

RESEARCH

Open Access



The impact of stress-coping strategies on perceived stress during the COVID-19 pandemic among university students an interventional study

Asmaa Younis Elsary^{1*} and Naglaa A. El-Sherbiny¹

Abstract

Background Coronavirus (COVID-19) pandemic is a public health emergency. During the outbreak, a broad range of psychological disorders affected people at the individual, community, and international levels. This study aimed to assess the role of stress-coping strategies in relieving perceived stress among university students during the COVID-19 pandemic.

Methods This interventional study was nested on a cross-sectional design and involved students at Faiyum University in 2022.

Results Out of a sample of 2640 students, 2176 (82.4%) experienced moderate perceived stress, while 56 (2.1%) had more severe levels. Being female, nonmedical students, and rural inhabitants having a low socioeconomic status were associated with scores for severe and moderate levels of perceived stress. Among the interventional group, Modified Perceived Stress Scale scores significantly decreased after the implementation of the stress-coping program, with a p value < 0.001. Improvements in perceived stress levels were observed among male, medical, and high-socioeconomic-status students.

Conclusion Perceived stress levels were associated with being female, engaging in nonmedical study, and having low socioeconomic status and decreased after a stress-coping program was implemented. These findings assert the need to develop regular campaigns to provide psychological support and stress-coping strategies that may help students overcome different stressors.

Keywords COVID-19, Student, Stress, Coping, Pandemic

*Correspondence:

Asmaa Younis Elsary

ays00@fayoum.edu.eg; asmaa_elsary@yahoo.com

¹Faculty of Medicine, Fayoum University, Fayoum, Egypt



© The Author(s) 2023. **Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>. The Creative Commons Public Domain Dedication waiver (<http://creativecommons.org/publicdomain/zero/1.0/>) applies to the data made available in this article, unless otherwise stated in a credit line to the data.

Introduction

The coronavirus disease (COVID-19) is a serious infectious respiratory illness. The World Health Organization (WHO) reported 619,161,228 confirmed cases of COVID-19, including 6,537,636 deaths, since the beginning of the pandemic in different countries with global vaccine doses of 12,723,216,322. It was considered a public health emergency with the greatest challenges facing the global community [1].

COVID-19 infections influence the psychological profile of the general population, especially those who experience the illness themselves, fear a serious complication, or even panic from transmitting the disease to their families and those who are afraid of the COVID-19 social stigma even after full recovery [2]. The pandemic has caused a significant increase in psychiatric and behavioral disorders that could end with the patient considering suicide [3]. Governments had to implement some quarantine measures such as pausing the academic year and closing businesses leading to the collapse of income and even loss of jobs, with no information about the return to normal life [4].

The pandemic has also placed an unprecedented amount of strain on students, universities, and the educational system. Colleges faced the difficult choice of offering classes online to avoid diminishing their ability to serve their students [5]. Overall, the findings and respondents' open-ended remarks about professors' personal experiences and concerns about the future demonstrate the "degree of worry and scrambling" that many teachers experienced throughout the shift to online education [6].

Stress response can depend on an individual's background, family, social support from friends, financial situation, health and emotional background, the community in which they live, and many other factors. Anyone can be affected by the potential changes due to the COVID-19 pandemic and the actions taken to stop the spread of the virus [7].

Many studies have evaluated stress and anxiety during the COVID-19 pandemic, the majority of which concentrating on healthcare workers and patients. With respect to the youth or university students, research has been scant. Universities had to shift their teaching and assessment processes to online methods, which disrupted all academic activities and put students under many stressors; in fact, some incidents of suicide among university students occurred during and after the COVID-19 period because of stress.

For these reasons, the current study investigated levels of perceived stress among university students and tested the effect of a stress-coping program in relieving their stress. It could help control stress caused by any stressors that students are exposed to.

Methods

Design and setting of the study

This interventional study, conducted at Faiyum University, Egypt, was nested on a cross-sectional design. It has two stages: a cross-sectional stage involving 2640 Faiyum University students to assess the prevalence of perceived stress levels, and an interventional stage that enrolled 400 students who had moderate or severe levels of stress at the first stage. They then underwent a stress-coping program to test its impact on their perceived stress and coping levels. (Fig. 1)

Sampling and participants

The sample size was calculated according to Epi Info 2000, at a confidence interval of 95% and a precision of 2%. The sample was increased by 10% to overcome problems associated with no responses and missing data. The study had a power of 85%. Its sample type was a multi-stage cluster random sample. At the first stage, six medical and nonmedical faculties were selected. At the second stage, two grades in each faculty were selected randomly. The final stage included two selected section/tutorial groups from each grade.

Study tool and material

The students answered a self-administered Arabic questionnaire divided into three parts. The first part had five items on sociodemographic characteristics such as age, sex, residence, type of faculty, and grading. The second part assessed the students' socioeconomic level using the **socioeconomic status scale**. The scale included 10 questions (parents' educational background and occupation, family domain, home sanitation, and economic domain) with a total score of 48. Socioeconomic status was classified as low if the participants achieved less than 40% of the total score with a range of 0–19.2, medium if they achieved 40–70% of the total score ranging between 19.2 and 33.6, and high if they attained higher than 70% of the total score (between 33.6 and 48) [8].

The third part featured the **modified perceived stress scale (PSS)** as a psychological tool. The current study used 10 questions with 6 points reflecting the negative effect and 4 points estimating the positive effect of coping with stress. Scoring followed a 5-point scale: "never" (0), "seldom" (1), "sometimes" (2), "often" (3), and "very often" (4). Scores ranged from 0 (low perceived stress) to 40 (high perceived stress). The students were classified according to their total PSS scores: 0–13 (low perceived stress), 14–26 (moderate perceived stress), and 27–40 (high perceived stress) [9].

The questionnaire was developed in English and translated into Arabic with the help of a bilingual specialist. Another specialist revised the scale, and then a pilot study was conducted on 50 students to test the clarity

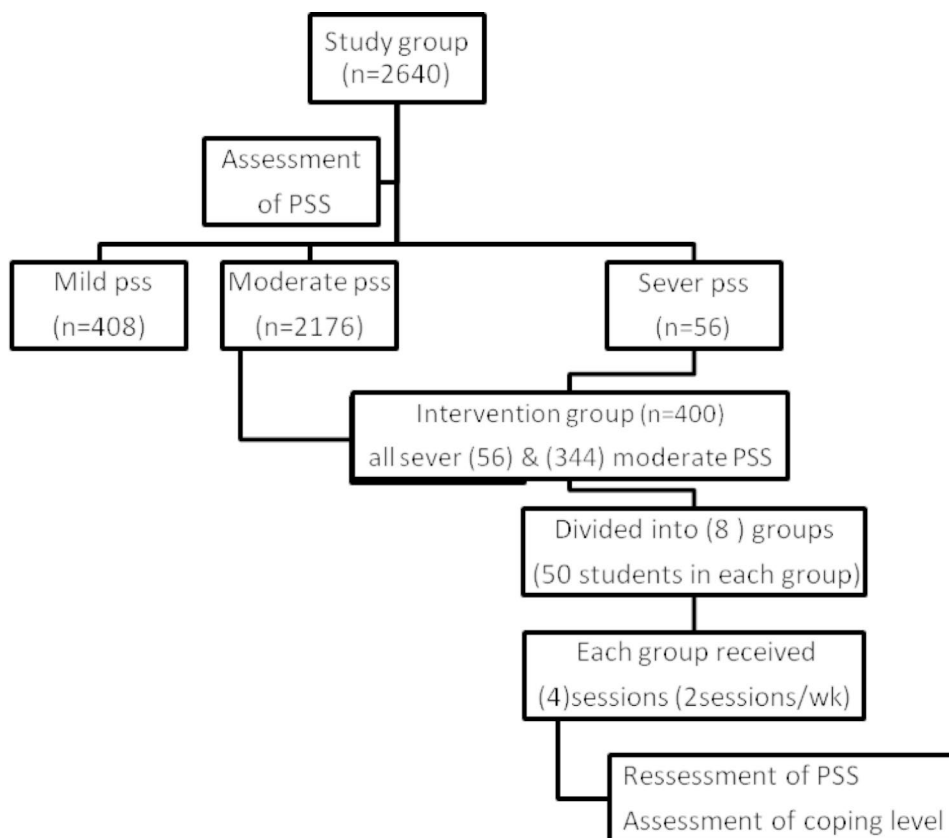


Fig. 1 Flow chart of the study framework

of questions and assess the questionnaire's validity and reliability.

The intervention

The second stage of the study included 400 students with moderate and severe levels of perceived stress divided into 8 groups of 50 students each. Each group underwent two sessions of the stress-coping program per week for four sessions. The first session held an orientation about stressors (definition, types, and impact on mental and physical health). Afterward, an active stress-coping program was implemented for students. The researchers defined stress-coping strategies as methods utilized in circumstances where students experience a change in their environment or a stressor they cannot control. The coping program was based on four key strategies: **The first** strategy mainly focuses on identifying and managing all factors and sources of stress (problem-focused coping strategies) through action-oriented coping, aiming to change the source of stress. **The second** involves controlling stressor-related emotional responses using emotion-focused coping methods directed toward managing emotions. In this session, we taught individuals how to express their negative feelings, such as fear, anxiety, and depression. Each individual chose to either talk

to an expert or write to express his or her emotions. **The third** focuses on avoidance behavior through which the participants ignore the problem and engage in other positive activities for mental disengagement. This is defined by a person's conscious or unconscious efforts to avoid dealing with a stressor to protect themselves from the difficulties that it brings. **The fourth** key strategy is seeking and asking for help (e.g., social and family support, strengthening one's religious faith by adopting a positive interpretation of events, etc.). Each session lasted between 30 and 45 min [10, 11].

The questionnaire was distributed to the intervention groups to estimate students' perceived stress before and at the end of the stress-coping program. In addition, the **brief resilience scale (BRS)** was used to assess their coping level after finishing the program. The BRS included 6 items using a Likert scale from 1 to 5 with total scores ranging between 6 and 30. Total scores are divided by 6 to calculate the final score. Scores between 1 and 2.99 are interpreted as having low resilience, between 3 and 4.3 as having normal resilience, and between 4.31 and 5 as having high resilience [12, 13].

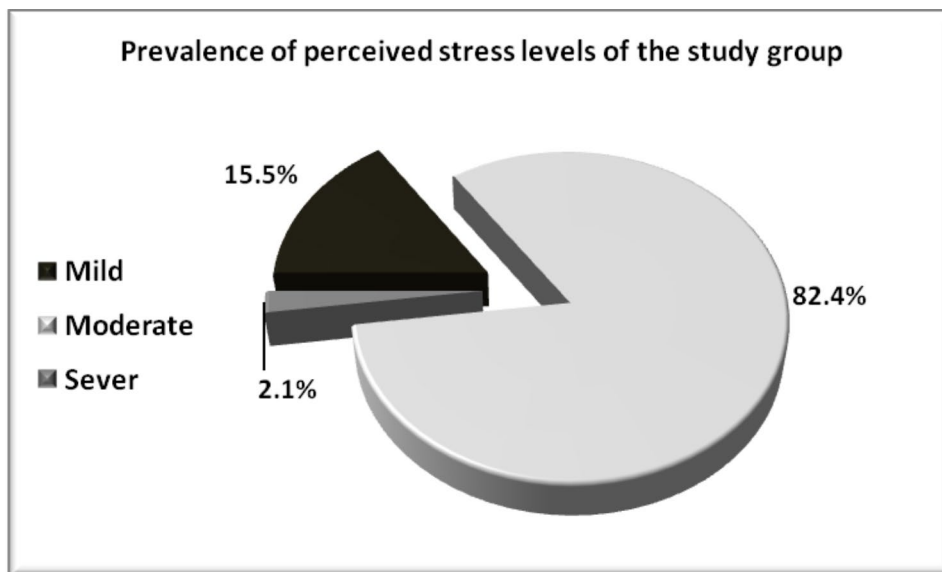


Fig. 2 Prevalence of students’ Perceived stress levels of study group

Table 1 Comparisons of PSS scores in different demographic characteristics among university students

Variables	PSS score			p value
	Low No (%)	Moderate No (%)	Severe No (%)	
Sex				
Male	136 (27.9%)	344 (70.5%)	8 (1.6%)	< 0.001
Female	272 (12.6%)	1832 (85.1%)	48 (2.2%)	
Type of study				
Medical	112 (24.6%)	344 (75.4%)	0 (0%)	< 0.001
Nonmedical	296 (13.6%)	1832 (83.9%)	56 (2.6%)	
Residence				
Urban	183 (18.4%)	809 (81.6%)	(0%)	< 0.001
Rural	225 (13.7%)	1367 (82.9%)	56 (3.4%)	
Socioeconomic level				
Low	16 (7.7%)	184 (88.5%)	8 (3.8%)	< 0.001
Middle	216 (13.2%)	138 (84.4%)	40 (2.4%)	
High	176 (22.2%)	608 (76.8%)	8 (1%)	

Statistical analysis

Data analysis was conducted using the statistical package for the social sciences version 22 [14]. Independent-samples t-test was performed to compare quantitative measures between two independent groups. To compare the data of the three groups, a one-way analysis of variance test was used. In addition, a paired t-test was performed to compare two dependent quantitative data. For qualitative data, chi-square and McNemar’s test were used. P<0.05 was considered statistically significant.

Results

Among the 2640 students enrolled in the study, 488 (18.5%) were male while 2152 (81.5%) were female, 1648 (62.4%) lived in rural areas whereas 992 (37.6%) lived in urban areas, and 2184 (82.7%) were nonmedical students while 456 (17.3%) were medical students. Regarding socioeconomic status, 208 (7.9%) were classified as low, 1640 (62.1%) medium, and 792 (30%) high.

The mean perceived stress score of the study group was 17.4±4.2. The survey showed that 408 participants (15.5%) had a mild level of perceived stress, 2176 (82.4%) had moderate perceived stress, and 56 (2.1%) had severe perceived stress. (Fig. 2)

Statistically significant higher percentages of moderate and severe stress levels were observed among females, nonmedical students, rural inhabitants, and low-socioeconomic-status students (p<0.001) (Table 1).

Data analysis for the intervention stage

Out of 400 students involved in the stress-coping program, 74 (18.5%) were male, and 326 (81.5%) were female. As for their type of study, 250 (62.5%) were medical students while 150 (37.5%) were nonmedical students. Regarding socioeconomic status, 248 (62%) were at the medium level, 120 (30%) at the high level, and only 32 (8%) at the low level.

Significant higher mean perceived stress scores were observed among females, nonmedical students, and low-socioeconomic-status individuals (p<0.001) (Table 2).

After undergoing the program, the interventional group’s mean perceived stress scores decreased from 29.02±4.3 to 18.4±3.2. In addition, PSS scores significantly declined for each sociodemographic characteristic (sex, study type, and socioeconomic status) (Table 3).

Table 2 Comparisons of the interventional group's PSS stress scores for different sociodemographic characteristics before undergoing the stress-coping program

Variables	PSS score before undergoing the stress-coping program		p value
	Mean ± SD		
Sex			
Male	20.3 ± 3.2		< 0.001
Female	28.2 ± 4.5		
Type of study			
Medical	21.3 ± 3.8		< 0.001
Nonmedical	29.2 ± 4.4		
Socioeconomic level			
Low	28.1 ± 4.1		0.001
Middle	24.3 ± 4.2		
High	19.8 ± 4.4		

Table 3 Comparison of the interventional group's PSS stress scores for each sociodemographic characteristic before and after undergoing the stress-coping program

Variables	PSS score		p value
	Before	After	
	Mean ± SD	Mean ± SD	
PSS score			
Among study group	29.02 ± 4.3	18.4 ± 3.2	< 0.001
Sex			
Male	20.3 ± 3.2	15.5 ± 3.9	< 0.001
Female	28.2 ± 4.5	18.6 ± 4.2	< 0.001
Type of study			
Medical	21.3 ± 3.8	16.8 ± 4.4	< 0.001
Nonmedical	29.2 ± 4.4	19.5 ± 4.2	< 0.001
Socioeconomic level			
Low	28.1 ± 4.1	23.2 ± 3.9	0.001
Middle	24.3 ± 4.2	20.4 ± 4.2	< 0.001
High	19.8 ± 4.4	12.8 ± 4.2	< 0.001

Table 4 Comparison of the interventional group's PSS stress levels before and after undergoing the stress-coping program

PSS score level	Follow-up				P value
	Before		After		
	No.	%	No.	%	
Low	---	----	82	20.5%	0.005
Moderate	344	86%	298	74.5%	
Severe	56	14%	20	5%	

Meanwhile, male, medical, and high-socioeconomic-status students showed much improvement in perceived stress levels and were more responsive to the stress-coping program.

After the participants' engagement in the stress-coping program, we found a statistically significant increase in the percentage of those with low-level perceived stress and a decrease in the percentage of those with moderate and severe levels of perceived stress (p=0.005) (Table 4).

After the implementation of the stress-coping program, 250 of the students (62.5%) achieved normal resilience levels, 68 (17%) achieved high resilience levels, but 82 (20.5%) achieved low resilience levels. (Fig. 3)

Discussion

COVID-19 caused panic all over the world [15]. Feelings of stress, fear, confusion, or even anger during a crisis are normal phenomena. These are emotional responses to expected threats. The first step to managing stress and anxiety is to recognize it when it happens and not ignore it [16]. Infectious outbreaks and pandemics propagate fear and stress, which remain long after they are over, because the larger their scale, the greater the magnitude and impact of their psychological consequences [17].

The present findings are consistent with those of recent research showing moderate perceived stress levels among students [18, 19].

Among female participants, this study found statistically significant higher means of stress levels before and after they engaged in the stress-coping program. This could be explained by the higher incidence of stress-related disorders among females, such as anxiety and depression. In addition, females displayed different coping behaviors in response to stress [20, 21]. A higher incidence of stress and anxiety disorders among females owing to the increase in their stress response [22]. Also, a study conducted in China reported that during the COVID-19 outbreak and pandemic, stress, anxiety, and depression scores were higher among females and students [2].

A study in India found that stress is associated with being female and medical students because of academic, lifestyle, environmental, and social factors [23]. In accordance with previous findings, fear and stress levels increase during outbreaks and pandemics [24]. On the other hand, a study conducted in Egypt concluded that perceived stress had no predictive power with respect to gender or income. These results were in contrast with the current findings, which revealed a statistically significant higher mean of stress among females and people with low socioeconomic status [25].

The current study also showed a statistically significant association between perceived stress levels and low socioeconomic status, which was consistent with a study conducted in Denmark that reported a significant link between perceived stress and low income, low socioeconomic status, and unhealthy habits [26].

Low-income people are at a higher risk of psychological stress as well as respiratory diseases and infection because of poor housing and sanitary conditions, the absence of hand washing facilities, increased household crowding, and poor nutrition. In addition, people with low income usually cannot stay home and are likely late

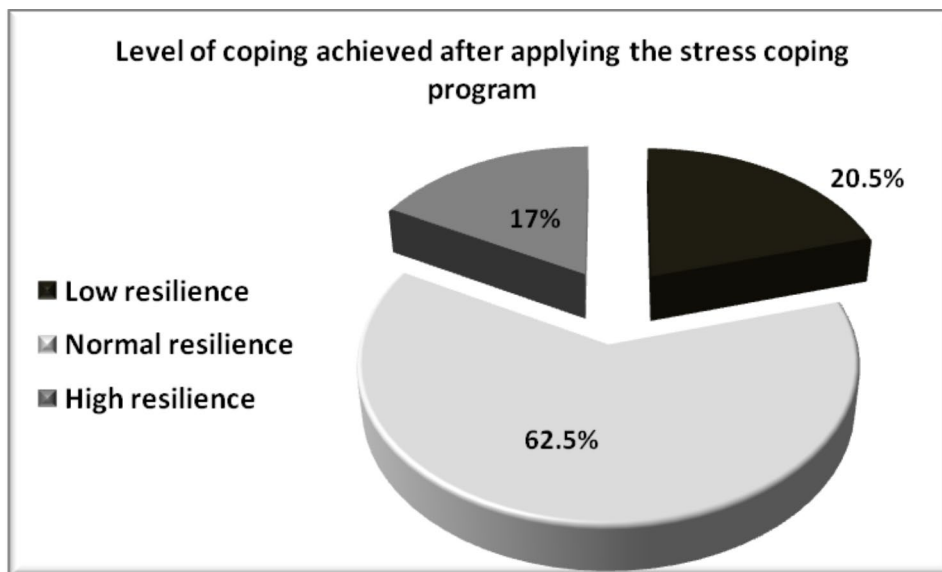


Fig. 3 Students' coping level achieved after undergoing the stress-coping program

in seeking medical advice because of financial constraints [27]. Also, individuals who grew up in lower-socioeconomic-status families would be regularly exposed to external stimuli that might result in higher perceived levels of stress [28]. Preliminary findings from Belgium, the Netherlands, Switzerland, and the United Kingdom suggest that inequality has widened with the decline in learning. During the school closures, children from high socioeconomically levels received more parental support with their studies [29].

This study revealed a statistically significant link between perceived stress levels and nonmedical study, which is consistent with a study in China that revealed that being knowledgeable about the COVID-19 pandemic, may be a protective agent against perceived stress among medical staff [30].

The present study also showed a statistically significant decrease in perceived stress levels after implementing the stress-coping program. This improvement in perceived stress levels was in agreement with another Chinese study that reported that proper communication and training could reduce psychological stress during outbreaks and pandemics [23]. Another American study concluded that active coping strategies offer vital mental and physical protection against the negative effects of stress [28].

In addition, this study observed a statistically significant increase in cases of mild perceived stress compared with the decrease in cases of moderate and high-perceived stress after enrolling the study group in the stress-coping program. These findings were consistent with those of another Egyptian study that concluded that 70% of the study group showed moderate stress, 22% low stress, and 7% severe stress [23]. Another study in

India found that the prevalence of stress among the study group was 24.42%; 10% had low stress, 7.6% had moderate stress, and 6.8% had severe stress [22].

The WHO reported that credible and trustworthy sources of information would help determine the risk so that reasonable precautions could be taken [31]. The Center for Disease Control and prevention (CDC) shared information and facts about COVID-19 with the population so that they could understand the risk and therefore feel less stress during an outbreak. However, information overload could aggravate stress and anxiety in the community [32]. Furthermore, a Chinese study found that disclosing additional information about COVID-19 was significantly associated with lower stress, anxiety, and depression scores [2].

The current results are consistent with research showing the ability of stress-coping strategies to improve students' resilience [33, 34].

This study's strengths included its implementation of a stress-coping program and examination of its positive effect on improving perceived stress levels. It had some limitations, however, such as the difficulty in obtaining permits and the logistics of delivering all program sessions to reach an actual measure of stress during the COVID-19 outbreak. The participants received too much information in such a short time; one program was not enough to enable them to control their stress.

Conclusion and recommendations

This study found moderate perceived stress levels among students. PSS was associated with being female, studying in nonmedical faculties, residing in rural areas, and having low socioeconomic status. Our results showed that perceived stress levels decreased and improved after the

implementation of a stress-coping program. These findings highlight the need to develop regular campaigns to provide students psychological support and stress-coping strategies that would help them overcome stressors, especially during pandemics.

Acknowledgements

not applicable.

Authors' contributions

AYE conceived and designed the study; conducted research; collected, organized, analyzed, and interpreted the data; and wrote the initial draft. NAE, critically reviewed and revised the content. All authors have thoroughly reviewed and approved the final draft and are responsible for its content and similarity index.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or nonprofit sectors. Open access funding provided by The Science, Technology & Innovation Funding Authority (STDF) in cooperation with The Egyptian Knowledge Bank (EKB).

Data Availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The study procedures were performed under the ethical standards of the Helsinki declaration and approved by the Ethical Committee of the Faiyum University Faculty of Medicine. The approval number is R (297) on 13/11/2022. Before answering the questionnaire, the participants were informed about the objectives of the study and the confidentiality of their information. All participants provided written informed consent.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Received: 14 February 2023 / Accepted: 29 March 2023

Published online: 13 July 2023

References

- World Health Organization. (2022). WHO Coronavirus (COVID-19) Dashboard. Retrieved 12 October 2022, from <https://Covid19.who.int/>.
- Wang C, Pan R, Wan X, Tan Y, Xu L, Ho C, Ho R. Immediate psychological responses and Associated factors during the initial stage of the 2019 Coronavirus Disease (COVID-19) epidemic among the General Population in China. *Int J Environ Res Public Health*. 2020;17(5):1729. <https://doi.org/10.3390/ijerph170517293>.
- Gyeong KY, Jeong Ji yoon, Lim Jae jeong, Bo-Kyung SEO. / The Effect of Perceived Stress on Suicidal Ideation Due to COVID-19 of College Students: Focusing on the Mediating Effect of Hopelessness 1 Korean Journal of Food & Health Convergence. 2021. 7(5).pp 19 ~ 31.
- United Nation Development Program (UNDP). (2020, April). Retrieved 30 June 2022, from <https://www.undp.org/coronavirus>
- Butrymowicz S, D'Amato P. Analysis finds hundreds of colleges show serious financial warning signs [Internet]. The Hechinger Report. 2020 [cited 2020 Sep 7]. Available from: <https://hechingerreport.org/analysis-hundreds-of-colleges-and-universities-show-financial-warning-signs/>
- Lederman D. How professors changed their teaching in this spring's shift to remote learning | Inside Higher Ed. 2020 Apr 22 [cited 2020 Nov 30]; Available from: <https://www.insidehighered.com/digital-learning/article/2020/04/22/how-professors-changed-their-teaching-springs-shift-remote>
- Centers for Disease Control and Prevention. (2020, March 6). Mental health and coping during COVID-19. Centers for Disease Control and Prevention report. Retrieved 17 July 2022, from <https://stacks.cdc.gov/view/cdc/85738>
- Fahmy SI, Nofal LM, Shehata SF, Kady E, H. M., Ibrahim HK. (2015). Updating indicators for scaling the socioeconomic level of families for health research. *The Journal of the Egyptian Public Health Association*, 90(1), 1–7. Retrieved from <https://doi.org/10.1097/O1.EPX.0000461924.05829.93>
- Cohen S, Kamarck T, Mermelstein R. (1983). A global measure of perceived stress". *Journal of Health and Social Behavior*; 1983. 24 (4): 385–396. doi: 10.2307/2136404. JSTOR 2136404. PMID 6668417. Retrieved from <https://www.jstor.org/stable/2136404>
- McLeod SA. (2015). Stress management. *Simply Psychology*. Retrieved 17 July 2022, from <https://www.simplypsychology.org/stress-management.html>
- Hudson TM. "Impact of Stress-Coping Strategies on Perceived Stress, Intrinsic Motivation, and Self-Efficacy Levels of Students" (2013). *Education Dissertations and Projects*. 36. Retrieved from: https://digitalcommons.gardner-webb.edu/education_etd/36/
- Smith BW, Dalen J, Wiggins K, Tooley E, Christopher P, Bernard J. The brief resilience scale: assessing the ability to bounce back. *Int J Behav Med*. 2008;15(3):194–200. Retrieved Oct. 12, 2022, from <https://ogg.osu.edu/media/documents/MB%20Stream/Brief%20Resilience%20Scale.pdf>.
- Smith BW, Epstein EE, Oriz JA, Christopher PK, Tooley EM. The Foundations of Resilience: what are the critical resources for bouncing back from stress? In: Prince-Embury S, Saklofske DH, editors. *Resilience in children, adolescents, and adults: translating research into practice*, the Springer series on human exceptionalism. New York, NY: Springer; 2013. pp. 167–87.
- IBM SPSS statistics V22.0. (2021). <https://www.ibm.com/support/pages/spss-statistics-220-available-download>
- Wang C, Horby PW, Hayden FG, Gao GF. (2020). A novel coronavirus outbreak of global health concern. *Lancet (London, England)*, 395(10223), 470–473. [https://doi.org/10.1016/S0140-6736\(20\)30185-9](https://doi.org/10.1016/S0140-6736(20)30185-9). Retrieved from: <https://pubmed.ncbi.nlm.nih.gov/31986257/>
- World Health Organization Report. (2020, March 27). Mental health and psychological resilience during the COVID-19 pandemic". Retrieved 17 Sep, 2021, from <http://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-COVID-19/news/news-2020/3/mental-health-and-psychological-resilience-during-the-COVID-19-pandemic>
- Moukaddam N. (2019). Fears, outbreaks, and pandemics: Lessons learned. *Psychiatric Time*. November.36 (11). <https://www.psychiatrictimes.com>
- Li Y, Yao L, Luo Y. Perceived stress and its impact on health behaviour of Chinese residents during the epidemic of Covid 19: an Internet Survey. 2020. Doi: <https://doi.org/10.21203/rs.3.rs-27180/v1>
- Kostić J, Zikić O, Đorđević V, et al. Perceived stress among university students in south-east Serbia during the COVID-19 outbreak. *Ann Gen Psychiatry*. 2021;20:25. <https://doi.org/10.1186/s12991-021-00346-2>.
- Shansky RM. (2015). Sex differences in PTSD resilience and susceptibility: Challenges for animal models of fear learning. *Neurobiology of stress*, 1, 60–65. Retrieved from, <https://doi.org/10.1016/j.ynstr.2014.09.005>
- TePoel M, Rohlman D, Shaw M. (2017). The Impact of Work Demand and Gender on Occupational and Psychosocial Stress in Hispanic Farmworkers. *Journal of agricultural safety and health*, 23(2), 109–123. Retrieved from, <https://doi.org/10.13031/jash.11753>
- Parker G, Brotchie H. (2010). Gender differences in depression. *Journal International Review of Psychiatry*.22 (5), 429–436. Retrieved from, <https://doi.org/10.3109/09540261.2010.492391>
- Waghachavare VB, Dhumale GB, Kadam YR, Gore AD. (2013). A Study of Stress among Students of Professional Colleges from an Urban area in India. *Sultan Qaboos University medical journal*, 13(3), 429–436. Retrieved from <https://pubmed.ncbi.nlm.nih.gov/23984029/>
- Wong EL, Wong SY, Kung K, Cheung AW, Gao TT, Griffiths SM. (2010). Will the community nurse continue to function during H1N1 influenza pandemic: a cross-sectional study of Hong Kong community nurses? *BMC Health Services Research*, 10, 107–107. Retrieved from <https://doi.org/10.1186/1472-6963-10-107>
- Saleh M, Galal AF, Hafez SF, Mustafa SS. (2018). Investigating the association between perceived stress and some biochemical, socio-demographic and work-related predictors of stress. *Bioscience Research*. 15(3): 2551–2557. Retrieved from <https://www.sciencedirect.com/science/article/pii/S1658361215001110>

26. Algren MH, Ekholm O, Nielsen L, Ersbøll AK, Bak CK, Andersen PT. (2018). Associations between perceived stress, socioeconomic status, and health-risk behaviour in deprived neighbourhoods in Denmark: a cross-sectional study. *BMC public health*, 18(1), 250. Retrieved from <https://doi.org/10.1186/s12889-018-5170-x>
27. Quinn SC, Kumar S. (2014). Health inequalities and infectious disease epidemics: a challenge for global health security. *Biosecurity and bioterrorism: biodefense strategy, practice, and science*, 12(5), 263–273. Retrieved from <https://doi.org/10.1089/bsp.2014.0032>
28. Furman M, Joseph N, Miller-Perrin C. (2018). Associations between coping strategies, perceived stress, and health indicators. *Psi Chi Journal of Psychological Research*, 23(1), 61–72. Retrieved from <https://doi.org/10.24839/2325-7342.jn23.1.61>
29. Robin Donnelly HA, Patrinos, James Gresham. The Impact of COVID-19 on Education – Recommendations and Opportunities for Ukraine. the world bank. April 2, 2021. <https://www.worldbank.org/en/news/opinion/2021/04/02/the-impact-of-Covid-19-on-education-recommendations-and-opportunities-for-ukraine>
30. Huang L, Wang Y, Liu J, Ye P, Chen X, Xu H, Guo Y, Qu H, Ning G. (2021). Short report: factors determining perceived stress among medical staff in radiology departments during the COVID-19 outbreak. *Psychology, health & medicine*, 26(1), 56–61. Retrieved from <https://doi.org/10.1080/13548506.2020.1837390>
31. World Health Organization. (2022). " coping with stress during the 2019-COVID-19 outbreak. Last access July, 23, 2022, from <https://Covid19.healthcoms.org/en/resource/coping-with-stress-during-the-2019-ncov-outbreak/>
32. Centers for Disease Control and Prevention. (2022, July 29). Coping with stress. Centers for Disease Control and Prevention. Retrieved August 20, 2022, from <https://www.cdc.gov/mentalhealth/stress-coping/cope-with-stress/index.html>
33. Gustems-Carnicer J, Calderón C, Calderón-Garrido D. Stress, coping strategies and academic achievement in teacher education students. *Eur J Teacher Educ*. 2019;42:375–90.
34. Freire C, Ferradás M, Regueiro B, Rodríguez S, Valle A, Núñez JC. Coping strategies and self-efficacy in University students: a person-centered Approach. *Front Psychol*. 2020;11:841. <https://doi.org/10.3389/fpsyg.2020.00841>.

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.