The Role of the Campus Outdoor Environment on University Student Mental Health

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ABSTRACT

Background and objective: The mental health and wellness of university students has been a pressing concern in recent years in the US and is becoming an even larger issue due to the COVID-19 Pandemic. Numerous studies have supported the idea that the natural environment can have a positive impact on mental health, but only a few studies focus on the role of university outdoor campus environments on student’s mental health. The main purpose of this study is to investigate the correlations between university student mental health and their campus’s outdoor environment.

Methods: An online survey was designed and distributed to students at Michigan State University, USA. Students were asked questions about their overall mental well-being, as well as questions about their environmental perceptions, outdoor activity, views to nature through windows and safety concerns regarding their outdoor campus environment.

Results: The major findings indicate a significant difference in mental health scores for windows in living quarters, where students with living quarter windows had better mental health scores (MHS) than students without living quarter windows. This study also found a marginally significant difference in MHS for students with classroom windows. Other results of this study include a significant difference in MHS for students’ perception of safety on campus, outdoor work time, and perception of greenspace on campus.

Conclusion: Future campus planner, landscape architects, university planners, and student counselors will use this study to determine what kinds of outdoor spaces should be created and used to improve the well-being of students.

Keywords: wellbeing, college student, Kessler Psychological Distress Scale, nature view, window

Introduction

Mental health has become a rising concern in recent years, especially amongst young adults and university students (Hunt and Eisenberg, 2010; Mahmoud et al., 2012; Roberts et al., 1999; Stallman, 2010; Stowell et al., 2021). Of the diseases that plague young adults, mental health disorders account for one-half (Hunt and Eilenberg, 2010). Due to the unique characteristics of university education lifestyles, many students experience relatively high stress levels, and in turn are at higher risks for mental disorders such as anxiety and depression (Stowell et al., 2021). Causes of higher stress levels among college students could be attributed to the unique university lifestyle with factors such as exam anxiety, the selection of degrees, living alone for the first time, and freedom of schedule organization (Saleh et al., 2017). In one study, online surveys were given to students at Australian universities to assess psychological...
distress in students. Results showed that 83.9% of students reported elevated stress levels while only 29% of the Australian public reported elevated stress levels during the same period (Stallman, 2010). This issue continues to be even more alarming during the COVID-19 Pandemic. According to the Center for Disease Control and Prevention (CDC), the percentage of people aged 18-29 experiencing symptoms of anxiety has more than doubled since the beginning of the Pandemic. Considering this risk of mental health issues among university students, more research needs to be focused on this population to increase awareness and better understand the extent of the issue (Vahratian et al., 2021).

Several surveys and studies have been conducted to try and grasp just how serious this challenge is. In their 2010 report, Hunt and Eisenberg introduced several different studies and illustrated important differences in mental health among males and females, college and non-college students, and other variables. Among males and females, this study found that men were more likely to commit suicide, but females were more likely to have major depression and anxiety disorders (Hunt and Eisenberg, 2010). Similar studies have been conducted to study how and why students may be experiencing more mental health issues. Roberts et al. (1999), investigated the general health and wellbeing of 260 British university students and possible contributing factors. Results of this study indicated that students' economic circumstances were strongly related with their mental and physical health, with poorer students having worse mental health. Students who had larger debts, and students who are required to work longer hours to budget properly were both more likely to have lower level of their mental health. Students who had lower mental health also were more likely to report worse physical health, and habits of smoking and drinking (Roberts et al., 1999). This study not only describes the mental health risks for students, but also illustrates the idea that mental health and physical health are connected. In another study conducted by Mahmoud et al. (2012), researchers focused on the increase in mental health problems among university students. They recruited 508 university students, their coping styles and symptoms of depression, stress, and anxiety. Results of this study found that maladaptive coping was a main predictor of depression anxiety and stress (Mahmoud et al., 2012).

With this rising concern of mental health issues, researchers are investigating possible solutions. The outdoor environment can have a tremendous impact on an individual's physical and mental health. The idea that natural environments are beneficial to human health and wellbeing has been carefully considered and studied for many years (Bowler et al., 2010). Many studies suggest that outdoor environments with more natural settings can have a positive impact on cognitive abilities and mental health (Greco et al., 2021; Kaplan, 1995; Kim et al., 2016; Li and Sullivan, 2016; Maes, et al., 2021; Moran, 2019; Peen et al., 2010; Ulrich et al., 1991). Previous studies have also been conducted to determine what factors of the natural environment are contributing to this influence of mental and physical health, with diverse research settings such as prisoner's exposure to natural settings (Moran, 2019), windows in classrooms with views of natural settings (Li and Sullivan, 2016), and cognitive function of adolescents with exposure to woodland areas (Maes et al., 2021). The effects of the natural environment on physical health have been studied by looking at neighborhood landscape spatial patterns and obesity and mental health in children (Kim et al., 2014) and gestational diabetes mellitus associated with residential greenness (Qu et al., 2020). All these studies suggest a positive relationship between exposure to natural settings and good mental and physical health. In one study conducted by Sugiyama et al. (2008), research set out to determine the possible beneficial factors of nature by studying the association between residents' perceptions of neighborhood greenness and their perceptions of mental health. Results of this study indicated a strong positive relationship of high perceptions of greenness, outdoor walking, and social factors with good physical and mental health (Sugiyama et al., 2008). In another study, human responses to different vegetation were measured, indicating that visual encounters with vegetation can have great benefits to individuals experiencing stress or anxiety (Ulrich, 1986). These articles indicate that some factors of natural environments that could contribute to mental health include perceptions of greenery, walking, social interaction, and views to nature. However, although many previous studies suggest that natural environments are beneficial to physical and mental health, the correlations between the greenery and university student
mental health conditions have not been yet fully investigated. University students may not be able to spend a substantial amount of time in completely natural areas to alleviate their stress. Considering this, the current study aims to assess how campus outdoor environments could impact student mental health by investigating students' activities, views, and perceptions of their outdoor campus environment, and their relationships with student mental health. By having a better understanding of how outdoor campus environments could be related to better mental health of students, campus master planners will be able to consider these needs and create designs that will promote healthier lifestyles for students.

**Research Methods**

**Study area and sample**

Students at Michigan State University (MSU) in East Lansing, Michigan, USA were recruited to participate in this study. Between September 30th, 2021 and October 31st, 2021, an online survey was circulated to various departments at MSU including, the School of Planning, Design, and Construction, Environmental Geography, Natural Science, Biology, Arts and Humanities, and Community Sustainability. Among 1,642 students recruited for this study, 161 students responded to the online survey, creating a response rate of approximately 9.8%. Participants were asked to complete the online survey that questioned them on their mental health, environmental perceptions, safety concerns, outdoor physical activity, views to nature and demographic information including residency. This study has been approved by the MSU Human Protection Program's IRB review (STUDY00006418).

**Survey design**

The online survey of this research consisted of 9 sections with a total of 55 questions. Section one (environmental perceptions) contained 12 questions, section 2 (safety concerns) contained 5 questions, sections 3-1, 3-2, 3-3, and 3-4 (transportation method, outdoor physical activity, outdoor relaxation, and outdoor work) each contained 4 questions, section 4 (views to nature) contained 5 questions, section 5 (mental health evaluation with K10) contained 10 questions, and section 6 (demographics) contained 7 questions.

Sections 1 and 2 of the survey are 5-point Likert scale responses ranging from "strongly disagree" to "strongly agree" and an option for "don't know" in section 1 and ranging from "none of the time" to "all of the time" and an option for "don't know" in section 2. Sections 3-1, 3-2, 3-3, and 3-4 all contain 4 multiple choice questions, asking respondents how often they spend time outdoors doing various activities. Responses of these questions include 0 days per week, 1-2 days per week, 3-5 days per week, and 5+ days per week, or 1-10 minutes per day, 11-20 minutes per day, 21-30 minutes per day, and 30+ minutes per day. Section 4 contains 3 multiple choice questions, and one open-ended question, asking respondents about their windows to nature in living quarters or classrooms at MSU. Responses to these questions include yes or no, as well as 1-2 windows, 3-4 windows, and 5+ windows. Section 5 is the Kessler Psychological Distress Scale (K10) questionnaire, a 10 question, 5-point Likert scale questionnaire designed to evaluate an individual's psychological distress. The last section of the online survey has 7 questions asking respondents' demographic information including gender, age, ethnicity, academic classification, residency, major, and nationality.

For this research, the K10 instrument was adopted to measure university student mental health. The K10 has been evaluated and concluded to be consistent with rates of mental disorders (Kessler et al., 2002), and several previous studies have adopted the K10 survey to evaluate psychological distress and mental health. (Hides et al., 2007; Stallman, 2010). The K10 scale is a 10 item, 5-point Likert scale questionnaire which is meant to evaluate an individual's mental state by determining a quantifiable measurement of psychological distress of individuals. This is a self-reported questionnaire in which questions are designed to measure distress based on anxiety or depressive symptoms experienced in the past 30 days. The 10 questions are scored from 1-5 (1 being none of the time, 5 being all of the time), totaling to a composite score of 10-50 (Stallman, 2010). For this research, scores from the K10 were inversed to have higher scores indicate good mental health, and low
scores indicate poor mental health. This was done to ensure the data analysis was easily understandable.

Data analysis

The research had four major steps of data analysis. First, descriptive statistics were performed to understand the respondents' environmental perceptions, safety concerns, outdoor physical activity, views to nature, location of residency, and demographic characteristics. Then the standard diagnostic testing was conducted to determine key variables and outliers. Second, bivariate analyses were performed to understand any associations between independent variables and dependent variable using t-test or one-way ANOVA test. The correlations among environmental perceptions, safety concerns, outdoor activities, views to nature through windows, demographic variables and mental health scores were evaluated. Third, a series of single regression models were tested to predict student mental health using the independent variables. Finally, a multiple regression model was estimated to predict the influence of the campus outdoor environment, physical activity, views to nature and residency conditions on student mental health.

Results and Discussion

Characteristics of respondents

Of the 161 participants in the survey 154 respondents completed the survey (Table 1).

Majority of respondents were 21 or older (32.47%), female (55.84%), and white (78.57%). According to residency status, majority of students reported living on-campus (51.95%), while 43.45% reported living off-campus, and majority were domestic (84.42%), as opposed to international students (6.49%). Participants were also from various academic backgrounds including engineering, planning, design and construction, geography, agriculture and natural resources, and others. Academic classification was somewhat evenly distributed with a slight majority that were freshman (27.27%).

The average mental health scores (MHS) were calculated for different groups. Lower MHS (10 being worst) indicate poor mental health, while high scores (50 being best) indicate good mental health. Of the gender category, the aver-

| Variables                  | Frequency (%) |
|----------------------------|---------------|
| Age                        |               |
| 18                         | 36 (23.38%)   |
| 19                         | 32 (20.78%)   |
| 20                         | 24 (15.58%)   |
| 21+                        | 50 (32.47%)   |
| Prefer not to answer       | 12 (7.79%)    |
| Gender                     |               |
| Male                       | 54 (35.06%)   |
| Female                     | 86 (55.84%)   |
| Other                      | 5 (3.25%)     |
| Prefer not to answer       | 9 (5.84%)     |
| Ethnicity                  |               |
| White/Caucasian            | 121 (78.57%)  |
| Asian                      | 10 (6.49%)    |
| Hispanic                   | 3 (1.95%)     |
| Black/African American     | 4 (2.60%)     |
| Other                      | 7 (4.55%)     |
| Prefer not to answer       | 9 (5.84%)     |
| Residency                  |               |
| Off-campus                 | 63 (40.91%)   |
| On-campus                  | 80 (51.95%)   |
| Other                      | 11 (7.14%)    |
| Nationality                |               |
| Domestic                   | 130 (84.42%)  |
| International              | 10 (6.49%)    |
| Prefer not to answer       | 14 (9.09%)    |
| Academic Classification    |               |
| Freshman                   | 42 (27.27%)   |
| Sophomore                  | 31 (20.13%)   |
| Junior                     | 20 (12.99%)   |
| Senior                     | 23 (14.94%)   |
| 5th year +                 | 11 (7.14%)    |
| Graduate student           | 15 (9.74%)    |
| Prefer not to answer       | 12 (7.79%)    |
| Major                      |               |
| Engineering                | 31 (20.13%)   |
| Planning Design and Constru| 39 (25.32%)   |
| Geography, Environment and Spatial Sciences | 8 (5.19%) |
| Agriculture and Natural Resources | 33 (21.43%) |
| Psychology                 | 3 (1.95%)     |
| Exploratory                | 1 (0.65%)     |
| Lyman Briggs               | 7 (4.55%)     |
| Natural Science & Pre-Health | 5 (3.25%)   |
| Other                      | 6 (3.90%)     |
| Prefer not to answer       | 21 (13.64%)   |
Mental Health Score Reported
Gender
MHS (Male) 37.9 8.75
MHS (Female) 34.3 8.80
MHS (Other) 29.0 4.97
Ethnicity
MHS (white) 35.9 8.32
MHS (non-white) 35.5 10.5
Academic Classification
MHS (Freshman) 36.6 7.64
MHS (Sophomore) 33.9 10.20
MHS (Junior) 36.2 9.93
MHS (Senior) 35.1 6.94
MHS (5th year+) 38.1 7.63
MHS (Graduate) 35.9 10.20
Residency
MHS (On-campus) 36.2 8.91
MHS (Off-campus) 35.0 8.47

Note - SD: Standard Deviation; 50 is the highest (best) score of MHS

Table 3. Environmental perceptions and safety concerns

| Variables | Mean | SD |
|-----------|------|----|
| Environmental perceptions | | |
| There are many planting materials on MSU’s outdoor campus (e.g. trees, shrubs, flowers). | 4.65 | 0.56 |
| There are many green spaces on MSU’s campus that I can view (e.g. open fields, wooded areas). | 4.54 | 0.66 |
| I enjoy the overall appearance of my outdoor campus environment. | 4.62 | 0.67 |
| There are many green spaces on MSU’s campus that I can access. | 4.38 | 0.82 |
| I live a short distance from green space on MSU. | 4.06 | 1.18 |
| There is adequate amount of seating opportunities on the MSU campus. | 3.48 | 1.19 |
| Overall, I can easily access the green space where I want to go on the MSU campus. | 4.35 | 0.91 |
| The MSU campus’s trees, shrubs, and lawns are well maintained. | 4.64 | 0.69 |
| Overall, MSU’s outdoor campus is well-maintained. | 4.59 | 0.63 |
| The MSU campus is safe during the day. | 4.53 | 0.77 |
| The MSU campus is safe at night. | 3.49 | 1.36 |
| Overall, I feel safe on MSU’s outdoor campus. | 4.22 | 0.81 |

For students' safety concerns, respondents reported lower mean scores to all questions, meaning they did not often have negative experiences on the campus. These 5 questions were also based on a 5-point Likert scale ranging from never (1) to always (5). The mean scores for how often students were injured (μ = 1.23) or seen someone

For environmental perception questions, many respondents indicated higher mean scores (greater than 3.00 out of 5-point Likert Scale), indicating positive perceptions of students’ outdoor campus environment. Questions regarding quality of greenery all had very high means (4.65, 4.54, and 4.62 respectively). Respondents reported higher mean scores to questions about greenspace accessibility (μ = 4.35), and plant maintenance (μ = 4.64). Students answered positively to questions about outdoor seating opportunities (μ = 3.48) and nighttime safety (μ = 3.49), but the mean scores were relatively lower than the other variables. According to the survey, majority of students had an overall positive perception of the quality of MSU’s outdoor campus (Table 3).
else injured on MSU campus were low ($\mu = 1.64$). Mean scores for how often students experienced crime ($\mu = 1.30$) or vandalism on campus were also low ($\mu = 1.54$), meaning students did not often have these experiences. The highest average score for safety concerns was how often students see trash/litter on campus ($\mu = 2.50$).

Respondents’ physical activity patterns

For outdoor physical activity on MSU’s campus, participating students were questioned about their time spent walking/biking, doing physical activities, relaxing outdoors, and working outdoors. These questions were asked for students considering seasonal climate differences in Michigan (e.g. time spent in the spring, summer and fall, vs time spent during the winter). For all questions, mean scores for time spent outdoors during the winter were lower than time spent outdoors during the spring, summer, and fall. These questions were then repeated to inquire average day per week outdoors as well as minutes per day, doing each activity. Of all activities, students reported spending more days per week walking/biking to class ($\mu = 3.10$ days for spring summer and fall and $\mu = 2.54$ days for winter) in all seasons than any other activity. The activity that had the lowest average days per week was working outside in both spring, summer, and fall ($\mu = 1.91$ days) as well as during the winter ($\mu = 1.20$ days).

This trend was also consistent with minutes per day spent doing each activity. The average score for minutes per day walking/biking to class was higher than any other activity with during the spring, summer and fall (42.2% answered 30+ minutes per day), and in the winter (27.9% answered 30+ minutes per day). The activity that had the lowest average minutes per day spent was outdoor working. For the winter season, minutes per day spent to work was lower than other outdoors (83.1% answered 0-10 minutes per day).

Respondents’ views to nature

Students were asked if they had windows to nature in their classrooms at MSU or at their living quarters, and if so, the number of windows they had. Majority of students reported having windows with a view to nature in their MSU classes (61.0%), as well as in their living quarters (85.7%) (Table 4). Of the students that have windows, ma-
Majority only had 2-3 windows in their classrooms (29.9%) while in living quarters, the majority had 1-2 windows (51.3%).

**Bivariate analyses between student mental health and different student groups**

According to an independent samples t-test conducted to compare MHS between genders, there was a significant difference in the scores for males (M = 37.93, SD = 8.75) and females (M = 34.33, SD = 8.804) on MHS. This result suggests that the difference in student MHS between males and females is significant, with males reporting higher MHS than females.

Another independent samples t-test was conducted to compare student MHS with and without windows in their MSU classes. There was a marginally significant difference in the scores for students with classroom windows to nature (M = 36.44, SD = 8.06) and students without classroom windows to nature (M = 33.91, SD = 9.99). The result suggests that the difference in MHS between students with and without classroom windows was significant, and students with classroom windows reported higher MHS.

Similarly, an independent samples t-test was conducted to compare student MHS with and without windows in their living quarters. There was a significant difference in the scores for students with windows to nature in their living quarters (M = 36.20, SD = 8.22) and students without windows in their living quarters (M = 29.62, SD = 12.28). This result suggests that the difference in MHS between students with living quarter windows and without living quarters windows was significant, and students with living quarter windows reported higher MHS. Table 5 contains all significant independent t-test results. These findings are consistent with other previous literature (Li and Sullivan, 2016), and strengthens the importance of having windows with a view to nature, especially in student living quarters. In addition, an ANOVA test was conducted to compare the effect of residency on student mental health. The result showed that there was a marginally significant difference between students’ residency status (living off campus versus living on campus: F(2,152) = 2.91, p = .058), and students living on campus reported higher MHS.

**Linear regression analysis result**

To examine the correlation among students’ MHS and the independent variables, this study ran a multiple linear regression analysis. MHS was a dependent variable, while nine independent variables from environmental perceptions, outdoor physical activity, and views to nature, and two demographic variables were selected as confounding variables, after considering multicollinearity and correlations among independent variables. The final model was statistically significant according to the ANOVA test (p < .001), and the r-square value of the model was .159. Of the nine selected independent variables and two confounding variables, four variables were significantly related to MHS. Higher perceptions of safety and greenspace were both positively related to higher MHS. Location of residency of students also had a significant difference in MHS, where students living on-campus had higher MHS. MSU has a great quality of outdoor environments with a number of matured trees. In addition to the many large trees, the campus also contains several gardens including the W.J. Beal Botanical Garden, MSU Horticulture Gardens, and many more that all act as both areas for relaxation and opportunities for education. The campus was also certified as the most beautiful campus from the American Society of Landscape Architects in 1999. Based on rich natural environments in MSU, the result of student residency could indicate that an on-campus living environment with well-

| Comparison Group 1: | Male | Female | t     |
|--------------------|------|--------|-------|
| Mean               | 37.93| 34.33  | t = .020** |
| SD                 | 8.75 | 8.80   |       |

| Comparison Group 2: | Classroom window | No classroom window | t     |
|--------------------|------------------|---------------------|-------|
| Mean               | 36.44            | 33.91               | t = .097*  |
| SD                 | 8.06             | 9.99                |       |

| Comparison Group 3: | Living quarters windows | Living quarters without windows | t     |
|--------------------|------------------------|-------------------------------|-------|
| Mean               | 36.20                  | 29.62                         | t = .010** |
| SD                 | 8.22                   | 12.28                         |       |

**Table 5. t-test Results with different independent groups**

Note - *p < .10; **p < .05; ***p < .01
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Established natural environments may be more beneficial for enhancing students’ mental health.

This research also found that more time spent outdoors working in the cold winter season had a negative relationship with MHS. This could mean that working longer hours in the winter outside has a negative effect on mental health. The Michigan climate in the winter can be quite harsh, having an average low temperature of -8.3 degrees Celsius in January, and an average 31-day snowfall of 14.47 cm in January in East Lansing (Cedar Lake Ventures, 2022). These harsh winter seasons could contribute to the lower MHS of students who are required to work outdoors during these months. Student perceptions of safety was the most significant predictor in the model. Gender, as a confounding variable also had significant difference in mental health where males had higher MHS (Table 6).

**Conclusion**

Evidence from the CDC of recent dramatic increases in mental health issues among college-aged individuals illustrates the need for further investigation of possible solutions for mental health issues on campus. The results of this study reported that gender and location of student residency were the demographic variables that had significant differences in MHS. According to the independent samples t-test, the difference of MHS between males and females was significant, with males having higher MHS. This is also consistent with other findings, where males typically have better mental health, or are less likely to have psychiatric disorders (Guite et al., 2006; Hunt and Eisenberg, 2010; Stowell et al., 2021). This study also found that there was a significant difference in the existence of windows in student classrooms and living quarters, where the presence of windows in both classrooms and living quarters had higher MHS. This study also found that the presence of windows in living quarters had a more significant effect on mental health than in classrooms. However, this study found that the quantity of windows did not have a significant relationship to student's MHS, indicating that only the presence of at least one window in classrooms and living quarters is still significant. Another major finding of this study includes the significant difference in MHS of the perceptions of greenspace and perceptions of campus safety. Both a greater amount of greenspace and safer campus environments were positively related to higher MHS. Other perceptions of the campus environment such as accessibility to greenspace and overall campus appearance had no significant effect on student mental health.

### Table 6. Final linear regression model of student mental health

| Variables                                | Unstandardized coefficients | Standardized coefficients |
|------------------------------------------|-----------------------------|---------------------------|
|                                          | B                           | Std. Error                | Beta  | t     | Significance |
| (Constant)                               | 24.056                      | 7.309                     | 3.291 | .001  |
| Perception of safety                     | 2.219                       | .970                      | .208  | 2.287 | .024         |
| Daytime safety                           | -2.193                      | 1.322                     | -.179 | -1.659| .100         |
| Nighttime safety                         | .801                        | .752                      | .127  | 1.065 | .290         |
| Perception of greenspace                 | 2.286                       | 1.169                     | .172  | 1.956 | .053         |
| Overall appearance of outdoor campus     | -4.37                       | 1.432                     | -.032 | -.305 | .761         |
| Days per week to walk in spring, summer, and fall | -1.861                   | 1.164                     | -.207 | -1.599| .113         |
| Days per week to walk in winter          | 1.571                       | 1.016                     | .193  | 1.546 | .125         |
| Minutes per day to work outside during winter | -1.884                   | .916                      | -.182 | -2.057| .042         |
| Number of windows in living quarters     | 1.000                       | 1.139                     | .091  | .878  | .382         |
| Gender                                   | -3.304                      | 1.529                     | -.196 | -2.161| .033         |
| Residency status                         | -1.681                      | 1.861                     | -.101 | -.903 | .369         |

Note - Dependent variable: MHS
This research is subject to a few limitations. These include accuracy of survey responses, due to the nature of self-reported survey design. Due to funding limitations and other factors, information was only gathered from MSU students’ self-reported responses from the survey and the K10 questionnaire. Students may have been less likely to report their honest answers of their mental health status with some bias in responses which may not accurately illustrate the true state of an individual's mental health. Also, responses to questions from the survey such as "I enjoy the overall appearance of my outdoor campus environment", may be skewed positively, because all participants are MSU students. As aforementioned, MSU is known for having a beautiful outdoor campus with many greenspaces, and this is often a factor in how students choose their schools. This may account for most students in this study reporting higher environmental perception values. To better evaluate mental health among individuals, future investigations on this subject may consider objective measurements such as heart monitors and blood pressure monitors to quantify participants' mental health. Lastly, to better evaluate campus appearance, future investigations may consider a comparison research design with multiple college campuses with different natural environment settings.

Overall, this study contributes to a better design guideline for campus planners and designers and provide information on how to create a stress-mitigating campus environment. Results of this study indicate a need for more windows to nature, safety, and greenspace. These aspects of the outdoor campus environment have a positive impact on mental health and designers will be able to emphasize these factors in their future designs. From the results of this study, university design needs to ensure the presence of windows with a view to nature in both classrooms and especially living quarters. Designers also need to ensure there is an adequate amount of open greenspace for students to access on campus. By utilizing this information and implementing it into their designs, campus architects and landscape architects can help improve student mental health. University faculty will also be able to utilize the information gathered from this experiment to help inform students on how they can improve their mental health. Student advisors and counselors will be able to identify areas on their campuses that may have a positive impact on students' mental health, and encourage students to access these spaces. By enhancing campus outdoor environments and helping university students improve their mental health, universities may also see an increase in graduation rates and an overall improvement of the quality of life of students.

References

Bowler, D.E., L.M. Buyung-Ali, T.M. Knight, and A.S. Pullin. 2010. A systematic review of evidence for the added benefits to health of exposure to natural environments. BMC Public Health 10(1):1-10.

Cedar Lake Ventures Inc. 2022. Weatherspark.com. East Lansing January Weather, Average Temperature (Michigan, United States) - Weather Spark. Retrieved March 10, 2022, from https://weatherspark.com/m/16064/1/Average-Weather-in-January-in-East-Lansing-Michigan-United-States

Greco, G., S. Toselli, A. Grigoletto, M. Mauro, P. Maietta, V. Iannuzzi, D. Gore, and F. Campa. 2021. Impact of different types of physical activity in green urban space on adult health and behaviors: a systematic review. European Journal of Investigation in Health, Psychology and Education 11(1):263-275. http://doi.org/10.3390/ejihpe11010020

Guite, H.F., C. Clark, and G. Ackrill. 2006. The impact of the physical and urban environment on mental well-being. Public Health 120(12):1117-1126. http://doi.org/10.1016/j.puhe.2006.10.005

Hides, L., D.J. Lubman, H. Devlin, S. Cotton, C. Aitken, T. Gibbie, and M. Hellard. 2007. Reliability and validity of the Kessler 10 and patient health questionnaire among injecting drug users. Australian & New Zealand Journal of Psychiatry 41(2):166-168. https://doi.org/10.1080/00048670601109949

Hunt J., and D. Eisenberg. 2010. Mental health problems and help-seeking behavior among college students. Journal of Adolescent Health 46(1):3-10. https://doi.org/10.1016/j.jadohealth.2009.08.008

Kaplan, S. 1995. The restorative benefits of nature: Toward an integrative framework. Journal of Environmental Psychology 15(3):169-182. https://doi.org/10.1016/0272-4944(95)90001-2
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Kessler, R.C., G. Andrews, L.J. Colpe, E. Hiripi, D.K. Mroczek, S.S. Normand, E.E. Walters, and A.M. Zaslavsky. 2002. Short screening scales to monitor population prevalences and trends in non-specific psychological distress. Psychological Medicine 32(6):959-976. https://doi.org/10.1017/s0033291702006074

Kim, J.H., C. Lee, N. Olvera, and C.D. Ellis. 2014. The role of landscape spatial patterns on obesity in Hispanic children residing inner-city neighborhoods. Journal of Physical Activity and Health 11(8):1449-1457. https://doi.org/10.1123/jpah.2012-0503

Kim, J.H., C. Lee, and W. Sohn. 2016. Urban natural environment, obesity, and health-related quality of life among Hispanic children living in inner-city neighborhoods. International Journal of Environmental Research and Public Health 13(1):121. https://doi.org/10.3390/ijerph13010121

Li D. and W. Sullivan. 2016. Impact of views to school landscapes on recovery from stress and mental fatigue. Landscape and Urban Planning 148:149-158. https://doi.org/10.1016/j.landurbplan.2015.12.015

Maes, M.J.A., M. Pirani, E.R. Booth, C. Shen, B. Milligan, K.E. Jones, and M.B. Toledano. 2021. Benefit of woodland and other natural environments for adolescents' cognition and mental health. Nature Sustainability 4(10):851-858.

Mahmoud, J.S.R., R. Staten, L. Hall, and T. Lennie. 2012. The Relationship among Young adult college students' depression, anxiety, stress, demographics, life satisfaction, and coping styles. Issues in Mental Health Nursing 33(3):149-156. https://doi.org/10.3109/01612840.2011.632708

Moran, D. 2019. Back to nature? Attention restoration theory and the restorative effects of nature contact in prison. Health and Place 57:35-43. https://doi.org/10.1016/j.healthplace.2019.03.005

Peen, J., R.A. Schoevers, A.T. Beekman, and J. Dekker. 2010. The current status of urban-rural differences in psychiatric disorders. Acta Psychiatrica Scandinavica 121:84-93. https://doi.org/10.1111/j.1600-0447.2009.01438.x

Qu, Y., B. Yang, S. Lin, M.S. Bloom, Z. Nie, Y. Ou, J. Mai, Y. Wu, X. Gao, G. Dong, and X. Liu. 2020. Associations of greenness with gestational diabetes mel-

литус: The Guangdong Registry of Congenital Heart Disease (GRCHD) study. Environmental Pollution 266:115127. https://doi.org/10.1016/j.envpol.2020.115127

Roberts R., J. Golding, T. Towell, and I. Weinreb. 1999. The effects of economic circumstances on British students' mental and physical health. Journal of American College Health 48(3):103:109. https://doi.org/10.1080/07448489.1999595681

Saleh D., N. Camart, and L. Romo. 2017. Predictors of stress in college students. Frontiers in Psychology 8:19. https://doi.org/10.3389/fpsyg.2017.00019

Sugiyama, T., E. Leslie, B. Giles-Corti, and N. Owen. 2008. Associations of neighbourhood greenness with physical and mental health: do walking, social coherence and local social interaction explain the relationships?. Journal of Epidemiology & Community Health 62(5):e9-e9.

Stallman H.M. 2010. Psychological distress in university students: a comparison with general population data. Australian Psychologist 45(4):249-257. https://doi.org/10.1080/00050067.2010.482109

Stowell, D., R.K. Lewis, and K. Brooks. 2021. Perceived stress, substance use, and mental health issues among college students in the Midwest. Journal of Prevention & Intervention in the Community 49(3):221-234. https://doi.org/10.1080/10852352.2019.1654263

Ulrich, R.S. 1986. Human responses to vegetation and landscapes. Landscape and Urban Planning 13:29-44. https://doi.org/10.1016/0169-2046(86)90005-8

Ulrich R.S., R.F. Simons, B.D. Losito, E. Fiorito, M.A. Miles, and M. Zelson. 1991. Stress recovery during exposure to natural and urban environments. Journal of Environmental Psychology 11(3):201-230. https://doi.org/10.1016/S0272-4944(05)80184-7

Vahratian, A., S.J. Blumberg, E.P. Terlizzi, and J.S. Schiller. 2021 Symptoms of anxiety or depressive disorder and use of mental health care among adults during the COVID-19 pandemic - United States, August 2020-February 2021. Morbidity and Mortality Weekly Report (MMWR) 70(13):490-494. http://dx.doi.org/10.15585/mmwr.mm7013e2