

VU Research Portal

Fostering a Supportive Study Environment: Promoting Student Health and Well-being through Fruit and Vegetable Interventions and through the Availability and Integration of Nature

van den Bogerd, N.

2020

document version

Publisher's PDF, also known as Version of record

[Link to publication in VU Research Portal](#)

citation for published version (APA)

van den Bogerd, N. (2020). *Fostering a Supportive Study Environment: Promoting Student Health and Well-being through Fruit and Vegetable Interventions and through the Availability and Integration of Nature*. [PhD-Thesis - Research and graduation internal, Vrije Universiteit Amsterdam].

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

Take down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

E-mail address:

vuresearchportal.ub@vu.nl

SUMMARY

Attaining an educational degree is seen as a key to success in modern society. For many secondary and tertiary education students, the road to their degree is bumpy. This period is characterized by new and exciting experiences, but also by many challenges, ranging from dietary changes to study-related stress. Because students spend a large share of their time in the study environment, it may be useful to pay attention to how the physical study environment can help students cope with these challenges. This dissertation examined two possible strategies that may help to create a study environment that supports student health, well-being, and academic performance. Consequently, this dissertation has two parts, which I will summarize below.

PART 1 – STUDENT’S FRUIT AND VEGETABLE INTAKE

The first strategy focused on changes in the food environment of tertiary education institutes that are aimed to promote the fruit and vegetable intake of students. Many tertiary education students do not meet the fruit and vegetable recommendations¹⁻⁴, which is concerning because low fruit and vegetable consumption has been associated with a higher risk of becoming overweight and developing diet-related chronic diseases⁵. Previous studies have shown that the food environments of tertiary education institutes offer more unhealthy than healthy foods such as fruits and vegetables and that unhealthy options are less expensive⁶⁻¹¹. Increasing the availability and price reductions of fruits and vegetables in the study environment could potentially improve the fruit and vegetable intake of Dutch students.

In Chapter 2, I first examined the need for fruit and vegetable interventions in the study environment. With the use of questionnaires, I examined self-reported fruit and vegetable intake and associated demographic and lifestyle characteristics of Dutch tertiary education students ($N = 717$). Results of Chapter 2 showed that students’ fruit and vegetable intake was far below Dutch recommendations with only 28% of the students

consuming at least two portions of fruit per day and only 7% consuming at least 250 grams of vegetables per day. Fruit intake was lower among students who were male, living independently, enrolled in a technical study, not adhering to physical activity guidelines, and heavy to excessive alcohol drinkers. Vegetable intake was lower among students who were non-Dutch, living with their parents, not adhering to physical activity guidelines, and moderate and heavy to excessive alcohol drinkers. These insights can be used to tailor future interventions to specific subgroups; however small explained variances (R^2) found in the prediction models suggest that other factors may also play a role of students’ fruit and vegetable consumption.

In Chapter 2, I also examined students’ perceptions of the current availability of fruits and vegetables in the study environment and possible future fruit and vegetable interventions. Students perceived that their university environment offers sufficient healthy foods and fruits and vegetables. Nevertheless, students also expected that that fruit and vegetable interventions in the study environment could encourage their fruit and vegetable intake. Students had the most faith in the proposed interventions of offering affordable fruits and vegetables in the university canteen or supermarket. This suggests that the price of fruits and vegetables may play a role in the fruit and vegetable consumption of students. To test this notion, I examined the effects of the provision of free fruits and vegetables at a tertiary education institute.

In Chapter 3, I examined the effects of providing free fruit and snack vegetables in a produce stand located in the central hall of a specialized agricultural university of applied science on students’ self-reported fruit, snack vegetable, and total vegetable intake. In three real-life pre-posttest intervention studies, students’ reported higher snack vegetable intake after the provision of free fruit and snack vegetables than before the intervention. Small changes in fruit and total vegetable intake were found in the overall study population. This suggests that facilitating free fruits and vegetables was not enough to encourage all students to consume more fruits and vegetables. Nevertheless, students with initially low fruit and vegetable intake did report

higher consumption of fruit and snack vegetable intake after the intervention. Students with low habitual fruit and vegetable intake may therefore benefit from providing free fruits and vegetables in the study environment.

PART 2 – NATURE IN THE STUDY ENVIRONMENT

The second strategy focused on the availability and integration of nature at secondary and tertiary education institutes to support students' health, well-being, and academic outcomes. Many students experience stress, symptoms related to burnout or depression, or other mental health problems¹²⁻¹⁶, which is a concern because it can negatively affect present and later-life quality of life¹⁷, and it has been associated with lower academic performances¹⁸⁻²¹ and dropout in the first two years of college²². Previous systematic reviews and meta-analyses have concluded that exposure to nature in outdoor and indoor environments can be beneficial to human mental and physical health²³⁻³², or outcomes related to potential underlying pathways of reducing harm, restoring capacities and building capacities (pathways based on Markevych et al³³). In view of these promising effects, nature in the study environment may also positively influence students' health and well-being.

In Chapter 4, I first examined the need for nature in the study environment. With the use of digitally enhanced photographs, I explored self-reported preference and perceived restoration likelihood for nature in the indoor and outdoor study environment among tertiary education students ($N = 722$). Students consistently preferred study spaces that included some type of nature to the same spaces without nature. Students also gave higher perceived restoration likelihood ratings to a university campus square with nature than the same campus square without nature. Preference and perceived restoration likelihood ratings of the study spaces with nature were not only much higher than the standard design of those spaces, but also higher than the same spaces that included colorful posters or colorful artifacts. This suggests that students would appreciate the integration of nature in the study environment.

In Chapter 5 and 6, I examined the effects of indoor nature interventions in university, secondary school, and secondary vocational school classrooms, and in a university study room on students' mood, cognitive performance, health complaints, and perceived environmental quality using quasi-experimental study designs. Classrooms and a study room with indoor nature were rated higher on perceived environmental quality (e.g. attractiveness, room rate, or comfort) than rooms without indoor nature. These outcomes were consistent even though various types of indoor nature were used and even though the quantity of indoor nature varied between the studies. Combined with the findings of Chapter 4, this suggests that students have a robust appreciation for adding indoor nature to the study environment. However, no convincing effects were found on student's mood, cognitive performance or health complaints. Not finding convincing effects does not necessarily mean that students cannot benefit from indoor nature. It means that more efforts are needed to determine at what place, at what time, or among which students, indoor nature has the most benefits.

In Chapter 7, I conducted a systematic review on the effects of nature in the study environment (indoor and outdoor) of secondary and tertiary education students on their well-being, academic outcomes, and outcomes related to potential underlying pathways. This systematic review showed that, to date, there is limited evidence for the effects of nature in the study environment on students' well-being, academic outcomes, or outcomes related to the potential underlying pathways. Current evidence is limited by the high risk of bias in the majority of studies, the diversity in their exposure measures and outcome measures, and the diversity in tools to measure similar constructs. Nevertheless, the systematic review revealed three promising leads. The first promising lead was that higher availability and use of campus green space was found to be associated with improved quality of life and perceived restoration among students. The second promising lead was that a higher amount of campus green space was associated with lower outdoor temperature. The third promising lead was the association between the integration of indoor nature and improved indoor climate.

GENERAL CONCLUSIONS

Findings of this dissertation suggest that there is a need for fruit and vegetable interventions, and the availability and integration of nature in the study environment. However, findings of this dissertation also showed that the integration of such strategies were not as helpful as expected. Both strategies showed some promising benefits, but findings of this dissertation suggest that there is still much to learn about the influence of fruit and vegetable interventions and how nature in the study environment can add to students' health, well-being, and academic performance. This dissertation examined the effects of two possible strategies separately. Thereby, this dissertation only scratches the surface of potential interventions. If a study environment integrates both strategies – or combine them with other environmental interventions - their potential beneficial effects may be accumulative. Although preliminary, findings of this dissertation may guide future research, administrators, and designers with creating a supportive study environment aiming to improve student health, well-being, and academic performance.

REFERENCES SUMMARY

1. Peltzer K, Pengpid S. Correlates of healthy fruit and vegetable diet in students in low, middle and high income countries. *International Journal of Public Health*. 2015;60(1):79-90.
2. Nour M, Sui Z, Grech A, Rangan A, McGeechan K, Allman-Farinelli M. The fruit and vegetable intake of young Australian adults: a population perspective. *Public health nutrition*. 2017;20(14):2499.
3. Teschl C, Nössler C, Schneider M, Carlsohn A, Lührmann P. Vegetable consumption among university students: Relationship between vegetable intake, knowledge of recommended vegetable servings and self-assessed achievement of vegetable intake recommendations. *Health Education Journal*. 2018:0017896917751833.
4. Vereecken C, Pedersen TP, Ojala K, Krølner R, Dzielska A, Ahluwalia N, et al. Fruit and vegetable consumption trends among adolescents from 2002 to 2010 in 33 countries. *The European Journal of Public Health*. 2015;25(suppl_2):16-9.
5. Boeing H, Bechthold A, Bub A, Ellinger S, Haller D, Kroke A, et al. Critical review: vegetables and fruit in the prevention of chronic diseases. *European Journal of Nutrition*. 2012;51(6):637-63.
6. Grech A, Hebden L, Roy R, Allman-Farinelli M. Are products sold in university vending machines nutritionally poor? A food environment audit. *Nutrition & Dietetics*. 2017;74(2):185-90.
7. Roy R, Hebden L, Kelly B, De Gois T, Ferrone E, Samrout M, et al. Description, measurement and evaluation of tertiary-education food environments. *British Journal of Nutrition*. 2016;115(9):1598-606.
8. Leischner K, McCormack LA, Britt BC, Heiberger G, Kattelman K, editors. *The Healthfulness of Entrées and Students' Purchases in a University Campus Dining Environment*. Healthcare; 2018: Multidisciplinary Digital Publishing Institute.
9. Pulz IS, Martins PA, Feldman C, Veiros MB. Are campus food environments healthy? A novel perspective for qualitatively evaluating the nutritional quality of food sold at foodservice facilities at a Brazilian university. *Perspectives in public health*. 2017;137(2):122-35.
10. Horacek TM, Erdman MB, Reznar MM, Olfert M, Brown-Esters ON, Kattelman KK, et al. Evaluation of the food store environment on and near the campus of 15 postsecondary institutions. *American Journal of Health Promotion*. 2013;27(4):e81-e90.
11. Horacek TM, Erdman MB, Byrd-Bredbenner C, Carey G, Colby SM, Greene GW, et al. Assessment of the dining environment on and near the campuses of fifteen post-secondary institutions. *Public health nutrition*. 2013;16(7):1186-96.
12. Auerbach RP, Mortier P, Bruffaerts R, Alonso J, Benjet C, Cuijpers P, et al. WHO World Mental Health Surveys International College Student Project: prevalence and distribution of mental disorders. *Journal of abnormal psychology*. 2018;127(7):623.
13. Eskin M, Sun J-M, Abuidhail J, Yoshimasu K, Kujan O, Janghorbani M, et al. Suicidal behavior and psychological distress in university students: a 12-nation study. *Archives of suicide research*. 2016;20(3):369-88.

14. Auerbach RP, Alonso J, Axinn WG, Cuijpers P, Ebert DD, Green JG, et al. Mental disorders among college students in the World Health Organization world mental health surveys. *Psychological medicine*. 2016;46(14):2955-70.
15. Polanczyk GV, Salum GA, Sugaya LS, Caye A, Rohde LA. Annual Research Review: A meta analysis of the worldwide prevalence of mental disorders in children and adolescents. *Journal of Child Psychology and Psychiatry*. 2015;56(3):345-65.
16. Deighton J, Lereya ST, Casey P, Patalay P, Humphrey N, Wolpert M. Prevalence of mental health problems in schools: poverty and other risk factors among 28 000 adolescents in England. *The British Journal of Psychiatry*. 2019:1-3.
17. Kessler RC, Matthias A, Anthony JC, De Graaf R, Demyttenaere K, Gasquet I, et al. Lifetime prevalence and age-of-onset distributions of mental disorders in the World Health Organization's World Mental Health Survey Initiative. 2007.
18. Brännlund A, Strandh M, Nilsson K. Mental-health and educational achievement: the link between poor mental-health and upper secondary school completion and grades. *Journal of Mental Health*. 2017;26(4):318-25.
19. Arsenio WF, Loria S. Coping with Negative Emotions: Connections with Adolescents' Academic Performance and Stress. *The Journal of Genetic Psychology*. 2014;175(1):76-90.
20. Suhrcke M, Da Paz Nieves C. The impact of health and health behaviours on educational outcomes in high-income countries: a review of the evidence. Copenhagen: World Health Organization 2011.
21. Bruffaerts R, Mortier P, Kiekens G, Auerbach RP, Cuijpers P, Demyttenaere K, et al. Mental health problems in college freshmen: Prevalence and academic functioning. *Journal of affective disorders*. 2018;225:97-103.
22. Arria AM, Caldeira KM, Vincent KB, Winick ER, Baron RA, O'Grady KE. Discontinuous college enrollment: Associations with substance use and mental health. *Psychiatric Services*. 2013;64(2):165-72.
23. Gascon M, Triguero-Mas M, Martinez D, Dadvand P, Fornis J, Plasencia A, et al. Mental health benefits of long-term exposure to residential green and blue spaces: a systematic review. *Int J Environ Res Public Health*. 2015;12(4):4354-79.
24. van den Berg M, Wendel-Vos W, van Poppel M, Kemper H, van Mechelen W, Maas J. Health Benefits of Green Spaces in the Living Environment: A Systematic Review of Epidemiological Studies. *Urban Forestry & Urban Greening*. 2015;14(4):806-16.
25. Twohig-Bennett C, Jones A. The health benefits of the great outdoors: A systematic review and meta-analysis of greenspace exposure and health outcomes. *Environmental research*. 2018;166:628-37.
26. Lachowycz K, Jones AP. Greenspace and obesity: a systematic review of the evidence. *Obesity reviews*. 2011;12(5):e183-e9.
27. McCormick R. Does Access to Green Space Impact the Mental Well-being of Children: A Systematic Review. *Journal of Pediatric Nursing*. 2017;37:3-7.
28. Vanaken G-J, Danckaerts M. Impact of green space exposure on children's and adolescents' mental health: A systematic review. *International journal of environmental research and public health*. 2018;15(12):2668.
29. Norwood MF, Lakhani A, Fullagar S, Maujean A, Downes M, Byrne J, et al. A narrative and systematic review of the behavioural, cognitive and emotional effects of passive nature exposure on young people: Evidence for prescribing change. *Landscape and urban planning*. 2019;189:71-9.
30. Han K-T, Ruan L-W. Effects of Indoor Plants on Self-Reported Perceptions: A Systemic Review. *Sustainability*. 2019;11(16):4506.
31. Bringslimark T, Hartig T, Patil GG. The psychological benefits of indoor plants: A critical review of the experimental literature. *Journal of Environmental Psychology*. 2009;29(4):422-33.
32. Mcsweeney J, Rainham D, Johnson SA, Sherry SB, Singleton J. Indoor nature exposure (INE): a health-promotion framework. *Health Promotion International*. 2015;30(1):126-39.
33. Markevych I, Schoierer J, Hartig T, Chudnovsky A, Hystad P, Dzhambov AM, et al. Exploring pathways linking greenspace to health: Theoretical and methodological guidance. *Environmental Research*. 2017;158:301-17.