Students' self-reported health and psychosocial status at home before and during COVID-19

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Abstract. During the COVID-19 outbreak, university courses were shifted online and students spent the majority of their time inside their homes. However, staying indoors can affect students' health due to the exposure to several environmental stressors, such as background noise, and/or inefficient ventilation, and/or insufficient lighting. Previous studies showed that the indoor environmental factors may cause health effects on students (physiological and psychological). Therefore, this research aimed at investigating the differences in students' health and psychosocial status between before and during COVID-19. An online questionnaire survey was completed by first-year undergraduate university students in March 2019, 2020, and 2021. This questionnaire includes questions about time spent at home, psychosocial status, diseases, and home-related symptoms. The mean number of hours that students spent at home during the weekdays and on weekends were calculated, respectively. Besides, occurrence frequencies of psychosocial statuses were calculated for each year. Furthermore, a statistical analysis, including one-way ANOVA and Chi2, were performed to examine the differences between the three groups in terms of time spent at home, psychosocial statuses, diseases, and home-related symptoms. It is worthwhile to note that students spent significantly more time at home, during the COVID-19 pandemic in March 2021. Another notable result is that students' mood and emotional states changed significantly over the three years; for example, fewer students reported to be active and inspired in 2021. Moreover, the home-related symptoms, such as headache and tiredness, significantly increased in 2021, compared with the other two years.

Keywords. Indoor environmental quality, self-reported health, home-related symptoms, students' home, psychosocial status, COVID-19 pandemic
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1. Introduction

During the COVID-19 outbreak, individuals spent the majority of their time inside their homes because one of the most common imposed lockdown measures is "staying at home" [1–3]. However, it has been indicated that staying indoors for a long time is not beneficial for individuals' well-being [4]. This is due to the number of environmental stressors which could affect individuals' well-being, including health and comfort. These stressors (e.g. noise, insufficient air quality) are related to the indoor environmental quality (IEQ), including air quality, acoustical quality, lighting quality, and thermal quality [5–7]. Also, the lockdown measures might cause social isolation and health issues, such as anxiety, and affect students' well-being [8]. For example, in a study conducted by Cao *et al.*, it was found that 21% of university students were suffering from anxiety during the COVID-19 pandemic, which suggested that the mental health of students is essential to be monitored [9]. Hence, this study aimed at investigating the differences in students' health and psychosocial status while staying at home before and during the COVID-19 outbreak.

2. Methods

2.1 questionnaire design

An online-based questionnaire was built in the *Qualtrics XM* platform in English and Dutch languages. Parts of this questionnaire, such as the psychosocial status (e.g. emotional state, PANAS) and the building-related symptoms, are based on the OFFICAIR questionnaire developed by Bluyssen *et al.* [10]. In this study, four sections of this questionnaire were analysed: 1) demographics, 2) time spent at home, 3) psychosocial status, and 4) self-reported health. In terms of the demographic section, two items were considered: gender and students' house type (student residence or parents' home). The question of the number of hours (including sleeping hours) spent at home was divided into two parts: weekdays and weekend. Pertaining to the psychosocial status, three items were considered: emotional states (e.g. relaxed, calm, sad), positive/ negative events (e.g. wedding and funeral) experienced recently, and the Positive and Negative Affect Schedule (PANAS) developed by Thompson [11] (e.g. active and upset). The self-reported health section included two questions: diseases and home-related symptoms. The diseases questions covered 17 types of diseases (e.g. anxiety), while the home-related symptoms questions included 11 home-related symptoms (e.g. dry eyes).

2.2 sample size

The questionnaire has been sent to first-year bachelor students in the faculty of Architecture and the Built Environment in Delft University of Technology, the Netherlands. The questionnaire was completed by 1132 students: 374 students in March 2019, 349 students in March 2020, and 409 students in March 2021. The students were asked to give consent before they started to process the survey.

2.3 data management and analysis

Data were exported from Qualtrics XM and stored in IBM-SPSS version 25. For the data analysis, percentages or mean values of the answers, were calculated with descriptive statistics. Additionally, Chi-squared tests (Chi^2) and analysis of variance (one-way ANOVA) were performed to compare the three groups of students (2019, 2020, and 2021) in terms of their time spent at home, psychosocial status, and health. In the case in which $p<0.05$ was found between the student groups (year) and the selected items, it was considered that there was a significant difference between the groups.

3. Results and Discussion

3.2 students' characteristics

The percentages of students' characteristics in terms of their gender and house types were calculated through the descriptive statistics and sorted in **Tab. 1.** There was no statistically significant difference in these two items among the three groups.

Tab. 1 – Students' characteristics.

Characteristics			Percentage
Gender	Male	2019	44.7%
		2020	45.6%
		2021	41.0%
	Female	2019	55.3%
		2020	54.4%
		2021	59.0%
House type	Student residence	2019	58.7%
		2020	54.3%
		2021	54.3%
	Parents' home	2019	41.3%
		2020	45.7%
		2021	45.7%

3.1 time spent at home

The mean number of hours the three groups of students spent at their homes during the weekdays and weekend is illustrated in **Fig. 1**. It is clear that students in 2021 spent more time (mean 20.0 hours) in their homes on the weekdays compared to the 2020 (mean 13.9 hours) and 2019 (mean 16.0 hours) groups. Also, the results of the ANOVA analysis showed that there was a significant difference between the three groups in terms of the number of hours spent on the weekdays ($p<0.001$), and weekends ($p<0.001$).

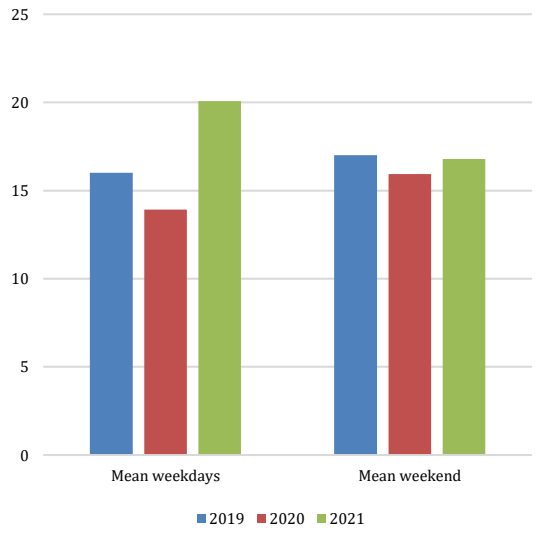

Fig. 1 – Students' time spent at home.

3.3 students' psychosocial status

The students' psychosocial statuses were analysed with regards to their emotional state, recently experienced events, and PANAS. Pertaining to the students' emotional states, **Fig. 2** demonstrates the emotional states of the three groups of students while they were answering the questionnaire. As can

be seen, the students in 2021 were feeling more bored and sad, as well as less calm, cheerful, and relaxed than the other two groups. It is worthwhile to note that the results from Chi2 revealed that there was a statistical difference among the three groups of students in their emotional states (*p<0.001*).

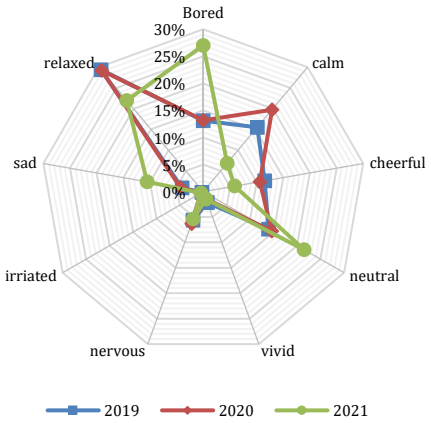

Fig. 2 – Students' emotional states while completing the questionnaire.

Fig. 3 indicates the percentages of students that have recently experienced positive and negative events. Generally speaking, the number of students who recently experienced positive events in March 2021 and 2020 were less than in 2019. Also, a significant difference among the three groups regarding their recently experienced positive event was observed (*p=0.015*).

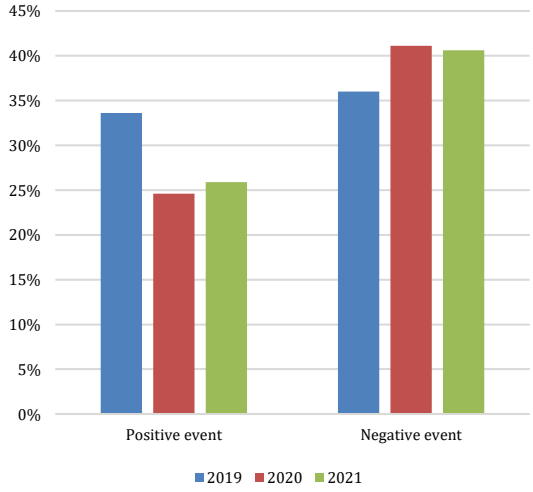

Fig. 3 – Students' experiences of recent positive and negative events.

Fig. 4 shows the students' emotional states related to the 10 PANAS items. It can be noted that there were significant less students in 2021 who selected the positive items which are inspired (*p=0.024*), attentive (*p=0.009*), and active (*p=0.007*). Furthermore, three negative PANAS items, nervous (*p=0.001*), upset (*p=0.018*), and anxious (*p=0.013*), were reported significantly more by students in 2021.

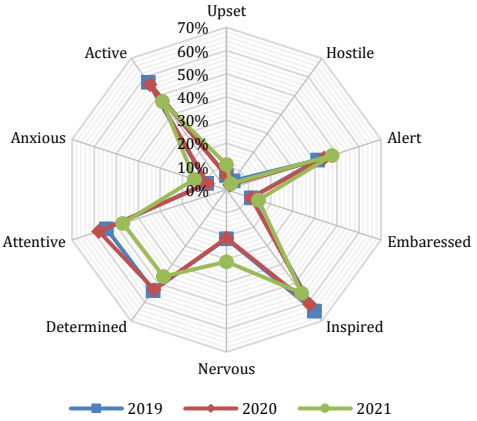

Fig. 4 – Students' emotional states based on PANAS.

3.4 students' self-reported health

The students' self-reported health was identified through analysing the data related to diseases and home-related symptoms. In terms of diseases, **Fig. 5** shows the percentages of students who suffered from them in the last 12 months. Four diseases showed to be significantly different among the three groups. These were bronchitis/pneumonia (*p=0.001*), wheezing (*p=0.005*), hay fever (*p=0.001*), and allergic rhinitis (*p=0.004*).

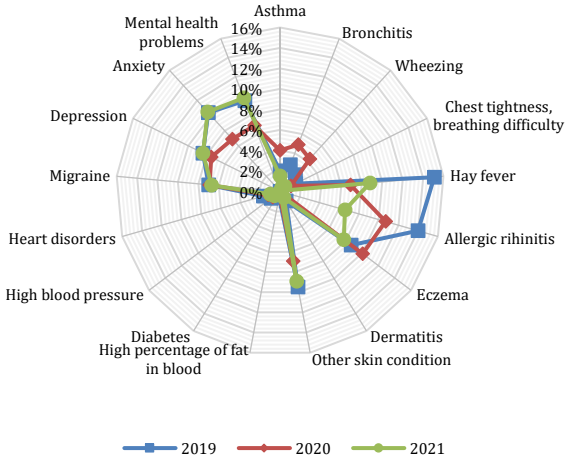

Fig. 5 – Percentages of students suffered from the disease in the last 12 months.

Regarding the home-related symptoms, **Fig. 6** illustrates the percentages of students who suffered from these while at home. For dry eyes (p<0.001), itchy or watering eyes (p=0.001), lethargy or tiredness (p<0.001), headache(p<0.001), there were significantly more students in 2021 suffering from them than in the other two years. Moreover, there were significantly less students in 2021 who suffered from blocked or stuffy nose (p=0.001) and there were significantly less students in 2019 who suffered from breathing difficulties (p=0.007).

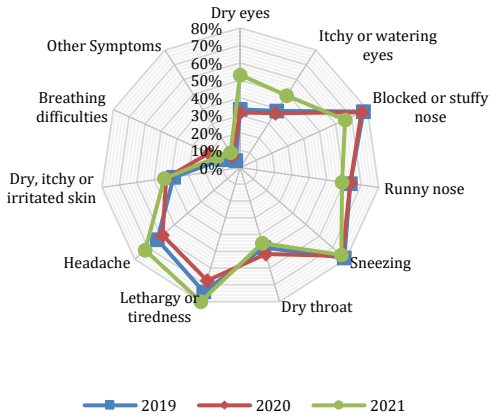

Fig. 6 – Percentages of students suffered from the home-related symptoms.

4. Discussion and Conclusion

This study examined the differences among university students' health and psychosocial status while at home before and during the COVID-19 pandemic. This was done by surveying three groups of students in March for three years: 2019, 2020, and 2021. The results showed that there was a significant difference in the number of hours that students stayed at home. The students during the COVID-19 pandemic recorded the highest number of hours during the weekdays (20 hours). In addition, there were significant differences found among the three groups regarding their psychosocial status. One of the key findings was that students in 2021 reported to be less inspired, active, and attentive, as well as they were more upset, anxious, and nervous than students before the COVID-19 pandemic. Moreover, the 2021 students were found to be more bored and sad, as well as less relaxed than the other two groups (2019 and 2020). In a previous study conducted by Aristovnik *et al.* [12] students were found to be suffering from boredom, anxiety, and frustration during the COVID-19 pandemic. Similarly, Son *et al.* [13] concluded that reported stress and anxiety of 71% of students increased during this pandemic. In addition, it was indicated that social distancing was one of the factors that affected the students.

In the current study, the students' health significantly differed among the three groups of students. For instance, the students in 2021 reported to suffer more from headaches and tiredness. This can be associated with the long time that students in 2021 used to stay at home. Also, Bluyssen *et al.* [14] found that staying at home was related to students' reported headache. Moreover, Zhang *et al.* [15] revealed that the indoor pollutants in homes such as dampness and mould were associated with the reported building-related symptoms such as headache and fatigue.

Thus, it can be concluded that during the COVID-19 pandemic more students suffered from both psychosocial as well as health related effects.

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Data Statement

The datasets generated during and/or analysed during the current study are not available because further analysis will be carried out but the authors will make every reasonable effort to publish them in near future.