

# Academic performance and well-being of medical students during online learning of basic sciences in a newly established medical faculty

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## Abstract

**Introduction:** The Faculty of Medicine, University of Moratuwa, established during the COVID-19 pandemic, was compelled to conduct the teaching activities online for the first intake of students until their first bar examination. Online learning is known to be linked to several health issues. This study aims to explore the academic performance and perceived health effects related to online learning in the Faculty of Medicine, Moratuwa.

**Methods:** A descriptive cross-sectional study was conducted among all 104 first-intake students using an anonymous online self-administered questionnaire to explore health effects and academic performance after ethical clearance.

**Results:** Out of 104 students, 82 students responded (response rate=78.85%). Majority participated from home using their own laptop (74.4%) and personal Wi-Fi (69.5%) and spent 5-10 hours daily for online academic activities (72%). Majority complained of related physical (86.6%), and psychological (81.7%) health issues: eye problems (69.5%), headache (47.6%), backache (43.9%), stress (46.3%) and concentration difficulties (45.1%). The first bar examination was cleared by 84.1% with the majority (52.4%) obtaining classes. There was a statistically significant positive association ( $p < .05$ ) between physical and psychological health concerns with the average screen-time spent on academic activities, but not with the academic performance. There was also no statistically significant association between screen-time and academic performance.

**Conclusions:** Majority of students using online learning had related physical and psychological health issues which were positively associated with the screen-time though not with academic performance. Designing online activities with less screen time may be considered as a strategy to minimise health effects related to online learning.

**Key words:** health effects of online learning, academic performance, online learning, undergraduate medical education, online assessment

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## Introduction

The COVID-19 pandemic in 2020 disrupted education in more than 150 countries and affected 1.6 billion students worldwide.(1) Ensuing lockdowns and movement restrictions compelled many countries to explore alternative learning methods to maintain the continuity of education.(1) The education response during the early phase of COVID-19 focused on implementing remote learning modalities as an emergency response.(1)

The global crisis also made significant influences on education in Sri Lanka. The government ordered all educational institutions to be closed from 12th March 2020, including higher education institutions encompassing 15 state universities and about 40 other state and non-state tertiary education institutions.(1) Such disruptions of tertiary education caused by COVID-19 were likely to delay the production of leaders and skilled workforce the country needs for a successful transition to upper-middle-income status. To mitigate the effects of disrupted learning, higher education institutions utilised existing learning management systems (LMS) operating under the university web servers to deliver remote teaching and learning activities.

Just as the COVID-19 pandemic was subsiding in Sri Lanka, the country encountered the worst economic crisis in its history, leading to a massive socio-economic downfall.(2) The economy seriously affected the country's education sector from pre-school to postgraduate levels.(3) As a result of fuel shortage both public and private transport were gravely affected.(1) Therefore, remote learning modalities had to be reimplemented to maintain the continuity of education.

Under such adverse circumstances, the Faculty of Medicine, University of Moratuwa was established in May 2021. In order to face the challenging situation prevailing in the country, the academic programme was designed on a remote learning basis using Moodle platform as the learning management system. With this set up, all the study material including lecture notes, practical video demonstrations and quizzes were made available on Moodle under a separate area for each module. Lectures and student-centred discussion sessions were also done through the Moodle and recorded. These recordings were automatically made available for replay on Moodle. The activity schedule consisted of a total of 10-hour time-tabled duration (inclusive of around three hours of self-directed learning) per day, five days a week. Formative assessments were also

online-based where for multiple choice and objective structured examinations, Moodle based quiz format was used. This task was made successful with the support of the well-established information technology unit of the University of Moratuwa. Implementation of remote learning facilities thus permitted the successful online delivery of the basic sciences curriculum for the first intake of medical students. Although the physical academic activities were later commenced for a brief period as a hybrid approach, the worsening socio-economic crisis in the country resulted in switching back to total online learning. Online delivery of the curriculum had to be continued until completion of the basic sciences learning, as the expected physical infrastructure development and new staff recruitments were halted during the crisis, making it a greater challenge to commence physical learning.

The objectives of this study were to describe the academic performance and well-being of medical students during online learning of basic sciences in a newly established medical faculty. The impact of almost total online learning during the very early years of medical curriculum on students' education, academic performance, and overall well-being is yet to be defined and the first intake of students therefore provides an ideal opportunity to explore this crucial matter. Local literature is sparse on this subject and available studies have focused on students' preference and usage patterns of remote learning(4,5) with little details available of its effect on students' academic performance and overall well-being. Further, the Faculty of Medicine, University of Moratuwa is currently the only state medical university to conduct all the assessments in an online platform. Under such circumstances, the results of this study will benefit in improving the delivery and usage of remote learning methods in a more student-friendly manner. It will also help to explore the possibility of using the LMS platform for assessments. This in turn will be beneficial to Sri Lankan undergraduate education in the long run as the education sector needs to prepare and strengthen methods to ensure and sustain the quality of undergraduate teaching under unprecedented situations.

## Methods

A descriptive, cross-sectional study was conducted among first-intake students using an anonymous self-administered online questionnaire. All 104 students of the first intake were invited to voluntarily take part in the survey after informed consent. Ethics approval was obtained from the Faculty of Medicine, University

of Moratuwa.

The survey was conducted immediately after the students had completed their basic sciences stream and the first bar examination in October 2022. A pre-tested, self-administered, anonymised questionnaire as a Google form in English was emailed to all students in the batch, along with the information sheet and the consent form. All who consented were invited to participate. All submitting the completed questionnaire within 2 weeks were recruited to the study.

The questionnaire consisted of items to assess socio-demographic factors, usage of online learning platforms, difficulties faced, students' perception of advantages and disadvantages, effects of their physical and psychological well-being, and effectiveness of using online-based assessments. The SPSS statistical software package [Version 28.0] was used for data entry and analysis. Data analysis was done with the intention of covering each specific objective of the research project. Descriptive statistics, and then inferential statistics were analysed using cross-tabulations and chi-square tests. Statistical significance was considered as  $p < .05$ .

## Results

Out of 104 students, 82 responded (response rate=78.85%) of whom the majority were females (69.5%). Most (20%) were from families with an average monthly income of Rs 30,000-50,000. The majority (91.5%) participated in online learning from home, using personal laptops (74.4%) and personal Wi-Fi connections (69.5%).

Online learning was preferred over onsite learning by 50% with the majority (72%) spending 5-10 hours/day on online learning, and 13.4% and 14.6% spending  $< 5$  hours and  $> 10$  hours a day on online learning respectively. Nearly half (51.2%) preferred continuing online learning activities in subsequent years.

Advantages and difficulties related to online learning as perceived by students are summarised in table 1.

The majority (84.1%), passed the first bar examination with 52.4% obtaining classes. There was no statistically significant difference ( $p > .05$ ) between the referred students and students with pass/classes in relation to hours of daily online learning, income, type of device or network connections used.

Health issues perceived by students as related to online learning are summarised in table 2.

There was a statistically significant positive association ( $p < .05$ ) between physical and psychological health concerns with the average screen-time spent on academic activities (table 3) though there was no statistical significance with the stated screen time spent on non-academic activities.

## Discussion

Online learning has become an important element in medical education worldwide and has shown positive student perception and adaptability.(6,7) There has been more focus on this with the onset of the COVID-19 pandemic. Accordingly, Sri Lankan tertiary education has also been swift in embracing this change.(8) However, the impact of online learning on the student's academic performance and wellbeing needs to be explored in detail not only to improve the quality of e-learning, but also to justify incorporating remote learning strategies into curricula. The results of this study provide a substantial insight into this as it is a study conducted in a group of students who have undergone online learning through their entire curriculum until the first bar examination.

In our study, the majority (72%) of students spent between 5-10 hours per day on online learning and 51% indicated their preference to continue learning online in future. This positive attitude was supported by multiple advantages of online learning based on accessibility of teaching, learning material and convenience in the learning environment, which is in keeping with a local study conducted among secondary school children.(9) Disadvantages stated were mainly of technical nature pertaining to device and network malfunctions. Therefore, we can infer that our students have embraced online learning with a positive attitude and this can be applied in the future to continue some of the teaching, learning activities online, changing over to a hybrid learning model. In fact, a meta analysis has shown that hybrid learning had a greater effect on the academic achievement of the students and that use of hybrid learning must be encouraged in educational environments.(10) To facilitate this process, we suggest that educational institutions be provided with sufficient devices and network facilities, thus eliminating the main shortcoming of device and network failures highlighted above. Further, according to the study findings, the academic performance of students is not significantly affected by the amount of time spent on online learning, device/network type or the socio-economic status of the students. This is in contrast to several studies which show a significant impact of low socio-

**Table 1** - Advantages and difficulties related to online learning and online assessments

		Frequency (%)
<b>Advantages of online learning*</b>	Ability to replay lectures	33 (80.5)
	Ability to continue education despite pandemic and fuel crisis	32 (78.0)
	Time saving	28 (68.3)
	Ability to listen at a convenient time	28 (68.3)
	Less costly than travelling to university	27 (65.9)
	Absence of transport problems	24 (58.5)
	Easier to ask questions than in onsite lectures	20 (48.8)
<b>Difficulties of online learning</b>	Connection problems	71(88.6)
	Device problems	31 (37.8)
	Disturbance at the place of participation	29 (35.4)
	Financial problems	12 (14.6)
	Lack of technical knowledge	10 (12.2)
	None	4 (4.9)
	<b>Advantages of online examination</b>	Images were clearly visible unlike in a printout
Could tag difficult questions for later reference		58 (70.7)
Less chance of making mistakes while marking answers		53 (64.6)
Less chance of your responses being seen by others		8 (9.8)
None		8 (9.8)
<b>Difficulties of online examination</b>		Network failure
	Device malfunction	23 (28.0)
	Not very familiar with using the online assessment forums	6 (7.3)
	Other	2 (2.4)
	None	46 (56.1)

\* - based on responses by 41 respondents

economic status on online learning.(11,12) This discrepancy may be partially explained by the fact that the University of Moratuwa is the most technically equipped state university in the country, thus students have access to online resources irrespective of their family background.

On a further positive note, the study unveils

beneficial aspects of conducting assessments online. The continuous and first bar examination under the basic sciences stream of the faculty consists of an array of assessment formats including multiple choice, best response, extended matching and objective structured practical examinations, all of which are conducted online on the same learning management system (Moodle) the students use for

online learning. Students are given an introduction to using the Moodle based online learning and assessment during their introductory module and formative assessments are carried out weekly on the same platform with which they gain sufficient hands-on skills prior to facing continuous and bar examinations. According to the study findings, the majority (73%) of students think conducting examinations online is successful.

The advantages stated can be inferred relating mainly to accuracy and reliability of the process while the main disadvantage stated again was of device and network related concerns. Numerous studies have shown online assessments are reliable in undergraduate medical education and that they can be successfully implemented with adequate training of the staff and the students (13) and that even clinical assessments can be performed effectively.(14) In the light of these findings, it is justifiable to suggest online assessment strategies to be trialled out/implemented in other higher educational

institutions. From personal experience of the authors, the network and device related issues are remediable as even in the face of a breakdown, the online responses will still be automatically saved and even automatically submitted and students can still resume the assessment from the point of interruption. Examination safety is ensured with the ability to centrally restrict network access at examination sites, video surveillance and options for shuffling questions. However, we recommend further studies focusing on the reliability, accuracy, examination safety and technical feasibility of local higher education institutions before endorsing such assessment strategies on a wider scale.

This study raises health concerns as perceived by students, both of physical and psychological nature in association with the screen time for academic related activities. This is a well-documented and proven association in literature.(15,16,17) Designing online activities with less screen time may be considered as a strategy to minimise health effects related to online

**Table 2** - Health issues perceived by students as related to online learning

		Responses (%)*
<b>Physical Issues</b>	Eye problems	57 (69.5)
	Headache	39 (47.6)
	Backache	36 (43.9)
	Sleep-related problems	24 (29.3)
	Overweight	20 (24.4)
	None	11 (13.4)
	Other	2 (2.4)
<b>Psychological Issues</b>	Stress	38 (46.3)
	Concentration difficulties	37 (45.1)
	Less focus on relationship development and maintenance with family and friends	36 (43.9)
	Addiction to electronic devices	35 (42.7)
	Social withdrawal	24 (29.3)
	Issues related to emotion control	20 (24.4)
	Anxiety	18 (22.0)
	None	15 (18.3)
Depression	13 (15.9)	

\* - based on responses by 41 respondents

**Table 3** - Association between daily average screen time for academic and non-academic activities with physical and psychological issues

	Daily average screen time	Presence of physical issues (n)			
		Physical issues present	p	chi-square value	
Academic activities	< 5 hours	7 (63.6)	.0001	18.338	
	5 - 10 hours	57 (96.6)			
	> 10 hours	7 (58.3)			
		Presence of Psychological issues (n)			
	< 5 hours	6 (54.5)	.024	7.422	
	5 - 10 hours	52 (88.1)			
	> 10 hours	9 (75.0)			
		Presence of physical issues (n)			
	Category	Physical Issues present	Physical Issues Absent	p	chi-square value
for non-academic activities per day	< 5 hours	49	7	.619	.246
	> 5 hours	20	4		
		Presence of psychological issues (n)			
	Category	Psychological Issues present	Psychological Issues Absent	p	chi-square value
	< 5 hours	47	9	.348	.879
	> 5 hours	18	6		

learning. Moreover, a hybrid approach will be the way forward, which will essentially help to curtail the screen time.

**Limitations**

This study was carried out among the first batch of students who were compelled to undergo almost exclusive online learning. In addition to the participation number being low, the student's perception of online learning may be biased as they had limited exposure to face-to-face learning as undergraduates. Therefore, we recommend further comparison studies among subsequent batches, who have experienced hybrid learning.

**Conclusion**

Majority of students using online learning have related physical and psychological health issues which are positively associated with the screen-time though not with academic performance. Designing online activities with less screen time may be considered as a strategy to minimise health effects related to online learning.

Future comparison studies with the next intake of students who have undergone blended learning is recommended to reveal more relevant information.

**Declarations****Author contributions**

UMW conceived the original study idea and contributed to research designing. UMW contributed to literature review and collected information. UMW and AF reviewed the collected data for analysis. UMW and AF contributed to the data analysis and drafted the manuscript. PA guided as senior author in data analysis, preparing the manuscript and corrected the manuscript. All the authors revised and approved the final manuscript.

**Conflicts of interest**

There are no conflicts of interest. All the authors declare that they have no competing interests.

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**Ethics approval**

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