a significant main effect for perceived social support, $t(124) = 1.34$, $p = 0.18$. The analyses shows that the mean score ratings of social support increased by 0.55 points for every one unit increase in daily scores of somatic symptoms, $b = 0.55$, 95% CI [-0.26, 1.35]. There was no significant main effect for perceived stress, $b = 1.01$, $t(124) = 1.90$, $p = 0.06$. The analyses shows that the mean score ratings of stress increased by 1.01 points for every one unit increase daily scores of somatic symptoms, $b = 1.01$, 95% CI [-0.05, 2.06].

Chapter 4 – Discussion

The current study investigates associations between perceived social support, perceived stress, and physical health (via heart rate variability, self-rated health, and somatic symptoms) among emerging adults. The current study also examined whether emerging adults' levels of social support would impact their levels of stress which will either improve or worsen their physical health (via heart rate variability, self-rated health, and somatic symptoms). The current study utilized modern technology (Garmin Vivosmart 5 watches) to determine HRV in relation to the stress buffering model of social support mitigating the relationship between stress and health.

The first hypothesis was partially support because perceived stress was not significantly, associated with SDNN recordings, but was negatively associated with self-rated health questionnaire and perceived social support. The second hypothesis was partially supported because perceived stress was not associated with LF/HF ratio, but was associated with the number of reported somatic symptoms. The third hypothesis was not supported because perceived social support was not associated with SRH or SDNN recordings. However, results suggested that perceived social support was negatively associated with SDNN recordings, which is not was predicted in original hypotheses. The fourth hypothesis was not supported because perceived social support was not negatively associated with somatic symptoms and LF/HF ratio. Though, results indicated perceived social support was positively associated with LF/HF recordings, which is not was predicted in original hypotheses. Hypothesis five was not supported, indicating that daily social support did not moderate the link between perceived stress and physical health (via heart rate variability, self-rated health, and somatic symptoms).

These current results were similar to findings by Park and Yoon (2019), in which they both were unable to determine whether there was a relationship between perceived stress and HRV recordings, as seen first and second hypothesis. However, Martinez et al (2022) showed a small correlation between perceived stress and HRV (LF/HF ratio recordings) indicating the most stress experience during the workday, which in the study there was no association found. Joshi and Nagpal's (2018) utilized a cortisol biomarker to establish the relationship between perceived stress and health. HRV is similar biomarker that can demonstrate activation of the autonomic nervous system. Assessments of HRV using advanced technology has mixed results and needs further exploration to develop the methodology and procedures. Kvadsheim et al.'s (2022) study found the association between social support and HRV did exist for females in the study. HRV recordings can be associated with perceived social support supporting the theory of higher perceived social support is associated HRV (SDNN and LF/HF recordings) showing more parasympathetic activation (Kvadsheim et al., 2022; Santarpia et al., 2023; Taylor et al., 2000). The third and fourth hypothesis was not supported with the previous research.

Also, the fourth hypothesis showed that perceived social support and somatic symptoms were not significantly associated, but other research shows a different relationship. Schat et al.'s (2005) study, which displayed individuals with fewer social support connections report having more somatic symptoms. Similarly, Ozbay et al.'s (2007) found that individuals with more social support are shown to have greater resilience to stress and are less likely to experience illness. The fifth hypothesis was not supported given that social support did not moderate the link between stress and HRV. On the contrary, the Santarpia et al.'s (2023) results showed perceiving more social support was associated with higher levels of HRV (SDNN recordings) that in

employees and concluded social support does enable individuals to psychologically adjust during stressful events.

Strengths and Limitations

A major strength of the study was the methodology for understanding and implementing new technology. Previous research showed HRV was collected for short duration of time (citation), while the new technology of modern watches allows data collect for a longer duration of time. The present study provided an extensive duration for HRV data by collecting for every second among consecutive 24-hour cycles. The methodology of implementing these Garmin Vivosmart 5 watches provide observable trends, patterns, and potential changes in HRV. Also, these modern watches provided data collection from real-world environments which capture HRV in a more diverse and naturalistic environment. Using these modern watches, gave a non-invasive alternative by reducing discomfort or stress that influence participants. Additionally, using the Remind app to notify participants on their phones to complete daily surveys resulted in high retention of daily survey responses.

Another strength, and potential limitation, of this study was the use of a convenience sample through the Psychology Department participant pool managed through SONA. The participant pool provides a quick and easy way for researchers to obtain participants in a short amount of time. This process provides a strength in assessing emerging adults transitioning into a stressful environment which is suitable for examining social support impacting stress and physical health. The unique population from Radford University provides a better understanding for university students attending college, but this factor makes it difficult for researchers to generalize this research toward other emerging adults. The college sample can also be considered

a limitation because it does not include emerging adults who do not attend college or choose a different career path.

A possible limitation for the study was not recording marijuana intake for possible outliers or used to examine HRV data. In the present study, researchers asked participants about their caffeine and alcohol consumption, but did not record any data relating to marijuana or other drugs. Park and Yoon (2023) acknowledge that caffeine and alcohol consumptions was not measured in their findings. Therefore, researchers, who did record caffeine and alcohol consumption, aim to include drug consumption when collecting HRV data.

A limitation for the study showed an issue with convergent validity for the daily measures. The daily social support measure provided an acceptable reliability and provided a good measure for daily scales. However, the limitation of the study's daily measure shows poor construct validity due to the MSPSS (Zimet et al., 1988) was not correlated with the daily social support. Also, the PSS (Cohen et al., 1983) was not correlated with daily stress measure, so this provides evidence of poor construct validity. Additionally, the daily stress measure showed that the shortened PSS Cronbach's alpha showed questionable reliability and was reassessed on which items needed to be removed to improve reliability. To consider, the current daily measures may need to be lengthened, because it may not capture the important aspects of perceived stress and social support.

Another minor limitation discovered during data collection concerned participants needing to charge the Garmin Viviosmart 5 watch on the third/fourth day of the study. This issue led to participants having to take off the watch and potentially forgetting to put the watch back on their wrist. A solution for this issue is shorting the duration of the daily study, so there will be no issues with needing to charge the watchers. However, researchers would recommend

purchasing the next generation of Garmin Viviosmart 5 watches, which have longer battery life, for longer duration of HRV recordings. The study concerns with updates on Fitrockr platform while simultaneously collecting HRV, which led to halt recruiting individuals. The time of data collection during updates on Fitrockr lead to three Garmin Vivosmart 5 watches not responding when transferring health data into the platform. These modern watches need to update with the new technology that drives the platform. The Fitrockr company gave researchers a gracious amount time for data collection due to the malfunction of the Garmin Viviosmart 5 watches. Fitrockr is accommodating to researchers while they continue to expand their knowledge and services.

Future Directions and Implications

Research on social support, stress, and health is important for secondary education, workplace, home, and numerous other settings. Social support has been shown to improve individual's response to stress (Santarpia et al., 2023) and allows individuals to be more resilient to stressors (Grey et al., 2020). Implementing advance modern watches helpful for examining physiological biomarker impacted from various constructs, like social support and stress. Previous research has measured HRV measured through short-term duration with devices that collect data points for only minutes at a time (Kim et al., 2017; Kleiger et al., 2005). However, advanced technology is enhancing psychophysiology research by collecting health data for much longer time periods. Modern watches, similar to Garmin Vivosmart 5 watches, allow researcher to gain insight into the human body at work with mental processes in their everyday experiences. With this new innovation in research, future researchers will be in a better position to identify the benefits of social support emerging adults in relation to their perceived stress and physical health. By inspecting social support further, it will either aid or deter individual's resilience

during stressful transitions, and better inform the fields to whether social support could improve or degrade their physical health in the future. If future researcher comprehends emerging adults adapting to stressful transition, this research can be applicable to helping them in the future acclimating to stressors in the future.

The current study was unable to determine whether social support moderates the relationship perceived stress and physical health. In spite of this, the current researchers recommend further investigation of social support, stress, and physical health due to their close association within the research field. The methodology and created scales for the current study should be modified in future studies to validate the moderation model and association between social support, stress, and physical in different population around the United States. Future researchers should consider expanding on the operational definition of social support for daily measures, because most research today examines daily diaries. There are exacting methods for measuring social support, but there is a need to implement daily social support in relation to HRV recordings that provide an accurate measurement. The current research findings contribute different methods from previous studies, but there is a need for more established methodology to understand HRV recordings for continuous 24-hour cycles along with measures. The current research gives an idea of how future researchers should consider the methodology of how upcoming modern watches collect can be used to HRV recordings and consider the moderation model by reevaluating emerging adults' perspectives of social support and stress in the post-pandemic era.

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Appendix A – Tables & Figures

Table 1.0

Demographic Information (N = 25)

Demographics	Percentage (%)
Gender	
Male	24%
Female	72%
Non-binary	4%
Biological Sex	
Female	76%
Male	24%
Race & Ethnicity	
Latino/Hispanic	4%
White/Caucasian	56%
Black/African American	24%
Asian	4%
Identified More Than One Race	12%
Year in School	
Freshman	52%
Sophomore	20%
Junior	12 %
Senior	16 %
Enrollment Status	
Full-time student	100%
Relationship Status	
Single/Unmarried	96%
Married	4%

Employment Status	
Full-time Employee	4%
Part-time Employee	40%
Work-study	16%
Unemployed	36%
Not Answered	4%
Dependents	
No	100%
Household Income	
Less than $25,000	36%
$25,000-$49,999	16%
$75,000-$99,999	8%
$100,000-$149,999	4%
$150,000 or more	16%
Prefer not to say	20%

Table 2.0

Descriptive Statistics

	N	Mean	Std. Deviation	Cronbach's Alpha
Perceived Stress	126	2.43	0.96	0.84
Perceived Social Support	126	3.80	0.78	0.71
SDNN	126	148.75	44.24	-
LF/HF	126	1.43	0.56	-
Somatic Symp.	124	1.09	1.37	-
Self-Rated Health	126	3.31	1.08	-
MSPSS	25	5.97	0.74	0.82
PSS	25	2.07	0.51	0.82
PHQ	25	3.60	0.71	0.49

Table 3.0

Correlations

Daily Physical Health with Daily Scales

		Somatic Symp.	Self-Rated Health Questionnaire	SDNN	LFHF	Social Support	Stress
Somatic Symp.	Pearson Correlation	--					
	N	124					
Self-Rated Health Questionnaire	Pearson Correlation	-0.58**	--				
	Sig. (2-tailed)	<.001					
	N	124	126				
SDNN	Pearson Correlation	-0.13	0.29**	--			
	Sig. (2-tailed)	0.147	<.001				
	N	124	126	126			
LFHF	Pearson Correlation	-0.19*	-0.02	-0.50**	--		
	Sig. (2-tailed)	0.033	0.787	<.001			
	N	124	126	126	126		
Social Support	Pearson Correlation	-0.02	0.03	-0.31**	0.19*	--	
	Sig. (2-tailed)	0.808	0.734	<.001	0.033		
	N	124	126	126	126	126	
Stress	Pearson Correlation	0.27**	-0.45**	-0.01	-0.10	-0.29**	--
	Sig. (2-tailed)	0.002	<.001	0.868	0.249	<.001	
	N	124	126	126	126	126	126

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

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

Table 4.0

Correlations

Initial Assessment Scales with Daily Scales

		Somatic Symp.	Daily Social Support	Daily Stress	MSPSS	PSS	PHQ
Somatic Symp.	Pearson Correlation	--					
	N	124					
Daily Social Support	Pearson Correlation	-.022	--				
	Sig. (2-tailed)	0.808					
	N	124	126				
Daily Stress	Pearson Correlation	0.27**	-0.29**	--			
	Sig. (2-tailed)	0.002	<.001				
	N	124	126	126			
MSPSS	Pearson Correlation	0.13	0.04	0.25	--		
	Sig. (2-tailed)	0.527	0.838	0.221			
	N	25	25	25	25		
PSS	Pearson Correlation	-0.07	0.04	-0.29	-0.44*	--	
	Sig. (2-tailed)	0.733	0.846	0.158	0.026		
	N	25	25	25	25	25	
PHQ	Pearson Correlation	-0.39	0.25	-0.06	-0.15	0.04	--
	Sig. (2-tailed)	0.053	0.220	0.757	0.467	0.840	
	N	25	25	25	25	25	25

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

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

Tables 5.0

Model Summary: R & R^2 of SDNN

Model	R	R Square	MSE	F	df1	df2	*p*
1	0.371	0.137	1730.68	6.46	3	122	.0004

a. Predictors: (Constant), Daily Stress, Daily Social Support, X*M

b. Dependent Variable: SDNN

Table 5.1

Matrix of SDNN

Model		Coefficients	Std. Error	*t*	*p*	LLCI	ULCI
1	(Constant)	316.06	49.89	6.33	0.0000	217.30	414.84
	Daily Stress	-34.50	16.75	-2.06	0.0415	-67.67	-1.35
	Daily Social Support	-41.05	12.79	-3.21	0.0017	-66.38	-15.73
	X*M	8.04	4.49	1.79	0.0762	-0.86	16.95

a. Dependent Variable: SDNN

Table 5.2

*Model Summary: X*M of SDNN*

Model	R Square Change	F	df1	df2	*p*
X*M	0.02	3.20	1	122	0.076

a. Predictors: (Constant), Daily Stress, Daily Social Support, X*M

b. Dependent Variable: SDNN

Tables 6.0

Model Summary: R & R^2 of LFHF

Model	R	R Square	MSE	F	df1	df2	*p*
1	0.20	0.04	0.30	1.63	3	122	0.185

a. Predictors: (Constant), Daily Stress, Daily Social Support, X*M

b. Dependent Variable: LFHF

Table 6.1

Matrix of LFHF

Model		Coefficients	Std. Error	*t*	*p*	LLCI	ULCI
1	(Constant)	0.98	0.66	1.48	0.140	-0.33	2.29
	Daily Stress	-0.01	0.22	-0.04	0.968	-0.45	0.43
	Daily Social Support	0.14	0.17	0.82	0.413	-0.20	0.47
	X*M	-0.01	0.06	-0.10	0.920	-0.12	0.11

a. Dependent Variable: LFHF

Table 6.2

*Model Summary: X*M of LFHF*

Model	R Square Change	F	df1	df2	*p*
X*M	0.0001	0.01	1	122	0.92

a. Predictors: (Constant), Daily Stress, Daily Social Support, X*M

b. Dependent Variable: LFHF

Tables 7.0

Model Summary: R & R^2 of SRH

Model	R	R Square	MSE	F	df1	df2	*p*
1	0.48	0.23	0.93	11.94	3	122	0.000

a. Predictors: (Constant), Daily Stress, Daily Social Support, X*M

b. Dependent Variable: SRH

Table 7.1

Matrix of SRH

Model		Coefficients	Std. Error	*t*	*p*	LLCI	ULCI
1	(Constant)	6.65	1.15	5.76	0.000	4.37	8.94
	Daily Stress	-1.08	0.39	-2.78	0.006	-1.84	-0.31
	Daily Social Support	-0.54	0.30	-1.83	0.070	-1.13	0.05
	X*M	0.15	0.10	0.16	0.157	-0.06	0.35

a. Dependent Variable: SRH

Table 7.2

*Model Summary: X*M of SRH*

Model	R Square Change	F	df1	df2	*p*
X*M	0.01	2.03	1	122	0.16

a. Predictors: (Constant), Daily Stress, Daily Social Support, X*M

b. Dependent Variable: SRH

Tables 8.0

Model Summary: R & R^2 of Somatic Symp.

Model	R	R Square	MSE	F	df1	df2	*p*
1	0.30	0.09	1.75	3.85	3	122	0.01

a. Predictors: (Constant), Daily Stress, Daily Social Support, X*M

b. Dependent Variable: Somatic Symptoms

Table 8.1

Matrix of Somatic Symp.

Model		Coefficients	Std. Error	*t*	*p*	LLCI	ULCI
1	(Constant)	-1.94	1.59	-1.22	0.225	-5.08	1.21
	Daily Stress	1.01	0.53	1.90	0.060	-0.05	2.06
	Daily Social Support	0.55	0.41	1.34	0.183	-0.26	1.35
	X*M	-0.17	0.14	-1.16	0.247	-0.45	0.12

a. Dependent Variable: Somatic Symptoms

Table 8.2

*Model Summary: X*M of Somatic Symp.*

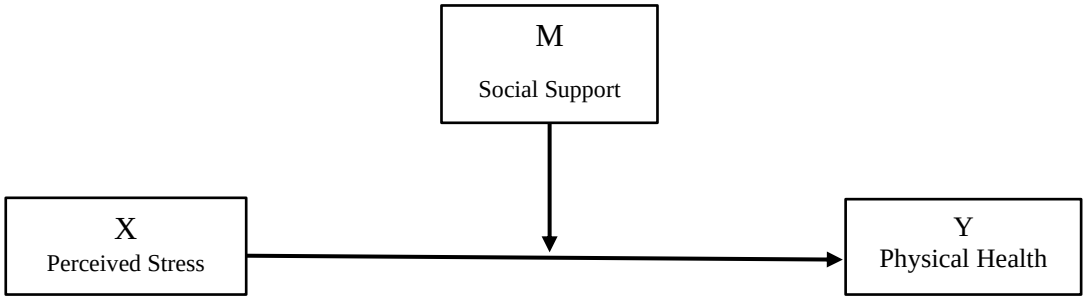
Model	R Square Change	F	df1	df2	*p*
X*M	0.01	1.35	1	120	0.25

a. Predictors: (Constant), Daily Stress, Daily Social Support, X*M

b. Dependent Variable: Somatic Symptoms

Figure 1

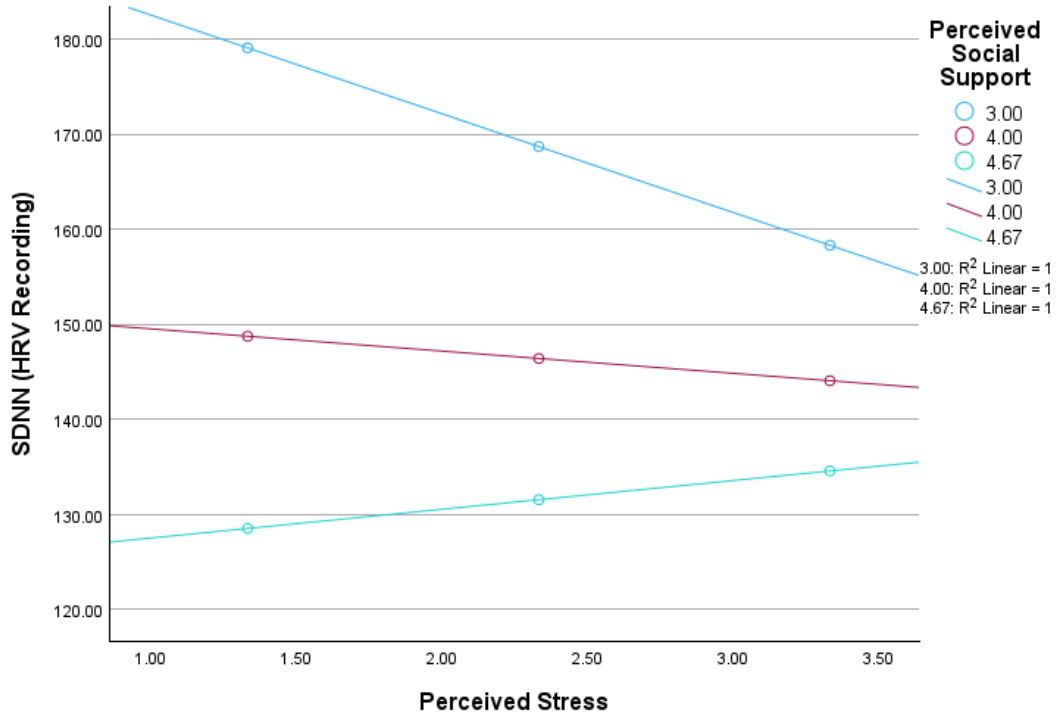
Model of Moderation Analyses



Note. Daily Perceived Stress will consist of items from the PSS (Cohen et al., 1983) plus 1 item made form researchers. Daily Perceived Social Support will consist of items based on Sarason et al. (1987) with Kahn and Antonucci (1980). Daily Physical Health will consist of one-item about somatic symptoms based on Schat et al. (2005), one-item SRH (Ware & Sherbourne, 1992), and HRV recordings (LF/HF Ratio and SDNN).

Figure 2

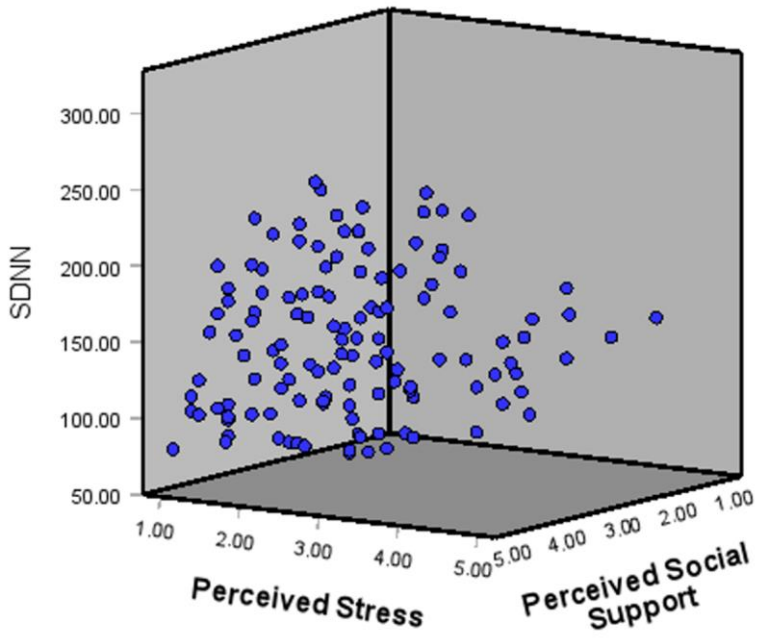
Social Support Moderating Stress and HRV



Note. Perceived stress, and HRV (SDNN Recording) was almost moderated by perceived social support through approaching significant. The three lines represent the levels of perceived social support which shows high social support regression line is approaching significantly different from low social support regression line. The physical health variable of HRV (SDNN recordings) was the only moderation approaching statistical significance, so this measure was displayed further.

Figure 3

Simple 3-D Scatter of SDNN by Perceived Stress by Perceived Social Support



Note. The 3D figures represent the moderation model. Perceived social support almost moderated the relationship between perceived stress and HRV (SDNN Recording). The physical health variable of HRV (SDNN recordings) was the only moderation approaching statistical significance, so this measure was displayed further.

Appendix B – Informed Consent

RADFORD UNIVERSITY
Research Compliance Office

Institutional Animal Care and Use Committee / Institutional Review Board

November 06, 2023

TO:	Jenessa Steele
RE:	Initial Expedited Approval
STUDY TITLE:	The Heart's Symphony: Connecting Stress to Heart Rate Variability through the Indirect Effects of Social Support
IRB REFERENCE #:	2023-103
SUBMISSION TYPE:	IRB Initial Submission
ACTION:	Approved
APPROVAL PERIOD:	November 06, 2023 – November 05, 2026

The above-referenced study has been approved by Radford University's Institutional Review Board (IRB). Your study has been approved under **Expedited Category 7: Research is on individual or group characteristics of behavior (including, but not limited to research on perception, cognition, motivation, identity, communication, cultural beliefs or practices, and social behavior) or the research employs survey, interviews, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies).**

Please note that if your research includes stamped materials, they will be provided with this letter and must be used when conducting your research. A copy of your approved IRB protocol is available for your records in IRBManager under your dashboard of active protocols.

You are approved for the enrollment of 40 participants.

Note: The number approved is the number of study participants is defined as the number who enroll in the project and NOT the number of subjects with usable data for analysis. If this should change, you must submit an amendment to increase the number of study subjects.

Your IRB approval period ends on November 05, 2026. If the study remains ongoing after the project end date, you must submit a three-year check-in application no later than ten (10) days prior to the expiration of this approval. If the project is no longer being pursued, a closure report must be submitted.

Should you need to make changes in your protocol, you must submit a request for amendment for review and approval before implementing the changes. Amendments must be submitted via the IRBManager system.

As the principal investigator for this project, you are ultimately responsible for ensuring that your study is conducted in an ethical manner. You are also responsible for filing all reports related to this project.

If you have any questions, please contact the Research Compliance Office at 540.831.5290 or irb-iacuc@radford.edu. Please include your study title and reference number in all correspondence with this office.

Good luck with this project!

Radford University Institutional Review Board (IRB)
Research Compliance Office
540.831.5290

Radford University IRB
Approval Date: November 06, 2023

Appendix C – Scales

Perceived Stress Scale (Cohen et al., 1983)

Instructions: Below are 10 statements about your status. PSS has 10 items on a 5-point Likert scale ranging from never (0) to very often (4). The PSS scores are obtained by reversing responses (e.g., 0 = 4, 1 = 3, 2 = 2, 3 = 1 & 4 = 0) to the four positively stated items (items 4, 5, 7, & 8) and then summing across all scale items.

Physical Health Questionnaire (Schat et al., 2005)

Instructions: The following items focus on how you have been feeling physically during the past [period of time]. Please respond by circling the appropriate number. Items 1-11 had responses ranging from "not at all" (1) to "all the time" (7), items 12-13 ranging from "0 Times" to "7+ Times", and item 14 ranging from "1 Day" to "7+ Days". Also, Item 4 should be reverse scored.

Multidimensional Scale of Perceived Social Support (Zimet, 1988)

Instructions: The MSPSS (Zimet et al. 1988) is a 12-item self-report questionnaire that includes three subscales consisting of four items each relating to family, friends, and a significant other. Items are scored on a 7-point Likert scale ranging from ‘strongly disagree’ to ‘strongly agree’, with higher scores indicating higher levels of perceived social support. The scale produces a score of perceived social support by averaging 12 items, which ranges from 1 to 7. It also yields three separate average scores assessing social support from friends, family, and a significant other, which range from 1 to 7, respectively.

1. There is a special person who is around when I am in need

2. There is a special person with whom I can share my joys and sorrows

3. My family really tries to help me

4. I get the emotional help and support I need from my family

5. I have a special person who is real source of comfort

6. My friends really try to help me

7. I can count on my friends when things go wrong

8. I can talk about my problems with my family

9. I have friends with whom I can share my joys and sorrows

10. There is a special person in my life who cares about my feelings

11. My family is willing to help me make decisions

12. I can talk about my problems with my friends

Demographics

1. What is your biological sex?

o Male

o Female

2. What is the gender you identify with?

o Male

o Female

o Non-binary

o Other

3. Are you of Hispanic or Latino origin?

o Yes

o No

4. Choose one or more races that you consider yourself to be:

o White or Caucasian

o Black or African American

o American Indian/Native American or Alaska Native/Asian

o Native Hawaiian or Other Pacific Islander

o Asian

5. What year of school are you in?

o Freshman

o Sophomore

o Junior

o Senior

6. Which best fits your enrollment status?

o Full-time student

o Part-time student

o Not enrolled

o N/A

7. Which best fits your employment status?

o Full-time employee

o Part-time employee

o Work-study

o Unemployed

o N/A

8. What was your total household income before taxes during the past 12 months?

o Less than $25,000

o $25.000-$49,999

o $50.000-$74,999

o $75,000-$99,999

o $100,000-$149,999

o $150,000 or more

o Prefer not to say

9. What is your relationship status?

o Single/Unmarried

o Married

o Divorced

o Widowed

o Separated

10. Do you have any dependents?

(EX: children, parents, siblings you take care of)

o Yes

o No

Daily Survey

1. What is your participant identification code?
   (Open Response)

Daily Social Support

2. Today, how frequently did you interact with the people closest to you?
- o Not at all
- o A little
- o Somewhat
- o Very
- o Extremely

3. Today, how important is it for you to have daily interactions with the people closest to you?
- o Not at all
- o A little
- o Somewhat
- o Very
- o Extremely

4. Today, how satisfied are you to have daily interactions with the people closest to you?
- o Not at all
- o A little
- o Somewhat
- o Very
- o Extremely

Daily Stress

5. To what extent did you feel stress today?
- o Not at all
- o A little
- o Somewhat
- o Very
- o Extremely

Perceived Stress Scale Shorten Version (Cohen et al., 1983)
4-items

Self-Rated Health

6. In general, how would you describe your health?

- o Poor
- o Fair
- o Good
- o Very Good
- o Excellent

Somatic Symptoms

7. Today, how would you rate your sleep quality?

- o 1
- o 2
- o 3
- o 4
- o 5
- o 6
- o 7
- o 8
- o 9
- o 10

8. Today, have you experienced any of these symptoms?

- o Sleep disturbances
- o Headaches
- o Upset stomach (indigestion)
- o Constipated
- o Diarrhea
- o Congestion
- o Cough
- o Runny Nose
- o Fatigue
- o No Symptoms

Covariables

9. About how many drinks containing caffeine did you have today?

- o 0
- o 1
- o 2
- o 3
- o 4+

10. About how many drinks of alcohol did you have today?
- o 0
- o 1
- o 2
- o 3
- o 4+

11. If you exercised today, when?
- o No Exercise
- o Morning
- o Afternoon
- o Evening

12. How strenuously have you exercised today?
- o No Exercise
- o Low
- o Moderate
- o Vigorous

13. Did you synchronize the Garmin watch with the Fitrockr Mobile App?
- o Yes
- o No