

A Cross-Sectional Study Investigating The Tools and Resources Australian Medical Students Used to Support Their Mental Health During COVID-19

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Abstract

Background

The mental health of medical students is notoriously poor, and with the additional challenges posed by the COVID-19 pandemic, there has never been greater concern for the wellbeing of the current cohort. This cross-sectional study investigates the impact of coping strategies used by Australian medical students during the COVID-19 pandemic on their mental health improvement, including exercise, using social media, and connecting with family and friends.

Methods

An anonymous questionnaire was shared with medical students from all years via Facebook and General Practice Students Networks' communications during the COVID-19 pandemic. The impact of a variety of lockdown coping strategies utilised by participants was assessed using SPSS.

Results

There were 321 participants in this study, 69.6% of whom were females, 54.9% in their pre-clinical years, and 70.5% between the ages of 18-24. The results showed that nearly 80% of participants credited their mental health improvement to peri-lockdown strategies. The logistic regression analysis demonstrated that reading (non-medical books) and spending more time with family were the most notable peri-lockdown strategies associated with mental health improvement. Interestingly, some coping strategies made some participants more "demotivated" and were in fact more "addictive" which "took away from study time", especially video games, TV series and movies.

Conclusion

In quantitatively and qualitatively illustrating the impact of peri-lockdown coping strategies, we hope that medical faculties and mental health support networks within medicine may more appropriately tailor support and resources for students, not only in this time of hardship, but also for the many challenges ahead of all medical students. More specifically, medical faculty leads could explore the possible implementation of small reminders in the course curriculum, i.e. at the end of lecture and study material, to remind students to take breaks from studying, through reading and/or spending more time with family.

Background

Before the beginning of the COVID-19 pandemic, medical students experienced poorer mental health outcomes than the general population. They have consistently shown higher rates of depression, anxiety, stigmatisation and are less likely to seek help than their peers in the same age cohort (1). Factors which contribute to a medical student's stress load include time and performance pressures that emerge from high coursework and study demands alongside long clinical placements hours (2, 3). A lack of

appropriate support and unaddressed poor mental health can continue to run its course, resulting in high rates of burnout, substance abuse and suicidal ideation in students (1).

The COVID-19 pandemic has shown to have worsened existing mental health conditions (4), making medical students an especially vulnerable population. Long-term social distancing and the lack of on-campus teaching resulted in a loss of peer interaction and social connectedness in medical students with additional financial strain many students may face due to the reduction in part-time work (5). The pause of clinical placements also resulted in a reduction in bedside teaching opportunities and clinical experience. For medical students who continued with clinical placements, the lack of adequate personal protective equipment (PPE) and risk of COVID-19 exposure carried additional anxiety and uncertainty which further contributed to mental health issues (6).

It has long been established that stress management interventions such as mindfulness-based stress reduction interventions and stress management courses were associated with significant positive effects on medical students' psychological health that include general psychological distress, stress, anxiety and depression symptoms compared with no intervention (7). The medical student literature also further supports that effective strategies such as participating in self-care activities such as healthy diet and exercise (8), having social support networks (9) and engaging in fulfilling interpersonal relationships (8) have served as protective factors against stressful and emotional situations recent challenging times have posed. A recent study has shown that in particular, video chats and social media apps were amongst the most commonly reported strategies medical students used to support their mental health during COVID-19 (10).

As the effects on the pandemic continue to endure into the foreseeable future, it is becoming ever so important to assess and monitor the mental wellbeing of medical students over time and determine the future prospects of coping strategies and tools medical students can benefit from in the long run. This study adds to the current gap in medical literature by shedding light on the impact of various coping strategies used by students and whether these coping strategies played a role in supporting (or worsening) the mental health of students during the pandemic. More importantly, this study will provide medical faculties with a clearer picture on the extracurricular activities students enjoy partaking in.

Methods

Objectives

We aimed to investigate the tools and resources utilised by Australian medical students for support of their mental health during the COVID-19 pandemic.

Design

A cross-sectional study

Participants

321 Students currently enrolled in Australian medical programs from 21 different institutes were recruited for the study. Recruitment was performed via social media groups on Facebook and General Practice Students Network (GPSN) communications. The primary inclusion criteria was experience of a “lockdown” period, defined as a period of time wherein individuals were only permitted to leave their home for essential reasons.

Data collection

Participants received the study information sheet and consent form (see Appendix B) via email or via message through their social media accounts. They were then given 2 months to complete an online Google Forms survey, sent as a URL link, comprising 17 questions pertaining to their mental health experiences during COVID-19 lockdowns (full list of questions available from Appendix A). These questions were self-developed and pilot-tested with a group of 20 participants, and included both multiple choice and short answer formats.

Participation was strictly voluntary: all participants were informed of their right to withdraw from the study at any point in time prior to submission of the survey. Incomplete survey responses were not able to be submitted, and thus excluded from data analysis; survey completion therefore implied consent. Responses were de-identified thereafter to preserve confidentiality.

Data Analysis:

The independent variables included age, sex, mental health condition status, coping strategy number and type, persistence of coping strategy post-lockdown and change of coping strategy between lockdowns. Coping strategies were selected for analysis based on their established efficacy in influencing mental health status (7–10), and prevalence of their use during lockdown (11). The dependent variable was whether or not participants’ mental health improved over lockdown.

Quantitative Analysis

Survey data was analysed using the Statistical Package for Social Science (SPSS) version 28.0.0.0. This involved performing descriptive analysis of survey results, and logistic regression of the predictors of mental health improvement (age, sex, mental health condition status, coping strategy number and type, persistence of coping strategy post-lockdown and change of coping strategy between lockdowns) after interventions.

Qualitative Analysis

Survey data was analysed thematically: open-ended responses from survey questions (Q10,11,13–17, see Appendix A) were annotated and highlighted for key words and analytical themes and subthemes were identified inductively with open coding. Subthemes and themes were processed iteratively using spreadsheets, mind maps and note thinking until themes were well-defined and apparent with any

discrepancies involved. 3 independent researchers conducted analyses independently and then collaboratively until consensus on key themes and categories was achieved.

Ethical Considerations

Ethics approval was received (see Declarations), and the procedure was conducted in accordance with the principles designated by the Declaration of Helsinki. Participants were informed that the survey may be distressing to individuals who struggled with mental health during the COVID-19 pandemic, and that they retained the right to freely withdraw from the survey at any point in time prior to survey submission. Emergency help numbers were provided on the consent form and on the bottom of the survey. Participants were also informed of the anonymity and confidentiality of their responses

Data Management & Sharing

All data was kept anonymous and confidential to the primary investigators and only involved the use of Excel and SPSS to analyse the statistics from the survey responses. All data was stored in the secure Bond University Network and will be deleted after five years.

Results

According to the Medical Deans 2019–2020 Student Statistics Report, there were 17752 total medical students enrolled in Australia in 2020. Therefore, the population size of this research is 17,752 people. Using the Australia Bureau of Statistics sample size calculator, for a confidence level of 95%, a confidence interval of 0.05 in a population of 17,752 people, we require 377 completed responses from participants. A total sample size of 321 participants from 21 institutes was obtained. A variety of universities were represented in this study. Notably, the University of Queensland (49, 15.4%), the University of Tasmania (37, 11.6%) and Monash University (35, 11%) contributed to the largest number of responses.

Table 1 depicts the demographic characteristics of participants in this study. Most participants were female (222, 69.6%) and 18–24 years old (215, 70.5%) followed by 25–30 years old (77, 25.2%). Slightly more than half were in the pre-clinical years of their medical degree (175, 54.9%). The majority of individuals lived in a state that experienced lockdowns (283, 88.7%) and did not have any mental health conditions (236, 74.2%). As shown in Table 2, most participants utilised 5–7 different coping strategies (152, 47.6%) and every person utilised at least one coping strategy. The highest number of coping strategies used by a person was 15. The most commonly used coping strategies were exercise/sports (259, 81.2%) and watching movies/TV shows (251, 78.7%). Spending more time with roommates (73, 22.9%), spending more time with pets (79, 24.8%) and arts and crafts (81, 25.4%) were the least popular coping strategies. Most participants experienced multiple lockdowns (307, 96.5%) but did not change their coping strategies between lockdowns (200, 65.1%). Mental health after using coping strategies was mostly much better (145, 46.9%) followed by somewhat better (98, 31.7%) and no change (66, 21.4%).

290 (90.9%) people are still utilising their coping strategies. The median length of lockdowns experienced by individuals was 60 days with a minimum of 0 and a maximum of 1123.

Table 1
Demographic characteristics of participants

	n (%)
Age (years)	
18–24	215 (70.5)
25–30	77 (25.2)
31–40	11 (3.6)
41+	2 (0.7)
Sex	
Male	94 (29.5)
Female	222 (69.6)
Stage of study	
Pre-Clinical	175 (54.9)
Clinical	144 (45.1)
University	
Queensland	99 (31.1)
New South Wales	76 (23.8)
Melbourne	59 (18.5)
Tasmania	37 (11.6)
Australian Capital Territory	28 (8.8)
South Australia	12 (3.7)
Western Australia	8 (2.5)
Lived in a lockdown state	
No	36 (11.3)
Yes	283 (88.7)
Has mental health condition	
Yes	82 (25.8)
No	236 (74.2)
	Median (min, max)
Length of state lockdown (days)	60 (0, 1123)

	n (%)
Table 2. Coping strategy usage among participants	
	n (%)
Total coping strategy number	
0–4	77 (24.1)
5–7	152 (47.6)
8–15	90 (28.2)
Exercise/sports	
No	60 (18.8)
Yes	259 (81.2)
Board games/puzzles	
No	213 (66.8)
Yes	106 (33.2)
Reading (non-medical books)	
No	170 (53.3)
Yes	149 (46.7)
Met up with friends in-person	
No	205 (64.3)
Yes	114 (35.7)
Spent more time with family	
No	175 (54.9)
Yes	144 (45.1)
Spent more time with roommates	
No	246 (77.1)
Yes	73 (22.9)
Watched movies/TV shows	
No	68 (21.3)
Yes	251 (78.7)
Spent more time with pets	

	n (%)
No	240 (75.2)
Yes	79 (24.8)
Learned new skills	
No	214 (67.1)
Yes	105 (32.9)
Arts and crafts	
No	238 (74.6)
Yes	81 (25.4)
Cooking/baking	
No	186 (58.3)
Yes	133 (41.7)
Cleaning	
No	224 (70.2)
Yes	95 (29.8)
Other	
No	273 (85.6)
Yes	46 (14.4)
Experienced multiple lockdowns	
Yes	307 (96.5)
No	11 (3.5)
Changed coping strategy between lockdowns	
no change	200 (65.1)
mild change	72 (23.5)
significant change	35 (11.4)
Mental health after using coping strategies	
No change	66 (21.4)
Somewhat better	98 (31.7)
Much better	145 (46.9)

	n (%)
Binary Mental health after using coping strategies	
No change	66 (21.4)
Somewhat better/much better	243 (78.6)
Still using coping strategies	
No	29 (9.1)
Yes	290 (90.9)

Table 2
Coping strategy usage among participants

	n (%)
Total coping strategy number	
0-4	77 (24.1)
5-7	152 (47.6)
8-15	90 (28.2)
Exercise/sports	
No	60 (18.8)
Yes	259 (81.2)
Board games/puzzles	
No	213 (66.8)
Yes	106 (33.2)
Reading (non-medical books)	
No	170 (53.3)
Yes	149 (46.7)
Met up with friends in-person	
No	205 (64.3)
Yes	114 (35.7)
Spent more time with family	
No	175 (54.9)
Yes	144 (45.1)
Spent more time with roommates	
No	246 (77.1)
Yes	73 (22.9)
Watched movies/TV shows	
No	68 (21.3)
Yes	251 (78.7)
Spent more time with pets	

	n (%)
No	240 (75.2)
Yes	79 (24.8)
Learned new skills	
No	214 (67.1)
Yes	105 (32.9)
Arts and crafts	
No	238 (74.6)
Yes	81 (25.4)
Cooking/baking	
No	186 (58.3)
Yes	133 (41.7)
Cleaning	
No	224 (70.2)
Yes	95 (29.8)
Other	
No	273 (85.6)
Yes	46 (14.4)
Experienced multiple lockdowns	
Yes	307 (96.5)
No	11 (3.5)
Changed coping strategy between lockdowns	
no change	200 (65.1)
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Mental health after using coping strategies	
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	n (%)
Binary Mental health after using coping strategies	
No change	66 (21.4)
Somewhat better/much better	243 (78.6)
Still using coping strategies	
No	29 (9.1)
Yes	290 (90.9)

Prediction Of Mental Health Improvement By Determinants

Logistic regression analysis in Table 3 demonstrated that the sex of participants, reading (non-medical books), spending more time with family, utilizing other coping strategies not listed in the survey, still currently using the coping strategies, and significantly changing coping strategy between lockdowns were all significant predictors of mental health improvement. All other variables were insignificant.

Table 3
Prediction of mental health improvement by determinants

Variables		Mental Health Improvement OR (95% CI)		
Age	18–24	1		
	25–30	1.822	(0.780	-4.256)
	31–40	2.343	(0.316	-17.396)
Sex	Male	1		
	Female	4.027**	(1.769	-9.168)
Length of state lockdown (days)		0.997	(0.993	-1.000)
Has mental health condition	No	1		
	Yes	1.752	(0.819	-3.747)
Total coping strategy number	0–4	1		
	5–7	0.776	(0.229	-2.633)
	8–15	0.475	(0.044	-5.173)
Exercise/sports	No	1		
	Yes	1.136	(0.419	-3.083)
Board games/puzzles	No	1		
	Yes	1.040	(0.426	-2.538)
Reading (non-medical books)	No	1		
	Yes	2.422*	(1.114	-5.265)
Met up with friends in-person	No	1		
	Yes	0.908	(0.373	-2.211)
Met up with friends virtually	No	1		
	Yes	0.991	(0.411	-2.387)
Used social media to meet/make friends	No	1		
	Yes	2.212	(0.934	-5.239)
Spent more time with family	No	1		
	Yes	3.013**	(1.369	-6.634)

*p < 0.05, **p < 0.01, ***p < 0.001

Variables		Mental Health Improvement OR (95% CI)	
Spent more time with roommates	No	1	
	Yes	1.102	(0.455 -2.670)
Watched movies/TV shows	No	1	
	Yes	0.888	(0.340 -2.320)
Spent more time with pets	No	1	
	Yes	1.639	(0.628 -4.277)
Learned new skills	No	1	
	Yes	2.343	(0.907 -6.056)
Arts and crafts	No	1	
	Yes	0.463	(0.179 -1.203)
Cooking/baking	No	1	
	Yes	0.484	(0.212 -1.103)
Cleaning	No	1	
	Yes	1.334	(0.537 -3.313)
Other	No	1	
	Yes	0.291*	(0.109 -0.780)
Still using coping strategies	No	1	
	Yes	4.141*	(1.304 -13.149)
Changed coping strategy between lockdowns	No change	1	
	Mild change	2.058	(0.807 -5.247)
	Significant change	4.286*	(1.159 -15.847)
χ^2		65.040***	
R^2		32.6%	
*p < 0.05, **p < 0.01, ***p < 0.001			

Females were more likely than males to experience mental health improvement after utilising coping strategies (OR = 4.027, CI = 1.769–9.168, p < 0.01). Coping strategies including reading non-medical

books (OR = 2.422, CI = 1.114–5.265, $p < 0.05$) and spending more time with family (OR = 3.013, CI = 1.369–6.634, $p < 0.01$) significantly improved mental health. However, utilising other coping strategies not listed in the survey was associated with a lower likelihood of mental health improvement (OR = 0.291, CI = 0.109–0.780, $p < 0.05$). Out of the 46 people that utilised other coping strategies not included in the survey, 15 people played video games and 7 people performed meditation/mindfulness. Incorporation of video game and meditation/mindfulness variables into the combined logistic regression analysis was unable to be performed due to insufficient sample size. However, logistic regression analysis of the individual variables revealed that those who did not play video games were 4.632 times as likely to experience mental health improvement (CI = 1.613–13.302, $p < 0.01$). Results were insignificant for meditation/mindfulness.

Participants who were still currently using their coping strategies experienced a higher likelihood of mental health improvement (OR = 4.141, CI = 1.304–13.149, $p < 0.05$). Those who significantly changed their coping strategies between lockdowns were 4.286 times (CI = 1.159–15.847, $p < 0.05$) as likely to have mental health improvement compared to those who did not change their coping strategies. However, no significant differences were found between mild change and no change. Overall, the predictors account for 32.6% of the variance in mental health improvement.

Emergent Themes

4 major themes were identified in the responses of participants.

Theme 1: Feelings before and after coping strategy implementation

Before the employment of coping strategies, lockdown tended to induce feelings of anxiety, boredom, loneliness, depression, sadness, stress, demotivation and isolation. However, a small portion reported already feeling “pretty good”, citing it suited their personalities or allowed them to enjoy personal time.

‘Like a couch potato, like I’m wasting away and days pass without anything memorable happening. Gloom’

For the most part, coping strategies vastly improved mental health and provided peace and clarity to individuals ($n=145$, 46.9%). Individuals became more energetic, healthier and in control.

“Alone, sad, anxious” -> “Relieved, clear-headed”

“Baseline mood fairly low, dejected, helpless” -> “Calmer, more at peace”

However, for some these improvements were more limited and merely reduced the negative impacts of lockdown ($n=98$, 31.7%). Equally, others mentioned that their mental health was only temporarily better and coping strategies acted more as a distraction.

“Burnt out” -> “Burnt out but at least not bored”

A small but significant portion did not experience any improvement at all (n=66, 21.4%). Participants reported feeling “no change”, “neutral” or “similar” after coping strategy implementation. Slight or no improvements appeared to be especially prevalent in those with pre-existing depression or sadness.

'No different, these activities were simple escapes and I do not have family or friends to contact or "hang out with" in my current location'

Contrarily, as some individuals did not view lockdowns as a negative experience, they were also not greatly impacted by their coping strategies.

'Also well - I don't think lockdowns generally were an overly negative experience to begin with, but I know I'd be in the minority'

Theme 2: Numerous benefits of using coping strategies

Participants commonly utilised exercises and workouts to maintain physical health and strength. Fitness goals provide focus to individuals and distract them from the impacts of the pandemic. Participants found that the activities helped them to ‘recharge’ giving them ‘new focus and purpose’

'I got in to running with a friend who lives in my 5km radius, and we worked towards goals such as running a 10km fun run which helped me to take my mind of the situation'

Moreover, mindfulness and wellbeing-focused exercises were commonly used strategies that helped many feel less stressed and led to overall improved mental health. Feelings of self-worth, quality of life and general mental wellbeing were all improved. Strategies enabled users to keep positive and motivated.

'Walking and listening to podcasts helped me to practice mindfulness and stay calm'

Equally, participants enjoyed exploring new hobbies and challenging themselves to produce excitement and a sense of accomplishment. Individuals were able to regain control in life and their perspectives were broadened beyond medicine and COVID-19.

'...accomplishment for creating something, sometimes emotional release...was difficult to do often though because it requires some level of inspiration first'

Social coping strategies provided a method to combat loneliness and boredom which was an important aspect for many participants. Lockdowns offered participants more time to spend with family and roommates.

'...calling friends on discord almost daily was wonderful for connection, jokes and keeping tabs on each other. Spending time with family helped with connection and understanding each other'

Theme 3: The disadvantages and limitations of coping strategies

While coping strategies offered a variety of benefits, they also produced negative consequences. Lack of physical intimacy and interaction was a common problem experienced, with many stating that virtual contact could not match the joys of face-to-face meetups. Online calls to friends & family overseas made some people more homesick.

'Talking does not have the same impact as an in-person catch up. Majority of my friends reside in Melbourne / outside of 5km radius'

The excessive use of computers and online platforms to communicate also led to higher screen time and eye strain. Many individuals got bored of their hobbies which became repetitive and required more motivation to perform.

'TV and movies caused further eye strain on top of Zoom. The board games were short-lasting. They initially were fun and everyone was interested. But the novelty wore off and we stopped playing board games.'

Excessive sedentary activities and the closure of gyms during lockdowns limited the ability of some people to maintain their physical health and weight. While many people still performed exercises at home, they were not as effective as going to the gym.

'Type of exercises were limited as gyms weren't open. Wasn't able to see friends at all. Spent too long watching TV and movies to distract myself from other things.'

Coping strategies often only distracted from underlying mental health issues and decreased the productivity of participants. Some responses stated that the TV shows and movies consumed were too addictive.

'Found it hard to separate work and home life, I probably procrastinated more'

'Sometimes got distracted from important university work'

Theme 4: Changes in coping strategies between lockdowns

The majority of participants did not change their coping strategies between lockdowns (n=200, 65.1%), usually due to the effectiveness of existing strategies.

'The strategies worked, so didn't really change'

A large proportion of participants that changed their coping strategies mentioned that they stopped enjoying games or online calls with their friends as lockdowns progressed.

'Online communication is tiresome, phone calls have a more personable effect'

'Less keen to put in the effort to engage with people online/phone/video'

Some tried new strategies due to the monotony and repetitiveness of previous activities. The mental burden of prolonged and multiple lockdowns required a larger variety of coping methods.

'Got more inventive or exploratory as lockdown dragged on and became very monotonous'

'The second lockdown was much harder and I had to resort to a wider variety of coping mechanisms'

A key to many changes was the realisation that the lockdown would be more long-term. A number of individuals refined their lockdown routines to be more streamlined and productive, focusing on long term academic and physical goals rather than short-term pleasures.

"They changed because I was craving more long term hope and stability. Having more purposeful goals allowed me to see a greater progression and reward for my efforts over time, and meant I always had something to turn to for using up my time while in lockdown."

A small number cited financial reasons for change as they could no longer afford the equipment and resources required for their hobbies.

"I did not want to buy a second paint"

"As a full time student I don't have the income to indulge in many hobbies and interests."

Discussion

Overall, utilising coping strategies vastly improved mental health for 46.9% of participants, and mildly improved for 31.7%. Only 21.4% of individuals did not experience any improvement, indicating that coping strategies were effective for most participants. Being female, reading (non-medical books), spending more time with family, still currently using the coping strategies, and significantly changing coping strategies between lockdowns were all associated with mental health improvement during logistic regression analysis.

Numerous previous studies support the importance of reading for pleasure in the improvement of mental health outcomes. A 2022 study found that reading stories significantly improved the mindfulness, happiness and optimism of students while reducing depression, pessimism and anxiety (12). Berns *et al* performed functional MRI on novel readers and found increases in neural connectivity that allowed the reader to be placed in the protagonist's body (13). Reading exposes individuals to alternative worlds which may divert attention away from the stresses of the pandemic (14).

Equally, spending time with family members is crucial in maintaining mental health. A 2022 study showcased that providing flexible work schedules and allowing increased family time improved job satisfaction and mental health outcomes (15). Many participants in our study mentioned that lockdowns offered them more time to spend with family and roommates which supported them emotionally during

the pandemic. Another cross-sectional study found that possessing social support was one of the most significant preventers of psychological distress in Australian undergraduate medical students (16).

While insignificant in the logistic regression analysis, physical activity was the most common coping strategy utilised by participants (259, 81.2%). Numerous participants commented on the benefits of physical activity for improving both their fitness and mindfulness. Many also exercised with friends which improved social health and allowed more effective fitness goal setting. A 2021 study found that outdoor activities such as exercising and gardening were associated with mental health improvements during COVID-19, while those who spent large amounts of time following news about the pandemic experienced the opposite (17). Exercising and having social support networks also relieved stress and led to higher quality of life in American medical students (18).

Meanwhile, utilising other coping strategies not listed in the survey such as playing video games decreased the likelihood of mental health improvement. This was supported by the qualitative analysis results where participants stated that excessive time spent online worsened eyestrain and sedentary lifestyle. Many commented on the addictiveness of certain games and TV shows which distracted from underlying mental health issues and decreased the productivity of participants. Another cross-sectional study on medical students found that self-control and resilience significantly prevented psychological distress (9). Increasing intensity of video game playing was associated with poorer sleep quality and mental health (19). Alternatively, active video games involving exercise or dance may be suitable replacements and have been shown to improve mental health and physical functioning (20).

Implications

Investigation of the tools and resources medical students utilise in supporting their mental health provide insight into the coping strategies relied upon the most during stressful times such as the COVID-19 pandemic. This information can be used by universities and other organisations to help tailor specific interventions that can better support students. As reading non-medical books and spending more time with family have been associated with improved mental health in this study, measures that encourage students to read and improve their access to a wide range of free books should be considered. Family bonding events and activities that remind students to cherish their familial relationships can be implemented. Meanwhile, spending excessive time on devices should be discouraged and active video games can be explored as alternatives to traditional sedentary games. Students can be encouraged to continue using their coping strategies even when there is no lockdown, and to think about how their strategies can be improved and altered to optimise mental health outcomes.

Limitations

Limitations of the study include the omission of key coping strategies such as playing video games and meditation in the survey. Numerous participants mentioned that they performed those activities in the 'other coping strategies' section. By including more coping strategies in the survey, sufficient sample sizes can be obtained to incorporate them into the logistic regression analysis. Overall, the predictors

accounted for only 32.6% of the variance in mental health improvement, meaning that there was a significant amount of variance that remained unexplained. Another limitation was the participant sample size; despite best efforts, only 321 of 17,752 currently enrolled medical students could be recruited for the survey, and a definitive response rate could not be deduced due to the method of social media recruitment. Consequently, the survey cohort may not have been representative of the general medical population, particularly given our inability to obtain equal numbers of participants from all medical universities despite extensive online advertising, especially for students without social media. Some universities such as the University of Notre Dame Fremantle only had 1 response, while 37 came from the University of Tasmania. This compromised the national representativeness of the results. As this was a cross-sectional study, the ability to generate causation was limited. Further studies incorporating temporal data can be utilised to monitor the change in coping strategies over time and their effects on mental health outcomes.

Conclusions

Our study emphasises the importance that various coping strategies have on improving and maintaining the mental health of medical students during the COVID-19 pandemic. Strategies that facilitated students to socialise and engage in activities that preoccupied them away from their routine studying allowed them to cope with their mental stressors more effectively. Preventing mental fatigue is critical to ensure success not only as medical students, but also as medical practitioners who are life-long learners. Educators need to understand the importance of supporting students with resources that will allow them to cope and take care of their mental health during the COVID-19 pandemic, as that will play a key role in their ability to create strong leaders for the future.

Abbreviations

COVID-19

Coronavirus Disease of 2019

GPSN

General Practice Students Network

PPE

personal protective equipment

SPSS

Statistical Package for Social Science

Declarations

Ethics approval and consent to participate

Informed consent was obtained from all subjects. Additionally, a plain language statement was provided to all subjects of the study.

Ethics Application Number: AY0020

Application Title: AY0020: A cross-sectional study investigating the tools and resources Australian medical students used to support their mental health during COVID-19

Listed Investigators: Loai Albarqouni (Chief Investigator); Alex Yeoh (Partner Investigator); Andrea Tan (Partner Investigator);

I am pleased to advise that the Committee has accepted your responses to the conditions imposed relating to your application, and unconditional approval is granted until 7/04/2023. Please consider this email formal advice of your approval to proceed with the protocol as described in your application.

Approved by Bond University Human Research Ethics Committee

Consent for publication

Not applicable.

Availability of data and materials

Access to raw data can be found in the Bond University Archives and can be accessed upon request by the publishers. The datasets generated and/or analysed during the current study are not publicly available for the purposes of protecting the participants' privacy, but are available from the corresponding author on reasonable request.

Competing Interests

Nil known.

Funding

Nil funding was required for this study.

Authors' contributions

SJ made substantial contributions to the design of the work, analysis and interpretation of the data and drafted a substantial portion of the work.

AL made substantial contributions to the analysis and interpretation of the data, drafted a substantial portion of the work and substantially revised the work.

AY made substantial contributions to the conception and design of the work, acquired the data and analysed parts of the results, drafted a substantial portion and substantially edited the work.

AT made substantial contributions to the design of the work, analysis of the work and drafted a substantial portion of the work.

VV made substantial contributions to the design of the work and drafted a substantial portion of the work.

AX made substantial contributions to the design of the work and drafted a substantial portion of the work.

LA made substantial contributions to the conception and design of the work, and substantially revised the work.

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