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## Original Article

# Emergency remote learning in anatomy during the COVID-19 pandemic: A study evaluating academic factors contributing to anxiety among first year medical students



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## ABSTRACT

**Background:** ‘Emergency remote learning’ (ERL) has been undertaken as an emergency response globally to facilitate online shift of medical education due to COVID-19. Although medical students world-wide have reported an increased level of anxiety, factors in the academic setting during ERL that influenced anxiety levels have not been studied yet. The present study aimed to evaluate anxiety levels of first year medical students and its correlation with academic factors during ERL.

**Methods:** ERL for neuroanatomy was conducted for six weeks mainly by online small group teaching. At completion, feedback was collected from students ( $n = 97$ ) which included a GAD-7 questionnaire for anxiety levels and a modified VARK analysis to record changes in learning styles.

**Results:** Of 97 students (M46, F51) 43.30% had minimal, 31.96% mild, 10.31% moderate and 14.43% severe anxiety. Academic exchanges such as student–teacher interaction (80.41%), tutor feedback (90.72%) and mentor meetings (81.44%) were reported to be advantageous. There was a significant ( $p = 0.0056$ ) correlation between enjoyment of small group discussion and lower GAD-7 scores. There was significant change in perceived learning styles during ERL. Video calls ( $p = 0.018$ ) and gaming ( $p = 0.022$ ) were significant modes of stress relief. There was significant correlation ( $p = 0.022$ ) between gaming and GAD-7 scores.

**Conclusion:** About one-fourth of the students faced anxiety issues during ERL period. Small group interactions with focus on promoting connectedness and interaction, augmented by

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feedback, mentorship, familial and social support are important in reducing anxiety which should be kept in mind by educators while delivering such learning experiences.

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## Introduction

Educators across the globe face the unprecedented challenge of meaningful academic interaction in the context of physical distancing during the COVID-19 crisis.<sup>1</sup> Emergency remote learning (ERL) is a unique mode of learning and essentially differs from online learning. While the latter is well thought out and planned in advance, the former is as an immediate response, primarily as a means of continuing education during a crisis.<sup>2,3</sup>

While the concept of remote learning during pandemics is not new,<sup>4</sup> the world-wide unsettling of education during the COVID-19 crisis is uncharted territory for medical students. The COVID-19 pandemic has caused psychological distress in populations across the globe,<sup>5</sup> and in the student community<sup>6–11</sup> including medical students.<sup>12</sup> This requires educators to continue to engage with students, promote interaction, anticipate anxiety with active screening to enable early detection and intervention.<sup>11</sup>

In the authors' institution, the period of ERL coincided with the teaching of neuroanatomy in the first year undergraduate medical curriculum and the need was felt to gauge the psychological health of students in this context. This paper aims to evaluate the anxiety levels and emotional health of first year medical (M.B.B.S.) students who underwent neuroanatomy ERL during the COVID-19 pandemic, and to correlate with academic factors in this period.

## Material and methods

The teaching of neuroanatomy for first year medical undergraduate students during the ERL was implemented using Microsoft Teams as meeting platform. An orientation program was conducted to ease the transition from classroom to the online platform. The period of ERL consisted of six weeks of synchronous teaching via online small group discussions with a teacher student ratio of 1:10. The frequency of the small group sessions in the regular teaching schedule was for 14 h per week. The frequency of online small group discussions was similar with active teaching of seven to 9 h a week. The duration of neuroanatomy teaching was extended from four to six weeks to enable students to learn at their own pace. There was a smaller portion of asynchronous learning augmented by digital resources like specimen demonstration videos and recorded lectures. During the course of the ERL a one-to-one feedback session with the group tutor as well as a meeting of students with their academic mentors were conducted. The feedback session was to provide students the opportunity to express difficulties or suggestions related to

the ERL, and for tutors to discuss the students' progress in the neuroanatomy course. The mentor-mentee meeting (part of a program in place predating the pandemic) focused on the overall progress of the mentee in all the pre-clinical subjects and discussion of any issues pertaining to the same at the time of distance learning during the ERL. It was also an opportunity for mentors to check on the overall wellbeing of their mentees.

Permission for the study was obtained from the Institutional Review Board (IRB Min. No. 12974, dated 24.06.2020) An online informed consent for participation in the study was taken via Google Forms. On completion of neuroanatomy teaching, anonymous feedback from students was obtained by an online questionnaire using Google Forms. The feedback questionnaire was validated for content and consisted of open ended and reflective questions on students' experiences during the ERL. There were ordinal scale questions on stress relieving activities, small group teaching and academic interaction. Questions included student perceptions on the adequacy of teacher-student and peer interaction in online small group sessions, whether students enjoyed small group discussions, whether they felt more disciplined and motivated during the ERL, and were able to express their feelings and concerns adequately in the feedback session with tutor and mentor-mentee meeting. A GAD-7 questionnaire<sup>13,14</sup> was included to screen for anxiety. It consisted of seven questions, each question scored on a four-point scale of 0–3 and totaled. Total score was used to categorize anxiety levels as minimal to no anxiety for GAD-7 scores of 0–4, mild anxiety for 5 to 9, moderate anxiety for 10 to 14, and severe anxiety for  $\geq 15$ , of a total possible score of 21.<sup>14</sup> A score of  $\geq 10$  was used as cut off for moderate and severe anxiety. The GAD-7 score was administered as a part of a onetime cross-sectional record of psychological health during the ERL. For additional perspective, students resided in on-campus hostels for the first four weeks of the ERL, and at home for the last two weeks. While familial, demographic and other factors related to the pandemic can affect GAD-7 scores, the scope of this paper was to specifically analyze the associations of academic factors with anxiety levels during the ERL.

The feedback also focused on changes in personal learning habits based on a template of examples in Anatomy teaching and learning derived from VARK learning styles. The VARK learning style model categorizes based on four different learning modes; visual (V), aural (A), read/write (R), and kinesthetic (K) learners.<sup>15</sup> The students subjectively recorded their learning styles in order of preference during and before the ERL.

Qualitative data from open-ended questions, reflections and suggestions, and data from responses to the GAD-7 scale questionnaire and Likert-scale questions was collected,

recorded and analyzed. The GAD-7 scores were compared with other categorical variables using Chi-square test with Pearson's correlation and paired t-test. Each VARK learning style category was ranked from 1 to 4 based on the order of preference of each student. The mean score for each learning style category during the ERL was compared with the mean score before the ERL, and correlated with GAD-7 scores and gender.

A group online session with the student counsellor was scheduled after the completion of neuroanatomy.

## Results

The study comprised of first year MBBS students ( $n = 97$ ) with 46 (47.42%) males and 51 (52.58%) females. The age of students ranged from 17 to 23 years with a mean age of 19.15 years.

**Anxiety levels:** Anxiety levels as per the GAD-7 scores showed that 43.30% had minimal, 31.96% mild, 10.31% moderate and 14.43% of students had severe anxiety during the ERL. Of 73 (75.26%) students with GAD scores  $< 10$ , 32 were male (69.56% of males) and 41 were female (80.39% of females). Of 24 (24.74%) students with GAD scores  $\geq 10$  (moderate and severe), 14 were male (30.44% of males) and 10 were female (19.61% of females). The correlation of GAD-7 categories with gender was not statistically significant ( $p = 0.221$ ).

**Variables in academic interaction:** Student perceptions on academic interactions during the ERL were evaluated with respect to adequacy of teacher-student and peer interaction, the student experience of online small group discussion, the one-to-one feedback session with group tutor and the meeting with mentor. It was found that 84.53% of students enjoyed small group discussions, and while 80.41% of students felt teacher-student interaction was adequate, only 50.52% felt peer interaction was adequate. Correlation of anxiety levels with student experiences in the small group setting showed a significant ( $p = 0.0056$ ) correlation between lower GAD-7 scores and enjoyment of small group discussions (Table 1). It is of interest that, 30.14% of students with scores  $< 10$ , and 12.50% with scores  $\geq 10$ , strongly agreed that teacher-student interaction was adequate. Peer interaction was found

inadequate by 8.22% of students with scores  $< 10$ , and 20.83% students with scores  $\geq 10$ .

Further, 90.72% and 81.44% of students felt that feedback session and meeting with the mentor, respectively, helped in expressing themselves. Correlation with GAD-7 scores showed a similar pattern for both feedback and mentor-mentee meeting. Students with minimal and mild anxiety reported that the sessions were helpful in expressing their feelings as compared to students with moderate and severe anxiety (Table 1). Feedback session was found adequate by 15.07% of students with scores  $< 10$ , and 29.17% students with scores  $\geq 10$ . These differences in perceptions were not statistically significant.

**Learning styles and anxiety:** Evaluation of learning styles showed that students who preferred visual and kinaesthetic methods dropped from 47% to 24%, and 31%–4%, respectively during the ERL period. The auditory and reading categories saw an increase from 18% to 47%, and 2%–22%, respectively. There was a significant change in the learning style preferences for all VARK components. The change in preference was higher for visual and auditory components for GAD-7 scores  $\geq 10$  as compared to scores  $< 10$  (Table 2). The correlation of VARK categories with GAD-7 scores was not statistically significant both during ERL ( $p = 0.052$ ) and categories prior to lockdown ( $p = 0.070$ ).

Correlation of perceived changes in learning styles during and prior to the ERL with gender showed a significant change in the learning styles for male and female students (Table 3). Correlation of learning styles with gender and GAD-7 scores was statistically not significant (see Tables 4 and 5).

**Stress relieving factors:** Among outlets for stress relief during lockdown, students felt that activities like reading books (64.95%), video calling family and friends (91.75%), watching movies (84.54%), exercise (87.63%), gaming (42.27%) and following a routine including online classes (65.98%) were beneficial in relieving stress.

A significantly higher number ( $p = 0.022$ , correlation 5.2318) of male students resorted to video gaming, whereas a significantly higher number ( $p = 0.018$ ) female students found video calling friends and family helpful to relieve their stress. Although a greater number of female students resorted to

**Table 1 – Correlation of GAD-7 categories with student perceptions of academic interaction during ERL using means of Likert scale responses.**

GAD-7 Category	Minimal (n = 42; male 20, female 22) Mean $\pm$ SD	Mild (n = 31; male 12, female 19) Mean $\pm$ SD	Moderate (n = 10; male 4, female 6) Mean $\pm$ SD	Severe (n = 14; male 10, female 4) Mean $\pm$ SD	P value
Adequacy of Teacher-student interaction	1.79 $\pm$ 0.72	2.00 $\pm$ 0.63	2.40 $\pm$ 0.70	1.93 $\pm$ 0.47	0.0603
Enjoyed group discussion	1.74 $\pm$ 0.70	2.00 $\pm$ 0.52	2.20 $\pm$ 0.92	2.21 $\pm$ 0.80	0.0056**
Adequacy of Peer-to-peer interaction	2.48 $\pm$ 0.77	2.39 $\pm$ 0.84	2.90 $\pm$ 0.88	2.71 $\pm$ 0.73	0.3494
Feedback session with table tutor	1.90 $\pm$ 0.62	1.74 $\pm$ 0.63	2.00 $\pm$ 0.94	2.07 $\pm$ 0.47	0.5590
Mentor-mentee meeting	2.00 $\pm$ 0.77	1.84 $\pm$ 0.78	2.60 $\pm$ 0.84	2.14 $\pm$ 0.77	0.3381
More disciplined and motivated during ERL	2.50 $\pm$ 0.80	2.23 $\pm$ 0.84	2.70 $\pm$ 0.82	2.36 $\pm$ 0.74	0.7296

Key: \*\* very significant. Mean calculated from Likert scale responses. 1 for strongly agree, 2 for agree, 3 for disagree and 4 for strongly disagree.

**Table 2 – Correlation of changes in learning preferences (VARK) with GAD-7 scores.**

Learning Style	During ERL (n = 97)		Before ERL (n = 97)		Difference p value		GAD-7 Minimal and mild (scores <10) (n = 73)		During ERL		Before ERL		Difference p value	
	Mean ± SD (%)†	Mean ± SD (%)†	Mean ± SD (%)†	Mean ± SD (%)†	Mean ± SD (%)†	Difference p value	Mean ± SD (%)†	Mean ± SD (%)†	Mean ± SD (%)†	Mean ± SD (%)†	Mean ± SD (%)†	Mean ± SD (%)†	Mean ± SD (%)†	Difference p value
Visual	1.84 ± 0.96 (24.74)	2.21 ± 0.91 (47.42)	0.0026**	1.93 ± 1.02 (19.18%)	2.23 ± 0.83 (41.67%)	0.3	1.54 ± 0.72 (43.84%)	2.13 ± 1.15 (58.33%)	0.0405*	0.59				
Auditory	2.57 ± 1.02 (48.45)	1.88 ± 1.01 (18.56)	-0.69	2.44 ± 1.07 (53.42%)	1.79 ± 1.00 (33.33%)	0.0268*	3.00 ± 0.74 (24.66%)	2.13 ± 1.03 (0.00%)	-0.87	0.0405*				
Reading	3.41 ± 0.77 (22.68)	2.49 ± 1.06 (2.06)	-0.92	3.40 ± 0.76 (24.66%)	2.48 ± 1.11 (16.67%)	0.0000***	3.46 ± 0.83 (1.37%)	2.54 ± 0.93 (4.17%)	0.0038**	0.0038**				
Kinaesthetic	2.16 ± 1.03 (4.12)	3.42 ± 0.85 (31.95)	1.26	2.23 ± 1.05 (2.74%)	3.49 ± 0.77 (8.33%)	0.0000***	1.96 ± 0.95 (30.14%)	3.21 ± 1.06 (37.50%)	0.0015**	0.0015**				
			0.0000***			1.26			1.25	0.0001***				

Key- † of primary preference, Interpretation of p value: \* significant, \*\* very significant, \*\*\* highly significant.

watching movies and exercising for stress relief, the correlation across genders was not significant (Chart 1).

Correlation of stress relieving activities with GAD-7 scores (Chart 2) showed that gaming had a significant correlation (p = 0.22, correlation 9.6101) with anxiety levels. There was however an increased incidence of gaming in students with higher anxiety levels. Of 24.7% students with GAD scores ≥10, 54.2% found gaming helpful in relieving stress.

Student reflections: Students’ reflections on experiences during the ERL are quoted in Table 6.

### Discussion

Educators across the globe face the unprecedented challenge of meaningful academic interaction in the context of physical distancing during COVID-19. The present study is one of the first studies to evaluate anxiety levels in pre-clinical medical students and focus on factors in socio-academic interaction that can impact anxiety levels during ERL.

Pandemics are associated with high levels of stress, uncertainty and loss of control in the general population.<sup>5</sup> The COVID-19 pandemic is also reported to have worsened pre-existing mental health conditions, mainly due to closure of educational institutions, loss of routine, and restricted social connections.<sup>9</sup>

Students face high levels of anxiety during the COVID-19 pandemic.<sup>6–11</sup> Stress levels and anxiety is higher among undergraduate than post graduate students. Among undergraduate students it is reported to be highest in first year students,<sup>16</sup> possible factors including living away from home for the first time. Normative pressures like exams and social relationships can get compounded by disruptions to routines of learning and social interaction during the COVID-19 pandemic.<sup>11,17</sup> Financial considerations, quarantine, and fear for family members being affected with COVID-19, are additional stressors.<sup>2,9,18,19</sup>

Stress during ERL can be associated with resource inequality, fear of loss of academic year, technological issues and lack of peer interaction.<sup>6,9,19</sup> Students can experience reduced motivation toward studies and increased pressures to learn independently. Medical students, moreover, face concerns over missing out on anatomical dissections and clinics.<sup>11,12</sup> In the present study, psychological health was evaluated both qualitatively and quantitatively in a challenging situation in which a difficult topic was in a completely different manner through different methods.

The GAD-7 scale and anxiety levels: The GAD-7 scale consists of seven questions; it is considered a reliable screening tool for generalized anxiety and is commonly used in primary care settings.<sup>13,14</sup> Several studies have reported on anxiety levels during COVID-19 using the GAD-7 scale in different cohorts of students, as shown in Table 7. There appears to be less anxiety among students in this study as compared to medical students seen in a study by Sartorao et al,<sup>20</sup> and nursing students as reported by Savitsky et al<sup>21</sup> (Table 1). Possible factors can include continued engagement with students with high emphasis on emotional connectedness in the academic setting.

**Table 3 – Correlation of perceived changes in VARK categories with gender.**

Learning Style	Male Students			Female Students		
	During ERL	Before ERL	Difference P value	During ERL	Before ERL	Difference P value
	Mean (±SD)	Mean (±SD)		Mean (±SD)	Mean (±SD)	
Visual	1.70 (0.87)	2.07 (0.90)	0.37 0.0278*	1.96 (1.04)	2.33 (0.91)	0.37 0.0404*
Auditory	2.64 (1.00)	2.04 (1.05)	-0.6 0.0005***	2.51 (1.05)	1.73 (0.96)	-0.78 0.0001***
Reading	3.37 (0.77)	2.39 (1.06)	-0.98 0.0000***	3.45 (0.78)	2.59 (1.06)	-0.86 0.0000***
Kinaesthetic	2.26 (1.10)	3.50 (0.78)	1.27 0.0000***	2.08 (0.96)	3.35 (0.91)	1.27 0.0000***

Key for Interpretation of p value: \* significant, \*\* very significant, \*\*\* highly significant.

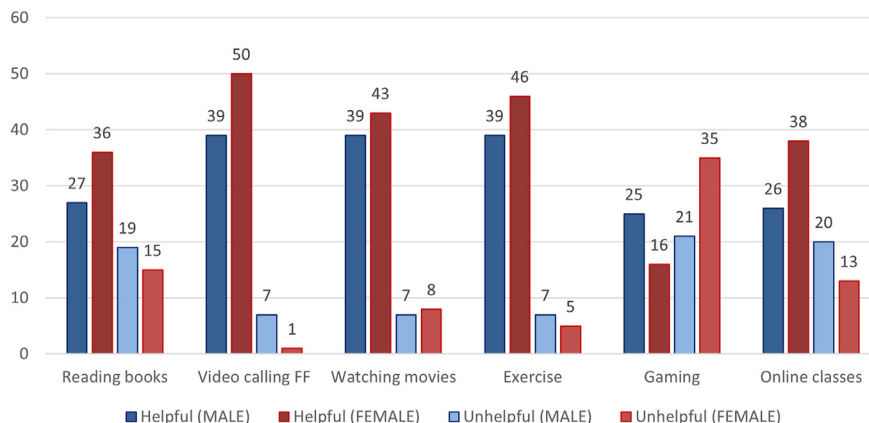
**Table 4 – Examples of student reflections.**

Some positive reflections	Some negative reflections
<p>“It was a different experience, but it was good. It taught us to be independent and learn things on time and according to priority. And the teachers were really supportive of us and used the best ways to teach us in this time” (S1)</p> <p>“ERL has been a great help during a time such as this lockdown. For this pandemic, that has tied our hands, ERL is one way we can still reach out to the faculty and the staff and keep a track of our future” (S73)</p> <p>“I have learnt a lot, how valuable everything is. Even the bad times in our lives could be the times making us stronger.” – anonymous from student counseling session</p>	<p>“Mental health is negatively affected after long periods of lockdown due to absence of social interaction with friends and increased stress due to approaching final exams” (S13)</p> <p>“Missed walking to class and normal human interaction” (S27)</p> <p>“Alone, I tend to worry about finishing certain topics” (S56)</p>

**Table 5 – Comparison of Anxiety levels among university students based on GAD-7 scores, during COVID-19.**

Study	GAD-7 Scores			
	Minimal/No anxiety	Mild	Moderate	Severe
1 Sartorao et al. <sup>20</sup> (in Medical student)			46.17%	
2 Savitsky et al. <sup>21</sup> (in nursing students)			42.8%	13.1%
4 Liu et al. <sup>19</sup>				45.4%
5 Cao et al. <sup>9</sup>	75.1%	21.3%	2.7%	0.9%
6 Islam et al. <sup>22</sup>		87.7%		
7 Essadek et al. <sup>18</sup>				20.7% of 39.19% who had anxiety
8 Elmer et al. <sup>23</sup>	Significantly higher levels of anxiety			
2 The present study	43.3%	31.96%	10.31%	14.43%

Stress relieving activities of student during ERL



**Chart 1 – Tabulation of stress relieving activities of students during ERL. Key: FF- friends and family.**

## Correlation of GAD7 scores with stress relieving activities

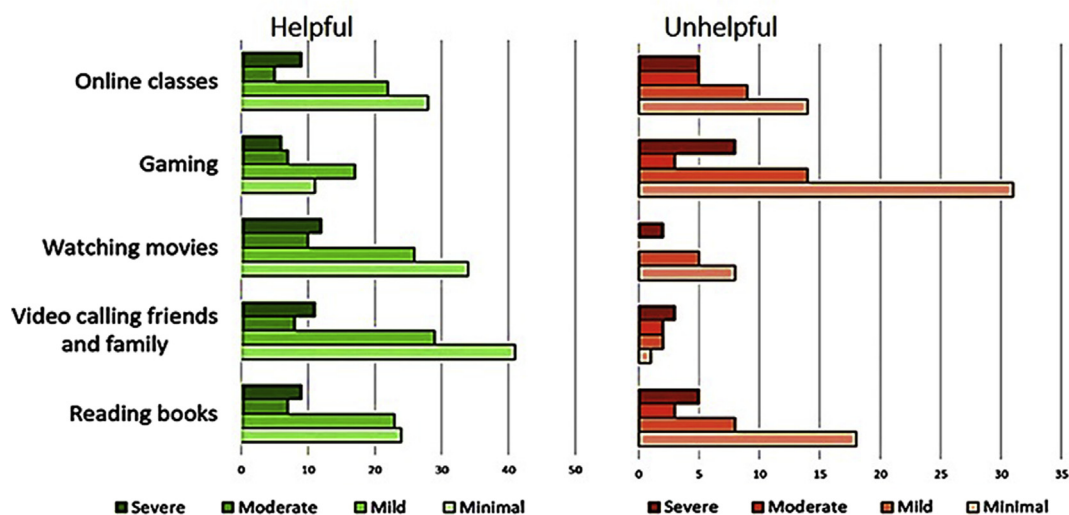


Chart 2 – Correlation of GAD-7 scores with various stress relieving activities.

Table 6 – Student reflections.

Some positive reflections	Some negative reflections
<p>“It was a different experience, but it was good. It taught us to be independent and learn things on time and according to priority. And the teachers were really supportive of us and used the best ways to teach us in this time” (S1)</p> <p>“ERL has been a great help during a time such as this lockdown. For this pandemic, that has tied our hands, ERL is one way we can still reach out to the faculty and the staff and keep a track of our future” (S73)</p> <p>“I have learnt a lot, how valuable everything is. Even the bad times in our lives could be the times making us stronger.” – anonymous from student counseling session</p>	<p>“Mental health is negatively affected after long periods of lockdown due to absence of social interaction with friends and increased stress due to approaching final exams” (S13)</p> <p>“Missed walking to class and normal human interaction” (S27)</p> <p>“Alone, I tend to worry about finishing certain topics” (S56)</p>

Table 7 – Anxiety levels in medical and nursing students during COVID-19.

Study	GAD-7 Scores			
	Minimal/No anxiety	Mild	Moderate	Severe
1 Sartorao et al. <sup>20</sup>			46.17%	
2 Savitsky et al. <sup>21</sup> (in nursing students)			42.8%	13.1%
4 Liu et al. <sup>19</sup>				45.4%
5 Cao et al. <sup>9</sup>	75.1%	21.3%	2.7%	0.9%
6 Islam et al. <sup>22</sup>		87.7%		
7 Essadek et al. <sup>18</sup>				20.7% of 39.19% who had anxiety
8 Elmer et al. <sup>23</sup>	Significantly higher levels of anxiety			
2 The present study	43.3%	31.96%	10.31%	14.43%

**Anxiety and gender:** Sartorao et al.<sup>20</sup> report higher levels of anxiety among female medical students during COVID-19. In the present study, there was a higher incidence of moderate and severe anxiety in males (30.43%) as opposed to females (19.6%) (Table 1) but this difference was not statistically significant.

**Gadgets and anxiety:** Though students are adept with technology and internet use, the COVID-19 crisis has resulted in

gadgets becoming the life-line of students. Excessive screen time has been associated with higher anxiety.<sup>9,24</sup> In the present study some students reported that not possessing a laptop reduced their engagement in online classes, but also that screen time was prolonged during ERL.

Ismail et al, found no difference in the motivation levels of students using gadgets for online classes before and during the pandemic.<sup>25</sup> Though there was a negative correlation

between discipline and motivation, and GAD-7 scores in the present study, it was not statistically significant.

*Academic interaction and anxiety:* Small group teaching in medical education has been shown to promote active learning, peer interaction, free communication and early identification of potential underperformers by teachers and facilitate a hands-on learning experience in the dissection lab.<sup>26</sup> The teaching of neuroanatomy by ERL in small groups of ten is a unique aspect of our study. Small group face-to-face teaching with a teacher-student ratio of 1:10 has been standard practice in the authors' institution. Unpublished course feedback data has previously indicated students find the study of neuroanatomy challenging. With this in mind, a deliberate decision was taken to continue the existing small groups during the neuroanatomy ERL. It was hoped that continuing established teacher-student and peer relations in the group would ease the transition to online teaching. Also, the time-frame for neuroanatomy teaching was extended to six weeks (from the previous 4-week model) to provide students additional time to adjust to the new method of learning.

Another unique aspect of the present study is the correlation of variables in the academic setting like student teacher and peer interaction, and individual feedback sessions to anxiety levels in medical students during ERL in COVID-19. In the present study, 84.53% of students enjoyed group discussion during the ERL and there was significant ( $p = 0.005$ ) relationship between enjoyment of small group discussion and lower GAD-7 scores (Table 1). The correlation with gender was not statistically significant, signifying that it was beneficial to male and female students. Though majority of students found teacher-student (80.41%) adequate, peer interaction (50.52%) was much less during small group sessions. Students reported that learning in smaller groups was better than large groups during the ERL, although they were not as interactive as compared to regular face-to-face group discussions.

*Feedback, mentorship and anxiety:* Even prior to the COVID-19 pandemic, online classrooms have been associated with feelings of aloneness and increased anonymity.<sup>27</sup> Peer and faculty support are recommended to reduce stress levels in preclinical medical students.<sup>28</sup> Teachers should continue to keep in touch with students during ERL, given that non-verbal communication which forms an important aspect of teacher-student interaction in face-to-face classes,<sup>29</sup> is diminished in the online environment. Mentorship programs which provide a supportive environment and an opportunity to share experiences have been shown to reduce stress levels in preclinical medical students during COVID-19.<sup>30</sup> In the present study, majority of the students found both the one-to-one group tutor feedback (90.72%) and the mentor-mentee meeting (81.44%) useful during ERL. There were similar results in the preferences for male and female students. The higher perceived benefit of the one-to-one feedback session could be because this was with the group tutor and therefore, directly addressed current academic performance. However, results are suggestive that both methods are beneficial to student emotional health during the ERL.

*Learning styles and stress:* Evaluation of changes in learning styles during ERL, and correlation to anxiety levels is another unique aspect of this study. Students have different preferences in the assimilation and processing of information. Prior to ERL forced by the pandemic, neuroanatomy was taught in

the authors' institution mostly by dissection in small groups, augmented by lectures, guest lectures and clinical visits. During the ERL, neuroanatomy was taught by online small group discussions, specimen demonstration videos, patient videos, and lectures (prerecorded as well as real time) by anatomists and clinicians. A clear difference in the teaching-learning methods during and prior to the ERL was the basis of the analysis of learning styles. The objective was not to classify learning into categories but to evaluate if the perceived change in preferences during ERL had any correlation with students' anxiety levels.

The correlation of learning styles with GAD-7 scores was not statistically significant both during ERL ( $p = 0.052$ ) and prior to lockdown ( $p = 0.070$ ). The mean values of the changes in learning preferences was significant during the ERL (Table 2) but correlation with anxiety was not significant. This, coupled with a student reflection quoted here, "though it seemed hard initially, within a week I got the hang of it (S5)", underlines the adaptability and flexibility of students.

The inference is that although VARK styles are supposed to be relatively stable traits of students and the inherent preferences may not change, students readily adapt to newer modes of learning during a crisis and the change in learning styles does not seem to significantly influence anxiety levels. Ideally, educators will have to design ERL in a way that serves the needs of students with different learning styles, although that may be challenging in some aspects of the curriculum, for e.g., dissection and handling of specimens. Educators should maintain continued focus on adequate academic interaction and connectedness with students during ERL to reduce anxiety levels. There is a strong case for small group and other academic interactions with students during ERL.

*Stress relieving activities* During the COVID-19 pandemic, social networking between students for academic interaction showed a decrease whereas friendship and support networks did not undergo a significant change.<sup>23</sup> Stress relief through social support including calling friends and family, extracurricular activities like music, physical exercise and gaming, were found to reduce anxiety levels, even in pre-clinical medical students.<sup>9,21,23</sup> There has also been increased incidence of gaming disorder during the pandemic.<sup>29</sup> In the present study, video calling friends and family significantly helped female students, whereas gaming helped male students. There was, however, an increased incidence of gaming in students with higher anxiety levels. It is open to debate if gaming is connected to the cause or relief of anxiety.

*Stress and social distancing* Social distancing has been a universal response to pandemics across the world,<sup>16,18,19</sup> and has emphasized to students, the importance of social and peer interaction, flexibility, adaptability and resilience.<sup>12,23</sup> In the authors' institution, activities like music and dance competitions, hostel days, college plays, intercollegiate and intramural sports and cultural events, student body meetings and interaction with foster families were a regular part of the students' social calendars. Students reflected that restriction of movement and social distancing during lockdown caused feelings of loneliness and that they sometimes found it difficult to control their emotions. However, students also reflected on the personal growth and unique perspectives gained from this pandemic.

In view of this, our students had an online interactive session with the student counsellor where concerns were addressed, the importance of establishing a routine emphasized, red flag signs for anxiety were discussed and individual guidance and counselling offered to students who felt more stressed.

## Conclusion

Educators will have to bear in mind that teaching during ERL does not end with creation and implementation of content but be aware of and anticipate the psychological aspects associated with ERL. The emphasis is that although learning styles appear to change during ERL, most students readily adapt to newer modes of learning in a crisis. The focus should be on maintaining meaningful academic relationships and connectedness with students during ERL to reduce anxiety levels. There is a strong case for online small group discussions in reducing anxiety levels in preclinical medical students, with added support systems like individual feedback sessions, mentoring, familial and social support. Transition back to regular classes will also be a time of change and the focus on academic connectedness and emotional support in the context of physical distancing should continue.

## Disclosure of competing interest

The authors have none to declare.

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