

# The Impact of Sars-Cov-2 on Educational Climate in Dental Students

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## Research Article

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# Abstract

## Background:

Students' perception of educational climate influences academic performance, and its analysis provides essential information to improve it. To evaluate the perception of 3rd and 5th grade students regarding educational climate, before and during the pandemic. Compare results obtained academic perception of self with institutions in different countries.

## Methods:

A descriptive, cross-sectional study involving dental students, who answered The Dundee Ready Education Environment Measure (DREEM) questionnaire, between March 20 and April 20, 2021. The overall DREEM and its 5 subscales were analyzed, with before and during the pandemic, the perception was "more positive than negative".

## Results:

There were statistically significant differences when comparing the results obtained by 3rd and 5th grade students, before and during the pandemic, with effect magnitude from high to very high. It is noteworthy that 3rd graders have more positive perceptions compared to 5th graders. The 3rd year students felt more strongly the difficulties inherent to the Covid-19 pandemic, while in the 5th year students during the pandemic was less significant compared to the before pandemic period, perhaps due to the fact that they maintain the face-to-face clinical classes. A negative point is associated with the scarce support system for students with stress problems.

## Conclusions:

The educational climate and its subscales are perceived more positively than negatively by students. The Social perception of self-subscale was the most positively evaluated and the student's perception of teachers obtained lower results.

## Background:

The current worldwide pandemic, known as COVID-19, began in Wuhan in China in December 2019. The rapid spread around the world has led to the World Health Organization (WHO) considering this coronavirus epidemic a pandemic on March 11, 2020 and declaring the outbreak a public health emergency of international concern (Ohannessian, Duong et al. 2020).

In this context, several countries have adopted as a response strategy the implementation of social distancing measures, as well as home quarantine and school closures (Tang, Xiang et al. 2021).

School closures have impacted 87% of students worldwide (Araujo, de Lima et al. 2020), confronting the educational community with a new reality and the urgent need to adapt to it. Since the identification of the first positive case of Covid-19 and in line with the recommendations of the Directorate General of Health, several colleges have been forced to close their doors in order to protect the safety of the academic community and prevent the risk of contagion, suspending all on-site classes and replacing them with distance learning through digital platforms. (Tang, Xiang et al. 2021).

Theoretical and practical classes, as well as exams, are now taught by videoconference. Distance learning has posed significant challenges for students, with several studies advocating the negative impact on students' mental health,

particularly college students (Cao, Fang et al. 2020, Zhou, Zhang et al. 2020, Marelli, Castelnovo et al. 2021). The COVID-19 pandemic, caused by SARS-CoV-2, has transformed the lives of higher education students around the world with implications for how students live, work, and study, affecting their physical, mental, and social well-being (Kaparounaki, Patsali et al. 2020, Marelli, Castelnovo et al. 2021).

Stress, feelings of uncertainty, depression and anxiety, sleep disturbances, worries, about career and future, and fear were frequent during confinement (Nijhuis, Segers et al. 2007, Zhou, Zhang et al. 2020, Marelli, Castelnovo et al. 2021).

In order to mitigate the effects of COVID-19 on students' education, schools and universities were required to take a set of measures, arising from the recommendations of the DGS, with direct implications on the educational environment. The use of masks and visors, constant hand disinfection, distance between classmates and teachers, among others, were some of the recommended measures. In this sense, we cannot forget that the perception of the educational environment can influence the students' academic performance, as well as their satisfaction with the educational process, and its analysis can provide important information for its improvement (Nijhuis, Segers et al. 2007, Ostapczuk, Hugger et al. 2012).

The Dundee Ready Education Environment Measure (DREEM) is a quantitative measure of the educational environment, designed to analyze the educational environment specifically in medical universities or other health care fields (Roff, McAleer et al. 1997, Herrera, Pacheco et al. 2010). It is a non-specific tool for a given culture, used universally, enabling its use in a variety of sociocultural contexts (Pimparyon 2000, Roff, McAleer et al. 2001). Therefore, it can be used to evaluate, diagnose, compare with different groups, enabling the analysis of the educational environment, highlighting the positive aspects and eliminating or correcting the negative aspects (Mayya and Roff 2004, Till 2004).

The results will enable recommendations to be made about how students might be better supported in crisis situations in different economic, social, cultural, political, and institutional contexts (Denz-Penhey and Murdoch 2010, Kossioni, Varela et al. 2012). This study aims to evaluate the perception of 3rd and 5th year students of the Mestrado Integrado de Medicina Dentária at the Instituto Universitário de Ciências da Saúde about the Educational Environment before and during the COVID-19 pandemic, comparing the perception of students in preclinical education (3rd year) and students already in clinical practice (5th year). We also aimed to compare the results obtained at IUCS before the pandemic with other educational institutions in other countries where the DREEM questionnaire was used.

## **Methods:**

### **Research Methodology:**

This is a descriptive, cross-sectional study in which data were collected using an assessment instrument, the DREEM questionnaire, applied a single time to each student (Ali, McHarg et al. 2012).

### **Evaluation Instrument:**

The assessment instrument used was the DREEM, Dundee Ready Education Environment Measure. It consists of a questionnaire consisting of 50 closed-ended questions aimed at assessing the learning environment of educational institutions before and during the pandemic (de Oliveira Filho, Vieira et al. 2005, Riquelme, Oporto et al. 2009).

Each of the 50 points fall into five different subscales related to different aspects of the students' perception: Perception of student learning (*LP*), Student's perception of teachers (TP): Academic perception of self (AP); Perception

of the educational environment (AtmP) and Social perception of self (SP) (table 1).

Each of the 50 questions is scored on a Likert-type scale, with five possible answers, expressing the degree of agreement with each statement (4 - strongly agree; 3 - agree; 2 - do not agree/do not disagree; 1- disagree; 0 - strongly disagree). All questions are positive, except for 4, 8, 9, 17, 25, 35, 39, 48, and 50, which are scored differently (Wang, Zang et al. 2009).

The DREEM scale provides scores for each domain, corresponding to the sum of the scores of the corresponding items, and for the total score, equivalent to the sum of the scores for each domain (de Oliveira Filho, Vieira et al. 2005).

The maximum possible scores for the different domains are: LP: 48; TP: 44; PA: 32; AtmP: 48 and SP: 28 (Ali, Raja et al. 2012, Hammond, O'Rourke et al. 2012).

**Table (1)** DREEM subscales, questions, and specific scores.

Dimension	Questions	Maximum Score
LP	1, 7, 13, 16, 20, 22, 24, 25, 38, 44, 47 e 48	48
TP	2, 6, 8, 9, 18, 29, 32, 37, 39, 40 e 50	44
PA	5, 10, 21, 26, 27, 31, 41 e 45	32
AtmP	11, 12, 17, 23, 30, 33, 34, 35, 36, 42, 43 e 49	48
SP	3, 4, 14, 15, 19, 28 e 46	28

The overall score is 200 points, and the closer the score is to this value, the more positive the student's perception of the educational environment (Foster Page, Kang et al. 2012, Hammond, O'Rourke et al. 2012).

The analysis of all the questionnaires was carried out using the average score of all the answers. The average score given to each question allows us to identify in greater detail the positive and negative points of each domain evaluated. The practical guide for the use of the DREEM survey proposed by McAller and Roff (Appendix I) was used to analyze the scores (Herrera, Pacheco et al. 2010, Maria, Paula et al. 2020).

The mean score assigned to each dimension was evaluated according to the practical guide for the use of the DREEM questionnaire proposed by McAleer and Roff. Questions with a mean score  $\geq 3.5$  are considered "excellent educational aspects"; with a mean score between 3.01 and 3.49 correspond to "positive educational aspects"; with a mean score between 2 and 3 correspond to "educational aspects to be improved"; and questions with a mean score  $< 2$  reveal problem areas and, therefore, weak points of the educational environment that need intervention (Wang, Zang et al. 2009).

## Data collection:

Before starting the study, the proposal was submitted to the Ethics Committee of the Instituto Universitário de Ciências da Saúde with CE/IUCS/CESPU-02/21 reference in accordance with the Declaration of Helsinki. After approval, the participants were invited by email to fill out the online questionnaire on a voluntary basis. Before starting the anonymous questionnaire, each participant signs the online informed consent to process the data derived from their

anonymous responses, the first step prior to beginning the filling out of the survey form. The data obtained for this study were anonymous, and all ethical principles regarding data protection were strictly followed.

We asked the 3rd and 5th year students of the Integrated Master of Dental Medicine at the Instituto Universitário de Ciências da Saúde (University Institute of Health Sciences) to fill out the questionnaire.

The questionnaire was conducted through the CESPU Survey platform, surveying 3rd and 5th year students of the Integrated Master's Degree in Dental Medicine of the University Institute of Health Sciences.

Data collection took place between March 20 and April 20, 2021. The sociodemographic information collected from each participating student was age, gender, nationality, and the year they attend.

## Statistical Analysis:

Data were collected and further processed with the help of the statistical program SPSS (Statistical Package for Social Science) version 27 for Windows. The data of the global assessment of the EC, of each subscale and of each item of the DREEM questionnaire were expressed as means and percentages in relation to their maximum score. Based on the methodology applied in previous studies, the percentages of respondents in each of the different categories of interpretation of the EC, the domains, and the individual items were calculated.

To compare the results obtained in the overall EC assessment and in the different subscales between 3rd and 5th grade students, we used the independent t-test; to compare the results before and after COVID, for 3rd and 5th grade students, we used the dependent t-test.

The magnitude of the effect was evaluated using Cohen's d, taking into account the following classification: Insignificant < 0.19; Small 0.20–0.49; Medium 0.50–0.79; Large 0.80–1.29; Very large 1.29 > 1.30 (Note: These values were presented by Cohen (1988, p. 40). Rosenthal (1996) added the classification of "very large").

The significance level was taken as 0.05.

## Results:

### *Sociodemographic Data:*

The sample is made up of 330 students from the Integrated Master's Degree in Dentistry at the IUCS, the minimum age is 19 and the maximum age is 52 ( $25.07 \pm 5.78$ ). 74.8% (n = 247) are between 19–25 years old and 25.2% (n = 83) are between 26 and 52 years old. 35.2% (n = 116) of male participants and 64.8% (n = 214) of female participants.

Concerning nationality, 30% of the respondents are of Portuguese nationality, 16.4% are Spanish, 41.8% are French, 9.7% are Italian, and 2.1% are of other nationalities.

### *Total Score:*

According to Table 2, regarding the analysis of the questionnaire results before the pandemic, the average total score observed is 126.5 with a standard deviation of 24.46. The maximum score recorded is 185 and the minimum score is 26, for a total of 200 points.

Regarding the results achieved during the pandemic, the average total score observed is 124.93 with a standard deviation of 21.46. In this case, the maximum score recorded is 183 and the minimum score is 15.

Table 2  
Overall Educational Climate before and during the pandemic.

	Educational Climate - Before the Pandemic					Educational Climate - During the Pandemic				
	N	Minimum	Maximum	Average	DP	N	Minimum	Maximum	Average	DP
3rd Grade	163	111	185	146,07	13,27	163	105	183	141,07	12,53
5th Grade	167	26	151	107,05	16,5	167	15	146	109,19	16,09
Total	330	26	185	126,55	24,46	330	15	183	124,93	21,46

According to Table 3, with regard to the results obtained before the pandemic, 225 (68.2%) of the participants scored between 101 and 150 points, which reveals a perception of the educational environment "more positive than negative", according to the DREEM interpretation guide proposed by McAleer and Roof (Appendix II). With regard to the data analyzed during the pandemic, 258 (78.2%) individuals had scores between 101 and 150 points, which shows a "more positive than negative" perception of the educational environment.

Table 3  
Analysis of EC before and during the pandemic, in the global sample, according to the DREEM interpretation guide proposed by McAleer and Roof.

Classification	N (%)	
	Before the pandemic	During the pandemic
"Very poor" 0–50 points	2 (0,6%)	2 (0,6%)
"There are many problems" 51–100 points	45 (13,6%)	34 (10,3%)
"More positive results than negative ones" 101–150 points	225 (68,2%)	258 (78,2%)
"Excellent" 151–200 points	58 (17,6%)	36 (10,9%)
Total	330 (100%)	

Nevertheless, according to Table 4, it is possible to verify that with regard to the results obtained from the surveys of 3rd year students, with respect to their opinion before the pandemic, 57 (35%) consider the educational environment "excellent" and 106 (65%) recognize that the EC is "more positive than negative". However, with regard to the period "during the pandemic", only 36 (22.1%) students judge the EC to be "excellent" and 127 (77.9%) recognize that the EC is "more positive than negative".

Table 4

Distribution of the total score 3rd year.

3rd year	Before the pandemic		During the pandemic	
	N	%	N	%
Excellent	57	35,0	36	22,1
More positive results than negative ones	106	65,0	127	77,9
Total	163	100,0	163	100,0

In opposition, according to Table 5, when considering the results obtained from the 5th grade respondents before the pandemic, only 1 (0.6%) student considers "excellent", 119 (71.3%) "more positive than negative", 45 (26.9%) "there are many problems" and 2 (1.2%) "very poor". Regarding the period during the pandemic, 131 (78.4%) students consider the EC "more positive than negative" and 34 (20.4%) report that "there are many problems".

Table 5

5th grade total score distribution.

5th year	Before the pandemic		During the pandemic	
	N	%	N	%
Excellent	1	0,6	0	0
More positive results than negative ones	119	71,3	131	78,4
There are many problems	45	26,9	34	20,4
Very poor	2	1,2	2	1,2
Total	163	100,0	163	100,0

### *3rd year students' perception of the educational climate:*

According to Table 6, we found that the perception of the educational climate of 3rd year dental students had higher mean values before the pandemic, compared to the pandemic, in all subscales, and these differences were statistically significant. The greatest difference concerns the Perception of Student Learning (LP), with a mean value of  $35.67 \pm 3.56$  before the pandemic and  $33.91 \pm 3.65$  during the pandemic, these differences being statistically significant ( $t = 8.45$ ;  $p < 0.001$ ). The smallest difference is related to the Perception of the educational environment with a mean value of  $34.69 \pm 3.68$  before the pandemic and  $33.99 \pm 3.72$  during the pandemic, these differences being statistically significant ( $t = 3.53$ ;  $p < 0.001$ ).

Regarding the educational climate in general, we found higher mean values before the pandemic ( $146.07 \pm 13.27$ ), compared to during the pandemic ( $141.07 \pm 12.35$ ), with these differences being statistically significant ( $t = 8.32$ ;  $p < 0.001$ ).

As for the magnitude of the effect, we found that the subscales Perception of teachers by the student, Academic self-perception, Perception of the educational environment and social self-perception are small, with values ranging

between 0.28 and 0.45. As for the subscales Perception of student learning and Educational Climate, the magnitude of the effect is moderate ( $d = 0.66$  and  $d = 0.65$ ).

Table 6  
Comparison of the different subscales of the educational climate before and during the pandemic in 3rd year dental students (dependent t-test).

	N	Average	DP	Difference of the averages	t	p	d
TP Before	163	29,87	4,35	0,90	5,51	< 0,001	0,43
TP During	163	28,97	4,30				
LP Before	163	35,67	3,56	1,75	8,45	< 0,001	0,66
LP During	163	33,91	3,65				
PA Before	163	24,35	2,83	0,79	5,01	< 0,001	0,39
PA During	163	23,56	2,80				
AtmP Before	163	34,69	3,68	0,69	3,53	< 0,001	0,28
AtmP During	163	33,99	3,72				
SP Before	163	21,49	2,67	0,87	5,81	< 0,001	0,45
SP During	163	20,63	2,62				
EC Before	163	146,07	13,27	5,0	8,32	< 0,001	0,65
EC During	163	141,07	12,35				

#### ***5th grade students' perception of the educational climate:***

According to Table 7, we verified that 5th year dental students' perceptions of their teachers have higher mean values before the pandemic ( $21.63 \pm 3.34$ ) than during the pandemic ( $20.95 \pm 3.97$ ), with these differences being statistically significant ( $t = 2.25$ ;  $p = 0.026$ ).

In relation to the students' perception of learning, they showed higher mean values during the pandemic ( $27.10 \pm 5.46$ ), compared to before the pandemic ( $24.71 \pm 4.31$ ), and these differences were statistically significant ( $t = -6.96$ ;  $p < 0.001$ ). Regarding the Perception about the educational environment, they show higher mean values during the pandemic ( $26.49 \pm 4.86$ ) compared to before the pandemic ( $25.34 \pm 5.17$ ), with these differences being statistically significant ( $t = -2.61$ ;  $p = 0.01$ ). With regard to Academic Self Perception and Social Self Perception, there were no statistically significant differences before and during the pandemic.

As for Educational Climate, we found higher mean values during the pandemic ( $109.19 \pm 16.08$ ), compared to before the pandemic ( $107.50 \pm 16.57$ ), with these differences being statistically significant ( $t = -2.06$ ;  $p = 0.041$ ).

With regard to the magnitude of the effect, we found that in the educational climate, as well as in all subscales, except for the Perception of student learning, the effect is insignificant. In the Perception of student learning, the effect size is moderate ( $d = 0.50$ ).

Table 7  
Comparison of the different subscales of the educational climate before and during the pandemic among 5th year dental students (dependent t-test).

	<b>N</b>	<b>Average</b>	<b>DP</b>	<b>Difference of the averages</b>	<b>t</b>	<b>p</b>	<b>d</b>
<b>TP Before</b>	167	21,6347	3,33900	,30318			
<b>TP During</b>	167	20,9521	3,97099		2,25	0,026	0,17
<b>LP Before</b>	167	24,7126	4,31459	,34312			
<b>LP During</b>	167	27,1018	5,46361		-6,96	< 0,001	0,54
<b>PA Before</b>	167	20,1078	5,57320	,36054			
<b>PA During</b>	167	19,6407	3,55714		1,30	ns	0,10
<b>AtmP Before</b>	167	25,5389	5,17495	,36228			
<b>AtmP During</b>	167	26,4850	4,86301		-2,61	0,01	-0,20
<b>SP Before</b>	167	15,5090	2,73722	,26885			
<b>SP During</b>	167	15,0060	2,61483		1,87	ns	0,15
<b>EC Before</b>	167	107,50	16,57	-2,06			
<b>EC During</b>	167	109,19	16,08		-2,06	0,041	-0,16

Comparison between 3rd and 5th year dental students' perceptions of the educational climate before and during the pandemic:

The data in Table 8 reveal that before the pandemic, 3rd year dental students have higher mean values in the overall Educational Climate and in all subscales compared to 5th year students, and these differences are statistically significant.

The greatest differences are found in the subscales Perception of learning by the student (mean difference = 10.96) and Perception of the educational environment (mean difference = 9.15). The results during the pandemic go in the same direction, with 3rd grade students showing higher mean values in the Global Educational Climate and in all subscales, compared to 5th grade students, with these differences being statistically significant. The greatest differences occur in the subscale Perception of teachers by the student (mean difference = 8.02) and analogously to before the pandemic in the subscale Perception of the educational environment (mean difference = 7.51).

With regard to the magnitude of the effect, it ranged from high to very high, both before the pandemic and after the pandemic.

Table 8

Comparison of the different subscales of the educational climate before and during the pandemic among 3rd and 5th year dental students (independent t-test).

	Year Course	N	Average	DP	Difference of the averages	t	p	d
<b>TP Before</b>	3rd Year	163	29,87	4,35	8,23	19,33	< 0,001	2,13
	5th grade	167	21,63	3,34				
<b>LP Before</b>	3rd Year	163	35,67	3,56	10,96	25,12	< 0,001	2,77
	5th grade	167	24,71	4,31				
<b>PA Before</b>	3rd Year	163	24,35	2,83	4,24	8,68	< 0,001	0,96
	5th grade	167	20,11	5,57				
<b>AtmP Before</b>	3rd Year	163	34,69	3,68	9,15	18,47	< 0,001	2,03
	5th grade	167	25,54	5,17				
<b>SP Before</b>	3rd Year	163	21,49	2,67	5,98	20,11	< 0,001	2,21
	5th grade	167	15,51	2,74				
<b>EC Before</b>	3rd Year	163	146,07	13,27	38,56	234,3	< 0,001	2,27
	5th grade	167	107,50	16,58				
<b>TP During</b>	3rd Year	163	28,97	4,29	8,02	17,61	< 0,001	1,94
	5th grade	167	20,95	3,97				
<b>LP During</b>	3rd Year	163	33,91	3,65	6,81	13,29	< 0,001	1,46
	5th grade	167	27,10	5,46				
<b>PA During</b>	3rd Year	163	23,56	2,80	3,92	11,11	< 0,001	1,22
	5th grade	167	19,64	3,56				
<b>AtmP During</b>	3rd Year	163	33,99	3,72	7,51	15,72	< 0,001	1,73
	5th grade	167	26,49	4,86				
<b>SP During</b>	3rd Year	163	20,63	2,62	5,62	19,50	< 0,001	2,15
	5th grade	167	15,01	2,61				
<b>CE During</b>	3rd Year	163	141,07	12,35	31,88	20,16	< 0,001	2,22
	5th grade	167	109,19	16,09				

***Comparison between 3rd and 5th year dental students' perceptions of the educational climate before and during the pandemic:***

The data in Table 9 reveal that before the pandemic, 3rd year dental students have higher mean values in the overall Educational Climate and in all subscales compared to 5th year students, and these differences are statistically significant.

The greatest differences are found in the subscales Perception of learning by the student (mean difference = 10.96) and Perception of the educational environment (mean difference = 9.15). The results during the pandemic go in the same direction, with 3rd grade students showing higher mean values in the Global Educational Climate and in all subscales, compared to 5th grade students, with these differences being statistically significant. The greatest differences occur in the subscale Perception of teachers by the student (mean difference = 8.02) and analogously to before the pandemic in the subscale Perception of the educational environment (mean difference = 7.51).

With regard to the magnitude of the effect, it ranged from high to very high, both before the pandemic and after the pandemic.

Table 9

Comparison of the different subscales of the educational climate before and during the pandemic among 3rd and 5th year dental students (independent t-test).

	Year Course	N	Average	DP	Difference of the averages	t	p	d	
<b>TP Before</b>	3rd Year	163	29,87	4,35	8,23	19,33	< 0,001	2,13	
	5th grade	167	21,63	3,34					
<b>LP Before</b>	3rd Year	163	35,67	3,56	10,96	25,12	< 0,001	2,77	
	5th grade	167	24,71	4,31					
<b>PA Before</b>	3rd Year	163	24,35	2,83	4,24	8,68	< 0,001	0,96	
	5th grade	167	20,11	5,57					
<b>AtmP Before</b>	3rd Year	163	34,69	3,68	9,15	18,47	< 0,001	2,03	
	5th grade	167	25,54	5,17					
<b>SP Before</b>	3rd Year	163	21,49	2,67	5,98	20,11	< 0,001	2,21	
	5th grade	167	15,51	2,74					
<b>EC Before</b>	3rd Year	163	146,07	13,27	38,56	234,3	< 0,001	2,27	
	5th grade	167	107,50	16,58					
<b>TP During</b>	3rd Year	163	28,97	4,29	8,02	17,61	< 0,001	1,94	
	5th grade	167	20,95	3,97					
<b>LP During</b>	3rd Year	163	33,91	3,65	6,81	13,29	< 0,001	1,46	
	5th grade	167	27,10	5,46					
<b>PA During</b>	3rd Year	163	23,56	2,80	3,92	11,11	< 0,001	1,22	
	5th grade	167	19,64	3,56					
<b>AtmP During</b>	3rd Year	163	33,99	3,72	7,51	15,72	< 0,001	1,73	
	5th grade	167	26,49	4,86					
<b>SP During</b>	3rd Year	163	20,63	2,62	5,62	19,50	< 0,001	2,15	
	5th grade	167	15,01	2,61					
<b>CE During</b>	3rd Year	163	141,07	12,35	31,88	20,16	< 0,001	2,22	
			167	109,19					16,09
		5th grade							

## Discussion:

In this study, we applied the DREEM questionnaire to 3rd and 5th year students of the Integrated Master of Dental Medicine course at the IUCS, in order to assess the educational environment before and during the pandemic and compare the different perceptions between preclinical and clinical students. The purpose of this study is to detect the

positive and negative aspects of the institution, subsequently promoting possible changes that enhance the satisfaction and success of IUCS students. With regard to adherence to the survey, there was a good adherence, similar to several previous studies (Mohd Said, Rogayah et al. 2009, Prashanth and Ismail 2018) with a response rate of 74.1% of the academic population of the IUCS. This fact, may be indicative that students are concerned about the EC in the institution and consider that through the DREEM questionnaire, the institute can verify the main failures, thus seeking to solve them (Whittle, Whelan et al. 2007).

In the present study, the mean total score of the questionnaire, before the pandemic, was 126.5, showing a positive response regarding the EC of the MIMD students of the IUCS. The total DREEM score at our educational institution when compared to the other studies conducted in Germany (Rotthoff, Ostapczuk et al. 2011), India (Thomas, Abraham et al. 2009), Pakistan (Ali, Raja et al. 2012), Spain (Maria, Paula et al. 2020) and Malaysia (Mohd Said, Rogayah et al. 2009), was higher. In contrast, when compared to studies in the universities of New Zealand (Foster Page, Kang et al. 2012) and Oman (Prashanth and Ismail 2018), our institution shows lower total DREEM values, which shows that although IUCS shows positive results, there is always an opportunity for improvement in order to meet the needs of students, providing an even more positive view of students towards the EC. As for the comparative analysis of the DREEM subscales, we can see that similarly to the overall score, the IUCS presents quite positive values. With regard to social self-perception and perception of learning, the IUCS showed very optimistic results, similar to the results obtained in Oman and New Zealand (Foster Page, Kang et al. 2012, Prashanth and Ismail 2018).

With regard to the academic perception of oneself and the perception of the educational environment, the IUCS is one of the institutions with the highest values, allowing us to conclude that the students consider that they are prepared to practice their profession in the future and find in the teaching institute an organized place, and in addition, it provides a calm and relaxed environment during theoretical classes and clinical activity.

In opposition, regarding the perception of the student in relation to the teachers, our institution has one of the lowest values compared to the other countries (Rotthoff, Ostapczuk et al. 2011, Foster Page, Kang et al. 2012, Prashanth and Ismail 2018), but is still considered to be "going in the right direction". These values can be explained by the fear of the shier students to talk openly with the teachers during the classes, thus inhibiting the sharing of knowledge, which may negatively influence the learning process.

When comparing the values obtained before the pandemic, between preclinical and clinical students, we found that both the overall DREEM values and the values of the different subscales were higher in the preclinical students than in the clinical students, and these differences were statistically significant and with high or very high magnitude of effect. These results may be due to the fact that fifth-year students, since they are in the final phase of the course, a crucial moment in their lives, may show higher levels of anxiety than third-year students. In this regard, the study developed by Bunmi et al. mentions that the transition from pre-clinical to clinical practice, despite being reported by students as an exciting learning phase due to changes in the context and responsibilities, is also a source of stress and anxiety among medical students, which may be related to perceptions of preparation for the clinical part (Malau-Aduli, Roche et al. 2020).

The stress factor is the factor that most influences the results obtained from the DREEM questionnaire. The MIMD is a very intense course and at the same time, very stressful, with numerous theoretical and practical assessments, which cause anxiety in students. This is particularly pronounced during the various stages of training, whether preclinical or clinical, however, it is considered to be higher when it comes to caring for the health of "flesh and blood" patients rather than phantoms with artificial teeth.

As for the period during the pandemic, the results obtained for 3rd year students were lower overall, however, there was still a "more positive than negative" response to the overall EC.

Third-year students felt the differences inherent to the COVID-19 pandemic most notably, with distinct results obtained before and during the pandemic with statistically significant differences. These values can be explained by the fact that they were completely unable to have face-to-face classes at the college, with all classes being held at a distance, through digital platforms. Therefore, they were consequently unable to be physically with friends, professors, causing a negative impact on the students' lives. Negative feelings of frustration, anxiety, anger, and boredom ended up being more frequent in the lives of these students, causing a more negative view of the EC during the pandemic.

It should be noted that the greatest difference in this group of students was reflected in the perception of learning, with lower mean scores during the pandemic compared to before the pandemic. This result may be justified by the negative view of these students, which made them consider that education did not help them develop skills for their future as dentists. In this sense, the study developed by Ahmad et al. states that although videoconferences and educational blogs are an asset in disseminating theoretical knowledge, we cannot neglect that clinical courses are designed primarily to ensure students' competence in routine medical-dental procedures. These clinical skills and expertise cannot be optimally obtained without a supervised patient treatment experience, and significant disruption of the educational process can adversely affect the development of students' competencies (Jum'ah, Elsalem et al. 2020).

In contrast, the impact of SARS-cov-2 on 5th year students during the pandemic turned out to be less significant, and in comparison, to the period before the pandemic, higher values were registered. These values may be justified by the fact that, despite the pandemic situation, the teaching activity continued, with face-to-face classes at the CESPU Clinical Unit. Despite all the imposed rules, 5th year students, when attending face-to-face classes, end up having the opportunity to socialize with their course mates, with the teachers and assistants at the clinic, or even with the patients, thus promoting a better perception of the educational environment at the faculty.

The Covid-19 pandemic caused a drastic change in the students' lives, causing a rather negative impact on the students' lives. However, despite this negative view, 5th year students started seeing patients in the clinic for the first time, after a long 3 years of pre-clinical teaching, perceiving the fear of making mistakes and the responsibility that this implies and in opposition to the fulfilment of being able to perform what they have learned during their course in the educational institution.

Another hypothesis that may explain these values is the fact that students attended internships in hospital clinics and community oral health clinics, thus providing resources that increase students' self-confidence and strengthen their social relationships among students, teachers and patients. This assumption is supported by the results obtained in the LP subscale, since mean values for the perception of learning during the pandemic were higher than those obtained before the pandemic.

## **Conclusion:**

The perception of the educational climate of 3rd year dental students shows higher mean values before the pandemic compared to during the pandemic in all subscales, unlike 5th year students who showed higher mean values during the pandemic compared to before the pandemic. During the pandemic, 3rd graders' scores were lower overall than before the pandemic, yet there was a "more positive than negative" response to the overall EC. Third graders felt most acutely the difficulties inherent in the Covid-19 pandemic. The impact of SARS-COV-2 on 5th graders during the pandemic was less significant compared to the period before the pandemic. Compared to other countries, Portugal (IUCS) shows very positive values. Overall, the EC and its subscales are perceived more positively than negatively by

IUCS MIMD students. The subscale related to social perception was the most positively evaluated. On the other hand, the perception of teachers was the one with the lowest scores, but still more positive than negative. Regarding the academic self-perception and the perception of the educational environment, the IUCS is one of the institutions with the highest values, allowing us to conclude that students consider that they are prepared to practice their profession in the future and find the educational institution an organized place, providing a calm and relaxed environment during theoretical classes and clinical activity.

## **Declarations:**

### **Ethics approval and consent to participate**

The study has been performed in accordance with the Declaration of Helsinki. The ethical committee for the Instituto Universitário de Ciências da Saúde (CESPU), approved this noninterventional study for the information with CE/IUCS/CESPU-02/21 reference.

### **Consent for publication**

Not applicable.

### **Availability of data and materials**

The data that support the findings of this study are available from Dra M. Relvas but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of Instituto Universitário de Ciências da Saúde.

### **Competing interests**

The authors declare that they have no competing interests.

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### **Authors' contributions**

MR: Data Collection/Analysis/Interpretation; Drafting the Article; Approval of the Article. GMP: Data Analysis/Interpretation; Critical Revision of the Article; Approval of the Article. SF: Data Analysis/Interpretation; Drafting the Article; Approval of the Article. LJP, VAS Concept/Design, Statistics; Drafting the Article; Approval of the Article. CC: Statistics; Approval of the Article. RC: Concept/Design; Statistics; Critical Revision of the Article; Approval of the Article. MR, RC: Concept/Design; Statistics; Critical Revision of the Article. All authors have read and approved the manuscript.

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