

EXPLORING COLLEGE STUDENTS' PERCEPTIONS OF NATURE FOR HEALTH
PROMOTION

by

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Submitted in partial fulfillment of the
requirements for Departmental Honors in
the Department of Nursing
Texas Christian University
Fort Worth, Texas

May 3, 2021

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ABSTRACT

The purpose of this study was to explore undergraduate college students' thoughts and opinions about green space on a university campus and about the effect of nature on perceived mental health. A qualitative descriptive study was implemented using two focus groups that were each comprised of 6-8 undergraduate students from TCU. Participants completed a survey prior to the focus group session consisting of questions pertaining to demographics, mental health, nature, and technology use. Due to COVID-19 social distancing protocols, the focus groups were held on Zoom, and the transcripts were analyzed using thematic content analysis to extract meaning from the narrative responses. Findings revealed four main themes: technology's impact on mental health and nature, campus access to green spaces, suggested improvements to promote time in nature on campus, and stress reduction versus stress induction in college students. Technology often had a negative impact on the mental health of college students while nature-based health promotion had a positive effect. Universities could benefit from investing in nature-infused outdoor spaces with the goal of supporting connections with nature for the improvement of mental health.

ACKNOWLEDGEMENTS

I first want to thank my parents, Tina and Jeff Rogers, who made it possible for me to attend TCU where I had the opportunity to take part in research with the John V. Roach Honors College and to participate in the Harris College of Nursing program. I also want to thank my mentor and committee members who have supported me at each step along the way and have served as role models throughout this entire process. TCU has provided me with an education that has shaped the direction of my future, and it has blessed me with friendships and relationships with faculty members that will last a lifetime. I cannot express how grateful I am for TCU as an institution, and I look forward to seeing where the future takes me.

Introduction

College students have an increased susceptibility to mental illness due to the pressure of adapting to a new environment combined with the extensive obligations that university coursework demands (Lew et al., 2019). In fact, at some point within the past twelve months, 87% of college students felt overwhelmed by all they had to do, 55% felt overwhelming anxiety, 33% felt so depressed they found it difficult to function, and 9% seriously considered suicide (Windhorst & Williams, 2015). With university pressures mounting, many students turn toward technology use to ease some of the anxieties that are associated with the complexities of college life (Zhang et al., 2020), despite associations between smartphone use/social media time and various mental health concerns (Rakow & Eells, 2019).

Not only is it imperative that college students are made aware of the adverse effects of screen time, but it is timely to examine their perceptions of nonpharmacological means of mental and physical health promotion, particularly during times of isolation that many have faced during the SARS-CoV-2 pandemic. Nature-based health behaviors and increased connectedness with the environment augment perceptions of quality of life, strengthen community cohesion, and improve self-esteem (Hansen-Ketchum & Halpenny, 2010). Time in nature also yields a variety of health benefits such as offering relief from stress, depression, and lack of focus (Meredith et al., 2020). While research studies like these have discovered that nature positively influences the general population, evidence is growing regarding the perceptions of college students and their management of mental health and perceptions of nature to influence their well-being (Meredith et al., 2020; Rakow & Eells, 2019; Windhorst & Williams, 2015).

The primary purpose of this project is to explore undergraduate college students' thoughts and opinions about green space on a university campus and about the effect of nature on perceived mental health. Green space will be defined as "any vegetated land adjoining an urban area...and includes bushland, nature reserves, national parks, outdoor sports fields, school playgrounds, and rural or semi-rural areas immediately adjoining an urban area" (Chong et al., 2013, p. 1). Mental health will be defined as "a state of well-being in which every individual realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community (Windhorst & Williams, 2015, p. 241). Having preliminary understanding of college students' perceptions of the effect of time spent in nature on their perceived mental health will assist in the development of campus-based interventions for resilience and wellness.

Nature-Based Health Promotion Conceptual Framework

Nature-based health promotion improves human health through effectively managing symptoms of stress, improving cognitive function, accelerating recovery from illness, and encouraging a sense of community belonging (Hansen-Ketchum et al., 2009). The goal of Hansen-Ketchum's conceptual framework was to encourage nurses, other healthcare professionals, and community members to re-examine the relationship between nature and humans as well as the physical and mental health advantages associated with time outdoors (Hansen-Ketchum et al., 2009). A restorative approach was used; individuals must, first, learn to restore respect for the world they inhabit so that they may reframe the way they view nature. Active restoration projects and hands-on engagement amplifies concern for nature, and once healthcare providers are able to restore their own connection with the natural environment, they will be better equipped to promote the benefits of nature with others (Hansen-Ketchum et al.,

2009). Furthermore Hansen-Ketchum et al. (2009) asserts that incidental contact with nature is linked to a positive effect on self-esteem as well as a reduction in symptoms of attention deficit disorder. Not only does incidental contact with nature show health benefits, but active participation with nature may improve cognition and reduced mental fatigue (Hansen-Ketchum et al., 2009). This framework was developed over a decade ago during a time when the field of nature-based health promotion was just beginning to develop. Since this period, the evidence base is continuing to grow, and the goal of this research is to use this framework to build the evidence base for nature-based health promotion.

Review of the Literature

The evidence is growing in support of the physical and mental health benefits that college students receive from time spent outdoors in nature. A review of the literature focused on several databases, including Cochrane Library, EMBASE, Joanna Briggs Institute, Medline Complete, and CINAHL Complete. Key terms used included “nature,” “nature-based health promotion,” “college students,” “well-being,” “mental health of college students,” “nature-therapy,” “stress,” and “benefits of nature.”

Inclusion criteria included studies that were published within the past 10-11 years, written in English, and examined either the relationship between nature and mental health/general well-being or the relationship between mental health and college students. Exclusion criteria were studies published earlier than 2009-2010 and those yielding no results concerning the relationship between mental health, general well-being, or college students. From the twelve selected studies that fit the inclusion criteria, subheadings were created to organize the bodies of evidence into themes related to the research. These subheadings include mental health

status of the college-student population, technology use among college students, effects of time in nature on mental health, and influences of the location of nature on mental health.

Mental Health Status of the College-Student Population

Due to the intensity of homework, tests, quizzes, projects, internships specific to coursework, and other personal obligations, college students are vulnerable to stress, anxiety, depression, and even suicidal ideations (Lew et al., 2019). Students must learn to adapt to a new environment without the protection of their parental figures, and they are expected to uphold grades and responsibilities all while adjusting to a brand-new space. Financial strains, increasing competition, and technology-induced isolation also contribute to increasing emotional distress among college students (Meredith et al., 2020). These stressors can precipitate mental illness, which is concerning due to the positive correlation between the severity of depression and levels of hopelessness and stress and the increased likelihood for suicidal behavior (Lew et al., 2019). Fifty-three percent of college students expressed that they experienced depressive symptoms when entering college, subjecting them to an increased risk of experiencing suicidal ideations (Lew et al., 2019). Additionally, academic studies demand prolonged use of directed attention, which often leads to mental fatigue and associated irritability and stress (Rakow & Eells, 2019). Among enrolled college students, mental health issues are noted as the number one health concern (Meredith et al., 2020). Often, college students find it difficult to incorporate effective coping strategies due to the focus on their many academic responsibilities (Lew et al., 2019).

Technology Use among College Students

Students can escape stress by spending time on smart phones, computers, tablets, and other forms of technology to view social media, popular trends, and television or movie series. Too much time spent on devices like these or “smart-phone use disorder” (SUD) has been linked

to antisocial behaviors, poor peer relationships, suicidal ideation, substance addition, and alcohol use disorder (Zhang et al., 2020). Moreover, SUD is associated with sleep disorders, poor concentration, anxiety, depression, and physical and mental problems (Zhang et al., 2020).

Technology in the personal lives of college students continues to increase; as a result, students can become isolated from the human experience with nature. In addition, college students are highly susceptible to mental illness: 67% report tremendous stress, 61% report feeling overwhelming anxiety, 51% report hopelessness, and 13.2% report being diagnosed with or treated for anxiety or depression (Meredith et al., 2020). High levels of addictive social media use have been linked to a low volume of grey matter in the subgenual anterior cingulate and nucleus accumbens, which play a role in complex cognitive functions such as decision-making and emotion (Zhang et al., 2020). Individuals who are depressed and lack social support or interpersonal connections can turn to social media and technology to find instant gratification by interacting with the virtual world. Further research is necessary to understand the phenomenon of SUD more clearly and to investigate possible pathways to facilitate a balance of technology use with time outdoors and social connection with others in order to promote overall mental and physical health benefits.

Although technology has the potential to be detrimental to students, it is often required for various academic assignments and projects and can be a beneficial resource. College students have access to technology and can use digital tools to facilitate time spent in nature. Certain programs such as Campus Nature Rx have employed online webpages and electronic health records to prescribe and promote time spent in nature (Rakow, 2020). In this case, students can use technology to access resources related to green space locations around campus, and they can redeem tailored, digital nature prescriptions from a healthcare provider on campus (Rakow,

2020). When used to promote time spent in nature, technology can facilitate engagement with the natural world, leading to a reduction in stress, increase in physical and mental health, and increase in nature appreciation (Rakow, 2020).

Effects of Time in Nature on Mental Health

Time spent in nature relieves stress, improves lack of focus, and decreases symptoms of depression; moreover, time in nature is associated with reduced cortisol and alpha-amylase concentrations, which are two biomarkers of stress (Meredith et al., 2020). While the location of the natural ecosystem plays a role in mental health management, the length of time spent in the environment significantly affects the outcome. Twenty to 30 minutes in nature, three times a week, leads to the highest self-reports of positive health and well-being as compared to individuals who did not spend any time in nature (Meredith et al., 2020). Physiological factors such as blood pressure, heart rate, cortisol levels, and sympathetic nervous system activity each decreased with only 10-30 minutes of looking at or being in nature. Walking outdoors in nature also showed an increase in parasympathetic nervous system activity (Meredith et al., 2020). Reductions in stress, anxiety, and depression as well as an increase in positive mood and affect also resulted from time spent walking outdoors. Furthermore, individuals reported feeling more calm, comfortable, and refreshed after walking in nature (Meredith et al., 2020). College students who self-identified as “high users” of campus green space rated their overall quality of life as being higher compared to students who used campus green spaces less often (Rakow & Eells, 2019). Additionally, college students who spent time in green spaces reported a reduction in stress levels and an increased ability to concentrate (Rakow & Eells, 2019). With as little as only 10-20 minutes spent sitting or walking in nature, college students can have the opportunity to improve their mental health through stress reduction and increased physiological health.

Influences of the Location of Nature on Mental Health

While the duration of time spent in nature impacts mental health symptoms, the location of where that time is spent is also linked to beneficial health improvements. Exposure to green spaces such as parks, forests, or community gardens has an effect on stress and mood and is associated with reduced risk of depressive symptoms, clinical anxiety, and negative emotions (Vujcic et al., 2017). Ewert and Chang's (2017) study examined the stress response from individuals who visited three different sites, Site A (wilderness-like characteristics [most natural]), Site B (municipal-type park), and Site C (indoor exercise facility). Results from the study showed that participants' cortisol levels drastically decreased after visiting Site A but not after B or C, and participants levels of joy increased after visiting Site A. Visitors at the most natural site (Site A) also reported having the least amount of worries and demands (Ewert & Chang, 2017). By reducing cortisol levels and increasing feelings of joy, individuals can improve both their physical and mental health. Not only does stress play a role in mental health, but it also negatively impacts well-being by affecting the immune system, cardiovascular health, and endocrine health (Ewert & Chang, 2017). By managing stress, individuals are better able to take control of their lives by increasing their level of joy, decreasing their level of worry, and improving their overall health.

In a separate study conducted by Windhorst and Williams (2015), college students chose a natural environment that they enjoy visiting the most. The participants of the study noted that they appreciated getting away from the social and built environment, which in their minds represented city life, busyness, academic demands, and social expectations (Windhorst & Williams, 2015). In contrast, they reported that their chosen natural environments represented feelings of relaxation, calm, and peace as well as promotion of deep thought and reflection

(Windhorst & Williams, 2015). Each chosen natural environment had similar natural elements, including rocks, leaves, plants, trees, animals, and soil and were located away from the stimulation of their everyday college lives (Windhorst & Williams, 2015). By escaping the demands of daily life and entering the realm of natural environments, college students have the opportunity to reduce stress and restore their sense of peace (Windhorst & Williams, 2015). This review of the literature affirms the value of nature-based health promotion among college students. The primary purpose of this project is to explore undergraduate college students' thoughts and opinions about green space on a university campus and about the effect of nature on perceived mental health.

Methods

Study Design

A qualitative descriptive study was implemented using focus groups to gather undergraduate college students' thoughts and opinions about their university's green space availability and the effects of nature on perceived mental health.

Responsible Conduct of Research

The student completed the CITI Training for Human Subjects Research (Social-Behavioral-Educational) and followed all guidelines for ethical conduct of research. Refer to Appendix A for the informed consent, which outlines the protection of participants. The student also received study approval from the affiliated institutional review board.

Subject Population and Setting

The setting for this study was a private Christian university in the South and included undergraduate students of all classes (freshman, sophomore, junior, and senior). The target sample size was approximately 6-8 students in two separate focus groups for a maximum total of

16 participants. The investigator sought to enroll participants from at least three to four separate colleges on the university campus as well as different demographic backgrounds for optimal representation of students. The student used purposeful sampling in attempts to ensure a sample representative of the undergraduate student body.

The inclusion criteria for this qualitative study were age (18 years or older), student status (undergraduate at the university at the time of the study with access to an online platform), and willingness to participate in a group discussion. Exclusion criteria were being less than 18 years old or not being an undergraduate student on the university campus at the time of the study. Due to COVID-19, the focus groups were moved to a virtual format over Zoom in compliance with social distancing restrictions. Each individual chose a safe, secure location for the Zoom focus group at the time of the study.

Recruitment Procedure

Students were recruited primarily through social media requests (e.g., GroupMe, Instagram), outlining the purpose of the study and contact information to participate in a focus group. An information graphic (see Appendix B) and short paragraph about the study were sent out to members of organizations such as the Neeley Leadership Program, National Student Speech, Language, and Hearing Association, Student Nurses' Association, and sororities/fraternities. Resident advisors (RA) from various dorms on campus were also contacted and given the information graphic to distribute to their dorm residents. Information about participating in the study was electronically posted and shared on social media platforms such as Instagram. A \$20 Eatzi's gift certificate was offered as an incentive for participation and compensation for the time and effort on the part of participants to attend the focus group and contribute to discussion. If interested, individuals were instructed to email or text message the

student principal investigator about their willingness to participate in order to receive an individualized email including the informed consent, personal ID number, and other pertinent information related to the study.

Data Collection

Prior to beginning data collection, the student investigator obtained consent from all participants. Data collection consisted of a demographic data survey (Appendix C) to collect general information via an online Qualtrics survey (Qualtrics, Provo, UT) and included the following demographic data: age, ethnicity, gender, major, and length of time as a student at the university. The survey also included a few general questions asking about technology use, overall mental health rating, time spent outdoors, and perceptions of nature. The Nature-Relatedness Scale (NR-6) was used to determine each participant's connectedness to nature. This scale was researched by Nisbet and Zelenski (2013) as part of a study that assessed Canadian undergraduate students' connectedness with the natural environment. The goal was to test the reliability and predictive validity of the NR-6, which was a shortened version created by the researchers from the original 21-item version of the scale (Nisbet & Zelenski, 2013). 184 undergraduate students were recruited and asked to complete paper versions of the NR-6, and the results revealed that the shortened scale was a reliable predictor of behaviors and attitudes related to nature (Nisbet & Zelenski, 2013).

Virtual focus groups were used to gain perspective on the participants' views on mental health, available green space on campus, and experiences with nature. The overarching goal was to gauge a preliminary understanding of what university students perceive about the effect that increased time spent in nature has on their mental health.

Each focus group was approximately one hour in length and yielded an audio transcript through Zoom. The first focus group was comprised of eight students while the second focus group was comprised of six students. The semi-structured focus group guide is found in Appendix D, but the student investigator used additional prompts when necessary to clarify participants' responses during the focus group. These items were selected to facilitate a conversation centered on students' opinions about university green space and their general perceptions about stress, mental health, and technology use in conjunction with time spent outdoors in nature. Participants accessed the Qualtrics demographic survey via computer or smartphone, and the output was password-protected, so that only the investigator and faculty mentor were able to view the information.

Data Analysis

Descriptive statistics were used to gather information about the sample, and IBM SPSS Statistics version 26 (IBM Corp, 2019) was used to analyze the datasets from the demographic data survey. Each Zoom session was recorded, and the session was transcribed verbatim. Thematic content analysis was used to extract meaning from the collected data responses from the focus groups. Small sections of data that represent a certain idea were identified and assigned a word or phrase code (Brown, 2018). When continuing the data analysis, if a new section of text did not reflect the essence of the previous code, a new code was formed, and if at any point multiple different codes reflected closely related ideas, the codes were combined into one (Brown, 2018). Coding reduced the amount of raw data that was relevant to the research question, breaking the data into manageable sections for the student investigator (Vaismoradi et al., 2016). If a group of codes were repeated in a patterned way, they became a theme which was

further divided into subthemes as appropriate (Vaismoradi et al., 2016). The student investigator took caution not to lose the meaning of the original data throughout the coding process.

Results

A total of 14 students participated in the study; the average age of participants was 21.4 years (range 19-23 years), and the sample was predominantly composed of white women, studying the health professions, with an average of 3.5 years enrolled at the university. The most frequent amount of daily time spent on technology was 6-8 hours, and the most frequent amount of daily time spent outdoors was less than 2 hours. The majority (64.3%) of participants rated their overall mental health as good, while 21.4% rated as very good, and 14.3% as excellent. The participants reported a moderate connectedness with nature, with an average score of 3.5 on the Nature Relatedness Scale (standard deviation: 0.94, range: 2-5). See Table 1 to review sample characteristics.

After reviewing the Zoom transcripts from both focus groups, the student investigator used thematic content analysis to extract themes and subthemes from the participants' responses. Repeating themes were identified and the frequency of each was quantified. Key quotes from the participants were also identified that represented the essence of each main theme. The four main themes were classified as the following: technology's impact on mental health and nature, campus access to green space, suggested improvements to promote time in nature on campus, and stress reduction vs. stress induction in college students.

Theme 1: Technology's Impact on Mental Health and Nature

Participants spoke to the feelings that they experience from technology and the impact it has on mental health and their relationships with nature. Six students discussed the warped sense of reality that they feel on social media as well as the negative impact that is on self-esteem when

social media is used as a comparison game. One student said, “Social media always makes the grass look greener on the other side.” Additionally, they spoke to COVID-19’s impact on their outlook toward technology since the pandemic forced the majority of human interactions online. Ten participants stated that they feel “Zoom fatigued” due to the pressures of having to use technology constantly for coursework, meetings, social interactions, and other activities because of social distancing restrictions. One participant noted, “During the height of the pandemic, it was embarrassing to see my screen time at upwards of six hours a day” while another participant said, “I miss making and building friendships in person rather than online through Zoom.”

Students appreciate being able to “hang up and hang out” by putting their technology devices away and spending time out in nature. One student mentioned that she tries to leave her cell phone inside if she goes outside for a walk because she does not want to associate nature with some of the stresses that come from being in constant communication with others via technology. Six participants stated that they enjoy being able to disconnect from the virtual world and feel a sense of freedom from Zoom, screen time, and social media. A student expressed, “Time spent outside is more special now since I’m cooped up all day just staring at a screen, so when I do go outside, it is more relaxing.”

Although the majority of participants spoke to wanting to put technology away when experiencing nature, five students expressed the difficulties associated with breaking the cycle of technology use. They discussed the inconveniences of not having outlets outside to charge computers as well as the challenges of not being able to see computer screens if it is sunny outside. One student stated that she finds it hard to break her habit of getting on social media after classes: “Instead of using my time to go outside and disconnect, I find myself just in a cycle

of constantly using technology.” Technology can oftentimes be hard to escape as a college student, but overall, students believed nature is a great way to unplug from the virtual world.

Theme 2: Campus Access to Green Space

The general beauty of the university’s campus attracted many of the participants to attend the college as an undergraduate student. Five students specifically mentioned the vibrant, colorful flowers that are planted around campus as well as the cleanliness of the green spaces. One student noted, “The beauty of the outdoor environment contributed to why I became a student here.” Moreover, ten students pointed out the Commons as a green space that is fantastic for students, especially for underclassmen and for prospective students who attend campus tours. One student remembered feeling this way when she toured the campus as a prospective student herself: “When I toured other schools, I would see some that I felt like were all concrete, and I hated those places. I didn’t feel comfortable there, so I think the outdoor space has a lot to do with how one experiences college.” Other green spaces on campus that students enjoy included the grassy areas around campus that house hammocks and swings, the greenery outside of the sorority/fraternity housing and the College of Education building, and the outdoor seating areas near the library.

When students arrived back on campus in the fall after being away due to COVID-19, eight participants noted the positive effects that the pandemic had on outdoor spaces at the university. They noticed the increase in outdoor seating as well as the addition of landing zones that encouraged human interactions in a safe, outdoor, covered area. The landing zones were tents with socially distanced tables where students were able to socialize safely, complete homework, attend online classes, or do other activities. One student expressed, “I think they’ve done a great job with expanding green spaces due to COVID-19, especially with the landing

zones,” while another student said, “Even just the extra tables and chairs they put out because of COVID-19 are super helpful, especially as the weather gets nice.” In general, participants had an overall positive attitude regarding access to campus green spaces that are currently available for students.

Theme 3: Suggested Improvements to Promote Time in Nature on Campus

While the focus group participants had many positive thoughts and opinions about the university’s access to campus green space, they also spoke to some suggested improvements that could be made in the future to further promote time spent in nature. Of the ten students who mentioned the Commons as the first green space they think of on campus, four of those students proposed having a space like the Commons on the east side of campus where the majority of the academic buildings are housed. A student mentioned, “Something like the Commons on the other side of campus to make it more accessible for off-campus students.” Participants who live off-campus stated that they visit the east side of campus more often since that is where the majority of upper-level classes are held, but they feel the east side lacks green spaces that are similar to the Commons. Other suggestions included adding more swings, hammocks, benches, tables, and flowers/trees to areas that are primarily surrounded by concrete. One participant said, “There seems to be a lot of concrete and parking lots over by the new music building, so it would be good to spruce that area up with flowers and trees.” Students spoke to the fact that they enjoy spending time outdoors in between classes, whether that be eating a meal, talking with friends, or completing homework. Increasing the availability of green spaces for students on all sides of campus could help increase time spent in nature.

Six participants discussed adding elements similar to off-campus green spaces such as the Trinity Trails, for example. Students enjoy viewing off-campus natural elements such as water

features like creeks, waterfalls, or streams. “I think the water portion of the Trinity is really relaxing, and I think adding a waterfall or some other water element on campus would be nice,” said a student who visits the Trinity often. Students spoke to the calming nature of water and the desire for potentially implementing more water aspects into the green spaces on campus. Additionally, participants discussed suggested improvements that could be made by the Recreation Center on campus and the nature activities that they promote. Activities centered on water were again mentioned such as kayaking or paddle boarding, and students suggested moving fitness classes that are typically held indoors to outdoors. A participant expressed, “I know some other schools have made their recreation classes where they do yoga classes outside and have other activities outdoors.” Because it is more challenging to get into the Recreation Center due to social distancing restrictions for COVID-19, students believe that they have missed out on viewing poster advertisements that are normally stationed in the Recreation Center. Some suggestions included improving communication by promoting the nature activities in classes, posting flyers on the back of bathroom stalls in academic buildings, and talking with group organizations about ways to participate in the nature activities offered by the Recreation Center. Ultimately, participants were passionate about suggesting positive changes that can be made on campus to improve access to green spaces and time spent in nature.

Theme 4: Stress Reduction vs. Stress Induction in College Students

College students are tasked with handling a wide variety of responsibilities upon entering college that can often lead to increased stress and anxiety. Fifteen participants spoke to the fact that exercising and spending time in nature are the number one way they like to destress, improve their mood, and boost their mental health by taking a break from stressful activities such as online coursework. A student stated, “Spending time in nature takes away a layer of stress.

Being outside automatically makes what I'm doing a little bit better." Outdoor yoga, walks, runs, meals, and pet playtime were a few of the activities that the fifteen participants mentioned when they discussed using nature and the outdoor environment as a way to reduce stress. Of these activities, walking and running outdoors were the most popular in the natural environment: "Nature plays a big role. If it's 75 degrees and sunny and you can just kind of run out your stresses and sweat it out, it feels really good." Other stress reducing activities included spending time in the community with friends and family, spending time in meditation, and spending time in faith. One participant said, "Learning from one another and praying for each other was really big for me and also seeking mental health resources when necessary." Students talked about using these stress-reducing activities as ways to escape technology, online classes, and the feelings of "Zoom fatigue."

While students spoke to the ways that they work to reduce stress in college, they also discussed what induces stress and brings about feelings of worry and anxiety. Eleven students mentioned examples including leaving parents for the first time and learning to be independent, balancing schoolwork with other daily responsibilities, meeting new friends, and an overall feeling of being overwhelmed by college life. One student mentioned, "Learning how to balance taking care of yourself and being on your own as well as balancing academics and meeting new people is a lot of stress and pressure added to your life."

The students from the second focus group agreed with students from the first focus group that nature tends to serve as a stress reducer, but they also mentioned an interesting point about how nature can induce stress. The second focus group was held after an unexpected snowstorm that left students and faculty members without access to power, running water, internet access for schoolwork, and other essentials. These students viewed nature as anxiety-

producing during the week of the snowstorm due to its negative effects on everyday life. The natural disaster that the city faced left many of the participants feeling thankful for days with cooperative weather: “The snowstorm definitely started getting to me because I was already stressed with from not having a shower that worked and stuff like that, so it definitely made me grateful for good weather and being able to get outdoors.” While this finding was unexpected due to the nature of the unforeseen snowstorm, it revealed how appreciative the participants are for weather that permits them to get outside and enjoy the fresh air.

Discussion

The sample was homogenous, consisting primarily of white women nearing the end of their college experience. This sample spent a substantial amount of their time on technology each day, and while they appreciated the beauty of nature and the outdoor environment, most of them spent less than 2 hours outdoors each day. These findings are similar to other reports in the literature, in which students find it challenging to disconnect from technology and spend more time outside (Zhang et al., 2020). These challenges were exacerbated by the pandemic, when many universities moved to online course delivery with little to no on-campus gathers. Students also believe that technology, especially Zoom, contributes to symptoms of smart phone use disorder (SUD) such as depression, anxiety, poor concentration, and physical and mental health problems (Zhang et al., 2020). While technology often negatively impacts the mental health of college students, participants noted that spending time in nature improves lack of focus and decreases symptoms of mental health problems (Meredith et al., 2020). They reported that nature relieves stress, which correlates with previously published findings that time in nature is associated with reduced cortisol and alpha-amylase concentrations, two biomarkers for stress (Meredith et al., 2020). Students agreed that nature serves as freedom from the social and built

environment and that it provides them feelings of relaxation and peace (Windhorst & Williams, 2015).

This sample reported a moderate degree of connectedness to nature, using the NR-6, with the average score slightly higher than scores of Canadian undergraduates of similar demographic background, as reported by the survey developers (Nisbet & Zelenski, 2013). This finding may confirm the growing interest in nature and being outdoors, particularly during a pandemic when technology use skyrocketed due to social distancing restrictions. Participants understand that technology is difficult to escape as a college student; however, they point out that COVID-19 has left them “Zoom fatigued” and isolated from human experiences with nature (Zhang et al., 2020). The stressors of college already leave students vulnerable to stress, anxiety, depression, and suicidal ideation (Lew et al., 2019), but the additional stress from the pandemic has the potential to put them at an even higher risk. In order to combat these stressors, participants recognize that nature provides mental and physical health benefits.

The four main themes that were identified from the collected data revealed that the responsibilities of being a college student are associated with increased stress and anxiety and that technology can negatively impact the mental health of college students, which is corroborated by reports from Zhang et al. (2020) and Meredith et al. (2020), who have documented the correlation between technology use and depression, anxiety, and other mental illnesses. The pressures of adapting to a new environment combined with the many responsibilities of being a college student can lead students to feel overwhelmed, stressed, and anxious about life on campus. Additionally, social media can cause students to feel isolated if used as a comparison game, which can in turn negatively affect self-esteem, mood, and mental health. Other researchers (Lew et al., 2019, Meredith et al., 2020, & Zhang et al., 2020) have

reported similar findings, particularly during the pandemic when so many students were restricted from a fundamental component of the college experience: socializing in person.

Findings from this study confirm that nature-based health promotion does positively affect college students and their mental health, and increased time in nature for college students may lead to healthier minds and bodies, as indicated by participants. By spending time in the natural environment, students have the opportunity to reduce stress, improve mood, and positively support their mental health. Others (Ewert & Chang, 2017, Vujcic et al., 2017, & Windhorst & Williams, 2015) have reported the many creative ways that students can enjoy being together in nature to revitalize, refresh, and take a break from technology. In this study, participants expressed the desire to see future investments focused on increases in nature-infused spaces for the east side of campus. By adding more green spaces to that area, off-campus students can have a better opportunity to access natural environments that have the potential to reduce stress and anxiety.

Challenges

During the middle of the planning process for the research project, COVID-19 unexpectedly plagued the world and forced individuals across the globe to stay inside and limit human interaction for social distancing purposes. The pandemic sent the student investigator home from the university, taking valuable face-to-face research time away from her faculty mentor and peers. An adjustment period followed this send-home as the student investigator, faculty mentor, and individuals across the country had to learn how to use Zoom and adapt to life online. Not only did COVID-19 affect communication regarding the coordination and planning of the research project, but it also affected the design of the project. The focus groups had to move from an in-person, on-campus format to an entirely virtual format via Zoom. The methods

portion of the research project was forced to change to reflect an entirely online platform, which posed a challenge for the student investigator.

Another challenge for the student investigator was an unexpected snowstorm. The city typically does not see snow very often, so disaster preparedness efforts were quickly exhausted by the magnitude of the storm, which resulted in detrimental damages and losses to businesses, families, and individuals across the area. The snowstorm caused power outages, loss of running water, loss of internet access, and other issues that negatively affected students and faculty members on the university's campus. The second focus group that was held was scheduled for the week after the unexpected snowstorm, which posed challenges for recruitment. It was more difficult to reach out to students since the university closed campus for a week and the entire university community was more worried about their own personal safety and that of their family. The priority was staying safe, warm, and dry, rather than focusing on school-related assignments. This external factor influenced participation in the second focus group; however, the student investigator was still able to reach the minimum of six participants for the focus group.

Limitations

One limitation to the study was the homogeneity of the sample, in spite of the effort to recruit a more diverse group of students. 100% of the sample was female and 71.4% of the sample was from the same college, Harris College of Nursing and Health Sciences. Additionally, a limitation of using Zoom was the option for the participants to leave their camera off, even after being invited to turn it on to simulate a conversation. Although the protocol allowed for participant anonymity and privacy if preferred, the lack of video presence created less of a discussion-like atmosphere during the focus group. There was also the potential for social

desirability bias, where participants might have been telling the student investigator what they thought the student investigator wanted them to say.

Implications for Practice and Research

This research study serves to build the evidence base for nature-based health promotion and to advance the current understanding of college students' perceptions of the effect of time spent in nature on perceived mental health. These findings will assist in the development of campus-based interventions for wellness, similar to those in the Campus Nature Rx Network (2021). Several universities across the country have implemented Campus Nature Rx programs that promote spending time in nature for health promotion. When used to support increased time in nature, technology used in conjunction with Campus Nature Rx can have positive mental and physical health benefits for college students. These findings can assist the university in developing its own effective Campus Nature Rx program, and they can also be used to make positive changes to the green spaces that are currently available for students. The participants' suggestions can be implemented by the university to improve access to green spaces with the hope of ultimately reducing stress levels and improving mental health among the population of college students on campus.

These findings can also impact nursing care in acute and primary care settings. Nurses and other healthcare professionals can promote time spent in nature for the benefit of patients' mental and physical well-being. Nature can be prescribed as a nonpharmacological method to improve mood, reduce stress, and decrease symptoms of mental health illnesses such as anxiety and depression (Meredith et al., 2020). In the future, there is still a need for further research to capture the perspective of underrepresented students and community members. This will ensure that all voices are heard and will reflect the perspectives of a more diverse sample with varied

life experiences. Other studies can be done by future students for campus green space mapping as well as translation of current research in Campus Health practices and Campus Recreation and Wellness activities.

Conclusion

In conclusion, mental health is a valid concern for college students, and universities could benefit from investing in nature-infused outdoor spaces with the goal of reinforcing connections with nature for the improvement of mental health. By making some of the participants' suggested improvements to promote time in nature on campus, college students have the opportunity to further improve mental health, reduce stress, and instill a connection with the natural environment. In the future, directions could include student involvement in green space planning as well as investing in the opinions of other members of the university's community. Other directions include increasing green spaces on the east side of campus in addition to making those green spaces more accessible for off-campus students. The responsibilities of college life can be taxing; therefore, the hope and goal of this research is to assist in the development of campus-based interventions for resilience and wellness of the college student population.

Table 1*Sample Characteristics*

Age	n (%)	M (SD)
19	1 (7.1%)	21.4 (0.93)
21	7 (50.0%)	
22	5 (35.7%)	
23	1 (7.1%)	
Number of years as a student at the university	n (%)	
2	2 (14.3%)	
3	1 (7.1%)	
4	11 (78.6%)	
In the past week, time spent on technology daily	n (%)	
2-4 hours/day	2 (14.3)	
4-6 hours/day	3 (21.4)	
6-8 hours/day	6 (42.9%)	
8+ hours/day	3 (21.4%)	
In the past week, time spent outdoors daily	n (%)	
0-2 hours/day	7 (50.0%)	
2-4 hours/day	5 (35.7%)	
4-6 hours/day	1 (7.1)	

6-8 hours/day	1 (7.1%)	
Overall mental health rating	n (%)	
Excellent	2 (14.3%)	
Very Good	3 (21.4%)	
Good	9 (64.3)	
Race/Ethnicity	n (%)	
White/Caucasian	11 (78.6%)	
Asian/Asian Indian	1 (7.1%)	
Hispanic/Latino	1 (7.1%)	
Other	1 (7.1%)	
Gender	n (%)	
Female	14 (100%)	
College	n (%)	
Business	1 (7.1%)	
Nursing and Health Sciences	10 (71.4%)	
Sciences and Engineering	3 (21.4%)	
Nature-Relatedness Scale (NR-6)		3.5 (0.94)

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Appendix A
Informed Consent



Informed Consent to Participate in Research

Title of Research: Exploring College Students' Perceptions of Nature for Health Promotion

Principal Investigator: Dr. Gina Alexander

Overview: You are invited to participate in a research study. In order to participate, you must be 18 years or older, an undergraduate at the university at the time of the study with access to an online platform, and willingness to participate in a group discussion.

Study Details: This study is being conducted via Zoom.

Having preliminary understanding of college students' perceptions of the effect of time spent in nature on their perceived mental health will assist in the development of campus-based interventions for resilience and wellness. If you choose to participate, the research study will include a 1-2-hour focus group.

Participants: You are being asked to take part in this study because you are a member of the university community, and we want to hear your thoughts and opinions about green space on a university campus and about the effect of nature on perceived mental health. If you choose to participate, you will be one of 12-16 participants in this research study at TCU.

Voluntary Participation: Your participation is voluntary. You do not have to participate and may stop your participation at any time. There will not be any loss of benefit or opportunities if you decide to stop participating after you have started.

Confidentiality: Even if we publish the findings from this study, we will keep your information private and confidential. Anyone with authority to look at your records must keep them confidential.

What is the purpose of the research? The primary purpose of this project is to explore undergraduate college students' thoughts and opinions about green space on a university campus and about the effect of nature on perceived mental health. Green space is defined as "any vegetated land adjoining an urban area...and includes bushland, nature reserves, national parks, outdoor sports fields, school playgrounds, and rural or semi-rural areas immediately adjoining an urban area" (Chong et al., 2013). Having preliminary understanding of college students' perceptions of the effect of time spent in nature on their perceived mental health will assist in the development of campus-based interventions for resilience and wellness.

What is my involvement for participating in this study? If you agree to be in the research study, we will ask you to complete a demographic data survey using Qualtrics Online Survey Software that will include questions about age, ethnicity, gender, college, and length of time at the university. The survey also includes a few general questions asking about technology use, overall mental health rating, and perceptions of nature. You will then be asked open-ended (not simply yes or no) questions as part of the focus group. These questions will relate to green space (outdoor area partially or completely covered with grass, trees, plants, etc.) on the campus and student mental health and well-being. The focus group will be held virtually via Zoom due to COVID-19 concerns and safety.

Your involvement in this study will take about 1-2 hours. The focus group will be audio and video recorded but will not include your name. You will be assigned a code number that will help maintain your privacy that will be used in place of your name on Zoom. We may learn information about your health and well-being as part of the research. Your responses will remain confidential, and no names will be included in the final report.

Are there any alternatives and can I withdraw? There are no known alternatives available to you other than not taking part in this study. However, any significant new findings developed during the course of the research which may relate to your willingness to continue participation will be provided to you.

It is totally up to you to decide to be in this research study. Participating in this study is voluntary. You may choose to withdraw your participation at the end of the survey, zoom session, or at any other point of the research study. Even if you decide to be part of the study now, you may change your mind and stop at any time. You do not have to answer any questions you do not want to answer. If you decide to withdraw before this study is completed, you can contact the student investigator at any time either by email or by telephone. Any of the information you provided as part of your participation in this study will be destroyed according to the institutional policy. The student investigator would only remove you from this study if the Nursing Review Board or the Institutional Review Board would stop this study.

You can withdraw from the focus group at any point during the Zoom discussion. If you participate with your camera engaged or utilize a profile image, you are consenting to have your video or image recorded. If you do not consent to having your profile or video image recorded, you may choose to keep your camera off and not use a profile picture.

If you un-mute during the discussion and participate orally, you are consenting to have your voice recorded. If you do not consent to having your voice recorded, you may communicate exclusively using the Zoom “chat feature.”

What are the risks for participating in this study and how will they be minimized? In order to minimize human interaction and contact due to COVID-19 safety concerns, the research study focus groups will take place via Zoom. One risk for participating in this study is the potential loss of confidentiality of participants’ information. If a participant chooses to utilize audio and video features on Zoom, there is a possibility that confidentiality could be lost due to another participant recognizing them on audio or video. However, names will only be identified on the consent form, and each participant will be given a code number to identify their information. Names will not appear on the demographic data sheet (online), recorded focus group, focus group transcript, or final study data. Participants will be asked to type their assigned code into the Zoom session in place of their name. The recorded focus group will be electronically protected in a Box folder accessible only to the investigator and faculty mentor. The typed transcript of each focus group will be kept in a password-protected Word file. We don't believe there are any risks from participating in this research that are different from risk that you encounter in everyday life.

What are the benefits of participating in this study? Individuals participating in one of the focus groups may benefit from this study by having the opportunity to expand their thoughts and opinions about the availability of green space on campus and how it could potentially impact their mental health and well-being. This research will benefit the development of future interventions to improve mental health wellness and resilience among college students.

Will I be compensated for participating in this study? You will not receive direct payment for participating in this study; however, you will receive a \$20 digital gift certificate to a popular restaurant directly from the student researcher after completing the focus group session. If you choose to claim the gift certificate, you will need to complete a gift certificate disclosure document in order to receive it. Participants will be required to disclose personally identifying information such as a personal email address in order to receive the gift certificate if they choose to do so.

What are my costs to participate in the study? There will be no additional costs to you as a result of being in this study.

How will my confidentiality be protected? Efforts will be made to limit the use and disclosure of your personal information, including research study records, to people who have a need to review this information. Any names or personally identifying information will be removed for the purpose of this study. During the focus group, the student investigator will ask the participants to try to avoid using personal names or statements that could identify them. When the investigator reviews the transcript, any names or personally identifying information will be removed. The participants will each be given a code number to identify their information. Participants will be asked to type their

assigned code into the Zoom session in place of their name. The coded focus group recordings will be kept in an electronically protected Box folder only accessible to the investigator and faculty mentor. The typed transcripts will be in a password-protected Word file. The consent documents will also be kept in the Box. Only the investigator and faculty mentor will have access to these electronic recordings and transcripts. The gift certificate disclosure documents will be stored in a locked cabinet, separate from the research data.

What will happen to the information collected about me after the study is over? We will not keep your research data to use for future research or other purposes. Your name and other information that can directly identify you will be deleted from the research data collected as part of the project. We will not share your research data with other investigators.

Who should I contact if I have questions regarding the study or concerns regarding my rights as a study participant?

You can contact Caroline Rogers at caroline.rogers@tcu.edu or 901-826-7727 with any questions that you have about the study. You can also contact Dr. Gina Alexander, principal investigator, at g.alexander@tcu.edu or 817-257- 6763.

Dr. Dru Riddle, Chair, TCU Institutional Review Board, (817) 257-6811, d.riddle@tcu.edu; or Dr. Floyd Wormley, Associate Provost of Research, research@tcu.edu

By signing this document, you are agreeing to be in this study. Make sure you understand what the study is about before you sign. You will be given a copy of this document for your records. A copy also will be kept with the study records. If you have any questions about the study after you sign this document, you can contact the study team using the information provided above.

I understand what the study is about and my questions so far have been answered. I agree to take part in this study.

Printed Participant Name

Signature

Date

Printed Name of the person obtaining consent

Signature

Date

Consent to be audio/video recorded

I agree to be audio/video recorded. Yes _____ No _____

Signature

Date

Consent to be Contacted for Participation in Future Research

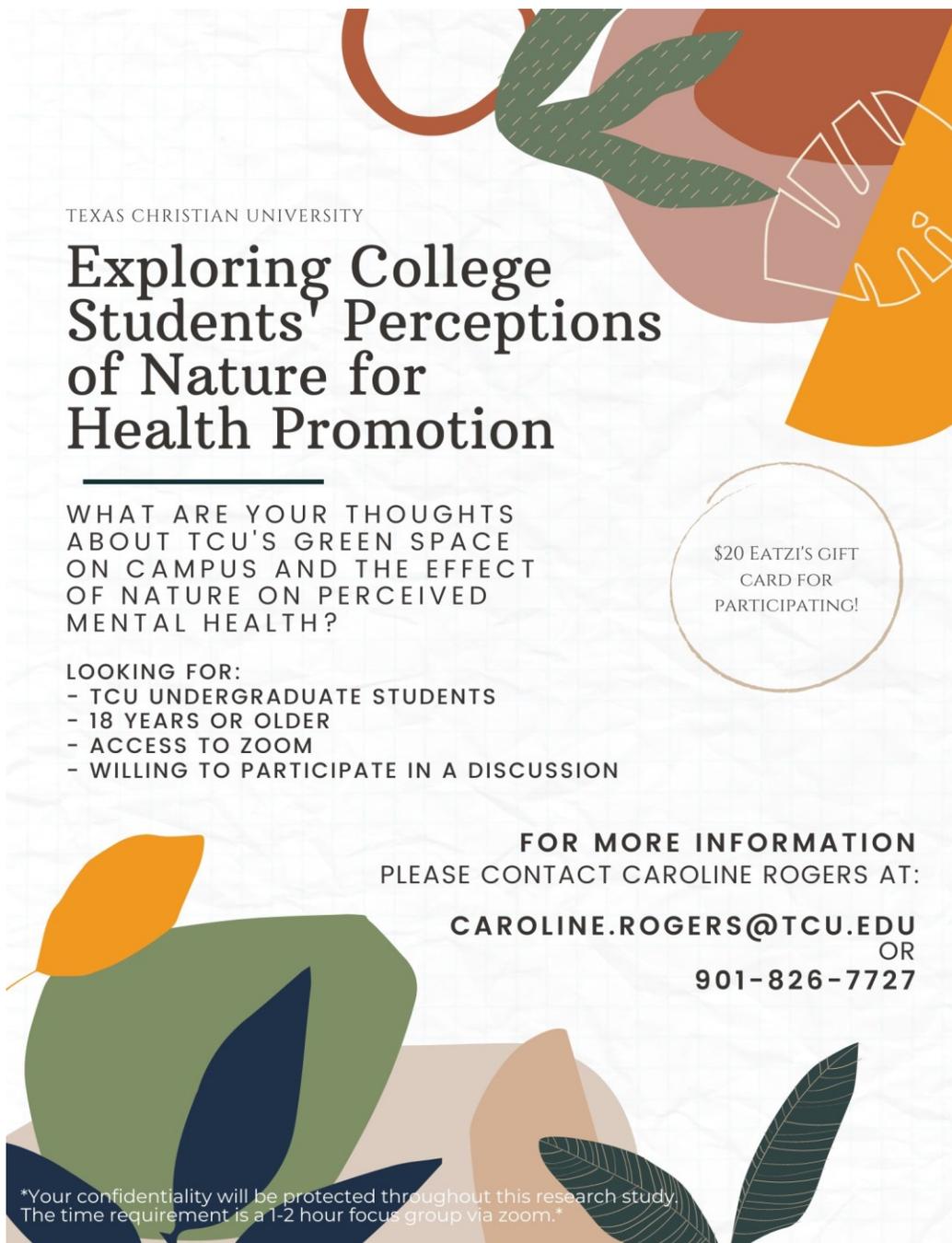
I give the researchers permission to keep my contact information and to contact me for future projects. Yes _____ No _____

Signature

Date

Appendix B

Infographic



TEXAS CHRISTIAN UNIVERSITY

Exploring College Students' Perceptions of Nature for Health Promotion

WHAT ARE YOUR THOUGHTS ABOUT TCU'S GREEN SPACE ON CAMPUS AND THE EFFECT OF NATURE ON PERCEIVED MENTAL HEALTH?

LOOKING FOR:

- TCU UNDERGRADUATE STUDENTS
- 18 YEARS OR OLDER
- ACCESS TO ZOOM
- WILLING TO PARTICIPATE IN A DISCUSSION

\$20 EATZI'S GIFT CARD FOR PARTICIPATING!

FOR MORE INFORMATION
PLEASE CONTACT CAROLINE ROGERS AT:

CAROLINE.ROGERS@TCU.EDU
OR
901-826-7727

Your confidentiality will be protected throughout this research study. The time requirement is a 1-2 hour focus group via zoom.

Appendix C

Demographic Data Survey

Please type/select your responses to the following:

Please type in your age: ____

Ethnicity:

- White/Caucasian
- Black/African
- Asian/Asian Indian
- Hispanic/Latino
- Native American
- Pacific Islander
- Other
- Prefer not to answer

Gender:

- Male
- Female
- Transgender
- Nonbinary
- Other
- Prefer not to answer

College:

- Business
- Communication
- Education
- Fine Arts
- Liberal Arts
- Nursing and Health Sciences
- Sciences and Engineering
- Interdisciplinary Studies

Please type in the number of years you have been a student at the university: ____

In the past week, how much time did you spend outdoors each day?

- 0-2 hours
- 2-4 hours
- 4-6 hours
- 6-8 hours
- 8+ hours
- If more than 8 hours daily, how many hours would you estimate you spent outdoors/day?

In the past week, how much time did you spend on any technology device daily?

- 0-2 hours
- 2-4 hours
- 4-6 hours
- 6-8 hours
- 8+ hours
- If more than 8 hours daily, how many hours would you estimate you spent on technology/day?

How would you rate your overall mental health?

- Excellent
- Very Good
- Good
- Fair
- Poor

Nature Relatedness Scale-6 (NR-6): Please rate the extent to which you agree with the following statements, using the scale from 1 to 5:

- My ideal vacation spot would be a remote, wilderness area.
 - 1: Disagree strongly
 - 2: Disagree a little
 - 3: Neither agree or disagree
 - 4: Agree a little
 - 5: Agree Strongly
- I always think about how my actions affect the environment.
 - 1: Disagree strongly
 - 2: Disagree a little
 - 3: Neither agree or disagree
 - 4: Agree a little
 - 5: Agree Strongly
- My connection to nature and the environment is a part of my spirituality.
 - 1: Disagree strongly
 - 2: Disagree a little
 - 3: Neither agree or disagree
 - 4: Agree a little
 - 5: Agree Strongly
- I take notice of wildlife wherever I am.
 - 1: Disagree strongly
 - 2: Disagree a little
 - 3: Neither agree or disagree
 - 4: Agree a little
 - 5: Agree Strongly
- My relationship to nature is an important part of who I am.
 - 1: Disagree strongly
 - 2: Disagree a little

- 3: Neither agree or disagree
- 4: Agree a little
- 5: Agree Strongly
- I feel very connected to all living things and the earth.
 - 1: Disagree strongly
 - 2: Disagree a little
 - 3: Neither agree or disagree
 - 4: Agree a little
 - 5: Agree Strongly

Appendix D

Semi-Structured Focus Group Guide

Please answer the following open-ended questions:

1. Describe how the responsibilities of being a college student impact your mental health and well-being.
2. What do you do to cope with stress and anxiety?
3. What do you think about the university's access to green spaces on campus?
4. When you think of green space, what areas on campus do you see? What areas of green space do you visit? How do you see other people using green space on campus?
5. What types of green space or nature would you like to see on campus?
6. How often do you spend time outdoors? What does spending time in nature mean to you? What would that look like?
7. What kinds of outdoor recreation interest you? How much interest do you have in the adventure programs offered by TCU? What improvements would you like to see in outdoor recreation opportunities?
8. How has your use of technology affected the time you spend in nature?