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**Enfrentar A Covid-19: Determinar Quais Atividades Fornecem O Melhor Coping Com O
Isolamento Durante A Pandemia**

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**Facing COVID-19: Determining Which Activities Best Help To Cope With Isolation
During The Pandemic**

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Resumo:

Introdução:

A pandemia por COVID-19 que o mundo enfrenta atualmente, é um grande desafio que impôs alterações do estilo de vida a uma escala global. Como tal, adquire grande relevância determinar os mecanismos de *coping* com maior efeito na saúde mental das pessoas durante este período.

Objectivos:

Com o presente estudo pretendemos determinar quais os factores com efeito significativo na saúde mental dos estudantes da Faculdade de Medicina da Universidade de Coimbra (FMUC).

Métodos:

Foi criado e distribuído pelos 6 anos do curso um questionário sobre as atividades realizadas pelos estudantes durante a pandemia, assim como o Questionário de Saúde do Paciente-4 (PHQ-4). Os dados obtidos foram submetidos a análise.

Resultados:

Determinamos que, durante a pandemia, a satisfação académica ($p \leq 0.001$), a prática de arte ($p=0.003$), a leitura ($p=0.017$) e o exercício físico em casa ($p=0.019$) se associavam a níveis mais baixos de *distress*. Por sua vez, a jardinagem ($p=0.035$), o *binging* ($p=0.001$) e o consumo de *media* ($p=0.004$) estavam associados a níveis mais elevados de *distress*. Estudantes dos anos clínicos (4º ao 6º) mostraram estar mais satisfeitos com o seu desempenho académico ($p=0.05$) e ter níveis de *distress* mais baixos ($p=0.003$).

Discussão:

Estes resultados podem ser explicados pelo facto de que a satisfação académica dos estudantes de medicina tem um papel de relevo para a sua saúde mental. Enquanto que os métodos de *coping* positivos estavam associados a níveis mais baixos de *distress*, métodos negativos associavam-se a níveis mais elevados de *distress*. Embora a jardinagem e o consumo de *media* também tenham mostrado associação a níveis de *distress* mais elevados, isto poderá dever-se ao facto de serem mais praticados em estudantes que já sofrem de níveis mais elevados de *stress*, uma vez que estas atividades são geralmente consideradas métodos de *coping* positivos em estudos prévios.

Conclusão:

Concluimos que a prática de arte, a leitura e o exercício físico em casa devem ser promovidos para ajudar a melhorar a saúde mental dos estudantes de medicina, e que deve ser dada mais atenção ao apoio dos estudantes em como enfrentar o seu desempenho acadêmico e a evitar o *burnout*, incluindo mais experiências clínicas durante o curso.

Palavras-Chave: Adaptação Psicológica; COVID-19; Estudantes de Medicina; Questionário de Saúde do Paciente; Saúde Mental

Abstract:**Introduction:**

The COVID-19 pandemic is one of the greatest challenges the world has ever faced and completely changed the way people live on a global scale. It is important that we determine which types of coping activities had the best effect on people's mental health during this period.

Objective:

The goal of our study was to determine what factors significantly affected the mental health of Coimbra University Faculty of Medicine (FMUC) students.

Methods:

A questionnaire about what activities students performed during the pandemic coupled with the Patient Health Questionnaire-4 (PHQ-4) scale was distributed between the 6 academic years and the collected data was then analyzed.

Results:

We found that academic satisfaction was associated to lower distress levels in students during the pandemic ($p \leq 0.001$). The activities practicing art ($p=0.003$), reading ($p=0.017$) and indoor exercise ($p=0.019$) were associated to lower levels of distress, while bingeing habits ($p=0.001$), media consumption ($p=0.004$) and gardening ($p=0.035$) were associated to higher levels of distress. Furthermore, students in clinical years (4th to 6th) were overall more satisfied with their academic performance ($p=0.05$) and had lower distress levels ($p=0.003$).

Discussion:

These results could be explained by the fact that medical students are very concerned with their academic situation, making it one of the heaviest factors that affects their mental health. The activities that positively affected students' mental health were all positive coping methods, while negative coping methods were associated to higher levels of distress. Meanwhile, while gardening and media consumption were also associated to higher distress levels, this could be due to the fact that they are more frequently practiced in students that already suffer from higher levels of stress since these activities are generally referenced as positive coping methods in existing studies.

Conclusion:

These findings lead us to conclude that practicing art, reading and indoor exercise should be promoted to help improve the mental health of medical students and that more attention should be given to helping students better manage their academic performance and avoid burnout, including introducing more clinical experiences throughout their course.

Keywords: Coping Strategies; COVID-19; Mental Health; Patient Health Questionnaire; Students, Medical

Introduction:

In March of 2020 COVID-19 was declared to be a pandemic by the World Health Organization and it has proven to be one of the greatest challenges the world has faced in the last century by far. Not only has it resulted in a massive death toll but it has also had a major impact on the mental health of society on a global scale as well.^[1-20]

Practically every aspect of daily life has been changed due to the pandemic. The necessity for social distancing and isolation has birthed the demand for alternative methods of communication, education, and work, as well as ways to cope with this new reality.^[3-10]

Previous studies have covered the effectiveness of coping strategies but they mostly studied the different types of coping, for example “positive versus negative coping”, rather than specific activities, such as “reading versus exercise”. As such, there are few articles about which specific activities can act as protective factors against psychological distress. Furthermore, the challenges that communities around the world are now facing might even create some positive psychological changes and the development of new coping skills that can be beneficial for mental health not only during the current health crisis but in the future as well.^[3,4,8] As such, it is important to determine which activities being adopted during this period have the ability to create the most impact on people’s lives.

These previous studies have determined that activities that potentiate communication, positive coping, and access to city services can decrease loneliness. For example, using technology as an alternative for socialization can be a good coping mechanism for isolation. Psychological support, social and familial support, and access to news about the state of the

pandemic are also recommended. Coping strategies that focus on resilience, acceptance, positivity, self-compassion, spirituality, self-distraction, personal health and forward planning have also had positive effects according to various studies. Finally, the importance of making professional psychological support easily accessible either in person or through telemedicine has been determined to be very important in multiple studies.^[3-9, 11-17]

These same studies have shown that not utilizing proper coping mechanisms can place people at a higher risk of developing detrimental mental health conditions such as depression, anxiety, traumatic stress, somatization, insomnia, suicidal ideation, and burnout, especially among those directly connected to the field of healthcare. In particular, medical students are an important part of the field of healthcare and the experience that they gather as students can heavily impact their performance in their professional lives. As such, more studies should look into the stressors and coping mechanisms utilized by medical students. For example, some studies have shown that healthcare workers with more years of experience and the perception of appropriate training can better cope with the increased levels of stress during crises periods. By extension, medical students who are in senior college years and have had better academic satisfaction will also be more likely to be able to cope with periods of increased stress such as the current pandemic. Furthermore, many other factors such as prior physical and mental health conditions, age, habitation conditions, socioeconomic conditions, placement in quarantine, gender, and the availability of services should also be taken into account.^[4-21]

Objective:

This study aimed to determine which activities adopted by Coimbra University (UC) medical students since the start of the COVID-19 pandemic have had the best impact on their academic performance and distress.

Methods:

The Patient Health Questionnaire-4 (PHQ-4), which has already been demonstrated to be valid for the Portuguese population, was used to determine the impact on students' mental health.^[21] A new questionnaire about activities, coping mechanisms, and academic satisfaction was created through the process of discussion and review with several colleagues and the project coordinator. The questionnaire was distributed throughout all 6 academic years of the UC medical school with the assistance of the Student Council

("Comissão de Curso") for each year via their respective social network groups. The questionnaire was distributed digitally using Google Forms and also included an Informed Consent page at the beginning.

Afterwards, descriptive and nonparametric statistics were performed using the IBM SPSS Statistics 27 program. Significance was defined as $p < 0.05$.

Differences in gender were analyzed using the Mann-Whitney test and then individually studied using Spearman's correlation test.

To study the differences between academic years the Kruskal-Wallis test was applied for the ordinal variables and the Chi-Square test was used when studying the nominal variables.

The Kolmogorov-Smirnov test was used to determine the distribution of the variable "Distress".

Afterwards, to study the variable "Distress" the Mann-Whitney test was used when studying nominal data with 2 grouping values, the Kruskal-Wallis test was used for nominal data with more than 2 grouping values, and Spearman's correlation test was used for ordinal data.

The variables "Are you happy with your current academic situation?" and "Are you satisfied with your academic performance this year?" were studied using the Mann-Whitney test for ordinal data and the Chi-Square test was used when studying nominal variables. The variables "Do you think the pandemic affected your academic performance?" and "In your opinion, do you think the pandemic affected your mental health?" were studied using the Kruskal-Wallis test for ordinal data and the Chi-Square test was used when studying the nominal variables.

Results:

A total of 126 students answered the questionnaire, of which 104 were female and 22 were male (no student chose the "other" option given at the start of the questionnaire). No incomplete answers were registered. The variable "Distress" was created during data analysis and represents the overall distress score of the PHQ-4 answers, categorized as the sum of the 4 questions of the PHQ-4 scale (from 0 for "Not at all" to 3 for "Nearly every day"). Table 1 introduces the results that were obtained.

Table 1. Questionnaire answers

Gender	
Female	104 (83%)
Male	22 (17%)
Total	126 (100%)
What FMUC year are you in?	
1 st	18 (14%)
2 nd	19 (15%)
3 rd	16 (13%)
4 th	22 (17%)
5 th	41 (33%)
6 th	10 (8%)
Are you happy with your current academic situation?	
No	64 (51%)
Yes	62 (49%)
Are you satisfied with your academic performance this year?	
No	51 (40%)
Yes	75 (60%)
Do you think the pandemic affected your academic performance?	
No	28 (22%)
Yes, in a negative way	79 (63%)
Yes, in a positive way	19 (15%)
In the last year have you ever been in prophylactic isolation or quarantine due to being exposed to COVID-19?	
No	86 (68%)
Yes	40 (32%)
"Activities that I've done since the start of the pandemic"	
Taking online courses	
Never or almost never	80 (63%)
Once or twice a week	15 (12%)
Multiple times per week	9 (7%)

Everyday	22 (17%)
Checking for news about the pandemic	
Never or almost never	20 (16%)
Once or twice a week	38 (30%)
Multiple times per week	45 (36%)
Everyday	23 (18%)
Playing videogames	
Never or almost never	88 (70%)
Once or twice a week	19 (15%)
Multiple times per week	13 (10%)
Everyday	6 (5%)
Watching television, movies, TV shows, (YouTube, Netflix, etc.)	
Never or almost never	7 (6%)
Once or twice a week	22 (17%)
Multiple times per week	40 (32%)
Everyday	57 (45%)
Listening to music	
Never or almost never	4 (3%)
Once or twice a week	9 (7%)
Multiple times per week	47 (37%)
Everyday	66 (52%)
Playing board games (such as cards, monopoly, chess, etc.)	
Never or almost never	81 (64%)
Once or twice a week	37 (29%)
Multiple times per week	8 (6%)
Everyday	0 (0%)
Reading (in general)	
Never or almost never	9 (7%)
Once or twice a week	52 (41%)
Multiple times per week	39 (31%)
Everyday	26 (21%)
Practicing an art (such as drawing, painting, writing, cooking, etc.)	

Never or almost never	40 (32%)
Once or twice a week	49 (39%)
Multiple times per week	25 (20%)
Everyday	12 (10%)
Doing physical exercise at home	
Never or almost never	27 (21%)
Once or twice a week	36 (29%)
Multiple times per week	48 (38%)
Everyday	15 (12%)
Doing physical exercise outdoors	
Never or almost never	55 (44%)
Once or twice a week	30 (24%)
Multiple times per week	34 (27%)
Everyday	7 (6%)
Doing gardening	
Never or almost never	107 (85%)
Once or twice a week	14 (11%)
Multiple times per week	5 (4%)
Everyday	0 (0%)
Meditating, praying, or any other form of spiritualism	
Never or almost never	68 (54%)
Once or twice a week	33 (26%)
Multiple times per week	12 (10%)
Everyday	13 (10%)
Texting friends or family	
Never or almost never	2 (2%)
Once or twice a week	18 (14%)
Multiple times per week	30 (24%)
Everyday	76 (60%)
Calling friends or family	
Never or almost never	6 (5%)
Once or twice a week	26 (21%)
Multiple times per week	33 (26%)

Everyday	61 (48%)
Video-calling friends or family	
Never or almost never	17 (13%)
Once or twice a week	38 (30%)
Multiple times per week	38 (30%)
Everyday	33 (26%)
Doing household chores	
Never or almost never	4 (3%)
Once or twice a week	34 (27%)
Multiple times per week	44 (35%)
Everyday	44 (35%)
Binging (on sweets, junk food, sodas, alcohol, etc.)	
Never or almost never	58 (46%)
Once or twice a week	29 (23%)
Multiple times per week	24 (19%)
Everyday	15 (12%)
What about are your smoking habits?	
I don't smoke	116 (92%)
Same as before	4 (3%)
I smoked less	3 (2%)
I smoked more	3 (2%)
Did you contact a health professional due to suspected symptoms of COVID-19?	
No	105 (83%)
Yes	21 (17%)
Did you contact a health professional due to symptoms of anxiety or depression?	
No	105 (83%)
Yes	17 (13%)
Yes, regularly	4 (3%)
Did you adopt/buy a new pet in this period?	
No	111 (88%)

Yes	15 (12%)
Did you already have pets at home?	
No	53 (42%)
Yes	73 (58%)
In this time period, what were your living arrangements?	
I lived with family	94 (75%)
I lived alone	17 (13%)
I lived with friends	15 (12%)
Mental health auto-evaluation (PHQ-4)	
Feeling nervous, anxious or on edge	
Not at all	25 (20%)
Several days	66 (52%)
More than half the days	23 (18%)
Nearly every day	12 (10%)
Not being able to stop or control worrying	
Not at all	30 (24%)
Several days	53(42%)
More than half the days	33 (26%)
Nearly every day	10 (8%)
Little interest or pleasure in doing things	
Not at all	30 (24%)
Several days	54 (43%)
More than half the days	22 (17%)
Nearly every day	20 (16%)
Feeling down, depressed or hopeless	
Not at all	38 (30%)
Several days	52 (41%)
More than half the days	24 (19%)
Nearly every day	12 (10%)
In your opinion, do you think the pandemic affected your mental health?	

No, not at all	28 (22%)
Yes, in a negative way	91 (72%)
Yes, in a positive way	7 (6%)
Distress (numerical)	
0	14 (11%)
1	7 (6%)
2	12 (10%)
3	14 (11%)
4	26 (21%)
5	9 (7%)
6	6 (5%)
7	13 (10%)
8	9 (7%)
9	4 (3%)
10	5 (4%)
11	0 (0%)
12	7 (6%)

Differences were found between genders for the activities “Playing videogames” ($p < 0.001$), “Watching television, movies, TV shows, (YouTube, Netflix, etc.)” ($p = 0.001$) and “Reading (in general)” ($p = 0.037$). However, when studied separately these activities had no significant effects on distress levels in the male group ($p > 0.05$ for each correlation). In the female group, only “Watching television, movies, TV shows, (YouTube, Netflix, etc.)” ($p = 0.001$) and “Reading (in general)” ($p = 0.018$) had a significant correlation with distress levels. Consuming media had a positive correlation with distress levels (correlation coefficient of 0.332) and reading had a negative correlation (correlation coefficient of -0.231).

Meanwhile, the year in which FMUC students were in had significant differences for the variables “Are you satisfied with your academic performance this year?”, “Playing board games (such as cards, monopoly, chess, etc.)”, “Doing household chores”, “Did you contact a health professional due to suspected symptoms of COVID-19?”, and “Distress” (Table 2).

Students in the 2nd year played board games the most frequently, while students in the 6th year played board games the least. On the other hand, students in the 6th year did household chores the most frequently while the 1st year students did household chores the least.

Furthermore, distress levels were consistently higher in the pre-clinical years (1st, 2nd and 3rd) compared to the clinical years (4th, 5th and 6th). The year with the highest distress level was the 3rd year and the year with the lowest distress level was the 6th. Academic satisfaction had an overall more positive appreciation in the 2nd, 4th, 5th and 6th years. Meanwhile, academic satisfaction had a higher negative appreciation in the 1st and 3rd years. On the other hand, students in the 1st, 2nd, 3rd, 4th and 5th years had to contact a health professional for COVID-19 type symptoms less frequently compared to the 6th year students.

Table 2. Variables with significant differences, according to FMUC year

What FMUC year are you in?	1 st year mean rank	2 nd year mean rank	3 rd year mean rank	4 th year mean rank	5 th year mean rank	6 th year mean rank
Playing board games (such as cards, monopoly, chess, etc.) *p=0.002	61.92	86.84	73.31	61.82	53.06	52.8
Doing household chores *p=0.029	51.89	71.87	80.06	54.14	58.52	83
Distress *p=0.003	76.08	76.82	81.59	63.32	49.71	43.55
What FMUC year are you in?	1 st year	2 nd year	3 rd year	4 th year	5 th year	6 th year
Are you satisfied with your academic performance this year? *p=0.05						
No	11	8	9	10	12	1
Yes	7	11	7	12	29	9
Did you contact a health professional due to suspected symptoms of COVID-19? *p=0.04						
No	16	16	12	21	35	5
Yes	2	3	4	1	6	5

Distress was determined to have a non-normal distribution ($p < 0.001$), so non-parametric tests were used.

Distress levels were determined to have significant differences for the variables “Are you happy with your current academic situation?”, “Are you satisfied with your academic performance this year?”, “Do you think the pandemic affected your academic performance?”, “In your opinion, do you think the pandemic affected your mental health?”, “Watching television, movies, TV shows, (YouTube, Netflix, etc.)”, “Reading (in general)”, “Practicing an art (such as drawing, painting, writing, cooking, etc.)”, “Doing physical exercise at home”, “Doing gardening”, and “Binging (on sweets, junk food, sodas, alcohol, etc.)” (Table 3).

Students who were happy with their academic situation had significantly lower distress levels compared to those who weren't. Similarly, students that were satisfied with their performance had lower distress levels. Students who felt that the pandemic didn't affect their academic performance had lower distress levels compared to students who felt that the pandemic negatively affected their performance. On the other hand, those who replied that the pandemic had affected their performance in a positive way had similar distress levels to those who felt the pandemic didn't affect their performance.

Students who felt that the pandemic didn't affect their mental health had much lower distress levels compared to those who felt that the pandemic had negatively affected their mental health. The students who felt that the pandemic had positively affected their mental health also had lower distress levels than the students who felt that the pandemic affected their mental health negatively but their distress levels were higher than the students who didn't feel their mental health had been affected.

The activities “Watching television, movies, TV shows, (YouTube, Netflix, etc.)”, “Doing gardening” and “Binging (on sweets, junk food, sodas, alcohol, etc.)” had a positive correlation with distress levels. On the other hand, “Reading (in general)”, “Practicing an art (such as drawing, painting, writing, cooking, etc.)” and “Doing physical exercise at home” had a negative correlation with distress levels.

Table 3. Variables with significant differences, according to distress levels

Distress	Mean rank
Are you happy with your current academic situation? *p=0.001	
No	74.34
Yes	52.31
Are you satisfied with your academic performance this year? *p<0.001	
No	85.8
Yes	48.33
In your opinion, do you think the pandemic affected your mental health? *p<0.001	
No, not at all	30.04
Yes, in a negative way	75.19
Yes, in a positive way	45.43
Do you think the pandemic affected your academic performance? *p<0.001	
No	41.41
Yes, in a negative way	76.57
Yes, in a positive way	41.71
Distress	Correlation Coefficient (ρ)
Watching television, movies, TV shows, (YouTube, Netflix, etc.) *p=0.004	0.258
Reading (in general) *p=0.017	-0.213
Practicing an art (such as drawing, painting, writing, cooking, etc.) *p=0.003	-0.262
Doing physical exercise at home *p=0.019	-0.21
Doing gardening *p=0.035	0.188
Binging (on sweets, junk food, sodas, alcohol, etc.) *p=0.001	0.281

Academic satisfaction was studied using two separate questions, “Are you happy with your current academic situation?” and “Are you satisfied with your academic performance this year?” (Table 4).

The question “Are you happy with your current academic situation?” was significantly affected by the variables “Distress”, “Are you satisfied with your academic performance this year?”, “Do you think the pandemic affected your academic performance?”, “Watching television, movies, TV shows, (YouTube, Netflix, etc.)”, and “Did you contact a health professional due to symptoms of anxiety or depression?”.

For the variable “Are you satisfied with your academic performance this year?” students that felt unhappy with their academic situation were more likely to be unsatisfied with their academic performance and students that felt happy with their academic situation were more likely to be satisfied with their academic performance.

For the variable “Do you think the pandemic affected your academic performance?” students who either felt that the pandemic didn’t affect their academic performance or that it had affected their performance positively were more likely to feel happy with their academic situation, while students who felt that the pandemic had affected their performance negatively were more likely to not be happy with their academic situation.

For the variable “Watching television, movies, TV shows, (YouTube, Netflix, etc.)” students who answered “No” watched media more often compared to those who answered “Yes”.

Students who felt unhappy with their situation had higher distress levels than students who were happy with their situation.

When answering the question “Did you contact a health professional due to symptoms of anxiety or depression?” students who responded “No” were more likely to feel happy with their academic situation, whereas students that answered “Yes” or “Yes, regularly” were more likely to be unhappy with their situation.

The question “Are you satisfied with your academic performance this year?” was significantly affected by the variables “Are you happy with your current academic situation?”, “Do you think the pandemic affected your academic performance?”, “In your opinion, do you think the pandemic affected your mental health?”, “Distress”, “What FMUC year are you in?”, “Watching television, movies, TV shows, (YouTube, Netflix, etc.)”, and “Binging (on sweets, junk food, sodas, alcohol, etc.)”.

Students that felt unsatisfied with their academic performance were also more likely to be unhappy with their academic situation and students that felt satisfied with their performance were also more likely to be happy with their academic situation.

For the variable “Do you think the pandemic affected your academic performance?” students who either felt that the pandemic didn’t affect their performance or that it had affected their performance positively were more likely to feel satisfied with their academic performance, while students who felt that the pandemic had affected their performance negatively were more likely to be unsatisfied with their performance.

For the variable “In your opinion, do you think the pandemic affected your mental health?” students who felt the pandemic didn’t affect their mental health or that the pandemic had affected them in a positive way were more likely to be satisfied with their academic performance. Students who felt that the pandemic had negatively affected their mental health were also more likely to be satisfied.

Students who were unsatisfied with their performance had higher distress levels than students who felt satisfied with their performance. Furthermore, students who felt satisfied with their academic performance were more likely to belong to a more senior year. Students who were unsatisfied with their performance more frequently watched media and also more frequently performed bingeing habits.

Table 4. Variables with significant differences, according to the questions “Are you happy with your current academic situation?” and “Are you satisfied with your academic performance this year?”

Are you happy with your current academic situation?	No	Yes
Are you satisfied with your academic performance this year? *p<0.001		
No	43	8
Yes	21	54
Do you think the pandemic affected your academic performance? *p<0.001		
No	6	22
Yes, in a negative way	54	25
Yes, in a positive way	4	15
Did you contact a health professional due to symptoms of anxiety or depression? *p=0.039		
No	48	57
Yes	13	4
Yes, regularly	3	1
Are you happy with your current academic situation?	"No" Mean Rank	"Yes" Mean Rank
Watching television, movies, TV shows, (YouTube, Netflix, etc.) *p=0.004	72.21	54.51
Distress *p=0.001	74.34	52.31
Are you satisfied with your academic performance this year?	No	Yes
Are you happy with your current academic situation? *p<0.001		
No	43	21
Yes	8	54
Do you think the pandemic affected your academic performance? *p<0.001		
No	3	25

Yes, in a negative way	47	32
Yes, in a positive way	1	18
In your opinion, do you think the pandemic affected your mental health? *p=0.021		
No, not at all	5	23
Yes, in a negative way	43	48
Yes, in a positive way	3	4
Are you satisfied with your academic performance this year?	"No" Mean Rank	"Yes" Mean Rank
Distress *p<0.001	85.8	48.33
What FMUC year are you in? *p=0.003	52.09	71.26
Watching television, movies, TV shows, (YouTube, Netflix, etc.) *p=0.05	70.72	58.59
Binging (on sweets, junk food, sodas, alcohol, etc.) *p=0.015	72.52	57.37

Students were also asked if they thought the pandemic affected their academic performance. The variables “Listening to music”, “Binging (on sweets, junk food, sodas, alcohol, etc.)”, “Distress”, “Are you satisfied with your academic performance this year?”, “Are you happy with your current academic situation?”, and “In your opinion, do you think the pandemic affected your mental health?” were determined to have significant effects on students’ answers (Table 5).

Students that felt that the pandemic didn’t affect their performance listened to music less frequently than students that felt that the pandemic affected their performance negatively. On the other hand, students that felt the pandemic affected their performance positively listened to music the most frequently.

Students that answered “Yes, in a negative way” performed binging habits more frequently than students who answered “No”, while students who answered “Yes, in a positive way” performed binging habits the least.

Students who felt the pandemic didn’t affect their performance had lower distress levels compared to students who felt the pandemic negatively affected their performance. Students who replied that their performance was affected positively had similar distress levels to those who felt the pandemic didn’t affect their performance.

Students who felt the pandemic didn’t affect their performance or that it had affected their performance positively were more likely to feel satisfied with their academic performance, while students who felt that the pandemic had affected their performance negatively were more likely to be unsatisfied with their performance.

Students who felt the pandemic didn’t affect their performance or that it had affected their performance positively were more likely to feel happy with their academic situation, while students who felt that the pandemic had affected their performance negatively were more likely to be unhappy.

Students who felt the pandemic affected their performance negatively were most likely to feel that their mental health was also negatively affected. Students who felt the pandemic didn’t affect their performance were more likely to feel that the pandemic didn’t affect their mental health. Students that felt the pandemic affected their performance positively were more likely to feel that the pandemic negatively affected their mental health.

Table 5. Variables with significant differences, according to the question "Do you think the pandemic affected your academic performance?"

Do you think the pandemic affected your academic performance?	"No" Mean Rank	"Yes, in a negative way" Mean Rank	"Yes, in a positive way" Mean Rank
Listening to music *p=0.043	49.93	66.81	69.74
Binging (on sweets, junk food, sodas, alcohol, etc.) *p=0.028	60.21	68.87	46.03
Distress *p<0.001	41.41	76.57	41.71
Do you think the pandemic affected your academic performance?	No	Yes, in a negative way	Yes, in a positive way
Are you satisfied with your academic performance this year? *p<0.001			
No	3	47	1
Yes	25	32	18
Are you happy with your current academic situation? *p<0.001			
No	6	54	4
Yes	22	25	15
In your opinion, do you think the pandemic affected your mental health? *p<0.001			
No, not at all	15	5	8
Yes, in a negative way	12	70	9
Yes, in a positive way	1	4	2

Students were asked if they thought the pandemic had affected their overall mental health. The variables “Are you satisfied with your academic performance this year?”, “Do you think the pandemic affected your academic performance?”, “Practicing an art (such as drawing, painting, writing, cooking, etc.)”, “Binging (on sweets, junk food, sodas, alcohol, etc.)”, and “Distress” were determined to have a significant effect (Table 6).

Regardless of the affect the pandemic had on their mental health, students were more likely to be satisfied with their performance.

Students who felt the pandemic affected their mental health negatively were more likely to feel their performance was negatively affected. Students who felt the pandemic didn’t affect their mental health were more likely to feel the pandemic didn’t affect their performance. Students that felt the pandemic affected their mental health positively were more likely to feel the pandemic negatively affected their performance.

Students who felt the pandemic didn’t affect their mental health more frequently practiced art compared to students that felt the pandemic affected their mental health negatively. Students who felt the pandemic positively affected their mental health most frequently practiced art.

Students that felt the pandemic negatively affected their mental health practiced binging more frequently than students who felt their mental health wasn’t affected. Students who felt a positive effect on their mental health had the lowest frequency of binging habits.

Students who felt the pandemic negatively affected their mental health had higher distress levels than students who felt their mental health wasn’t affected. Students who felt the pandemic positively affected their mental health also had higher distress levels than students who felt the pandemic didn’t affect their mental health, although this average was still lower than that of students who felt negatively affected.

Table 6. Variables with significant differences, according to the question “In your opinion, do you think the pandemic affected your mental health?”

In your opinion, do you think the pandemic affected your mental health?	No, not at all	Yes, in a negative way	Yes, in a positive way
Are you satisfied with your academic performance this year? *p=0.021			
No	5	43	3
Yes	23	48	4
Do you think the pandemic affected your academic performance? *p<0.001			
No	15	12	1
Yes, in a negative way	5	70	4
Yes, in a positive way	8	9	2
In your opinion, do you think the pandemic affected your mental health?	"No" Mean Rank	"Yes, in a negative way" Mean Rank	"Yes, in a positive way" Mean Rank
Practicing an art (such as drawing, painting, writing, cooking, etc.) *p=0.010	68.8	59.19	92.29
Binging (on sweets, junk food, sodas, alcohol, etc.) *p=0.033	53.57	68.21	41.93
Distress *p<0.001	30.04	75.19	45.43

Discussion:

Out of the studied factors, we determined that being in a clinical year (4th to 6th), academic performance, reading, practicing art and doing physical exercise indoors were associated to lower distress levels.

Reading, art and indoor exercise are considered positive coping methods and are associated to beneficial effects on mental health in existing studies. However, in our study outdoor exercise was not found to have any effect on students' mental health.

Furthermore, the variable that showed the strongest effect on distress in medical students was their academia, since the questions that covered academic satisfaction, academic situation and academic performance all returned a $p \leq 0.001$. No matter the category, students that felt satisfied with their studies had significantly lower distress levels.

Academic satisfaction was also higher for students in clinical years when compared to those in non-clinical years (1st to 3rd). On the other hand, the average distress levels were significantly lower in clinical years in comparison to non-clinical years, with the highest distress level belonging to the 3rd year and the lowest belonging to the 6th year. This association further reinforces the conclusion that academic satisfaction is one of the primary factors directly related to students' mental health. In other words, the more satisfied medical students are with their academic performance, the less distress they experience. Furthermore, the reason students in their clinical years have lower distress levels and higher academic satisfaction could also be due to several other factors. For example, students that have passed the "barrier year" (the 3rd year in FMUC, which bars medical students from progressing to the 4th year if they haven't finished all their subjects up to that point) might have more confidence in their academic capabilities and feel more relaxed about their studies. On the other hand, the "barrier year" condition might explain why students in the 3rd year have the highest distress levels. Meanwhile, distress levels are progressively lower from the 4th to the 5th year and again from the 5th to the 6th year. One explanation for this could be that the more experienced medical students are, the more confident they are in their abilities and thus experience less distress. This could also explain why students in non-clinical years have higher distress levels and lower academic satisfaction, since they do not yet have the clinical experience that their seniors possess.

On the other hand, students who felt that their mental health was not affected or was positively affected by the pandemic were more likely to be satisfied with their academic performance. Similarly, students who felt that the pandemic either didn't affect their academic performance or that it affected their performance positively were also more likely to be

satisfied with their academic performance. And students who reported that the pandemic didn't affect their mental health were also more likely to feel that the pandemic didn't affect their performance. These parallels further strengthen our conclusion that the academic performance of medical students is one of the strongest factors that affects their mental health.

Our data also shows that the more frequently students consumed media, performed gardening and did bingeing habits, the higher their average distress levels were. One explanation for this situation could be that students who already have high levels of distress are more likely to frequently perform these habits. Bingeing, for example, is already considered to be a negative coping habit in existing studies. Meanwhile, students who are very stressed might watch media more frequently as a coping strategy and students who more frequently do gardening might be using this activity as a way to relax and manage their stress levels. Furthermore, students who more frequently consumed media and performed bingeing habits were also more likely to be unsatisfied with their academic performance which further reinforces the idea that academic satisfaction is a key factor to distress in medical students.

Students who contacted health professionals for depression or anxiety were also more likely to be unhappy with their academic situation. This could be due to the fact that students who are already feeling symptoms of these conditions are usually already unhappy with their academic situation.

Interestingly, the students who felt their mental health suffered during the pandemic were also more likely to be satisfied with their academic performance, although the "Yes" to "No" answer ratio was not as high as the students who didn't feel affected. Despite these answers, they were still much more likely to feel that the pandemic had negatively affected their academic performance. This situation could be due to the fact that many of the students who felt like their performance suffered were still able to adapt to the extra stress the pandemic placed on their studies. In other words, although they felt that their studies were affected by the pandemic, they were still somewhat satisfied with their academic performance. Furthermore, students who felt that the pandemic had a negative effect on their studies had higher distress levels and were also the most likely to perform bingeing habits. These students also listened to music more often than the students who felt that the pandemic didn't affect their studies. This could be due to music being used as an aid to study. This possibility is also supported by the fact that students who felt the pandemic affected their academic performance positively listened to music the most frequently. These conclusions also

reinforce the idea that academic performance is a prime factor to the well-being of medical students' mental health.

Continuing this train of thought, bingeing was most frequent in students who felt that their mental health was affected negatively, which further demonstrates how this negative coping mechanism is used in students who are already highly stressed. On the other hand, they were also the group who practiced an art the least frequently, whereas the students who felt that the pandemic had a positive effect on their mental health practiced an art the most frequently. This result, together with the negative correlation practicing art had on distress levels, suggests that this activity could be an effective positive coping mechanism and a protective factor against distress in medical students.

Finally, students who felt that their mental health was negatively affected by the pandemic also had the highest average distress levels. This confirms the efficacy of the PHQ-4 scale in Portuguese medical students.

Conclusion:

Our study shows that the COVID-19 pandemic had an overall negative effect on both the mental health and the academic performance of FMUC students. Although 7 students reported that the pandemic affected their mental health positively, they only represent a small fraction of the alumni (6%).

Our results show that UC medical students were heavily influenced by their academic performance, which makes their academia one of the most important factors to their psychological well-being while in college (the questions that covered academic satisfaction, academic situation and academic performance all returned a $p \leq 0.001$). This promotes the idea that investing in helping students to learn to better recognize and avoid academic burnout can be a very important step moving forwards not just in the current pandemic period we live in but also for future medical students in the post-pandemic era. Furthermore, teaching students methods about how to better face the challenges that their studies can present might help them feel more satisfied with their academic performance.

This study also found that students with more clinical experience were generally more satisfied with their academic performance ($p=0.05$) and experienced less distress overall ($p=0.003$). This promotes the idea that medical students might benefit from being introduced to even more clinical experience throughout their course.

Our study also shows that the impact of the many positive coping methods that are referenced in existing studies can vary in effectiveness according to the context and population in question. Of the activities we included in our questionnaire only reading ($p=0.017$), art ($p=0.003$) and indoor exercise ($p=0.019$) had a direct positive impact on students' mental health, while outdoor exercise had no significant impact at all. As such, practicing art, reading and indoor exercise should be promoted to help improve the mental health of medical students.

Of the studied positive coping methods, only practicing art also showed a significant impact on protecting students' mental health from deteriorating ($p=0.01$). Furthermore, it was the only activity that was associated to an improvement in students' mental health during the pandemic (students who were positively affected by the pandemic had a mean rank of 92.29, whereas students who felt negatively affected had a mean rank of 59.19 and students who didn't feel affected had a mean rank of 68.8). We believe that these findings warrant future studies into how different artistic activities can impact and improve mental health.

On the other hand, our study also confirms how negative coping methods can be directly related to distress levels. In particular, bingeing habits were associated to higher distress levels in medical students ($p=0.001$) and to the deterioration of their mental health ($p=0.033$).

Media consumption and gardening were also associated to higher distress levels ($p<0.05$) but not to the deterioration of mental health ($p>0.05$). This raises the question if these activities could be negative coping methods, positive coping methods used more frequently in students who are already highly stressed, or side-effects of the pandemic. By extension, it can be questioned if reading and indoor exercise are positive coping methods, protective factors of students' mental health, or were significant as a result of the pandemic. Future studies should look to better understand the exact effects that these four activities have.

As for the many other positive coping activities that didn't have any significant effects on students' mental health in our study, we theorize that this could be due to the fact that, even though they individually did not significantly impact the mental health of students, they could have synergic effects with each other and with other activities that were not measurable with our study and should be a point of interest for further research.

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