Original Research

PSYCHIATRY

The psychological impact of COVID-19 lockdown on the wellbeing, learning efficacy and sleeping behaviors of Romanian medical students

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Abstract

Background and aims. The COVID-19 lockdowns are reported to have negatively influenced the wellbeing and learning efficacy of students. In this context, we analyzed the psychological impact of the COVID-19 quarantine on healthcare students, a subpopulation experiencing high stress levels.

Methods. Our survey-based, cross-sectional study assessed wellbeing indicators, lifestyle and learning behaviors before and during the quarantine for 388 Romanian healthcare students.

Results. Our findings included the increase in phone and social media use, at the expense of formal and independent study time; deteriorations in mood, self-organization capacity and learning efficacy, and increased procrastination behaviors. Unexpectedly, our study identified an improvement in sleep quality and duration. The increase in social media use was less severe among rural students. We identified correlations between study time, online activities (including social media), wellbeing indicators and procrastination.

Conclusion. Our study draws attention to quarantine-induced deteriorations of wellbeing and learning capacity in an important category of students.

Keywords: COVID -19, lockdown, psychological impact, online learning

Introduction

The COVID-19 pandemic initially described on January 7th 2020 by a few case studies of pneumonia of an unfamiliar etiology [1,2] was declared a public health emergency by the WHO by the end of the month [3].

In response to a rate of transmission far exceeding that of other coronaviruses, quarantine and physical isolation were implemented by multiple countries in an attempt to minimize the spread of COVID-19 [2,4].

In Romania, the first case was registered on February 26, followed by a state of emergency and a 30-day lockdown being instituted on March 14 when pre-university education units and higher education units were closed [5].

While national authorities around the world focused on limiting the number of total and severe cases, the potential psychological threat of lockdowns was comparatively neglected, resulting in a range of psychological consequences such as heightened stress, depression, anxiety, insomnia, confusion, and anger [6–10].

Evidence from previous outbreaks revealed similar negative effects of quarantine on mental health and psychological wellbeing. For example, during the SARS epidemic, researchers reported stress [11–13], low mood [14], irritability [14], emotional exhaustion [15,16], and insomnia [8,14] among quarantined individuals, while worry, anxiety, and somatization were described as negative effects of the Ebola outbreak [17,18].

Disturbances in individuals' daily routine [6,9], reduced face to face contact [6], a deteriorating sleep

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schedule leading to insomnia [8–10,14], subjective lack of energy due to insufficient physical activity [19,20], and emotional detachment from friends [21] are reported, all corresponding to affected indicators of well-being [10,19,22,23]. Concurrent with this decline of well-being, students reported changes in learning behaviors, and a deteriorating study and work performance [9,21].

According to Satici et al., intolerance to uncertainty is the main predictive factor of mental health issues and indirect determinant of low mental wellbeing [9,24]. Uncertainty is the generic term used to refer to unpredictable events that increase individuals' stress, and in this specific situation it can be caused by not knowing the duration of the pandemic, fear of infection, the unfamiliar challenges of online education and exams, among others [20,25].

Low mood, fear of uncertainty, lack of energy due to insufficient sleep, and sedentarism [26] have been identified as causes of procrastination, itself a way of avoiding stress and anxiety [20,27,28].

Besides the added psychological pressure due to quarantine, medical students are frequently exposed to a high rate of stress, depression, anxiety, insomnia, emotional disturbance and burn-out periods, due to academic pressure and a short time to acquire knowledge [10,29–32].

Consequently, we attempted to study the impact of the COVID-19 quarantine in a population which already experiences higher-than-average levels of mental health issues related to psychological stress.

The two assumptions of this study based on the work of Xiao et al. [33], and Beutel et al. [34], were that: 1) online courses and quarantine conditions had a direct effect on medical students' well-being and sleep quality, and 2) decreased sleep quality and low mood affected learning behaviors, possibly mediated by an increase in procrastination behaviors (time spent on entertainment or social media) and a decrease in learning efficacy, organization and capacity to concentrate.

We conducted a survey-based, analytical, observational, cross-sectional study in order to identify and quantify the impact of COVID-19 quarantine conditions on Romanian medical students' lifestyle, learning efficacy, procrastination and wellbeing. In addition, we analyzed whether the impact of quarantine-induced stress was influenced by two relevant demographic factors, namely gender and place of origin (urban/rural), and to what extent, and finally we tried to identify and quantify correlations between students' lifestyle, learning efficacy, procrastination and wellbeing.

Method

We used Google Forms to create a questionnaire regarding multiple aspects of a student's life. The form consisted of 3 sections, one pertaining to demographic information, one for questions related to students' pre-quarantine lifestyle, and one for questions related to their lifestyle during the quarantine.

The first section obtained information on the following: age, gender, university, study program, year of study, other activities or work, place of origin (urban/rural), and residence. It should be noted that healthcare education in Romania consists of 6 different study programs, ranging from 3 to 6 years: General Medicine (6 years), Dentistry (6 years), Pharmacy (5 years), Nursing (4 years), Dental technology (3 years), Nutrition and Dietetics (3 years).

The second section consisted of questions regarding multiple topics. The respondents first answered a few questions on time spent on different activities: formal study (i.e. lectures and practical courses), independent study (i.e. any time spent studying outside formal study), and other activities. Secondly, the student was asked to rate the following indicators of wellbeing: mood, self-organizing capacity, and learning efficacy. The third subsection referred to phone use and time spent on the Internet, by category (social media, study, reading, entertainment). Finally, a number of sleep-related questions were included: self-assessed time spent asleep, bedtime hours, a number of sleep quality questions adapted from the Pittsburgh Sleep Quality Index (PSQI questionnaire) [35], and a few questions related to partaking in sleep-perturbing behavior namely having variable meal timing [36,37], drinking coffee or energy drinks less than 2 h before bed [38,39], alcohol [40,41], tobacco [42,43], or other substances use [44], administration of sedatives or other types of medicine [45], or other unspecified behaviors as identified by the students.

The third section repeated the questions of the second part, with a few additional items: an initial question regarding the student's residence during quarantine, a final question on the respondents' perceived change in procrastination time (3 possible answers: 1=decrease, 2=no change, 3=increase during quarantine compared to before quarantine) and a number of questions on self-assessed changes in morale as a result of the quarantine.

The form was disseminated through Facebook groups used by students of Romanian medical universities to collaborate and organize their academic activities and was open from April 12th to 21st; 389 entries were obtained, of which one was removed due to having invalid answers. No incentives were provided for the respondents. To ensure anonymity, the authors responsible for statistical analyses did not have access to the respondents' (optionally submitted) emails.

The PSQI-derived questions were used to compute a pre-quarantine and quarantine PSQI-like score (henceforth sleep quality score or SQS). The SQS score was computed using 12 questions, with higher values indicating a worse sleep quality.

Post-retrieval processing included adjusting the scales of pre-quarantine and during-quarantine questions to ensure the comparability of results.

For each response, a series of "differential" variables were defined, computed with the following formula:

$D_{Var} = Q_{Var} - N_{Var}$

As such, lower values of the differential mean that during quarantine, the value for the selected variable was lower. If the student slept for 6-8 h before quarantine, then $N_{Sleep} = 7$ and if the same student slept under 4 h during quarantine, then $Q_{Sleep} = 3$. As such, $D_{Sleep} = 3 - 7 = -4$, the student slept about 4 hours less during quarantine than before quarantine.

Data retrieval was done using Google Forms and Google Sheets (parts of Google Docs suite). Microsoft Excel was used for data conversion, formatting, parsing, and computing of differentials. Statistical analyses and graphing were performed in RStudio, using R for Microsoft Windows, version 4.0.2 [46].

We used the following statistical tests: Kolmogorov-Smirnov for testing distribution normality, Wilcoxon (paired and unpaired) for testing differences of ordinal data between groups, and McNemar for differences in sleep-perturbing factors during quarantine compared to the time before the quarantine.

We considered statistically significant all $p<0.05$. Even though our data are generally not normally distributed, we will represent the data in the following format:

median (1st *quartile* - 3rd *quartile*) *mean*±*SD*

Results

Demographic data

388 students answered our questionnaire. Out of them, 307 (79.12%) were females, and 81 (20.88%) were males; 322 (83%) came from urban households, while 66 (17%) came from rural areas. The median age was 21 (1st quartile 20, 3rd quartile 22), mean age 21.09, standard deviation 1.63. More detailed demographic data are provided in table I.

Table I. Detailed demographic data for the survey's respondents.

Demographic variable	Value	Count	Percentage
Age	19	21	5.41
	20	151	38.91
	21	105	27.06
	22	50	12.89
	23	32	8.25
	24	17	4.38
	25	7	1.8
	26	4	1.03
	37	1	0.25
University	Cluj-Napoca	245	63.14
	Bucharest	10	2.58
	Iași	104	26.8
	Târgu-Mureș	10	2.58
	Sibiu	16	4.12
	Oradea	2	0.52
	Timișoara	1	0.26
Study program	General medicine	286	73.71
	Dentistry	47	12.11
	Pharmacy	12	3.09
	Nursing	32	8.25
	Dental technology	1	0.26
	Nutrition and dietetics	10	2.58
Study year	1	29	7.47
	2	225	58
	3	76	19.59
	4	32	8.25
	5	24	6.19
	6	2	0.52
Gender	Female	307	79.12
	Male	81	20.88
Origin	Urban	322	83
	Rural	66	17

In Romania, some Universities provide their students with accommodation via dorms (137 of respondents, 35.31%); nonetheless, some students prefer to rent or live in an apartment if they study in another city than their hometown (137 of respondents, 35.31%). When the virus began to spread, universities turned to the online to continue their educational process. As such, at the time of our questionnaire, 352 students (90.72%) were staying with their family, while 29 (7.47%) remained in the city of their studies.

Observed behavior before and during the quarantine

In table II we present the median, quartiles, mean and standard deviation of time periods dedicated to different activities during the day, time dedicated to online activities, sleep quantity and quality, and the values of wellbeing indicators. While our data do not generally follow the normal distribution (see below), we nonetheless mentioned the mean and standard deviation, as we considered them to be more illustrative to the reader. Bedtime hour is shown as time, while sleep quality is shown as a score (higher values mean worse sleep). Indicators of wellbeing use a 5-step scale, with higher values meaning more positive views about their represented dimensions. Finally, change in procrastination is a 3-step scale (1=decrease during quarantine, 2=no change, 3=increase during quarantine).

Differences between daily time use, procrastination, sleep quality, and wellbeing indicators during quarantine compared to pre-quarantine conditions

We used the Kolmogorov-Smirnov test to confirm that the data were not normally distributed (all variables were confirmed to not have a normal distribution, $P<0.001$), and the Wilcoxon signed-rank test with continuity correction was used to confirm the statistical signification of observed differences in the lifestyle and wellbeing of the students during quarantine, compared to pre-quarantine values.

We have evaluated changes in the following variables during quarantine compared to pre-quarantine conditions: formal study time (mean decrease 1.01h, $p<0.001$), independent study time (mean decrease 0.28 h, $p=0.002$), time spent with other daily activities (mean increase 1.91 h, $p<0.001$), phone use (mean increase 1.23 h, $p<0.001$).

Regarding time spent online, we found a statistically significant ($p<0.001$) increase in time spent with social media (mean 0.55 h), formal study (mean 0.59 h), and entertainment (mean 0.81 h), but no statistically significant difference in time spent online for independent study (mean 0.0 4h) during quarantine compared to pre-quarantine conditions.

Regarding sleep and sleep quality, we found the following statistically significant differences ($p<0.001$): sleep duration (mean increase 0.64 h), bedtime hour (on average, students went to sleep 25 minutes later during quarantine than before), and sleep quality (decreased score i.e. better sleep quality during quarantine). A graphical representation of this data is available in figure 1.

Finally, we found statistically significant decreases in mood, self-organizing capacity, and learning efficacy ($P<0.001$), meaning that during quarantine the students reported a lower level of well-being during the lockdown.

This data are represented, using the format mentioned before, in table III.

Table II. Time spent with daily and online activities, sleep quality and duration, and wellbeing indicators.

Variables	Before quarantine	During quarantine
DAILY ACTIVITIES (h)		
Formal study time	5 (5-7) 5.87±1.35	5 (5-5) 4.86±1.56
Independent study time	3 (1-3) 2.77±1.69	3 (1-3) 2.49±1.73
Other daily activities	1 (1-3) 2.19±1.49	3 (3-5) 4.1±1.75
Phone use	3 (1.5-3) 2.86±1.61	3 (3-5) 4.09±1.92
ONLINE ACTIVITIES (h)		
Social media	1 (1-2.5) 1.79±1.19	2.5 (1-3.5) 2.34±1.38
Formal study	1 (0.33-1) 1.17±1.13	1 (0.33-2.5) 1.76±1.43
Independent study	1 (1-2.5) 1.76±1.2	1 (1-2.5) 1.72±1.3
Entertainment	2.5 (1-2.5) 2.02±1.25	3.5 (2.5-3.5) 2.83±1.36
SLEEP		
Sleep time (h)	7 (7-7) 6.79±0.97	7 (7-9) 7.43±1.28
Sleep quality (SQS value)	7 (3-13) 8.69±6.93	6 (2-11.25) 8.08±8.27
Bedtime hour	00:30 (23:30-00:30) 00:07±1.06h	00:30 (23:30-01:30) 00:32±1.17h
WELLBEING		
Mood	4 (3-4) 3.69±0.94	3 (2-4) 3.07±1.11
Self-org capacity	4 (3-4) 3.65±0.85	3 (2-4) 2.72±1.15
Learning efficacy	4 (3-4) 3.55±0.82	3 (2-3) 2.6±1.12
Change in procrastination		3 (2-3) 2.48±0.7

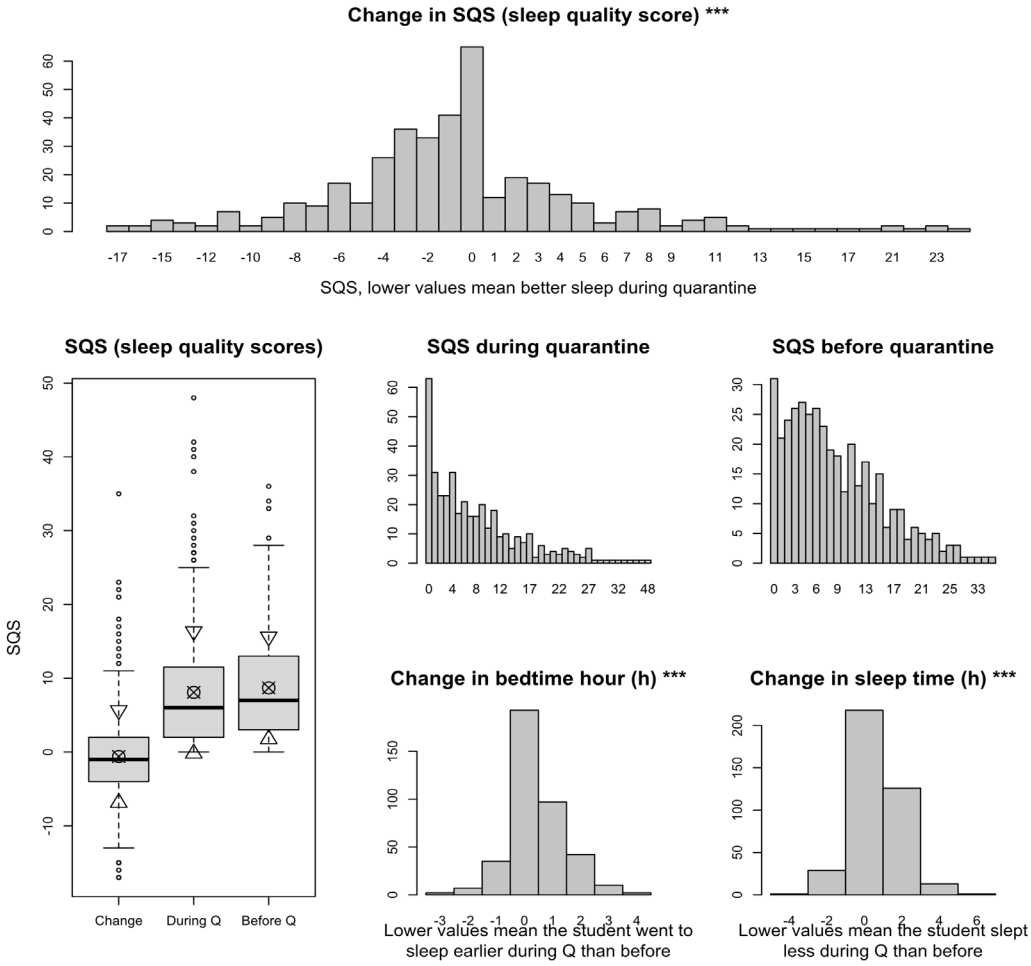

Figure 1. Graphical representation of changes in sleep-related behavior. For the boxplot representing sleep quality scores (lower values meaning better sleep), the middle line represents the median; the boxplot margins mean 1st and 3rd quartile; the crossed circle represents the mean and the inward triangles represent the standard deviation relative to the mean. *** represents statistically significant differences between the quarantine and pre-quarantine conditions as assessed with paired Wilcoxon tests, p<0.001.

Table III. Differences between quarantine and pre-quarantine lifestyle, sleep behavior, procrastination and perceived wellbeing. Statistical significance assessed with paired Wilcoxon test.

Differential variable	Median	1st Q	3rd Q	Mean	Standard deviation	Result (p)
DAILY ACTIVITIES (h)						
Formal study time	0	-2	0	-1.01	1.57	Decrease (<0.001)
Independent study time	0	-2	0	-0.28	1.71	Decrease (0.002)
Other daily activities	2	0	4	1.91	2.01	Increase (<0.001)
Phone use time	1.5	0	2	1.23	1.69	Increase (<0.001)
TIME SPENT ONLINE (h)						
Formal study	0	0	1.5	0.59	1.41	Increase (<0.001)
Independent study	0	-0.67	0	-0.04	1.21	No change (0,25)
Social media	0	0	1.5	0.55	1.17	Increase (<0.001)
Entertainment	1	0	1.5	0.81	1.27	Increase (<0.001)
SLEEP						
Sleep time (h)	0	0	2	0.64	1.37	Increase (<0.001)
Going to sleep hour	0	0	1	0.42	1.01	Increase (<0.001)
SQS	-1	-4	2	-0.61	6.26	Decrease (<0.001)
WELLBEING						
Mood	-1	-1	0	-0.62	1.37	Decrease (<0.001)
Self-org	-1	-2	0	-0.92	1.27	Decrease (<0.001)
Learning efficacy	-1	-2	0	-0.95	1.32	Decrease (<0.001)

Differences in sleep perturbing factors

We used the McNemar test to confirm the statistical significance of observed changes in the frequency of sleep-perturbing behaviors during the quarantine compared to before quarantine. We did not observe an increased frequency, but on the contrary, statistically significant decreases for the most common 4 behaviors: variable mealtimes, consumption of coffee and energy drinks before going to sleep, alcohol consumption and tobacco smoking. The results are presented in table IV.

Differences in changes of lifestyle, learning efficacy, procrastination and wellbeing between genders and rural or urban origin

We found statistically significant differences between genders pertaining to the evolution of following indicators: online independent study time, online entertainment time and sleep quality. Namely, while the time spent online for independent study (expressed in hours) decreased for male students [median 0 (-0.92 – 0); mean -0.28 ±1.03], it registered a slight increase for female students [median 0 (-0.67 – 0.67); mean 0.03±1.25], p=0.024. On the other hand, time dedicated to online entertainment increased less among male students [median 0 (0 – 1); mean 0.58±1.16] compared to female students [median 1 (0 – 2); mean 0.87±1.29]. Finally, we observed a more noticeable increase in sleep quality (i.e. higher decrease of SQS) among male students [median -2 (-4 – 0); mean -1.47±5.03] compared to female students [median -1 (-3 – 2); mean -0.38±6.54], p=0.034. Although we failed to prove statistical significance, our results also suggest that female students had a higher increase in time spent online for formal study [median 0 (0 - 1.5); mean 0.65±1.45] than male students [median 0 (0 - 0.67); mean 0.34±1.23], p=0.062; also, the increase in sleeping time was higher among females [median 0 (0 - 2); mean 0.69±1.41] than males [median 0 (0 – 0); mean 0.44±1.18], p=0.065. It should be noted that pre-quarantine values were similar for students of different genders, except for a significant difference in online formal study (male students studying less than female students).

The only difference regarding students of rural versus urban origin was seen in the change in time spent on social media. As such, there was a higher increase in time spent on social media (expressed in hours) among students of urban origin [median 0.12 (0-1.5); mean 0.6±1.17] compared to students of rural origin [median 0 (0-1); mean 0.31±1.12], p=0.017. There were no statistically significant difference between time spent on social media before quarantine when comparing between students of rural or urban origin.

Students' morale during the quarantine

We have asked the students to rate their (dis) agreement with 8 sentences related to how the quarantine impacted their life. The highest agreement was for the fact that they felt unable to balance leisure with work: 245 students (63.14%) agree or strongly agree. On the other hand, the highest disagreement was towards the idea of wasting less time during quarantine than before: 286 students (73.71%) disagree or strongly disagree. More detailed data are available in table V.

Table IV. Number of students engaging in sleep perturbing factors. Statistical significance assessed with McNemar test.

Factor	No. before Q	No. after Q	Diff (Q-N)	Gave up	Picked up	P
Variable meal timing	220	193	-27	46	19	0.001
Coffee or energy drinks 2h before bed	73	40	-33	37	4	<0.001
Alcohol	40	26	-14	23	9	0.022
Tobacco smoking	85	46	-39	39	0	<0.001
Other substances	6	4	-2	3	1	0.617
Sedatives	11	5	-6	8	2	0.114
Other medicine	26	24	-2	3	1	0.617
Others	6	6	0	2	2	1

Table V. Students' morale assessment through 8 questions with 5-point Likert scale answers.

Question	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Inefficient due to quarantine	23	55	98	110	102
Unable to balance leisure with work	22	61	60	141	104
Unable to self-control	36	78	80	109	85
Desperate due to lack of self-control	102	88	79	73	46
Searched info about escaping Internet addiction	197	96	44	34	17
Quarantine helps me to be more efficient	94	107	113	55	19
I waste less time during the quarantine than before	172	114	46	36	20
The quarantine doesn't affect me	163	99	78	34	14

Table VI. Computed correlations between changes in lifestyle, learning efficacy, procrastination and wellbeing. The data use the following format: Spearman correlation coefficient (p-value).

Differential variable	Mood	Self-org	Learning efficacy	Procrastination
DAILY ACTIVITIES				
Formal study time	0.017 (0.732)	0.075 (0.140)	0.069 (0.173)	-0.052 (0.307)
Independent study time	0.139 (0.006)	0.387 (<0.001)	0.401 (0)	-0.287 (<0.001)
Other daily activities	-0.024 (0.641)	-0.134 (0.008)	-0.101 (0.047)	0.061 (0.232)
Phone use time	-0.188 (<0.001)	-0.295 (<0.001)	-0.253 (<0.001)	0.231 (<0.001)
ONLINE ACTIVITIES				
Formal study	-0.043 (0.402)	-0.039 (0.449)	-0.034 (0.500)	-0.017(0.741)
Independent study	0.054 (0.286)	0.168 (0.001)	0.162 (0.001)	-0.169 (0.001)
Social media	-0.167(0.001)	-0.355 (<0.001)	-0.355 (<0.001)	0.303 (<0.001)
Entertainment	-0.188 (<0.001)	-0.346 (<0.001)	-0.296 (<0.001)	0.211 (<0.001)
SLEEP				
Sleep time	-0.017 (0.74)	-0.125 (0.014)	-0.093 (0.066)	0.071 (0.16)
Going to sleep hour	-0.142 (0.005)	-0.188 (<0.001)	-0.199 (<0.001)	0.117 (0.021)
SQS	-0.318 (<0.001)	-0.218 (<0.001)	-0.260 (<0.001)	0.147 (0.004)
WELLBEING				
Mood		0.537 (<0.001)	0.523 (<0.001)	-0.281 (<0.001)
Self-org	0.537 (<0.001)		0.789 (<0.001)	-0.527 (<0.001)
Learning efficacy	0.523 (<0.001)	0.789 (<0.001)		-0.516 (<0.001)
Procrastination	-0.281 (<0.001)	-0.527 (<0.001)	-0.516 (<0.001)	

Correlation between changes in lifestyle, learning efficacy, procrastination, and wellbeing

Finally, we have computed Spearman's correlation coefficient between changes in lifestyle, learning efficacy, procrastination, and wellbeing. Of note are the positive correlations between independent study time and self-organization capacity, and independent study time and learning efficacy (compared to a very weak correlation between formal study time and learning efficacy). Also, change in time spent on social media platforms, time spent on online entertainment and time spent daily on phone are negatively correlated with change in wellbeing indicators across the board. More detailed data are provided in table VI, in the format *correlation coefficient (p-value)*. For all variables, higher values indicate increases during quarantine compared to before the quarantine. Positive correlations towards SQS mean the studied variable was correlated with worse sleep.

Discussion

Using a survey-based study, we have found that the COVID-19 quarantine conditions negatively impacted the lifestyle, learning efficacy and wellbeing of Romanian healthcare students', while also increasing time spent procrastinating. In addition, we have found that the impact of quarantine is influenced by gender and place of origin (urban/rural), and finally we identified negative correlations between wellbeing indicators and procrastination or social media use.

One limitation we encountered stems from the use of non-probabilistic convenience sampling. This resulted in the over-representation of some demographical categories such as: younger and lower-year students, female students, General Medicine students, and students mainly from two of the 8 analyzed universities. Another limitation is that the questionnaire was self-administered and as such we could not obtain objective data. Moreover, we did not use standardized questionnaires for all the items investigated, except for the PSQI-derived questions, and the questionnaires have not been previously validated.

Stress as a factor explaining changes in wellbeing and procrastination

Numerous studies suggest that, during a quarantine, students have to cope with high levels of stress and a diminished life satisfaction due to quarantine-determined monotony and online classes, in addition to the habitual academic stress [10,22,47–50].

According to some studies, academic procrastination is described as a failure in self-regulation [51], and is strongly correlated with (perceived) stress, anxiety-provoking situations, and life regrets [9,28,52–55]. In our study, we hypothesized that alterations of wellbeing indicators (learning efficacy learning efficacy, mood, self-organization), i.e. negative differences between quarantine and pre-quarantine values, were directly associated with (quarantine v. pre-quarantine) changes in procrastination. We found negative associations between the evolution of procrastination and that of self-organization (r=-0,52) and mood (r=-0,28), which might indicate that procrastination is linked to reduced life satisfaction, as suggested by

[9,28,55,56]. As expected, changes in mood were rather strongly correlated with the difference between quarantine and pre-quarantine values of self-organization (r=0.53) and learning efficacy learning efficacy (r=0.52).

Related to our results, Beutel et al. [34], in a study dedicated to procrastination, have reported a positive correlation between procrastination and perceived stress (r=0.39) and between procrastination and loneliness (r=0.27) and life satisfaction (r=0.35). A different study analyzing the psychological effects of COVID-19 quarantines on Chinese school students suggests an upset balance between phone use and physical activity as a possible contributor to the changes observed in our study. Specifically, the authors noticed a nearly fivefold decrease in weekly time dedicated to physical activity time, and that the percentage of sedentary students increased approximately 3 times. Furthermore, screen time during the quarantine increased by about 4 hours per day (1730 minutes per week) [56].

Increased procrastination behaviors are associated with negative consequences ranging from low mood to concerns of mental wellbeing [28,51,53], and subsequently, we hypothesize that increased levels of procrastination are a result of reduced life satisfaction, itself a result of the lockdown [28,34,55].

Yet another possible contributor to a decreased wellbeing of students during the lockdown, and subsequently to procrastination, is mentioned by Twenge et al. [57]. The researchers suggests that 4 hours daily screen time (considered by the authors a moderate level) is associated with lower psychological wellbeing, or more specifically with indicators thereof: inability to finish tasks, lower self-control, less curiosity, less emotional stability [9,20,57].

On a side note, Hong et al. found that dissatisfaction of the need for autonomy is a predictor of proneness to boredom and of increased mobile gaming time, leading, in time, to problematic mobile phone use [58]. Given the fact that, during the quarantine, over 90% of students returned home to live with their families, we hypothesize that decreased independence induced autonomy dissatisfaction that further decreased their wellbeing and caused specific behaviors related to phone and Internet use [28,58].

Lastly, some studies propose that dopamine receptor sensitivity related mechanisms are at play in social media addiction or excessive use [59], due to their short-term provided pleasure [60]. Although we did not initially aim to discuss such physiological mechanisms, the idea that the quarantine-induced increases in time spent online might have had a negative impact on students' wellbeing is a valid future research hypothesis.

Students' morale during quarantine

We assessed the students' morale by asking their (dis)agreement grade with 8 statements. The respondents generally complained of being inefficient, lacking self-control and balance between leisure and work, and considered that they were affected by quarantine. However, most students also strongly disagreed with the idea of searching information about escaping Internet addiction and being desperate due to lack of self-control, which suggests that they did not perceive a severe increase in Internet use.

Moreover, our study highlighted a decrease in independent (-0.28 h) and formal (-1.01 h) study time, an increase in phone use (0.55 h), and online entertainment (0.81 h). Additionally, time spent with other daily activities increased by almost 2 hours.

Similar to our results, a survey of Saudi medical students [21] has found deterioration of work performance, lack of concentration during studying and a decrease in overall study time, a part of the students also reporting difficulty in mental calculations.

Students' sleep quality during quarantine

Unlike most studies on poor sleep quality in quarantine [61,62], we observed a modest, but statistically significant, improvement in sleep quality (mean decrease of SQS score=-0,61, consistent with a better sleep quality), and an increase in sleep duration (mean increase=0,64 h). However, students tended to go to sleep later during quarantine (on average 25 minutes later), which is similar to the results of previous studies [62,63]. Those changes might be due to most of the students (352 students, 90,72%) returning home and having online courses, as such the time spent daily for going to and coming from University courses has been nullified, and the need to wake up early (and incidentally, to go to sleep early) disappeared. However, increasing free time during quarantine might explain the improvement in sleep quality and duration. Otherwise, students were able to skip hours online, which could result in better sleep quality and duration.

The statistically significant improvement in sleep quality is nonetheless unexpected. While the negative aspects of quarantine (boredom, frustration, lack of social support, fear of uncertainty) are likely to have contributed to the previously mentioned decrease in wellbeing, they seem to have had a minimal effect on sleep quality, possibly outweighed by the comfort of sleeping at home.

Differences between students or rural and urban origin, pertaining to social media use

The only statistically significant difference between students of rural or urban origin we observed was between the increases in time spent on social media (namely, students of rural origin spent on average 18 minutes more on social media during the quarantine, while students of urban origin spent the double of that, 36 minutes). Together with the fact that most students went home due to quarantine, we further hypothesize that this difference comes from the fact that in rural areas, physical activity is more accessible than in urban areas and as such, students of rural origin (which also lived in rural areas during the quarantine) went outside more and thus spent less time on social media [64,65].

Conclusion

The long-term quarantine imposed in response to the COVID-19 pandemic determined lifestyle, learning efficacy and wellbeing changes of Romanian healthcare students, which previous studies linked to heightened levels of stress, monotony, boredom and frustration. Specifically, the lockdown caused an increased phone and social media use, at the expense of formal and independent study, as well as deteriorations in mood, self-organization capacity and learning efficacy learning efficacy, and increased procrastination behaviors. However, the increase in social media use was slightly lower for students of rural origin.

Generally, students complained of being inefficient, lacking self-control and having difficulty in balancing work and leisure. On the other hand, the quarantine's effects on sleep quality and duration were contrary to those of other studies, the two parameters registering a moderate improvement.

In conclusion, our study draws attention to the problem of quarantine-induced deteriorations of wellbeing and learning capacity in a category of students who are already considered to experience increased levels of study-related stress. Subsequently, we propose social and mental health support as a means of minimizing the negative impact of quarantine.

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