Exploring the Relationship between Online Learning, Student Health, and Academic Performance: Insights from Postgraduate Education in Egypt

Cherine Soliman [1]
Dean – Graduate School of Business, Arab Academy for Science, Technology and Martime Transport, Giza, Egypt
Email**: cherine.soliman@aast.edu**

Doaa M. Salman Abdou,[2]
Department of Economics, Faculty of Management Sciences, October University for Modern Sciences and Arts, Cairo, Egypt
Email: **dsalman@msa.edu.eg**

Sara Abdel Baset [3]
Statistic instructor, Faculty of Management Sciences, October University for Modern Sciences and Arts, Cairo, Egypt
Email: **sbaset@msa.edu.eg**

Rasha Fahmi[4]
Clinical Oncology Consultant, CEO El-Salam Oncology Center, MD, MBA, Cairo, Egypt
Email: rashafahmi@adj.aast.edu

Abstract: The COVID-19 pandemic has caused significant disruptions in the higher education system, particularly in the learning and well-being of postgraduate students. The shift to online learning has presented unique challenges, including reduced social interaction, motivation difficulties, and technical obstacles. This study aims to investigate the impacts of the pandemic on the health and well-being of postgraduate students during online learning in Egypt. A structural equation modelling (SEM) methodology is employed to examine the relationships between online learning, physical well-being, mental well-being, sleep patterns, dietary habits, and academic performance. The findings highlight the widespread effects of the pandemic on the physical and mental health of postgraduate students, including outbreaks on campuses, heightened levels of stress and anxiety, and negative impacts on academic outcomes. The study emphasizes the importance of addressing these challenges and developing strategies to support student health and well-being in higher education during times of crisis. However, it is important to note that the study's findings are specific to postgraduate students in Egypt and may not be generalized to other student populations or geographical locations.
Keywords: COVID-19 pandemic, student health, well-being, online learning, higher education, postgraduate students, Egypt

1 ORCID: 0000-0003-1117-9969
[2] ORCID: 0000-0001-5050-6104
[3] ORCID: 0000-0002-5160-0458
4 ORCID: 0000-0002-0847-7247

Introduction

The COVID-19 pandemic has had a profound impact on the higher education system, resulting in significant changes in the way students learn and interact with their peers and instructors. The transition to online learning has introduced unique challenges for students, including reduced opportunities for social interaction, difficulties with motivation and engagement, and technical hurdles. Moreover, the pandemic has had substantial effects on students' physical and mental health, leading to increased levels of stress, anxiety, and depression.

Student health and well-being in higher education have been widely affected by the COVID-19 pandemic. The physical health of university students has been negatively impacted, with COVID-19 outbreaks occurring on numerous campuses when students returned for the fall semester. Although severe illness and hospitalizations were relatively rare among the typically young student population, asymptomatic carriers contributed to the transmission of the virus, resulting in widespread disruption as infected students had to self-isolate. Additionally, the pandemic has taken a toll on students' mental health, with a rise in reports of stress, anxiety, depression, and other psychological issues. Concerns about contracting the virus, isolation, disruption to social lives and education, worries about family members, and financial problems have all contributed to heightened stress levels. The decline in both physical and psychological health is likely to have implications for student performance, as studies have found associations between deteriorating health, increased workloads, inadequate online learning, and poorer academic outcomes and examination results (Ihm, et al., 2021).

In response to the pandemic, educational institutions have had to quickly adapt to ensure continuous learning for their students. However, the transition to online learning has presented challenges in terms of supporting students' health and well-being. Many students have reported difficulties in maintaining healthy lifestyles, including disrupted sleep patterns, reduced physical activity, and changes in dietary habits. These factors have the potential to not only affect students' health and well-being but also impact their academic performance. Therefore, it is crucial to comprehend the impact of the COVID-19 pandemic on students' health during online learning in higher education. This understanding can aid institutions in developing strategies and interventions that better support student health during pandemics or virus mutations.

By identifying both the challenges and opportunities arising from the pandemic, institutions can mitigate the negative impact on students' health and well-being, thus ensuring they receive the necessary support to succeed academically. This paper is structured as follows: Section 2 provides a brief literature review, Section 3 presents the methods and methodology, followed by the results and conclusion.

Literature review

The issue of students' mental health is of great importance to researchers because of the increasing prevalence of mental health issues in the university community. The World Health Organization (WHO) defined mental health as "a state of well-being in which the individual realizes his or her abilities, can cope with the normal stresses of life, can work productively and fruitfully, and can contribute to his or her community". Poor mental health can be linked to fast social change, social exclusion, unhealthy lifestyles, and physical illness (WHO, 2018)

Research has consistently shown that pandemics can have a significant negative impact on the mental health of students. A systematic review by Cao et al. (2020) found that the psychological impact of the COVID-19 pandemic on students was substantial, with high levels of anxiety, depression, and stress reported. Similarly, a study by Wang et al. (2020) found that nearly half of the hospitalized COVID-19 patients in their sample experienced anxiety and depression.In addition to the mental health impacts of pandemics, there are also significant physical health challenges associated with these outbreaks. For example, studies have found that pandemics such as SARS and COVID-19 are associated with respiratory symptoms, fatigue, and headaches (Huang et al., 2020; Wang et al., 2020). These physical symptoms can impact not only students' physical health but also their ability to engage in academic activities.

The shift towards online learning during the COVID-19 pandemic has also brought about unique challenges for students' physical and mental health. Studies have found that online learning can lead to reduced physical activity levels and increased sedentary behaviour (Dunton et al., 2020; Kaur & Singh, 2021). This can contribute to poor health outcomes, such as increased risk of obesity and chronic diseases. In addition, the lack of social interaction and isolation associated with online learning can negatively impact students' mental health (Cao et al., 2020; Wang et al., 2020).

Furthermore, students may have varying levels of access to resources that can support their health and well-being during pandemics and online learning. For example, some students may have limited access to technology and internet connectivity, which can impact their ability to participate in online learning and access resources for mental and physical health support. Additionally, students may have limited access to healthcare services, particularly during periods of lockdown or social distancing.According to Jessica Mangis (2016), in her thesis, the prevalence of online education has led to the rise of a sedentary lifestyle, resulting in delayed bedtimes, longer sleep onset latency, and decreased physical activity (p. 2-3). Mangis argues that while online courses offer students the

flexibility to learn at their own pace and in their preferred environment, the sedentary nature of online classes has contributed to health issues such as cardiovascular diseases, type two diabetes, and depression.

In a study conducted at Netaji Subhas University of Technology, New Delhi, Chakraborty et al. (2021) examined various aspects of online classes, including content delivery, interaction, assessment, and health issues. The study aimed to compare the impact of online classes on the well-being of students. The findings indicated that students struggled to adapt to the sudden lifestyle and academic changes brought about by the transition to online learning. Many students reported experiencing mental health problems of varying severity, with depression, anxiety, and suicidal thoughts being the most common issues encountered (Shawney et al., 2021).To gain a comprehensive understanding of the impact of screen-based education on health deterioration, we have summarized the relevant literature findings in Table 1 below:

Table (1) The Impact of Screen Time on Health

	Variables	Definition	Authors
1	Impaired Cognitive Function	"The mental processes involved in acquiring and processing information necessary for everyday life" (Magni and Bilotta, 2016, p. 411)	Bayne et al., 2019; Shree & Shukla, 2016; Alice G. Walton (2018); Walsh et al., 2018; Amrit Kumar Jha and Alisha Arora (2021); Mylene Mendoza (2020)
2	Computer Vision Syndrome	a group of eye-and-vison-related problems triggered by prolonged digital device usage.	Swati Agarwal et al. (2021) and Chee Wai Wong et al. (2021)
3	Insomnia	the presence of an individual's report of difficulty with sleep" (Ruth, 2007)	Rosenberg et al. (2019) and Morin (2021) Ruchir Khare et al. (2020)
4	Orthopaedic Pains	the interconnectivity between orthopaedic pains and online classes	Shawney et al, 2021)
5	Depression & Anxiety	the state of stativeness that ruptures the patient's understanding of selfhood.	Nadar Salari et al. (2020) ; Notivol et al., 2021; Rajkumar 2020; Jha and Arora (2020)

Source: Shawney et al, 2021

Table (1) represents the findings in the field, we recognize that this representation is not comprehensive however, on one hand, it is related to our research interest, on the other hand, the novelty of their production is also more relative to our research objective, which is not only online learning, but most important in the light of COVID-19. The first variable "impaired cognitive function" the literature stresses a negative correlation between the number of screen hours and the learning produced such as the "quality of comprehension, prioritization, dep-level processing of incoming information" (Shawney et al, 2021). Hence the development of the terminology "Zoom fatigue" by Mylene Mendoza (2020) to develop the mental exhaustion resulting from the extra effort performed to stay attentive in online education. Alice G Walton (2012) has found a negative correlation between screen time and test results, the longer the screen time, the lower the test grades. The predominant reason is the impact of screen time on mental cognitive function.

The second variable is very logical hence online education depends on prolonged "eye exposure to computer screens". Swati Agarwal et al. (2021) and Chee Wai Wong et al. (2021) discuss a range of ocular problems like "discomfort leading to tearing, tired eye, burning sensation, headache, blurring vision, redness, and double vision that has augmented during the COVID-19 pandemic".

The next variable addressing the "orthopaedic pains" due to the difficulty of the medical content to be reported in this document, we only limit our representation to the understanding of the correlation between long hours of sitting, physically adjusted to the screen position and its impact on bones and joints. However important to complete the information, this section is not developed in our research framework, however, we do consider it in the recommendations section.

Most important for our research interest is the literature related to the variables of "depression and anxiety". Scientific evidence finds similarity in the result on individual mental wellbeing between online education and internet addiction in terms of experiencing isolation and sadness eventually leading to depression and anxiety. Consequently, impacts poorly on education performance outcomes and endangers the students' overall well-being (Nadar Salari et al. (2020); Notivol et al., 2021; Rajkumar 2020; Jha and Arora, 2020). To address these disparities, it is important for institutions to consider the unique needs of different student populations and to implement strategies that support a diverse range of student experiences. This may include providing targeted resources and support for marginalized and vulnerable populations, such as mental health services and financial assistance. Additionally, institutions can work to ensure that all students have access to technology and internet connectivity, as well as healthcare services and resources for physical and mental health support.

Overall, the literature suggests that pandemics such as COVID-19 can have significant negative impacts on student health, both physical and mental. The shift towards online learning during these outbreaks can exacerbate these challenges, particularly in terms of reduced physical activity levels and increased sedentary behaviour. Scholars highlight the importance of considering the potential disparities in health outcomes among students during pandemics and online learning (Salman & Soliman, 2022). By prioritizing the needs of all students and implementing strategies that support a diverse range of student experiences, institutions can help mitigate the negative impacts of pandemics and online learning on student health and well-being. Therefore, it is important for institutions to prioritize the health and well-being of students during these challenging times and to develop strategies and interventions that better support student health during pandemics or virus mutations.

Methodology

Research Design

The research conducted in this study is primarily quantitative, as indicated by Yilmaz (2013). Quantitative research focuses on predicting, monitoring, and describing phenomena through the collection of numerical data. It is an empirical approach that aims to test theories and determine if they explain the topic of interest within a societal phenomenon or human issue. A quantitative survey was conducted with 300 postgraduate students. Questions assessed physical activity levels, dietary habits, sleep patterns, mental health status, challenges faced, and support received from their institutions. Non-parametric tests were used for analysis.
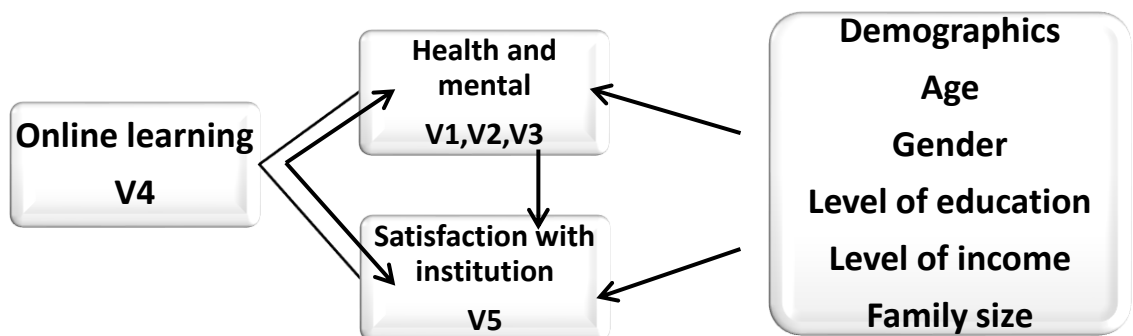

Figure one: conceptual framework work
Source: Prepared by authors

Initially, the researchers conducted a literature review using secondary sources of information to gain a comprehensive understanding of the study's topic. This literature review helped to inform the research and provide valuable insights. Subsequently, the researchers implemented a quantitative research design by conducting a survey. The survey aimed to gather the opinions, beliefs, and feelings of a selected group of individuals, often chosen through demographic sampling. Common research methods used in quantitative studies include interviews and questionnaires, which may contain both closed-ended and open-ended questions to gather data.

Data Collection and Sampling Techniques

The researchers used the survey technique to conduct this study. It is a simple method used to collect information types on different people with different behaviour and attitudes. It is also designed to enable the researchers to take comprehensive general views. (Bird, D. K., 2009). Surveys are questionnaires which contain self-administered questions addressed to the target. The survey encompasses various variables on the Yilmaz, K. (2013). Comparison of quantitative and qualitative research traditions: Epistemological, theoretical, and methodological differences, Yilmaz, K. (2013).

Health and well-being of students during online learning in higher education amid the COVID-19 pandemic. These variables include the students' educational level, their physical and mental health status throughout their studies, their involvement in physical, outdoor, and social activities, their sleep and dietary patterns, the challenges and opportunities they encountered during the transition to online learning, their satisfaction with the support provided by their institution, and their familiarity with the latest advancements and challenges in COVID-19 research concerning medical issues for students. To measure these variables, the survey employs different scales, primarily the Likert scale, multiple-choice questions, and nominal scale. The Likert scale is a widely utilized and fundamental tool in educational and social science research due to its ability to facilitate debates and address controversies. On the other hand, the nominal scale represents the lowest level of measurement used for qualitative rather than quantitative variables. It involves classifying variables into distinct categories, with the units of the scale being based on the classification to which the objects belonged groups of people (respondents).Sample Size and Type: The researchers selected 300 respondents whose are post-graduate students during the COVID-19 problem. The sample type is the 'non-probability random sampling technique'. a non-probability sampling technique where the researcher selects units to be sampled based on his existing knowledge, or his professional judgment.

Data Collection Process:

The questionnaires were distributed online and face to face, and in different locations to obtain as much data as possible, and to ensure the quality and reliability of the results. Questionnaires were distributed randomly to those who were knowledgeable and faced the COVID-19 problem. The questionnaires were distributed in Cairo and Giza.

Data Coding, Verification, and Entry

The researchers have used the statistical package for social sciences and data coding, verification, and analyzing quantitative data (IBM) SPSS data file that contains data and analysis of his/her conducted questionnaires. The researchers applied the following steps, first was the data verification to determine the distribution of answers based on the response of the respondents. Then a reliability test was made to cross out the unreliable statements. finally, in the analysis stage, the descriptive statistics are calculated like mean, valid percentage, mode and standard deviation. Moreover, the chi-square is calculated using the Kruskal-Wallis test to check the relationship between variables.

Data Analysis and Results

Table (1) presents an overview of the personal characteristics of the sample respondents, encompassing gender, age, social status, occupation, monthly income, and average family size. The data reveals that most of the respondents were male, accounting for 72.3% (217 out of 300), while the remaining 27.7% (83 out of 300) were female. In terms of age, the largest age group was "30 to less than 40," comprising 47.3% (142 out of 300) of the respondents. The age group "less than 30" accounted for 22.7% (68 out of 300), "40 to less than 50" represented 28% (84 out of 300), and the smallest representation was observed in the "50 and above" age group, with only 2% (6 out of 300) of the respondents.Regarding social status, married individuals constituted the highest proportion, representing 65.7% (197 out of 300), followed by the single category at 32% (96 out of 300). The divorced category had the lowest representation, with 2.3% (7 out of 300). When examining occupation, the largest group consisted of private sector employees, accounting for 73.7% (221 out of 300). Academic staff and public sector employees made up 4.3% (13 out of 300) and 12.3% (37 out of 300), respectively. The remaining categories, including unemployed individuals, business owners, housewives, and others, had smaller representations. Concerning monthly income, most respondents (65%, 195 out of 300) reported a monthly income of 16,000 L.E or higher. The other income categories, ranging from less than 4,000 L.E to 12,000 L.E, had smaller proportions. Lastly, the respondents' average family size varied, with "4 members" being the most common category, representing 31.3% (94 out of 300). Other family sizes,

including alone, 2 members, 3 members, 5 members, and more than 5 members, exhibited varying proportions. All the demographics answers have a standard deviation of less than 2 which indicates that the sample is representative and homogenous.

Table (1): Personal characteristics of the Sample respondents:

	Frequency	Valid %	Mode	Std. Dev.
Gender				
1-Male	217	72.3	1	0.448
2-Female	83	27.7		
Total	300	100.0		
Age				
1. Less than 30	68	22.7	2	0.762
2. 30 to less than 40	142	47.3		
3. 40 to less than 50	84	28.0		
4. 50 and above	6	2.0		
Total	300	100.0		
Social status				
1. Single	96	32.0	2	0.506
2. Married	197	65.7		
3. Divorced	7	2.3		
Total	300	100.0		
Occupation				
1. Unemployed	2	0.7	4	0.909
2. Academic staff	13	4.3		
3. Public sector employee	37	12.3		
4. Private sector employee	221	73.7		
5. Business owner	17	5.7		
6. Housewife	3	1.0		
8. Others	7	2.3		
Total	300	100.0		
Monthly income(optional)				
1. Less than 4000 L.E	12	4.0	5	1.199
2. 4000 L.E to less than 8000 L.E	27	9.0		
3. 8000 L.E to less than 12000 L.E	35	11.7		
4. 12000 L.E to less than 16000 L.E	31	10.3		
5. 16000 L.E and more	195	65.0		
Total	300	100.0		
The average size of Family				
1-Alone	24	8.0	4	1.373
2-2 members	31	10.3		

3-3 members	56	18.7
3-4 members	94	31.3
4-5 members	66	22.0
5-More than 5 members	29	9.7
Total	300	100.0

Table (2): Descriptive Statistics of Physical and mental health status:

V1: Physical and mental health status					
	Frequency	Valid Percent	Mean	Mode	Std. Dev.
Have you experienced any health challenges during your studies due to COVID-19?					
1-Yes	103	34.3			
2-No	197	65.7			
Total	300	100.0			
The challenges were limited to					
1. The physical impact	103	34.3	1.99	1	0.822
2. Mental impact (i.e. depression, anxiety, fear, escapism…)	98	32.7			
3. Both	99	33.0			
Total	300	100.0			
COVID-19 impacted your physical health during your studies					
1-Negatively	90	30.0	1.79	2	0.593
2-No impact	182	60.7			
3-Positively	28	9.3			
Total	300	100.0			
COVID-19 impacted your mental health during your studies					
1-Negatively	77	25.7	1.86	2	0.592
2-No impact	189	63.0			
3-Positively	34	11.3			
Total	300	100.0			

Table 2 provides descriptive statistics related to the physical and mental health status of respondents during the COVID-19 pandemic. It shows that 34.3% of respondents experienced health challenges during their studies due to COVID-19, while 65.7% did not experience any challenges. Among those who experienced challenges, 34.3% reported the challenges were limited to the physical impact, 32.7% reported the challenges were mental impacts such as depression, anxiety, and fear, and 33% reported challenges to both physical and

mental health. When asked about the impact of COVID-19 on physical health, 30% of respondents reported a negative impact, 60.7% reported no impact, and 9.3% reported a positive impact. The mean response was 1.79 leaning towards negative impact. Similarly, for mental health impact, 25.7% reported a negative impact, 63% reported no impact, and 11.3% reported a positive impact. The mean response was 1.86 also leaning towards negative impact. In summary, most respondents did not experience health challenges during their studies due to COVID-19. However, among those who did, challenges were reported both in physical and mental health. On average, COVID-19 had a small negative impact on physical and mental health during studies.

Table (3): Descriptive Statistics of Engagement in physical, outdoor, and social activities:

V2: Engagement in physical, outdoor, and social activities					
	Frequency	Valid Percent			
How often do you engage in physical activity during the week?					
1-Less than once a week	74	24.7	2.57	3	1.256
2-Once a week	74	24.7			
3-2-3 times a week	91	30.3			
4-4-5 times a week	29	9.7			
5-More than 5 times a week	32	10.7			
Total	300	100.0			
How often do you engage in outdoor activities during the week?					
1-Less than once a week	64	21.3	2.72	3	1.312
2-Once a week	77	25.7			
3-2-3 times a week	80	26.7			
4-4-5 times a week	37	12.3			
5-More than 5 times a week	42	14.0			
Total	300	100.0			
How often do you engage in social activities with friends and family during the week?					
1-Less than once a week	62	20.7	2.46	2	1.086
2-Once a week	99	33.0			
3-2-3 times a week	96	32.0			
4-4-5 times a week	26	8.7			
5-More than 5 times a week	17	5.7			
Total	300	100.0			

Table 3 contains data about the respondent's engagement in physical, outdoor, and social activities weekly during the COVID-19 pandemic. For physical activity, 24.7% of respondents engaged less than once a week, another 24.7% engaged once a week, 30.3% engaged 2-3 times a week, 9.7% engaged 4-5 times a week, and 10.7% engaged more than 5 times a week. The average engagement was 2.57 times per week. For outdoor activities, 21.3% engaged less than once a week, 25.7% once a week, 26.7% 2-3 times a week, 12.3% 4-5 times a week, and 14% more than 5 times a week. The average was 2.72 times per week. In terms of social activities, 20.7% engaged less than once a week, 33% once a week, 32% 2-3 times a week, 8.7% 4-5 times a week, and 5.7% more than 5 times a week. The average was 2.46 times per week. In summary, while engagement levels varied, on average respondents were physically active, engaged in outdoor activities, and socialized with friends/family 2-3 times per week during the pandemic. Outdoor activities saw the highest average frequency of engagement at 2.72 times a week. The below table (table 4) represents the Descriptive Statistics of Sleep and dietary patterns where 178 of the respondents' sleep patterns didn't change since the start of the COVID-19 pandemic and 168 of them had no impact on their dietary patterns since the start of the COVID-19 pandemic.

Table (4): Descriptive Statistics of Sleep and dietary patterns:

V3: Sleep and dietary patterns					
How has your sleep pattern changed since the start of the COVID-19 pandemic?					
	Frequency	Valid Percent			
1-Worsened	93	31.0	1.79	2	0.602
2-Had no impact	178	59.3			
3-Improved	29	9.7			
Total	300	100.0			

How has your dietary pattern changed since the start of the COVID-19 pandemic?					
1-Worsened	83	27.7	1.89	2	0.655
2-Had no impact	168	56.0			
3-Improved	49	16.3			
Total	300	100.0			

Table 5 – see appendix- looks at the challenges, opportunities, perceptions and impacts of transitioning to online learning during the COVID-19 pandemic. Most respondents were Masters students (87%). The biggest challenges included lack of interaction (62.3%), difficulty staying motivated (36.3%), technical difficulties (26.3%) and understanding course material without face-to-face interaction (26%). Opportunities included flexibility (82.7%), convenience (50.3%), and learning in their own space (60.3%). A majority would recommend significant online learning in future pandemics (74%) and prefer 26-38% of future learning to be online (38.3%). Respondents had a neutral to positive view about using online learning in future. In terms of impacts, COVID-19 negatively impacted academic performance for 20.2%, had no impact for 59.3% and improved it for 20.5%. Similarly, it negatively impacted 14.6% GPA, had no impact on 68.8% and improved 16.6%. Family life was negatively impacted for 37.3%, no impact for 43.1% and improved for 19.7%.

In summary, while online transition brought challenges, flexibility and convenience were highlighted as opportunities. Most were open to recommending and using online learning in future pandemic situations, with varying impacts on performance, GPA and family life reported. Also, the majority added that there is no impact of COVID-19 on academic performance, GPA, and family life during their studies. Moreover, the biggest challenges respondents faced during the transition to online learning were a lack of interaction with classmates and instructors and difficulty in staying motivated. Where the opportunities provided for them during COVID-19 online learning were flexibility, the ability to learn at their pace and convenience.

Table 6 introduces Descriptive Statistics of Satisfaction with the support provided by their institution where the respondents are extremely satisfied with the support provided by their institution to facilitate the transition to online learning during COVID-19 and online learning during COVID-19 effectively accommodated their medical needs where the mean of this Likert statements is above 3. Besides 57.3 % of respondents find that their institution plays a supporting role in addressing the medical challenges of COVID-19 for post-graduates.

Table (6): Descriptive Statistics of Satisfaction with the support provided by their institution.

V5: Satisfaction with the support provided by their institution					
The support provided by your institution to facilitate the transition to online learning during COVID-19					
1-Extremely Not Satisfied	0	0	3.62	4	0.799
2-Not Satisfied	22	7.5			
3-Neutral	104	35.4			
4-Satisfied	131	44.6			
5-Extremely satisfied	37	12.6			
Total	294	100.0			
Online learning during COVID-19 effectively accommodated your medical needs					
1-Extremely Not Satisfied	0	0	3.57	3	0.720
2-Not Satisfied	8	2.7			
3-Neutral	142	48.3			
4-Satisfied	112	38.1			
5-Extremely satisfied	32	10.9			
Total	294	100.0			
What role do you believe your institution plays in addressing the medical challenges of COVID-19 for post-graduate students?					
1-Primary role	63	21.9	1.99	2	0.655
2-Supporting role	165	57.3			
3-No role	60	20.8			
Total	288	100.0			

Table 7 Represents the Reliability test for each variable to check if the selected statements are consistent or not, for all studied variables Cronbach's alpha is around 0.6 which means that the selected statements for each variable are consistent.

Table (7): **Reliability Statistics of Studied Variables:**

	Cronbach's Alpha
V1	0.582
V2	0.703
V3	0.531
V4	0.618
V5	0.590

Tables 8 and 9 show the result of using the Nonparametric test for K independent sample Kruskal Wallis test to find Chi-square to test if there is a relationship between the variables. If the significant level is less than 0.05 it means that there is a relationship between the variables. Table 8 presents the results of Chi-Square tests analyzing the relationships between different variables: Sleep and dietary patterns, Engagement in physical, outdoor, and social activities, Physical and mental health status, Satisfaction, Online presence, Gender, and Social status. The test statistics used for analysis are Kruskal-Wallis H statistics, which are non-parametric tests used to determine if there are any significant differences between groups.

For the variable "Sleep and dietary patterns" (V3), the Kruskal-Wallis H statistics are 5.642, 4.960, and 4.616 for the variables V2 (Engagement in physical, outdoor, and social activities), V1 (Physical and mental health status), and V5 (Satisfaction), respectively. The corresponding degrees of freedom (df) for all three tests are 3. The asymptotic significance values, or p-values, are 0.130, 0.175, and 0.202, indicating that there is no significant evidence to reject the null hypothesis of no association between sleep and dietary patterns with engagement in physical, outdoor, and social activities, physical and mental health status, and satisfaction.

The variable "Online presence" (V4) shows statistically significant associations with sleep and dietary patterns. The Kruskal-Wallis H statistics for this variable are 16.162, 1.501, and 14.572 for V2, V1, and V5, respectively. The degrees of freedom for these tests are 2. The p-values are 0.000, 0.472, and 0.001, indicating significant associations between online presence and sleep and dietary patterns for engagement in physical, outdoor, and social activities, and satisfaction.

The variable "Gender" shows significant associations with engagement in physical, outdoor, and social activities. The Kruskal-Wallis H statistics for this variable are 3.701, 6.744, and 0.260 for V2, V1, and V5, respectively. The degrees of freedom for these tests are 1. The p-values are 0.054, 0.009, and 0.610, suggesting a significant association between gender and engagement in physical, outdoor, and social activities, and physical and mental health status. Lastly, the variable "Social status" shows a borderline significant association with sleep and dietary patterns. The Kruskal-Wallis H statistics for this variable are 5.932, 1.834, and 3.737 for V2, V1, and V5, respectively. The degrees of freedom for these tests are 2. The p-values are 0.052, 0.400, and 0.154, indicating a potential association between social status and sleep and dietary patterns, engagement in physical, outdoor, and social activities, and satisfaction.

In summary, the Chi-Square test results suggest that there are significant associations between sleep and dietary patterns and online presence, gender and engagement in physical, outdoor, and social activities, and potential associations between social status and sleep and dietary patterns. However, there is no significant evidence of associations between sleep and dietary patterns, engagement in physical, outdoor, and social activities, physical and mental health status, and satisfaction.

Table (8): Chi-Square Test between Sleep and dietary patterns, Engagement in physical, outdoor, and social activities and Physical and mental health status with other variables:

	V3 Sleep and dietary patterns	V2 Engagement in physical, outdoor, and social activities	V1 Physical and mental health status
V5 Satisfaction			
Kruskal-Wallis H	5.642	4.960	4.616
Df	3	3	3
Asymp. Sig.	0.130	0.175	0.202
V4 Online			
Kruskal-Wallis H	16.162	1.501	14.572
Df	2	2	2
Asymp. Sig.	0.000	0.472	0.001
Gender			
Kruskal-Wallis H	3.701	6.744	0.260
Df	1	1	1
Asymp. Sig.	0.054	0.009	0.610
Social status			
Kruskal-Wallis H	5.932	1.834	3.737
Df	2	2	2
Asymp. Sig.	0.052	0.400	0.154

Table 9 shows that there is a significant relationship between learning online and the respondent's level of satisfaction where the significant level is 0.001 <0.05 which reflects that studying online during COVID-19 affects the respondent's level of satisfaction.

<u>Table (9):</u> Chi-Square Test between Satisfaction and Online:

V5 Satisfaction / V4 Online

	Would you like to use online learning in the event of future	Online Learning in general
Kruskal-Wallis H	38.556	17.437
Df	3	3
Asymp. Sig.	0.001	0.001

Structure equation Model SEM:

SEM can be visualized using path diagrams it is considered a collection of multivariate techniques used to test if models fit data in a confirmatory analysis instead of an exploratory manner**. SEM model** estimates the measurement error variance parameters for both independent and dependent variables where Most of the multivariate techniques are concerned with measurement error. **SEM is considered** an advanced statistical tool which requires sample sizes of at least 200

Figure 2: Structure equation Model

.
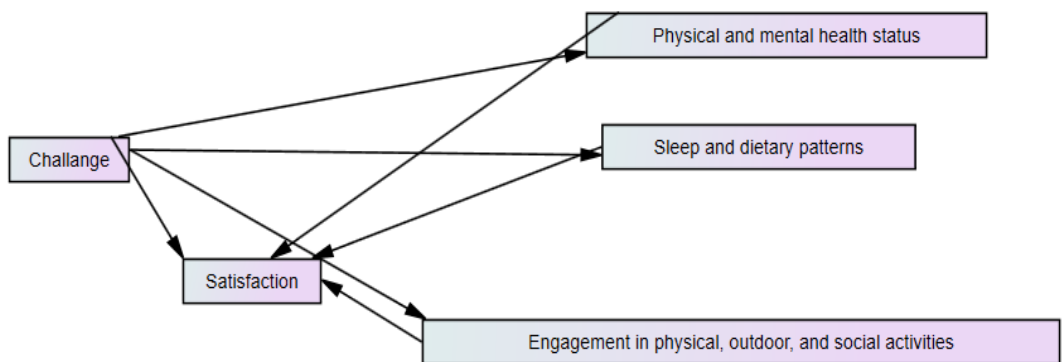
Model fitness- see appendix- examines the efficiency of the model where The acceptance criteria of the model are chi-square value (CMIN/Df) should be between 2 and 5, root mean square error of approximation (RMSEA) should be less than 0.1, goodness of fit index (GFI)greater than 0.9, adjusted goodness of fit index AGFI greater than 0.9, standardized mean square residual (SRMR) less than 0.05, TLI >0.09, normed fit index (NFI) >0.9, PNFI>0.05, IFI>0.09, parsimony normed fit index(PGFI) >0.05, and comparative fit index (PCFI)>0.05. According to the acceptance range of all the model indices, the following tables meet most of the acceptance level therefore the model fitness for the variables is accepted.

Results

The study findings revealed that a considerable proportion of students experienced worsening physical and mental health because of online learning. Specifically, 31% of the participants reported a decline in their physical health, while 25.7% indicated a deterioration in their mental well-being. Moreover, sleep patterns were negatively affected for 30% of the students, and dietary habits suffered for 27.7% of the participants. The challenges associated with online learning primarily revolved around the lack of interaction and motivation. Interestingly, 57.3% of the respondents acknowledged that their educational institution played a supportive role in addressing their medical needs. Furthermore, the level of satisfaction expressed by the students demonstrated a negative correlation with the challenges they faced during their online education experience.

Undoubtedly, post-graduate education is known for its rewarding nature, but it also brings forth significant demands and overwhelming pressures. When these demands are coupled with the transition to online learning, additional challenges arise, placing further strain on students' mental health. The findings discussed above align with the prevailing trends observed in the existing literature. Based on these findings and the recommendations derived from the literature, we propose a series of practical actions that are deemed necessary to effectively manage the mental health issues associated with online education. These recommendations are intended for both students and educational institutions.

First and foremost, as adults pursuing post-graduate education, students should possess a heightened level of self-awareness and commitment to self-care. Despite that online learning fosters the development of independent learners by promoting active engagement. In an online learning environment, students feel a sense of connection as they collectively work towards a shared learning objective and acquire knowledge from the online materials. Therefore, our initial

recommendation to online post-graduate students is to actively engage in mindfulness practices.

 Given that these students are juggling professional and educational responsibilities through screens, often for extended periods, they find themselves grappling with various commitments such as meetings, deadlines, research, assignments, and assessments. It is strongly encouraged for students to explore multiple channels for disconnecting and engaging in mindfulness activities, such as meditation, yoga, stretching exercises, and breathing exercises. The aim is to enable students to schedule regular breaks and detach themselves from the burdens of academia, allowing their bodies and minds the opportunity to heal and recharge.

Literature has made clear that continuing your education online means increasingly isolating yourself from friends and family. This is why we also highly recommend carefully planning socialization events and breaks. Being around others will encourage you to feel happy and think away from your worries and stress factors. Within the same idea, we also highly recommend developing support groups. Hence, among your fellow students, developing communication patterns and socialization breaks is a very rewarding practice. You share the same experience, consequently, you understand each other's worries, concerns, problems, and challenges. Getting the opportunity to be heard and understood is a very healthy practice.

While online education looks like it gives you flexibility in planning and time management, this also requires you to be very alert in your time allocation and priority management. Plan in a way that takes into consideration your professional responsibilities, your family obligations as well as your education requirements. Good planning will minimize stress and anxiety.

Discussion

The COVID-19 pandemic has brought about significant disruptions in the higher education system, with a shift towards online learning. This transition has posed unique challenges for students, including reduced social interaction, motivation and engagement difficulties, and technical obstacles. Moreover, the pandemic has adversely affected the physical and mental health of students, leading to increased levels of stress, anxiety, and depression.

The findings of the study demonstrate the widespread impacts of the COVID-19 pandemic on the physical and mental health of postgraduate students in higher education. Outbreaks of COVID-19 on university campuses have disrupted students' physical health, necessitating self-isolation and causing widespread disruption. Additionally, students have experienced heightened levels

of stress, anxiety, depression, and other psychological issues due to concerns about their health, family members, social lives, education, and financial uncertainties. These deteriorations in physical and psychological health are likely to have a negative influence on student performance.

The study reveals the associations between online learning, physical well-being, mental well-being, sleep patterns, dietary habits, and academic performance. It highlights the challenges faced by students in maintaining healthy lifestyles during online learning. Disrupted sleep patterns, reduced physical activity, and changes in dietary habits have emerged as significant factors affecting students' overall well-being and academic performance. These findings emphasize the importance of addressing these challenges to mitigate the negative effects on students. It is important to note that the study focuses specifically on postgraduate students in Egypt, which limits the generalizability of the findings to other student populations or geographical locations. However, the findings provide valuable insights into the specific impacts of the COVID-19 pandemic on postgraduate students' health and well-being during online learning in Egypt.

The practical limitation of the study lies in the inability to directly control or mitigate the effects of the COVID-19 pandemic on student health. The study provides insights and recommendations, but the implementation of strategies and interventions ultimately depends on the resources and capabilities of educational institutions. Institutions need to adapt and develop strategies to support student health and well-being during pandemics or virus mutations, considering the specific challenges faced by students in online learning environments. The study contributes to the existing literature by shedding light on the specific impacts of the COVID-19 pandemic on postgraduate students' health and well-being in Egypt. By understanding these impacts, educational institutions can develop targeted strategies and interventions to support student health during challenging times. Mitigating the negative effects on students' health and well-being is crucial for ensuring their academic success.

Conclusion and Implications for Practice and Policy

The study conducted a comprehensive examination of the impact of online learning on the physical and mental health of post-graduate students in higher education during the COVID-19 pandemic in Egypt. The findings revealed that online learning had a significant negative effect on students' physical and mental health, with participants reporting deteriorating health indicators. The lack of interaction and motivation associated with online learning was identified as a primary factor contributing to these challenges.

The study highlighted the importance of implementing health policies and mental health support systems in educational institutions offering online

programs. It emphasized the need for institutions to prioritize student well-being and develop strategies to mitigate the negative effects of online learning on student health. Practical recommendations were proposed, including prioritizing self-care through mindfulness practices, promoting socialization events and support groups, practicing effective time management, and engaging in joyful activities and hobbies.

Implications for Practice and Policy:

• Support for mental health: Educational institutions should prioritize the provision of mental health support services for students. This may include counseling services, online mental health resources, and proactive measures to promote well-being and resilience among students.

• Enhancing online learning experiences: Institutions should invest in resources and infrastructure to ensure the quality of online learning. This may involve providing technical support, training for instructors on effective online teaching methods, and improving access to online learning materials.

• Promoting healthy lifestyles: Institutions can encourage students to maintain healthy lifestyles during online learning. This may involve promoting physical activity, providing guidance on healthy eating habits, and addressing issues related to disrupted sleep patterns.

• Collaboration and coordination: Collaboration between educational institutions, healthcare providers, and relevant stakeholders is essential to address the multifaceted challenges faced by students. Coordinated efforts can help ensure that students receive comprehensive support and that resources are effectively utilized.

• Flexible policies and accommodations: Institutions should consider implementing flexible policies and accommodations to support students who may face additional challenges during the pandemic. This may include flexible deadlines, alternative assessment methods, and financial support for students facing economic hardships.

• By implementing these recommendations, educational institutions can create a healthier and more supportive online learning environment. Prioritizing student health and well-being during the COVID-19 pandemic and future crises is crucial for ensuring positive academic outcomes and overall student success.

Abbreviation

GPA   Grade Point Average

SEM   structural equation modelling

References:

Agarwal, S., Bhartiya, S., Mithal, K., Shukla, P., & Dabas, G. (2021). Increase in ocular problems during COVID-19 pandemic in school going children- a survey based study. Indian journal of ophthalmology, 69(3), 777–778. https://doi.org/10.4103/ijo.IJO_2981_20

Bayne, T., Brainard, D., Byrne, R. W., Chittka, L., Clayton, N., Heyes, C., Mather, J., Ölveczky, B., Shadlen, M., Suddendorf, T., & Webb, B. (2019). What is cognition?. Current biology : CB, 29(13), R608–R615. https://doi.org/10.1016/j.cub.2019.05.044

Bueno-Notivol, J., Gracia-García, P., Olaya, B., Lasheras, I., López-Antón, R., & Santabárbara, J. (2021). Prevalence of depression during the COVID-19 outbreak: A meta-analysis of community-based studies. International journal of clinical and health psychology: IJCHP, 21(1), 100196. https://doi.org/10.10 16/j.ijchp.2020.07.007

Bird, D. K. (2009). The use of questionnaires for acquiring information on public perception of natural hazards and risk mitigation–a review of current knowledge and practice. Natural Hazards and Earth System Sciences, 9(4), 1307-1325.

Chen, R., Chou, K. R., Huang, Y. J., Wang, T. S., Liu, S. Y., & Ho, L. Y. (2006). Effects of a SARS prevention programme in Taiwan on nursing staff's anxiety, depression and sleep quality: A longitudinal survey. International Journal of Nursing Studies, 43(2), 215-225. https://doi.org/10.1016/j.ijnurstu.2005.02.005

Dunton, G. F., Do, B., Wang, S. D., & Early, J. (2020). Ecological momentary assessment of physical activity and sedentary behavior during the COVID-19 pandemic in US adults: Longitudinal online survey. Journal of Medical Internet Research, 22(8), e21289. https://doi.org/10.2196/21289

Ihm, L., Zhang, H., Van Vijfeijken, A., & Waugh, M. G. (2021). Impacts of the Covid-19 pandemic on the health of university students. The International Journal of Health Planning and Management, 36(3), 618-627.

Huang, C., Huang, L., Wang, Y., Li, X., Ren, L., Gu, X., ... & Cheng, Z. (2020). 6-month consequences of COVID-19 in patients discharged from hospital: A cohort study. The Lancet, 397(10270), 220-232. https://doi.org/10.1016/S0140-6736(20)32656-8

Kaur, H., & Singh, S. (2021). The impact of COVID-19 pandemic on physical and mental health of students. Indian Journal of Public Health, 65(2), 156-161. https://doi.org/10.4103/ijph.IJPH_424_20

Jha, A. K., & Arora, A. (2020). The neuropsychological impact of E-learning on children. Asian journal of psychiatry, 54, 102306. https://doi.org/10.1016/j.ajp.2020.102306

Mak, I. W., Chu, C. M., Pan, P. C., Yiu, M. G., & Chan, V. L. (2009). Long-term psychiatric morbidities among SARS survivors. General Hospital Psychiatry, 31(4), 318-326. https://doi.org/10.1016/j.genhosppsych.2009.03.001

Magni, G., & Bilotta, F. (2016). Postoperative Cognitive Dysfunction. In H. Prabhakar (Ed.), Complications in Neoroanesthesia (pp. 411-422). Academic Press. https://10.1016/B978-0-12-804075-1.00041-9

Mendoza, Mylene. (2020). This is what happens to your brain during online classes. Lifestyle. https://www.candymag.com/lifestyle/what-happens-brain-online-classes-a00306-20200813

Salari, N., Hosseinian-Far, A., Jalali, R., Vaisi-Raygani, A., Rasoulpoor, S., Mohammadi, M., Rasoulpoor, S., & Khaledi-Paveh, B. (2020). Prevalence of stress, anxiety, depression among the general population during the COVID-19 pandemic: a systematic review and meta-analysis. Globalization and Health,16(1), 2–11. https://doi.org/10.1186/s12992-020-00589-w

Salman, D., & Soliman, C. (2022). Insights from online education in the Egyptian higher education. *International Journal of Educational Management*, *37*(1), 135-146.

Sawhney, Rahul & Singh, Pranvat & Agarwal, Govind & Sharma, Shashank & B, Dhanush & Karmakar, Manali. (2021). IMPACT OF ONLINE CLASSES ON THE HEALTH AND WELLBEING OF YOUNG LEARNERS. Humanities & Social Sciences Reviews. 9. 175-187. 10.18510/hssr.2021.9425.

Shree, A., & Shukla, P. C. (2016). Intellectual Disability: Definition, classification, causes and characteristics. Learning Community-An International Journal of Educational and Social Development, 7(1), 9. https://doi.org/10.5958/2231-458x.2016.00002.6

Walton, A. G. (2018). How Too Much Screen Time Affects Kids' Bodies And Brains. Forbes. https://www.forbes.com/sites/alicegwalton/2018/04/16/how-too-much-screen-time-affects-kids-bodies-andbrains/?sh=1450ca241549

Wang, D., Hu, B., Hu, C., Zhu, F., Liu, X., Zhang, J., ... & Zhao, Y. (2020). Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus–infected pneumonia in Wuhan, China. JAMA, 323(11), 1061-1069. https://doi.org/10.1001/jama.2020.1585

Walsh, J. J., Barnes, J. D., Cameron, J. D., Goldfield, G. S., Chaput, J. P., Gunnell, K. E., Ledoux, A. A., Zemek, R. L., & Tremblay, M. S. (2018). Associations between 24 hour movement behaviours and global cognition in US children: a cross-sectional observational study. The Lancet Child & Adolescent Health, 2(11), 783–791. https://doi.org/10.1016/s2352-4642(18)30278-5

Wong, C. W., Tsai, A., Jonas, J. B., Ohno-Matsui, K., Chen, J., Ang, M., & Ting, D. (2021). Digital Screen Time During the COVID-19 Pandemic: Risk for a Further Myopia Boom?. American journal of ophthalmology, 223, 333–337. https://doi.org/10.1016/j.ajo.2020.07.034

World Health Organization Mental health: Strengthening our Response. 2018. [(accessed on 4 January 2023)]. Available online: https://www.who.int/news-room/fact-sheets/detail/mental-health-strengthening-our-response

Yilmaz, K. (2013). Comparison of quantitative and qualitative research traditions: Epistemological, theoretical, and methodological differences. European Journal of Education, 48(2), 311-325.

Appendix

Table (5): Descriptive Statistics of Challenges and opportunities during the transition to online learning:

V4: Challenges and opportunities during the transition to online learning					
What is your current level of education?					
	Frequency	Valid Percent			
1-Masters student	261	87.0	1.18	1	0.507
2-PhD student	23	7.7			
3-Other	16	5.3			
Total	300	100.0			
The biggest challenges you faced during the transition to online learning:					
	Frequency				
Lack of interaction with classmates and instructors					
Yes	187				
Difficulty staying motivated					
Yes	109				
Technical difficulties					
Yes	79				
Difficulty understanding course material without face-to-face interaction					
Yes	78				
Other					
Yes	54				
The opportunities provide for you during COVID-19 online learning					
Flexibility					
Yes	248				
Convenience					
Yes	151				
Access to a wider range of courses					
Yes	92				
Ability to learn in my own space					
Yes	181	60.3			
Other					
Yes	22				
	Frequency	Valid Percent	Mean	Mode	Std. Dev.
Would you recommend a significant portion of online learning to others in the event of future pandemics or virus mutations?					
1-Yes	222	74.0	1.42	1	0.757
2-No	29	9.7			
3-Not sure	49	16.3			
Total	300	100.0			

Considering the possibility of facing another wave of mutation of viruses, how much percentage of your learning would you prefer to be online in the future?

	Frequency	Valid Percent			
1- 0-25%	52	17.3	2.82	4	1.125
2- 26-50%	65	21.7			
3-51-75%	68	22.7			
4-76-100%	115	38.3			
Total	300	100.0			

Would you like to use online learning in the event of future?

	Frequency	Valid Percent			
1-Strongly disagree	23	7.7	3.65	4	1.186
2-Disagree	21	7.0			
3-Neutral	80	26.7			
4-Agree	90	30.0			
5-Strongly agree	86	28.7			
Total	300	100.0			

How has COVID-19 impacted your academic performance during your studies?

	Frequency	Valid Percent			
1-Negatively impacted it	60	20.2	2.00	2	0.639
2-Had no impact	176	59.3			
3-Improved it	61	20.5			
Total	297	100.0			

How has COVID-19 impacted your GPA during your studies?

	Frequency	Valid Percent			
1-Negatively impacted it	43	14.6	2.02	2	0.559
2-Had no impact	203	68.8			
3-Improved it	49	16.6			
Total	295	100.0			

How has COVID-19 impacted your Family life during your studies?

	Frequency	Valid Percent			
1-Negatively impacted it	110	37.3	1.82	2	0.735
2-Had no impact	127	43.1			
3-Improved it	58	19.7			
Total	295	100.0			

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Saturated model	15	0	0		
Independence model	5	45.202	10	0	4.52
Zero model	0	747.5	15	0	49.833

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Saturated model	0	1		
Independence model	0.051	0.94	0.909	0.626
Zero model	0.313	0	0	0

Baseline
Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Saturated model	1		1		1
Independence model	0	0	0	0	0

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Saturated model	0	0	0
Independence model	1	0	0

NCP

Model	NCP	LO 90	HI 90
Saturated model	0	0	0
Independence model	35.202	17.991	59.951

FMIN

Model	FMIN	F0	LO 90	HI 90
Saturated model	0	0	0	0
Independence model	0.151	0.118	0.06	0.201

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Independence model	0.109	0.078	0.142	0.001

AIC

Model	AIC	BCC	BIC	CAIC
Saturated model	30	30.614	85.557	100.557
Independence model	55.202	55.407	73.721	78.721
Zero model	747.5	747.5	747.5	747.5