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Psychological well-being and coping strategies of healthcare students during the prolonged COVID-19 pandemic

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ABSTRACT

Background: This study aimed to investigate the psychological well-being, and stress coping strategies, as well as their relationships, among healthcare students during prolonged COVID-19 pandemic.

Methods: An online questionnaire was used to assess psychological well-being (the Ryff Scale) and coping strategies (the brief Coping Orientation to Problems Experienced Inventory [COPE] Scale). COPE scores were categorized to identify the primary coping strategies: “approach” indicates more active coping strategies; “avoidant” indicates more dysfunctional and maladaptive mechanisms.

Results: A total of 202 valid questionnaire were collected. Those with lower academic confidence and lower self-rated peer and family relationship scores during the COVID-19 pandemic had lower Ryff scores, indicating poorer psychological well-being. Nursing students reported the lowest psychological well-being and the highest levels of adopting avoidant coping strategies (26.4%).

Conclusion: The study’s findings may help educators identify the healthcare students most vulnerable to stress and develop interventions to empower students to adopt problem-focused stress coping strategies.

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Introduction

The novel coronavirus disease (COVID-19), induced by the SARS-CoV-2 virus, was first reported in December 2019. By April 2021, the virus had infected over 130 million people and caused approximately 3,000,000 deaths worldwide (World Health Organization [WHO], 2021). In more than 190 countries, educational institutions implemented school suspension measures, affecting approximately 7 billion students across the world (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2018). Specifically, the impact of the COVID-19 pandemic on healthcare education has been profound. Universities have broadly adopted online teaching methods during this period. However, clinical teaching is already a challenging part of medical education, even without the additional challenges of a pandemic. Online learning can hardly replace a hands-on approach to acquiring clinical and practical skills. A study conducted in Hong Kong found that the suspension of clinical teaching and subsequent shift to online teaching during the COVID-19 pandemic negatively impacted medical students’ confidence in learning physical assessment skills (Tsang et al., 2021). Medical education was similarly affected during the severe acute respiratory syndrome (SARS)

epidemic in 2003, when clinical teaching was suspended for over a month; the delay in examinations and reduced clinical exposure had consequent negative effects on student’s clinical competency and psychological well-being (Patil et al., 2003).

Psychological well-being indicates optimal psychological functioning and learning from life experiences (Ryan & Deci, 2001), and stress coping is a determining factor of psychological well-being. Coping strategies have been defined as reactions or efforts made to master, reduce or tolerate the demands created by stress (Weiten et al., 2011). One’s coping strategies account for the extent to which a stressor could affect physical, psychological and behavioral outcomes (Keyes et al., 2002). A study, conducted five months after the onset of the COVID-19 pandemic in Australia, reported that 68% of medical students experienced moderate psychological distress and deterioration in mental well-being during the pandemic (Lyons et al., 2020). A similar study conducted in Saudi Arabia, from April to May 2020, found that 12.8% of medical students suffered from severe stress (Abdulghani et al., 2020). However, these studies were conducted less than 6 months after the onset of the pandemic. To the best of our knowledge, no study has examined coping strategies, comparatively long-term psychological impacts on the well-being of healthcare students more than one year after the pandemic’s onset. Psychological well-being and stress coping strategies in healthcare students have been widely studied (Abdulghani et al., 2020; Lyons et al., 2020);

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however, the relationship between psychological well-being and stress coping strategies during the prolonged pandemic has not been explored. In any case, depression and anxiety levels are consistently higher among medical students, than those of the general population, as well as peers of the same age (Dyrbye et al., 2006). Thus, this study explored the impact of COVID-19 on the psychological well-being and stress coping strategies of healthcare students in Hong Kong. The study's purpose was to acquire data for supporting healthcare educators in the implementation of appropriate interventions for facilitating effective stress coping strategies.

Methods

Study Design and Participants

We conducted a cross-sectional study, between January and March 2021, at a Hong Kong university. Data were collected using an online survey platform (Qualtrics). All full-time undergraduate students enrolled in healthcare programs, including Bachelors of Nursing, Medicine and Surgery, Chinese Medicine, Pharmacy, Biomedical Sciences, Public Health, Dental Surgery, and Science in Speech and Hearing, were eligible, and invited to participate in the online survey via mass email and social media. The sampling method of convenience sampling was employed. The approximate number of students who received the invitation was 3,500.

The sample size was estimated by G*Power, based on a one-way ANOVA, to test for the difference in psychological well-being (Ryff scale scores) among different stress coping strategies (its categories are “approach,” “avoidant” and “no primary coping strategy identified”). Using a medium effect size of 0.25, with a level of significance (α) of 0.05 and power of 0.8, it was found that the minimum sample size required was 159.

The study protocol was approved by the Institutional Review Board at the University of Hong Kong, and the Hospital Authority Hong Kong West Cluster (Ref number: UW 20-880). An online informed consent form was signed by the participants, which stated that participation was voluntary, and assured confidentiality and anonymity.

Measures

The questionnaire, which consisted of three sections and a total of 70 question items, required approximately 15 minutes to complete. The first section covered demographics, self-rated peer relationships, family relationships, stress levels due to COVID-19, history of chronic diseases, and psychological disorders. The second section contained the Ryff Scale (Ryff & Keyes, 1995) (18 items), which was used to measure the psychological well-being of students on a 5-point Likert scale (from 1 = *strongly agree* to 5 = *strongly disagree*). The total score was calculated by adding the scores for all question items. The higher the score, the better was the psychological well-being. The reliability and validity of the Ryff scale have been tested among university students, and it proved suitable for assessing their psychological well-being (Bayani et al., 2008; Luștrea et al., 2018).

The final section comprised of the Brief-COPE Inventory (Carver et al., 1989), for evaluating coping strategies. The Brief-COPE is a simplified version of the long COPE Inventory, with 28, instead of 60 questions (Carver et al., 1997). For each question, options were provided on a frequency scale of 1 to 4 (1 = *I usually do not do this at all to 4 = I usually do this a lot*). The Brief-COPE scale has been reported to demonstrate acceptable reliability among Hong Kong Chinese university students (Tang et al., 2016). The coping strategies measured with this scale can be broadly classified as “problem-focused,” “emotion-focused” and “dysfunctional.” Additionally, the primary coping strategies identified include “approach,” indicating more active coping

strategies, or “avoidant,” indicating more dysfunctional and maladaptive items (NovoPsych., 2022). The third group, i.e., “no primary coping mechanism,” included subjects who adopted a mix of approach and avoidant coping strategies.

Statistical Analysis

The collected data were analyzed using IBM SPSS statistics (version 24.0, IBM Corp., Armonk, NY, USA). All the responses collected were screened and deemed eligible to be included in the analysis. COPE scores were calculated and categorized to identify the primary coping strategies (approach, avoidant, no primary coping mechanism) in participants. Descriptive statistics (mean, standard deviation frequency and proportion) were employed to summarize the healthcare students' general psychological well-being and coping strategies. Since the Ryff score data were normally distributed, we used independent *t*-tests and a one-way ANOVA to explore the differences in the levels of psychological well-being (Ryff scores) among students with different coping strategies (approach, avoidant, no primary coping mechanism), gender identity, religious beliefs, healthcare programs enrolled in, self-reported academic confidence, and stress levels during the COVID-19 pandemic. Chi-square tests were used to compare the coping strategies adopted by students of different genders, healthcare programs, and at varying levels of self-reported academic confidence and stress during the pandemic. In addition, Pearson's correlation coefficients were used to assess associations between Ryff scores, COPE subtype scores (problem-focused, emotion-focused, dysfunctional) and self-ratings for peer and family relationships. The level of significance was set at a *p*-value < .05 for all analyses.

Results

A total of 202 valid questionnaires were collected. The majority of respondents were either medical or nursing students (70.8%), and approximately one-third held religious beliefs (29.2%). More than two-thirds (70%) of the respondents reported no changes in peer or family relationships during the COVID-19 pandemic. Table 1 shows the characteristics of the study participants.

The Psychological Well-Being of Healthcare Students

The respondents' mean Ryff score was 63.8 (*SD* = 8.1). Nursing students (mean = 61.4, *SD* = 7.8, *p* = .003; Table 2), and respondents with no religious beliefs (mean = 62.7 vs 66.4, *p* = .003), lower academic confidence (*p* < .001), and a history of chronic diseases and/or psychological disorders (mean = 57.5 vs 64.2, *p* = .007) had a lower mean Ryff score. Conversely, respondents who adopted an approach strategy had a higher Ryff score, than those who employed an avoidant strategy (mean = 65.9 vs 53.6, *p* < .001). Respondents with higher self-ratings on peer (*r* = 0.234, *p* < .001; Table 3) and family relationships (*r* = 0.176, *p* = .012) during the pandemic also tended to have higher Ryff scores. However, Ryff scores did not differ between male and female students (*p* = .112). Higher self-reported stress due to COVID-19 was not found to be associated with Ryff scores (*p* = .732).

The Primary Stress Coping Strategies Adopted by Healthcare Students

Most of the healthcare students (81.2%) used approach-based primary coping mechanisms, which are also the more active coping strategies (Table 1). There were no statistically significant correlations between the primary coping mechanism adopted and gender (Table 3, *p* = .729), or level of stress during the COVID-19 pandemic (*p* = .942). Medical students were more likely to adopt an approach strategy, than healthcare students from other disciplines (*p* < .001).

Table 1
Sample Characteristics (N = 202)

	Frequency (%)
Age	
-18-25	197 (97.5)
-26 or above	5 (2.5)
Gender	
-Male	58 (28.7)
-Female	144 (71.3)
Healthcare programs enrolled in	
-Nursing	72 (35.6)
-Medicine	71 (35.2)
-Speech & hearing	22 (10.9)
-Others	37 (18.3)
Religion	
-Religious	59 (29.2)
-Nonreligious	143 (70.8)
Peer relationships during COVID-19	
-Improved	25 (12.3)
-Remains the same	147 (72.8)
-Worsened	30 (14.9)
Family relationships during COVID-19	
-Improved	39 (19.3)
-Remains the same	139 (68.8)
-Worsened	24 (11.9)
Stress level due to COVID-19	
-1 (= stressful)	7 (3.5)
-2	56 (27.7)
-3	47 (23.3)
-4	71 (35.1)
-5 (= not stressful)	21 (10.4)
History of chronic diseases & psychological disorder	
-Yes	11 (5.4)
-No	191 (94.6)
Ryff score (18-90), mean (SD)	63.8 (8.1)
Primary stress coping strategy	
-Approach	164 (81.2)
-Avoidant	27 (13.4)
-No primary strategy	11 (5.4)

More than a quarter of nursing students adopted an avoidant strategy. In addition, academically confident students were more likely to adopt an approach coping strategy, than those who were less confident about their academic performance ($p < .001$; Table 3).

Table 2
Ryff Scores Among Healthcare Student

	N (%)	Mean Ryff Score	SD	Significance ¹ (2-Tailed)
Gender				0.112
-Male	58 (28.7)	65.2	8.4	
-Female	144 (71.3)	63.2	8.0	
Healthcare programs enrolled in				0.003
-Nursing	72 (35.6)	61.4	7.8	
-Medicine	71 (35.2)	66.4	8.9	
-Speech & hearing	22 (10.9)	64.1	6.9	
-Others	37 (18.3)	63.4	6.6	
Religion				0.003
-Religious	59 (29.2)	66.4	8.9	
-Nonreligious	143 (70.8)	62.7	7.6	
Academic confidence				<0.001
-Extremely confident	2 (1.0)	71.0	2.8	
-Quite confident	71 (35.1)	66.1	6.4	
-Not sure	58 (28.7)	65.4	7.6	
-Not much confidence	62 (30.7)	61.0	8.7	
-Extremely unconfident	9 (4.5)	53.6	7.6	
Stress level due to COVID-19				0.732
-1 (= stressful)	7 (3.5)	63.1	10.9	
-2	56 (27.7)	62.7	7.9	
-3	47 (23.3)	63.8	7.9	
-4	71 (35.1)	64.3	8.5	
-5 (= not stressful)	21 (10.4)	65.2	7.3	
History of chronic disease and/or psychological disorders				0.007
-Yes	11 (5.4)	57.5	9.0	
-No	191 (94.6)	64.2	8.0	
Primary stress coping strategies				<0.001
-Approach	164 (81.2)	65.9	6.9	
-Avoidant	27 (13.4)	53.6	8.2	
-No primary strategy	11 (5.4)	58.2	2.4	

¹ p -value for t -test and one-way ANOVA.

The Relationship Between Psychological Well-Being, Primary Stress Coping Strategies and COPE Subtype Scores

Respondents who adopted an approach coping strategy tended to have higher Ryff scores, than those who adopted an avoidant strategy ($p < .001$; Table 1). The Ryff score was positively correlated with the

Table 3
The Primary Stress Coping Strategies and Various Factors

	Approach ² N (%)	Avoidant ³ N (%)	No Primary Strategy ⁴ N (%)	Significance ¹ (2-Tailed)
Gender				0.729
-Male	48 (82.8)	8 (13.8)	2 (3.4)	
-Female	16 (80.6)	19 (13.2)	9 (6.3)	
Healthcare programs enrolled in				<0.001
-Nursing	50 (69.4)	19 (26.4)	3 (4.2)	
-Medicine	65 (91.5)	5 (7.0)	1 (1.4)	
-Speech & Hearing	17 (77.3)	0 (0)	5 (22.7)	
-Others	32 (86.5)	3 (8.1)	2 (5.4)	
Academic Confidence				<0.001
-Extremely Confident	2 (100.0)	0 (0)	0 (0)	
-Quite Confident	65 (91.5)	0 (0)	6 (8.5)	
-Not Sure	51 (87.9)	6 (10.3)	1 (1.7)	
-Not Much Confidence	42 (67.7)	16 (25.8)	4 (6.5)	
-Extremely Unconfident	4 (44.4)	5 (55.6)	0 (0)	
Stress Level due to COVID-19				0.942
-1 (= Stressful)	6 (85.7)	1 (14.3)	0 (0)	
-2	45 (80.4)	9 (16.1)	2 (3.6)	
-3	36 (76.6)	7 (14.9)	4 (8.5)	
-4	60 (84.5)	7 (9.9)	4 (5.6)	
-5 (= Not Stressful)	17 (81.0)	3 (14.3)	1 (4.8)	

¹ p -value for chi-squared test.

² Subjects classified into the "Approach" group according to COPE inventory, adopting active coping strategies primarily.

³ Subjects classified into the "Avoidant" group according to COPE inventory, adopting dysfunctional and maladaptive coping strategies primarily.

⁴ Subjects showing a mix of "approach" and "avoidant" coping strategies.

Table 4
Pearson's Correlations Between Ryff Score and Various Factors

	Pearson's Correlation With Ryff Score	Significance ¹ (2-Tailed)
Self-rating on peer relationship	0.234	0.001
Self-rating on family relationship	0.176	0.012
COPE subtype scores		
-Problem-focused	0.269	0.001
-Emotion-focused	0.093	0.188
-Dysfunctional	0.532	0.001

¹ *p*-values for Pearson's correlation.

COPE problem-focused score ($r = 0.269$, $p < .001$, Table 4), and negatively correlated with the COPE dysfunctional score ($r = -0.532$, $p < .001$). There was no correlation between the Ryff scores and COPE emotion-focused scores ($p = .188$).

Discussion

During the COVID-19 pandemic, healthcare students have been greatly affected by prolonged school suspensions and insufficient on-site clinical teaching. This paper reports on the psychological well-being and stress coping strategies of healthcare students in Hong Kong. Nursing students reported the lowest level of psychological well-being, and represented the highest proportion of participants who adopted avoidant coping strategies. The level of psychological well-being was positively correlated with self-rated peer and family relationships during the pandemic. Approach coping mechanisms were correlated with better psychological well-being, while avoidant coping mechanisms were correlated with worse psychological well-being.

Particularly, nursing students seemed to be a vulnerable group, because of both their avoidant coping strategies and lower average Ryff scores, compared to students from other healthcare disciplines. The well-being of university students was bound to be disrupted by stressors emanating from the university environment, such as academic workload and changes in the learning environment (Ramli et al., 2018), which might explain the difference in Ryff scores between students of various healthcare programs, as each program has a unique learning environment and academic workload. Previous studies have corroborated that religiosity is a predictor for good psychological well-being among both medical and nonmedical students, with one study theorizing that this could be because religion offers a greater sense of meaning in life (Saleem & Saleem, 2017). The positive correlation between self-perception of peer relationships and Ryff scores suggests that healthy peer relationships might be a protective factor in psychological well-being during the pandemic; this is consistent with other findings (Sun et al., 2020).

This study found that students from different healthcare programs seemed to adopt different coping strategies during the prolonged pandemic. Medical students are more likely to use an approach strategy, a more active coping mechanism, than those in other healthcare disciplines, while nursing students were more likely to adopt avoidant coping strategies. Students with higher academic confidence seemed to have an increased likelihood of adopting an approach strategy, rather than an avoidant one. Longitudinal studies are required to confirm whether an approach coping strategy leads to higher levels of academic self-efficacy, or vice versa.

Our findings show that students who adopted an approach coping strategy had higher Ryff scores than those with avoidant coping strategies, suggesting that approach strategies are more effective in stress management, than the more dysfunctional avoidant strategies. As suggested by previous studies, possessing the ability and skills for effective stress management implies better psychological well-being (Clarke, 2006; Huppert, 2009), whereas not possessing such abilities

and skills causes low levels of psychological well-being (Ojala, 2012). This study's findings are consistent with research conducted on first-year medical students in Korea, which found that maladaptive and dysfunctional coping had a significant positive correlation with emotional exhaustion and cynicism (Palupi & Findyartini, 2019)—factors that might have negative impacts on psychological well-being. Furthermore, the Ryff scores of the no-primary-coping-mechanism group, which included students that adopted a mix of approach and avoidant coping strategies, lied in between those of the other two groups, thereby supporting the hypothesis that approach coping mechanisms lead to better psychological well-being, than avoidant coping mechanisms; students with mixed coping strategies inhabit the middle ground.

This study found that problem-focused scores were positively associated with psychological well-being. This finding is consistent with other studies which found that more active coping, such as seeking social support and planning, is conducive to better psychological well-being (Ni et al., 2010). A possible explanation could be that problem-focused coping addresses the root of the stressor, allowing for an active improvement of personal well-being. However, there was no correlation between emotion-focused coping and Ryff scores, suggesting that this category has both adaptive and maladaptive components. Further research is required to confirm this observation, and differentiate between healthy and unhealthy emotion-based coping strategies.

Strengths and Limitations

At the time when this study was conducted, the COVID-19 pandemic had been going on for a year. Thus, one of the strengths of the study is its timing, which allowed for an evaluation of the long-term impact of the pandemic on the psychological well-being and coping strategies of healthcare students.

The combined use of the Ryff scale and COPE Inventory made it possible to investigate the relationships between psychological well-being and coping strategies among healthcare students, which was previously under-explored. In addition, the study had a limited data collection period of three months, for limiting confounders. Social pressures and environments were constantly in flux during the pandemic, and a longer data period collection might have been witness to drastic changes that could have introduced new confounders. Moreover, this type of research is rarely interdisciplinary; thus, we directly compared coping strategies and psychological well-being trends across various healthcare disciplines. Most importantly, this allowed us to identify the most vulnerable groups of healthcare students, who could benefit from the findings of this study.

However, this study does have certain limitations. First, a cross-sectional study design meant that the temporal causality between psychological well-being and stress coping strategies could not be established. Future longitudinal studies could compare the changes in Ryff and COPE scores for evaluating the long-term impact of COVID-19. In addition, interventional studies could provide further insights into strategies for empowering students to adopt effective coping mechanisms, such as problem-focused coping strategies. Second, the use of convenience sampling introduced self-selection bias. Third, the study was conducted at only one university in Hong Kong; therefore, the results could lack generalizability. Finally, the outcomes in this study were mainly self-reported; therefore, the results might reflect self-report bias.

Conclusion

The results of this study show that nursing and healthcare students with poor self-perceived peer and family relationships during the pandemic, lower academic confidence, or chronic diseases, were

the most vulnerable to poor psychological well-being during the COVID-19 pandemic. Moreover, those who employed approach-based coping mechanisms had better psychological well-being. These findings provide useful insights that could aid medical educators and student wellness teams in universities in identifying healthcare students prone to poor psychological well-being. Such students could be assisted by programs that encourage beneficial stress-coping strategies. Future studies must explore effective strategies for guiding healthcare students to adopt problem-focused coping strategies, especially in the face of adverse events. The ultimate goal is to empower healthcare students to excel and become better at facing challenges in stressful environments in healthcare field and potential future pandemics (Table 4).

Author Contributions

All authors involved in the conception of the work, data collection, data interpretation and drafting the manuscript. Atalie CY Tse and HN Tang performed data analysis. All authors read, critically revised and approved the final version of the manuscript

Declaration of Competing Interest

The study authors have no known conflicts to declare.

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