

## **INFLUÊNCIA DAS ABORDAGENS METODOLÓGICAS DE ENSINO SOBRE AS AULAS REMOTAS DURANTE A PANDEMIA DA COVID- 19: A PERCEPÇÃO DOS ESTUDANTES DE MEDICINA BRASILEIROS**

### ***INFLUENCE OF TEACHING METHODOLOGICAL APPROACHES ON REMOTE CLASSES DURING THE COVID-19 PANDEMIC: THE PERCEPTION OF BRAZILIAN MEDICINE STUDENTS***

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## ABSTRACT

**Introduction:** The COVID-19 pandemic required a rapid and unplanned change in medical education. In Brazil, the teaching and learning practices of medical schools with a traditional, active or mixed methodological approach were reformulated. The face-to-face teaching process was replaced by the remote one and significantly impacted the development of activities

**Objective:** To assess the influence of teaching methodological approaches on remote classes in the perception of Brazilian medical students during the COVID-19 pandemic.

**Methods:** Descriptive online cross-sectional study carried out between June and October 2020. The study sample consisted of Brazilian medical students aged 18 years and over. A web-based self-reported questionnaire was administered using Google Forms.

**Results:** A total of 353 students from Brazilian medical schools with an active methodological approach (55.2%), mixed (28.9%), and traditional (15.9%) were included in the study. For 53.57%, 40.31%, and 35.05% of students of traditional, active, and mixed methodology, remote classes were considered regular. More than half of the students reported difficulties in concentration and commitment to studies. Perceptions about the advantages, disadvantages, and future impact of remote classes were different between groups of students with traditional, active, and mixed methodology ( $p < 0.05$ ).

**Conclusion:** Faced with the challenges faced by the COVID-19 pandemic, the different methodological approaches to teaching exerted an influence on the perception of medical students about remote classes in the teaching-learning process.

**Keywords:** SARS-CoV-2. Lockdown. Education. Medical. Teaching-Learning. Distance learning.

## RESUMO

**Introdução:** A pandemia de COVID-19 exigiu uma mudança rápida e não planejada na educação médica. No Brasil, as práticas de ensino e aprendizagem das escolas médicas com abordagem metodológica tradicional, ativa ou mista foram reformuladas. O processo de ensino presencial foi substituído pelo remoto e impactou significativamente no desenvolvimento das atividades



**Objetivo:** Avaliar a influência das abordagens metodológicas de ensino em aulas remotas na percepção de estudantes de medicina brasileiros durante a pandemia do COVID-19.

**Métodos:** Estudo transversal descritivo online realizado entre junho e outubro de 2020. A amostra do estudo foi composta por estudantes de medicina brasileiros com idade igual ou superior a 18 anos. Um questionário auto-relatado baseado na web foi administrado usando o Google Forms.

**Resultados:** Foram incluídos no estudo 353 estudantes de escolas médicas brasileiras com abordagem metodológica ativa (55,2%), mista (28,9%) e tradicional (15,9%). Para 53,57%, 40,31% e 35,05% dos alunos da metodologia tradicional, ativa e mista, as aulas remotas foram consideradas regulares. Mais da metade dos alunos relataram dificuldades de concentração e comprometimento com os estudos. As percepções sobre as vantagens, desvantagens e impacto futuro das aulas remotas foram diferentes entre os grupos de alunos com metodologia tradicional, ativa e mista ( $p < 0,05$ ).

**Conclusão:** Diante dos desafios enfrentados pela pandemia do COVID-19, as diferentes abordagens metodológicas de ensino exerceram influência na percepção dos estudantes de medicina sobre aulas remotas no processo de ensino-aprendizagem.

**Palavras-chave:** SARS-CoV-2. Confinamento. Educação. Médico. Ensino-Aprendizagem. Ensino à distância.

## 1 INTRODUCTION

Over the years, medical education has undergone gradual and important changes related to the methodological approach [1]. In the search for medical training with critical-reflexive skills [2] and capable of meeting the needs of the population, teaching centered on the figure of the teacher, known as traditional methodology, is being replaced by an active methodology [1]. In this scenario, student participation is active in the construction and integration of knowledge, since students are encouraged to solve their problems, acting as protagonists in the teaching-learning process [3].

The active teaching methodology makes it possible to more effectively associate theory with practice and the student-teacher approximation consolidates the formation of knowledge [4], however, it is still not a current reality for all medical schools. Currently, among the countries in the world, Brazil is considered the second



largest in terms of the number of medical schools, followed by India, which occupies the first place, and the United States in the third place [5]. More than half of the medical schools in Brazil are private, and the teaching methodology used in these schools, whether traditional, active, or mixed, is still not numerically known and consistent [5].

Just as the active teaching methodology has been gradually instituted in the country's medical schools [6], it was also possible to observe in the last century the expansion of another educational modality called distance learning [7]. The arrival of the world wide web made distance learning possible [7] through the development of diversified online educational activities [8]. In addition, the world was taken aback by the COVID-19 pandemic. Due to its high virulence and transmissibility, social isolation measures were implemented, impacting various aspects of human life, including medical education [7,9].

With the emergence of the COVID-19 pandemic, face-to-face classes in medical schools were suspended, and, as an alternative to reduce academic harm, learning became remote in

medical education [10]. The use of remote classes through virtual digital technology enabled students and teachers to interact, communicate and represent the continuity of studies and learning [10]. However, the change from face-to-face classes to remote classes happened unexpectedly, and in the absence of sufficient time for preparation, planning, and restructuring of activities and educational plans by teachers and adaptation of students [7].

Specifically, in medical schools, whether with a traditional, active or mixed methodological approach, students have a high workload of study and theoretical and practical learning. With the sudden change from face-to-face classes to remote classes, adaptations in the routine of medical students were necessary, as well as in the teaching-learning process, depending on the type of methodological approach adopted by medical schools.

In this sense, the present study aimed to assess whether the different methodological approaches to teaching influence the perception of medical students about remote classes during the COVID-19 Pandemic.



## 2 METHODS

### Study Design

A descriptive and cross-sectional study was conducted online from June to October 2020, while Brazilian medical schools were closed due to the COVID-19 pandemic.

### Study Population and Sample Size

Undergraduate students aged 18 or over, enrolled in the first to a fourth year of the medical course in Brazilian educational institutions during the 2019/2020 academic year, and who had their classes and/or other activities modified due to the pandemic of COVID-19 were included in the study. Students without internet access during the study period were excluded.

### Data Collect

A questionnaire was developed by members of the research team based on the literature and teaching and research experience of professors in undergraduate medicine. Twenty-three articles were selected to assess the perception of medical students regarding classes and/or remote activities during the COVID-19 pandemic, as well as associated variables. The questionnaire was applied using Google Forms (Google LLC, California, United States of America) (Supplementary Material).

Due to the convenience sampling, the research was published in the digital environment (Instagram, Facebook, and WhatsApp) to alert Brazilian medical students about the research event. Subsequently, the researchers invited all eligible medical students. A Google Forms™ link to the invitation and self-reported survey was shared. Daily reminders to participants were sent to increase the response rate.

### Data Analysis

The completed questionnaires were extracted from Google Forms™ and exported to Microsoft Excel 2016. Subsequently, the data were coded and exported to



the Statistica program version 7.0 for analysis. Categorical data were presented as frequencies and percentages. To assess the associations between independent categorical variables, Pearson's chi-square test or Fisher's exact test was used. p-value <0.05 was considered statistically significant.

## Ethical Approval

The study was carried out following the Brazilian National Health Council, Resolution no 466/212, and approved by the Research Ethics Committee of Faculdade Ceres – FACERES (nº 4.169.379). All participants who agreed to participate voluntarily provided their electronic consent before participation.

## 3 RESULTS

A convenience sample of medical students was invited to participate in the study and filled out the study questionnaire online through the Google Forms™ program. A total of 353 (83.3%) medical students were included in the study, 1 (0.2%) refused, 4 (0.9%) were not 18 years of age or older, and 66 (15.6%) did not access the invitation to participate in the study. The response rate was 98.2%. 270 (76.5%) of the medical students were female; 334 (94.6%), 17 (4.8%) and 2 (0.6%) were from private, state and federal institutions, respectively. The most frequent teaching methodologies were: active 195 (55.2%), mixed 102 (28.9%) and traditional 56 (15.9%). In general, 309 (87.5%) students from institutions located in the southeastern region of Brazil were predominant.

The characteristics related to classes and other activities of medical students according to the teaching methodology during the COVID-19 pandemic are shown in **Table 1**. The higher frequency of medical students from institutions with traditional, active and mixed methodology considered the remote classes as regular (n=30, 53.57%; n=77, 40.31%; n=34, 35.05%) and reported difficulties in concentration and



commitment in studies (n=42, 76.36%; n=145, 74.36%; n=145, 74.36%) respectively (Table 1).

**Table 1.** Characteristics of classes and other activities of medical students according to the teaching methodology of Brazilian institutions during the COVID-19 pandemic.

Variables	Teaching Methodology		
	Traditiona l	Active	Mixed
	n (%)	n (%)	n (%)
<b>Status of classes and other activities</b>			
All classes and activities suspended	1 (1.79)	1 (0.51)	0 (0.00)
All classes and activities online	30 (53.57)	126 (64.62)	36 (35.29)
Suspended classes and mandatory activities kept online	7 (12.50)	5 (2.56)	10 (9.80)
Suspended classes and optional activities kept online	0 (0.00)	0 (0.00)	2 (1.96)
Classes are partially suspended and partially online with mandatory online activities	16 (28.57)	63 (32.31)	54 (52.94)
Partially suspended and partially online classes with optional online activities	2 (3.57)	0 (0.00)	0 (0.00)
<b>Types of online classes</b>			
Recorded classes	11 (20.00)	2 (1.45)	37 (36.27)
Live classes	39 (70.91)	131 (94.93)	62 (60.78)
Online teaching platform with recorded classes	2 (3.64)	3 (1.45)	1 (0.98)
Online teaching platform with recorded and remote classes	3 (5.45)	55 (2.17)	2 (1.96)
<b>Types of assessments</b>			
Evidence	11 (19.64)	43 (22.05)	48 (47.06)
Works	0 (0.00)	0 (0.00)	1 (0.98)
Tests and assignments	44 (78.57)	152 (77.95)	53 (51.96)
None	1 (1.79)	0 (0.00)	0 (0.00)



## Students' self-perception

How do you consider remote classes?

To bad	5 (8.93)	11 (5.76)	11 (11.34)
Bad	4 (7.14)	28 (14.66)	27 (27.84)
Regular	30 (53.57)	77 (40.31)	34 (35.05)
Good	14 (25.00)	54 (28.27)	22 (22.68)
Very good	3 (5.36)	21 (10.99)	3 (3.09)

## Performance during remote classes

Difficulties in concentration and commitment to studies	42 (76.36)	145 (74.36)	81 (79.41)
Concentration and commitment remained the same	5 (9.09)	41 (21.03)	15 (14.71)
Concentration and commitment increased	8 (14.55)	9 (4.62)	6 (5.88)

In association analyses, participant gender was the sociodemographic characteristic significantly associated with medical students' perception of remote classes during the COVID-19 pandemic. Greater flexibility and student autonomy were considered an advantage among men when compared to women (67.90% vs. 55.56%;  $p=0.048$ ). Greater mental fatigue (47.21% vs. 30.49%;  $p=0.007$ ) and impaired association between theory and practice (70.37% vs. 51.22%;  $p=0.0010$ ) were considered a disadvantage among women when compared to men (**Table 2**).

**Table 2.** Significant associations between sociodemographic characteristics and perception of Brazilian medical students regarding remote classes during the COVID-19 pandemic.

Variables		No n (%)	Yes n (%)	p- value*
<b>Perception of the advantages of remote classes</b>				
Greater flexibility and student autonomy	<b>Male</b>	26 (32.10)	55 (67.90)	0.048





	<b>Femal e</b>	116 (44.44)	145 (55.56)	
<b>Perception of the disadvantages of remote classes</b>				
Greater mental fatigue	<b>Male</b>	57 (69.51)	25 (30.49)	0.007
	<b>Femal e</b>	142 (52.79)	127 (47.21)	
<b>Perception of the future impact of remote classes</b>				
Impairment in the association of theory with practice	<b>Male</b>	40 (48.78)	42 (51.22)	0.001
	<b>Femal e</b>	80 (29.63)	190 (70.37)	

\*Univariate analysis. Chi-square tests. p value <0.005.

The data provided in **Table 3** indicate that the student's perception of traditional methodology in remote classes was associated with greater participation in classes ( $p < 0.001$ ), greater flexibility and autonomy for the student ( $p < 0.001$ ), proximity between student and teacher affected ( $p < 0.001$ ), increased distractions during classes ( $p < 0.001$ ), greater mental fatigue ( $p = 0.009$ ), the convenience provided by online classes at home ( $p < 0.001$ ), impact on the professional future by replacing practical classes not simultaneous to theoretical classes ( $p = 0.016$ ). Mixed methodology students were associated with greater difficulty in committing to studies ( $p < 0.001$ ), problems with time and organization ( $p < 0.001$ ), loss of content training ( $p = 0.003$ ), a greater chance of developing psychic disorders ( $p < 0.001$ ), better experience in virtual access ( $p = 0.032$ ) and more productive with physical distance ( $p = 0.003$ ). The perception that remote classes replace face-to-face theoretical classes ( $p = 0.003$ ) and easier access to teachers ( $p = 0.021$ ) were associated with students of active methodology.

Also, the period of physical distancing in the remote classroom interfered with theoretical learning and generated an increase in the theoretical workload for most medical students, regardless of the teaching methodology ( $p < 0.05$ ) (**Table 3**).



**Table 3.** Significant associations between the types of teaching methodology and the perception of Brazilian medical students regarding remote classes during the COVID-19 pandemic.

Variables		Teaching Methodology			p-value
		Traditional n (%)	Active n (%)	Mixed n (%)	
<b>Perception of the advantages</b>					
Greater student participation in class	No	17 (33.33)	180 (92.31)	40 (41.67)	<0.001
	Yes	34 (66.66)	15 (7.69)	56 (58.33)	
Easy access to teachers (phone and Email)	No	44 (86.27)	133 (68.21)	74 (77.08)	0.021
	Yes	7 (13.73)	62 (31.79)	22 (22.92)	
Greater flexibility and student autonomy	No	10 (19.61)	106 (54.36)	26 (27.08)	<0.001
	Yes	41 (80.39)	89 (45.64)	70 (72.92)	
<b>Perception of disadvantages</b>					
The proximity between student and teacher affected	No	32 (58.18)	170 (87.18)	71 (70.30)	<0.001
	Yes	23 (41.82)	25 (12.82)	30 (29.70)	
Increased distractions during class	No	16 (29.09)	128 (65.64)	41 (40.59)	<0.001
	Yes	39 (70.91)	67 (34.36)	60 (59.41)	
Difficulty committing to studies	No	30 (54.55)	132 (67.69)	40 (39.60)	<0.001
	Yes	25 (45.45)	63 (32.31)	61 (60.40)	
Problems with time and organization	No	36 (65.45)	171 (87.69)	64 (63.37)	<0.001
	Yes	19 (34.55)	24 (12.31)	37 (36.63)	
Greater mental fatigue	No	21(38.18)	119 (61.03)	59 (58.42)	0.009
	Yes	34 (61.82)	76 (38.97)	42 (41.58)	



## Perception of future impact

Better experience in virtual access	<b>No</b>	37 (66.07)	150 (76.92)	64 (63.37)	0.032
	<b>Yes</b>	19 (33.93)	45 (23.08)	37 (36.63)	
Impairment in content training	<b>No</b>	40 (71.43)	163 (83.59)	68 (67.33)	0.003
	<b>Yes</b>	16 (28.57)	32 (16.41)	33 (32.67)	
Comfort provided by online classes in house	<b>No</b>	31 (55.36)	164 (84.10)	60 (59.41)	<0.001
	<b>Yes</b>	25 (44.64)	31 (15.90)	41 (40.59)	
Impact on the professional future by replacing the practical classes not simultaneous with theoretical classes	<b>No</b>	38 (69.9)	155 (79.90)	88 (88.00)	0.016
	<b>Yes</b>	17 (30.91)	39 (20.10)	12 (12.00)	

## Perception of physical distancing

Decreased social interaction	<b>No</b>	14 (25.00)	98 (50.26)	33 (32.35)	<0.001
	<b>Yes</b>	42 (75.00)	97 (49.74)	69 (67.65)	
Dynamics of family life affected	<b>No</b>	41 (73.21)	174 (89.23)	72 (70.59)	<0.001
	<b>Yes</b>	15 (26.79)	21 (10.77)	30 (29.41)	
Higher chance of developing disorders Psychics	<b>No</b>	20 (35.71)	118 (60.51)	36 (35.29)	<0.001
	<b>Yes</b>	36 (64.29)	77 (39.49)	66 (64.71)	
Became more productive by distancing Physicist	<b>No</b>	13 (23.21)	70 (35.90)	20 (19.61)	0.003
	<b>Yes</b>	43 (76.79)	125 (64.10)	82 (80.39)	
Remote classes replace theoretical classes face-to-face	<b>No</b>	21 (38.18)	42 (21.76)	12 (11.88)	0.003
	<b>Yes</b>	34 (61.82)	151 (78.24)	89 (88.12)	
Interfered with your theoretical learning	<b>No</b>	5 (8.93)	7 (3.59)	2 (1.96)	0.024
	<b>Yes</b>	50 (91.07)	188 (96.41)	100 (98.04)	



Increase in theoretical workload	<b>No</b>	24 (42.86)	32 (16.41)	31 (30.39)	<0.001
	<b>Yes</b>	32 (57.14)	163 (83.59)	71 (69.61)	

Univariate analysis. Chi-square tests. p value <0.005.

## 4 DISCUSSION

This study found that most medical students considered remote classes during the COVID-19 Pandemic as regular and brought difficulties in concentration and commitment to studies. The different methodological approaches to teaching influenced the students' perception of the advantages, disadvantages, and future impact of remote classes. On the other hand, the realization of remote classes together with the need for physical distance influenced theoretical learning and generated an increase in the study hours for most students, regardless of the teaching methodology. Another interesting finding was the difference in several items when comparing male and female sixth students.

The COVID-19 pandemic had a significant impact on the educational process, especially in the context of higher-level health courses such as medicine [7,9,11,12]. For the continuity of activities, rapid and unplanned changes from face-to-face to remote teaching were necessary [7,12]. According to Gottardi [13], teaching in the remote format requires self-determination, organization, study schedules, responsibility, and other skills from the student to obtain

adequate and effective learning. Such requirements were identified in the present study as a disadvantage of remote classes in the students' perception. In general, students reported difficulties in concentration and commitment to studies. Greater difficulty in committing to studies, problems with time and organization, and loss of content training were reported by students of mixed methodology.

Other negative factors observed in this study, such as increased distractions during classes, greater mental fatigue, proximity between student and affected teacher, and convenience provided by online classes at home were pointed out by



students of the traditional methodology. As for the positive factors, greater flexibility and autonomy were observed as advantages of remote classes by students of traditional methodology, but not by students of other methodologies. Such findings are consistent with the systematic review study carried out by Sunde et al [14]. The researchers, when evaluating the challenges of remote study in a time of the pandemic, as well as its advantages and disadvantages, concluded that remote teaching is a presupposition of challenges ranging from the acquisition of the necessary material to having access to the technological environment to knowledge and platform management and elaborated didactic content [14].

It is worth mentioning that this whole scenario, the unscheduled changes in teaching and education, has not only created an enormous need for self-discipline on the part of students, but also the desire to seek and gain knowledge [15]. In addition, in the meta-synthesis study carried out by Carmargo et al [7], it was shown that the perception not only of students but also teachers regarding online learning and satisfaction with online tools can be influenced by generational diversities, experience, and personal technological ability [7].

Regarding the influence on theoretical learning, we identified that for most students, regardless of the teaching methodology, remote classes interfered with theoretical learning and generated an increase in the study hours. In contrast, recent data from the World Health

Organization (WHO) showed that a total of 33 studies showed statistically significant data on knowledge gain among medical students whose learning methods were computer-based compared to those allocated to traditional methods of learning [16]. A significant portion of the mixed methodology students in our study reported the perception of greater productivity with physical distancing.

In an observational study carried out with 185 Brazilian university students from five different regions of Brazil, mostly from the Biological/Health area, the analysis of the effects on the teaching and learning process through remote activities was carried out. The results showed that 45.9% of the students considered that their studies were negatively affected, mainly by emotional issues [17].



Considering that in the active teaching methodology, learning is built from an integration of theory with practice and thus corroborates a solid and meaningful learning [18], the data from this study showed a predominant perception among students of active methodology that Remote classes can replace theoretical classes, which was not observed in the students of the other methodologies. As for practical classes, students of traditional methodology were associated with a greater perception that the replacement of these practices not simultaneously with theoretical classes can impact their professional future. Although scholars have identified a positive effect on learning related to clinical skills among medical students who used e-learning systems [19], practical classes provide students with the improvement of technical skills based on the previous study of theory, enable interaction with the patient, family, and multi-professional team and to perform an appropriate ethical-professional posture [20].

The difference between men's and women's perception of remote classes can be considered a characteristic related to gender differences, even observed in studies with medical students even before the pandemic, as in the studies by Tempski et al [21] and Brenneisen et al [22].

This study has some limitations. First, because it is a cross-sectional study, it was not possible to assess the direct relationship between the impact of the COVID-19 pandemic and the real learning with remote classes in the professional future of medical students. Second, the sample was predominantly composed of students from private medical schools, located in the southeastern region of Brazil and with an active and mixed teaching methodology. Therefore, this may limit the generalization of our results to other institutions. The emotional effects of the pandemic itself, with all its insecurity in the future and the loss of loved ones by the disease, also affect the results obtained.

## 5 CONCLUSION

Remote classes were the strategy adopted as an emergency alternative to replacing face-to-face classes and continuity of education and teaching activities in



medical schools as a result of the COVID-19 pandemic. The perception of medical students regarding online learning through remote classes was different among students of traditional, active, and mixed methodology. Thus, a greater or lesser influence of the type of methodological approach to teaching was associated with understanding and, consequently, the realistic perception of medical students regarding remote classes and their advantages, disadvantages, impact on the professional future, and physical/social distance on mental health. . In the future, we believe that an individualized assessment among medical students of different methodological approaches will be necessary if there is a tendency to adopt a hybrid teaching model (face-to-face and remote).

## **ACKNOWLEDGMENT**

Not applicable.

## **ETHICAL APPROVAL**

The study was carried out following the Brazilian National Health Council, Resolution no 466/212, and approved by the Research Ethics Committee of Faculdade Ceres – FACERES (nº 4.169.379). All participants who agreed to participate voluntarily provided their electronic consent before participation.

## **INFORMED CONSENT**

All participants who agreed to participate voluntarily provided their consent before participation.

## **DATA SHARING STATEMENT**

No additional data are available.

## **CONFLICT OF INTEREST**

The authors declare no conflict of interest.

## **SIMILARITY CHECK**

It was applied by Ithenticate@.



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