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The impact of Emergency Remote Education (ERE) on anatomy classes for medical students

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Abstract

Introduction: During the COVID-19 pandemic, with the need for social distancing as a way of preventing the spread of the virus, educational institutions had to reinvent themselves and adapt to the new reality. Different versions of Emergency Remote Education (ERE) emerged, in which theoretical classes were taught remotely to the detriment of practice, which would be taught at another time. The discipline of Anatomy, as it is based on practice, suffered a great impact on its modus operandi leading to adaptations. Practical classes were temporarily suspended to be taught in a subsequent period, dissociated from theoretical teaching, and carried out remotely online.

Methodology: 254 medical students from a public university were interviewed. All students had taken at least one period of Anatomy at ERE and at least one period in person.

Results: The majority of students did not agree with the usefulness of remote classes, but they participated in online tutoring and did not seem to believe that remote teaching could lead to insecurity in the application of anatomy in the clinic.

Conclusion: In general, the student did not fully approve of the ERE, but did not feel disadvantaged in the teaching of Anatomy, and prefers face-to-face teaching.

Keywords: Teaching Anatomy at ERE; Teaching methodologies during ERE; Impact of ERE on Anatomy teaching

1. Introduction

Studying Anatomy science is perhaps the biggest challenge for students newly enrolled in a health course. Traditionally, and in all medical schools, this teaching is divided into practical and theoretical activities [1-2]. During the COVID-19 pandemic, the virtual learning environment was the main teaching strategy used by higher education institutions to conduct classes. An example is the Human Anatomy discipline, which, despite depending on practical meetings, was taught through emergency remote Education [3,4,5,6].

During the COVID-19 pandemic, with the need for social distancing as a way of preventing the spread of the virus, educational institutions had to reinvent themselves and adapt to the new reality. Different versions of ERE emerged, in which theoretical classes were taught remotely to the detriment of practice, which would be taught at another time.

The discipline of Anatomy, based on what has already been discussed, as it is based on practice suffered a great impact on its modus operandi, leading to adaptations – often drastic – in the way of teaching, learning, and discussing the subject[7,8,9,10]. Practical classes were temporarily suspended to be taught in a subsequent period, dissociated from

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theoretical teaching, and carried out online. Then, with the gradual release of face-to-face teaching, a hybrid system was installed - theoretical video classes concomitantly with face-to-face practical classes [11,12].

Therefore, strategies were needed on the part of teachers, managers, and Universities so that implementing this ERE could affect student learning. Corrêa13 told us in an article about teaching Anatomy for Medicine during the pandemic, some examples of these challenges and the measures adopted to minimize the deleterious effects of the pandemic on the teaching-learning process.

Some courses in the health area, given the curricular requirements and their Pedagogical Projects, were able to adapt practical classes to the online system during the ERE. However, Dentistry, Nursing, and Medicine courses chose to postpone the teaching of practical classes until a later period, when classes could already be held in person, respecting the strict health rules in force. After this release, it was possible to replace the missing practical classes (corresponding to the theoretical ones already taught via video classes in the first phase of the ERE). Later, in hybrid teaching, it was possible to combine theoretical classes (still online, to avoid crowds) and practical classes in small groups, with great distance between students [12,13].

The teaching of Anatomy at ERE for the Medicine course, our object of this research, was presented in two distinct and sequential ways: A) the first phase: theory in video classes and practice - in person - at another time; B) the second phase - with face-to-face teaching permitted by the competent authorities throughout the country - the hybrid system was adopted (still within the ERE), with theoretical video classes temporally associated with face-to-face practical classes.

Having knowledge of the events in this complex period, and given the arduous task of the trans and post-pandemic, whether for the Medicine student or the Professors, Anatomy professors for this course, it becomes imperative and highly enriching for Research/Science, and also for future Anatomy teaching guidelines, the impact of ERE on the learning of anatomical sciences should be investigated.

The student, the main object and scope of didactics and teaching, must therefore actively act in measuring this impact. That said, the objective of this article emerged: to evaluate the perception of these Medicine students regarding the impacts on the study of Anatomy in times of ERE, whether in the hybrid system or with practice and theory in dissociated times.

2. Methodology

The research was a descriptive and cross-sectional study, in which data from a structured questionnaire (survey type) was evaluated, composed of closed questions, previously established, and capable of demonstrating in the evaluation of medical students (from the Anatomy discipline at UFJF), its relationship with the teaching of this science during ERE. The students were informed about the study and signed the informed consent form to participate in the research and the questionnaire was administered via Google Forms, with the students already in advanced stages, therefore immersed in the medical clinic. The student was invited to participate voluntarily in compliance with complete confidentiality. The study was submitted to the UFJF Ethics Committee, meeting all the requirements for research of such scope.

The inclusion criteria were students from the UFJF Medicine course who studied Anatomy: 1) In at least 1 period completely in person; 2) And at least 1 academic period of ERE, either with theory before practical replacement or the hybrid system (marking the post-pandemic, and the gradual return of face-to-face activities in teaching at UFJF). In this case, students who chose not to participate in the study, who responded incompletely to the questionnaire, or who had still attended all Anatomy only in ERE or only in the face-to-face system were excluded from the research.

The instrument used in the research, applied in simple interviews, was structured with closed questions, previously tested with 12 multiple-choice questions based on the "Liker Scale" with five answer options each: I completely agree; I partially agree; neutrality (neither agree nor disagree); I partially disagree and disagree. To determine the questions that were included in the questionnaire, we referred to the most modern and suggestive articles on the subjects "Teaching Anatomy" "New Strategies and Methodologies in Anatomical Teaching", and "Challenges of teaching Anatomy at ERE".

The parameters studied were based on a systematized script, considering the demographic variables: gender; age; marital status, your current academic period, in addition to the temporal relationship with the practical teaching of anatomy, whether it was at ERE, whether it was pre- or post-pandemic. The questionnaire asked: A) What was your

Anatomy study system during the ERE? B) Were anatomical theoretical classes useful tools? C) Remote theoretical classes were sufficient to improve the confidence in the clinical application of Anatomy? D) Were there similarities in the effectiveness between remote and in-person teaching?

E) Do the remote theoretical classes lead to insecurity in applying Anatomy in the clinic? F) Can individual study and practical classes reduce gaps in theoretical classes? G) Was there great difficulty in understanding practical Anatomy with online theoretical classes?

The data obtained were tabulated in an Excel spreadsheet, version 21.0, and processed using the SPSS program, version 20.0 - or more modern - (Chicago, IL, USA). The statistical tests applied were: Chi-square and Student's "t" test. Statistical significance was set at $P < 0.05$.

3. Results

The research involved 254 Medicine students at a Public University, UFJF. All students were already, 2024, in the final periods of the course. They are all part of the four classes that underwent regular face-to-face anatomy teaching, as well as remote and hybrid teaching.

Data analysis showed us a certain rejection of the effectiveness of online theoretical Anatomy classes, registering an increase from total agreement to total disagreement (n= 20, 24, 24, 72, and 114 respectively, in the variables) as shown in Figure 1.

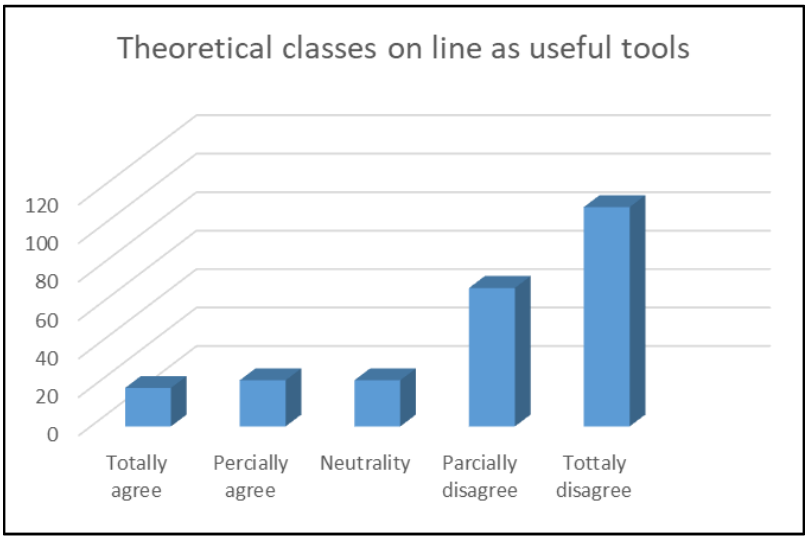

Figure 1 Represents the numbers referring to the answers to the question: "If the theoretical classes were useful tools in the learning of Anatomy". The “Y” axis shows the number of students, while the “x” shows the different degrees of agreement with the question.

Figure 2 shows the numbers relating to the question "Whether remote monitoring was a positive strategy" during ERT. The vast majority, approximately 2/3 of those interviewed, strongly agreed (n=171).

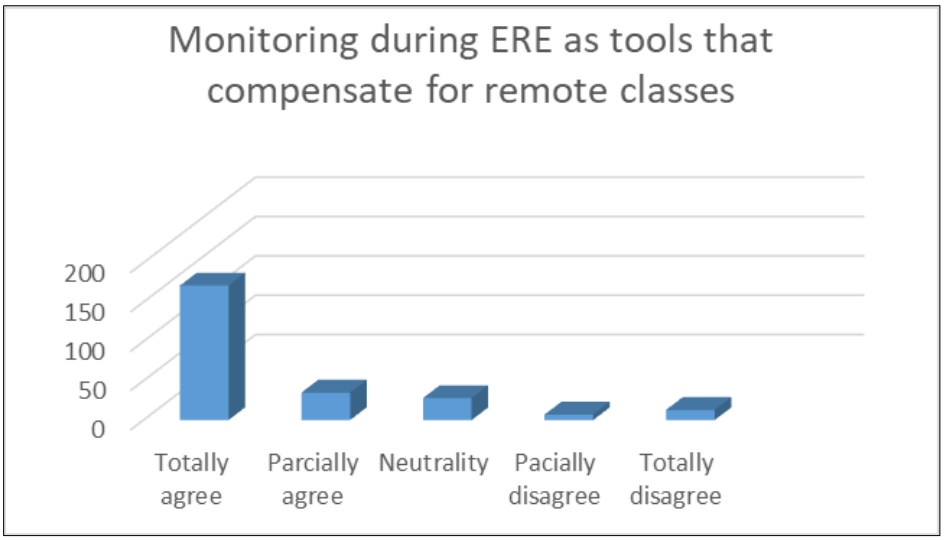

Figure 2 Represents the numbers referring to the answers to the question: "If the remote monitoring Anatomy classes compensate for remote theoretical classes ". The "Y" axis shows the number of students, while the "x" shows the different degrees of agreement with the question.

There was a fairly even distribution among the responses when the question was about whether online Anatomy classes raise confidence in applying the content in the clinic. Despite the large number of neutralities (Figure 3), 87 students (34% of the total) seem to agree yes, while 50% (n=127) disagree in some way.

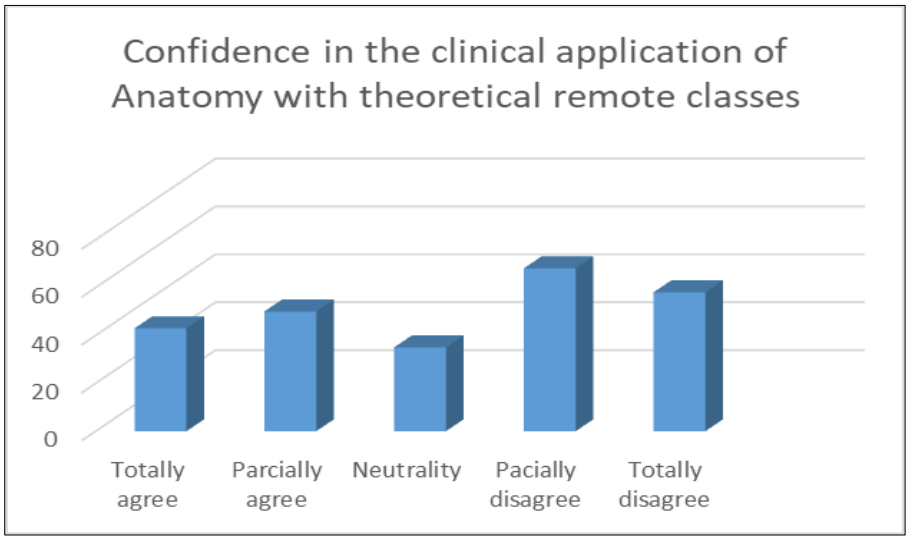

Figure 3 Represents the numbers referring to the answers to the question: "Whether there was confidence in the clinical application of Anatomy with the theoretical remote classes". The "Y" axis shows the number of students, while the "x" shows the different degrees of agreement with the question.

When the question was about the similarity in the effectiveness of online classes about face-to-face classes, the distribution was also large, however, 51% of students (n=128) did not agree with the situation (Figure 4)

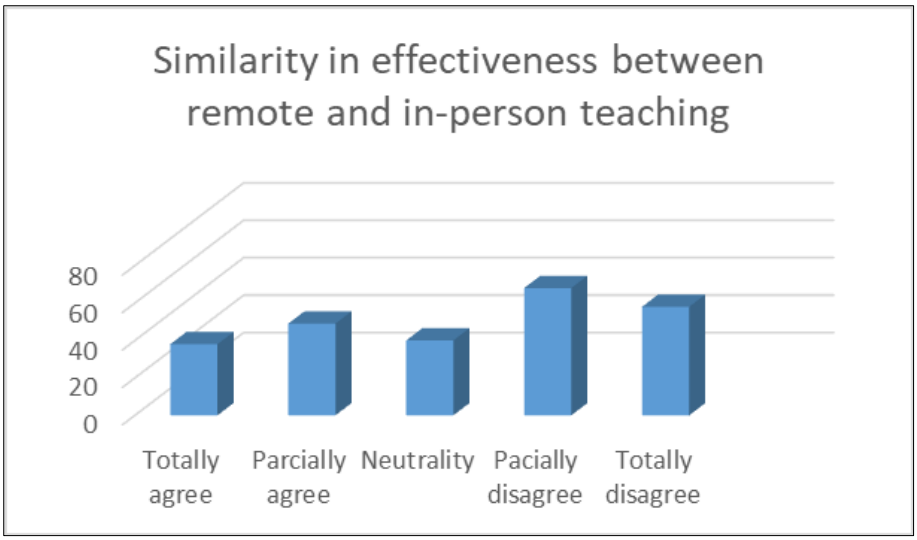

Figure 4 Represents the numbers referring to the answers to the question: "Whether there was a similarity in effectiveness between anatomical remote and in-person classes". The "Y" axis shows the number of students, while the "x" shows the different degrees of agreement with the question.

Figure 5 shows the response data for the question "Whether remote theoretical classes lead to insecurity in the clinical application of Anatomy", in which few students (n=59) 23% of them, believe so.

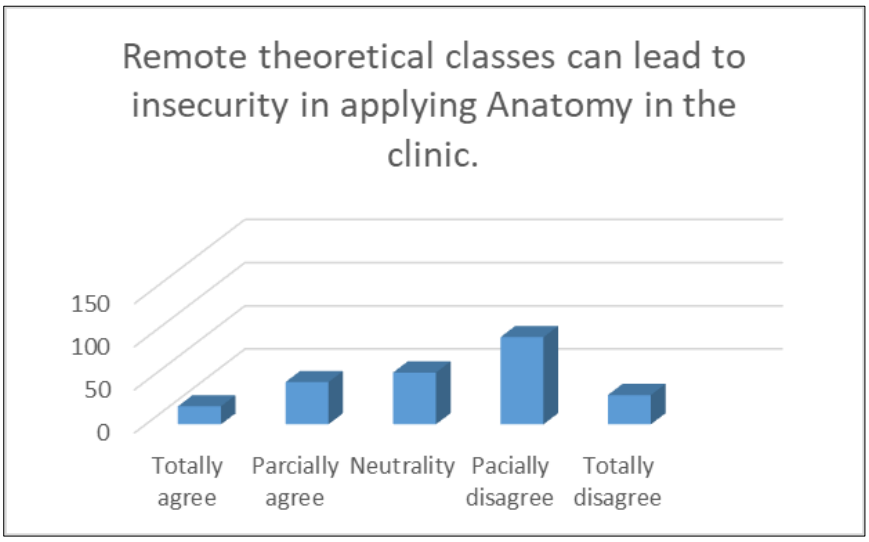

Figure 5 Represents the numbers referring to the answers to the question: "If theoretical Anatomy classes can lead to insecurity in applying Anatomy in the clinic". The "Y" axis shows the number of students, while the "x" shows the different degrees of agreement with the question.

When asked to answer whether individual study plus practical classes compensate for the possible flaws of remote theoretical classes, 15% of the students (n=38) totally or partially agreed, while 194 (76%) totally or partially disagreed. (Figure 6)

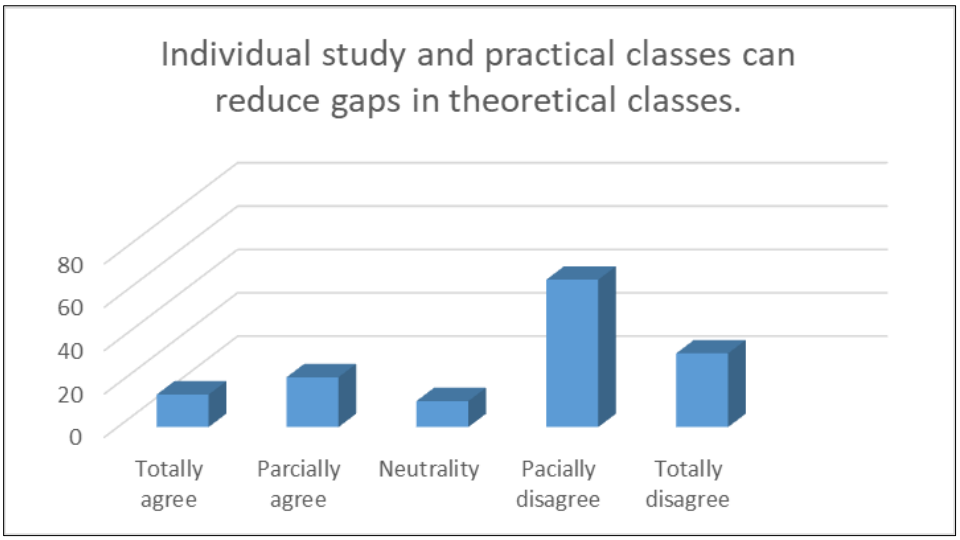

Figure 6 Represents the numbers referring to the answers to the question: "Whether the individual study and practical classes can reduce gaps in theoretical classes". The "Y" axis shows the number of students, while the "x" shows the different degrees of agreement with the question.

When asked if there was greater difficulty in understanding the practice with the content that was taught remotely, when compared to a normal situation, in-person classes, students completely agreed in 44% (n=112), as shown in Figure 7.

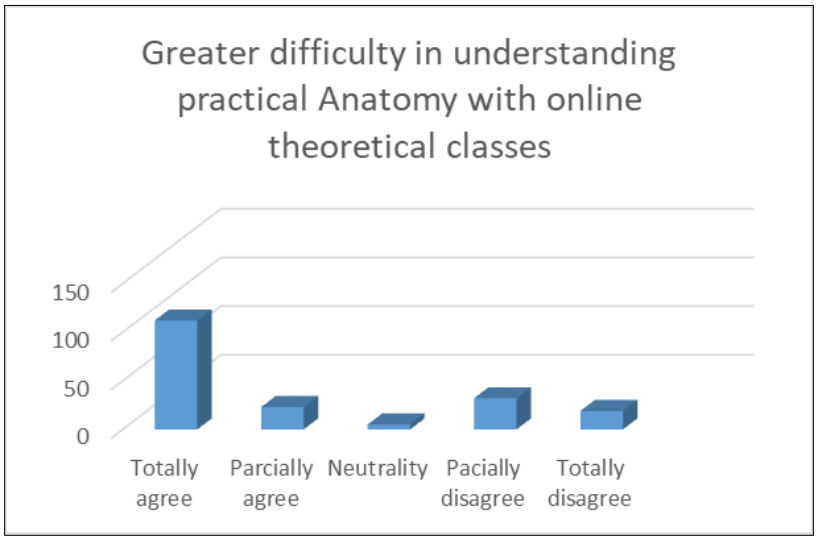

Figure 7 Represents the numbers referring to the answers to the question: "If there was great difficulty in understanding practical Anatomy after online theoretical classes". The "Y" axis shows the number of students, while the "x" shows the different degrees of agreement with the question.

When we analyzed the answers to the question: "Online theoretical classes are sufficient and effective when recorded and watched several times", we saw that the highlight was the 151 students (60%) dialed in, partially or completely. (Figure 8)

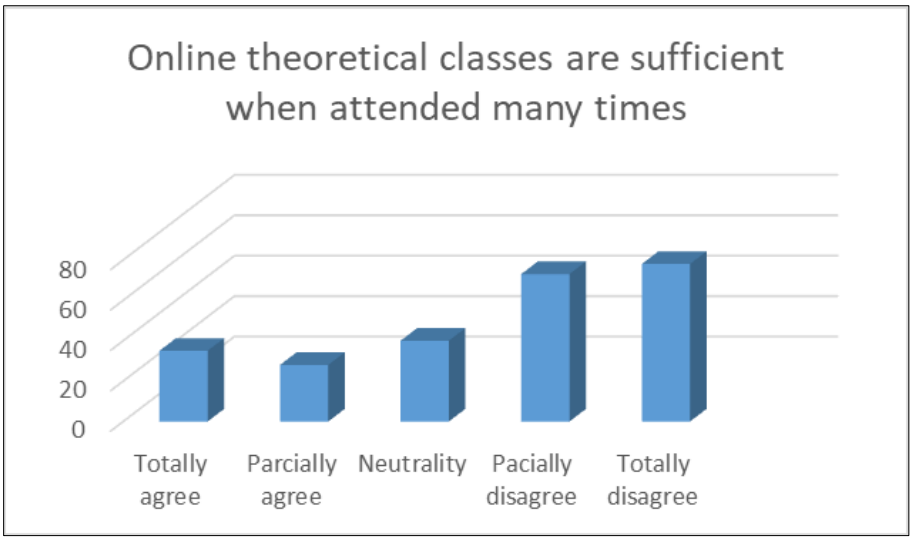

Figure 8 Represents the numbers referring to the answers to the question: "Whether the online classes are sufficient for learning when attended many times". The "Y" axis shows the number of students, while the "x" shows the different degrees of agreement with the question.

To check statistical agreement, we associated some data: 1) "Remote theoretical classes are effective tools for understanding Anatomy" X "individual study and practical classes eliminate possible lacks of a remote class"; 2) "If there was greater difficulty in understanding the practice with remote classes" X "individual study and practical classes eliminate possible lacks of a remote class"; 3) "Remote classes create insecurity in the clinic practice" X "similarity in the effectiveness of remote classes to in-person classes" 4) "Watching a recorded class several times is enough to have a good understanding of the content at the clinic" X "Remote classes create insecurity in the clinic practice"; and finally: 5) " is there was confidentiality in practice application of the contents of remote classes" X "Remote classes create insecurity in the clinic practice". The results are shown in Table 1.

Table 1 Statistical associations

Variable 1	**Variable 2**	**P-(parameter≥0,05)**	**Statistics Association**
Remote theoretical classes are effective tools for understanding Anatomy	Individual study and practical classes eliminate the possible lack of a remote class	P=0,04	Association
If there was greater difficulty in understanding the practice with remote classes	Individual study and practical classes eliminate the possible lack of a remote class	P=0,082	Little association
Remote classes create insecurity in the clinic practice	The similarity in the effectiveness of remote classes to in- person classes	P= 0,06	Association
Watching a recorded class several times is enough to have a good understanding of the content at the clinic	Remote classes create insecurity in the clinic practice	P= 1,360	No association
Is there confidence in the practice application of the contents of remote classes	Remote classes create insecurity in the clinic practice	P=0,04	Association

4. Discussion

More than a consensus, it is a reality that during the COVID-19 pandemic, ERE was the main teaching strategy used by higher education institutions to carry out classes. In the Anatomy discipline, limitations were greater during this period, as practical meetings, which complement theory, were postponed.

Taking students' opinions about these theoretical anatomy classes in the remote system, we noticed a great rejection of this type of class. Even though we studied the opinion of medical students, we could see a large discrepancy between the study by Silva et al [2] that, even with a small sample of 69 students interviewed in psychology, physical education, and physiotherapy courses, reported that the majority of these students considered that there was a good or very good affinity with the remote type of theoretical classes. And about this same issue, the majority of health academics indicated good or very good learning, in another similar study [3].

Cardoso [11], interviewing students in the first period of the Medicine Course at a private University, reported the motivation for asynchronous video classes on human anatomy, watched during the period of social isolation, despite the majority of students being very affected in their emotional state, Due to the social isolation imposed by the COVID-19 pandemic, this state did not interfere with the motivation for human anatomy video classes. Although completely divergent from our work, which shows that most students do not believe in remote classes as decidedly positive tools in the study of Anatomy, it is important to highlight that Cardoso's research [11] involved first-year students, that is, theoretically very more motivated than the students in our research, who were already in the third and fourth period of the course.

The same positive opinion regarding remote classes was defended by Fossa [12] who, after analyzing the results of a survey with medical students, demonstrated the adaptation and satisfaction of students with the methodology that alternated asynchronous and synchronous classes, and in particular, the use of videos recorded by teachers (Cognitive Support Station), which received much approval. Interestingly, our interviewees, who mostly do not agree with the effectiveness of remote classes, were reticent when comparing this type of class with in-person classes. In other words, there was a certain similarity in the numbers of agreement, disagreement, and neutrality, when we proposed that online and in-person classes would have the same effectiveness.

Although there are great divergences of perceptions among students, it is clear that the majority of academics demonstrate positive perceptions about the contribution of remote monitoring, demonstrating its relevance for the teaching-learning process of academics in distance learning [2,3, 8], as shown in our study, in which approximately 2 thirds of students approved remote monitoring during the period of absence.

Analyzing the data regarding the efficiency of remote theoretical classes, it can be inferred that for the majority of students, this efficiency is not supported, but that not even with great individual effort and practical classes, this deficiency can be resolved. This association was even statistically significant in our work. The study by Silva *et al* [3] also showed that there was a positive correlation between attendance in individual study and frequency in online tutoring, with the good performance of students in the Anatomy subject, which was corroborated by Oliveira *et al* [14].

Medical schools sought feasible ways to introduce improvements in the teaching-learning process, including the use of virtual laboratories (Weblab)[4] and podcasts[5] to reduce the theory-practice gap and increase confidence in the use of Anatomy. At the clinic. This distance, which could certainly lead to a reduction in confidence in how the student will use their knowledge of anatomy in clinical medicine, was reflected in this research when we asked whether there would be confidence in the clinical application of Anatomy after a remote course in this discipline. The students were divided, however, it was detected that for the majority, remote classes do not generate this insecurity in professional practice. And when we associated these variables, a statistical association was found.

Barbosa [15], reported the difficulties in accessing the internet during the pandemic, and that the assessment of internet quality in asynchronous classes was better than in synchronous classes, that is, when classes took place and could be recorded to be watched on a Another time, the use could be better. In a way, this contrasts with the data from this research, as it was evident that most students disagreed with the hypothesis that better learning would happen if asynchronous classes recorded and watched several times would be more efficient, even though these data had no association significant with increased confidence in the application of Anatomy in the medical clinic, having watched recorded classes countless times.

Finally, it seems to us that remote classes, for our students, do not offer ideal scientific support for practical classes, in line with what Paulino *et al* [6] wrote in their meta-analysis on emergency remote teaching in the Medicine course

5. Conclusion

We can infer that:

- Most students did not consider remote anatomy classes to be useful;
- Most of the interviewees attended the seminars proposed during the pandemic;
- They were non-specific, that is, they did not demonstrate a tendency to agree or disagree with the effectiveness of remote anatomy teaching, but they do not believe that this form of classes will harm, or is harming them in the clinical application of anatomy;
- Students prefer face-to-face teaching of theoretical Anatomy to remote teaching;
- They consider that with remote classes the understanding of the practice is more complex.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare that they have no conflict of interest.

Statement of informed consent

The authors declare that informed consent was obtained from all individual participants included in the study.

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