

COVID-19: a psychological nightmare

Rachelle A. Ho, MSc¹; Aleeza Sunderji, BArts Sc¹; Divya Prasad, BArts Sc¹; Kyle Gauder, BSc¹; Geoffrey B. Hall, PhD¹

¹Department of Psychology, Neuroscience, and Behaviour, McMaster University, 1280 Main Street W, Hamilton, Ontario

Abstract

The COVID-19 pandemic has dramatically influenced our lifestyles and sleep habits, compromising our ability to effectively process and regulate emotions. We explore a neurobiological perspective to illustrate that dreams and nightmares during the pandemic may be indicative of an increased emotional load in our waking lives. We also propose that the combined impact of daily stressors and poor sleep behaviours brought on by the COVID-19 pandemic may lead to detrimental psychological health outcomes. These negative effects are ultimately perpetuated through a vicious cycle, necessitating the development of appropriate and timely interventions. We suggest that dreams and nightmares can showcase the role COVID-19 as a chronic population stressor. As this pandemic ensues, researchers should not overlook the importance of dreams and how sleeping habits are linked to waking emotional states.

As COVID-19 emerged as a global crisis, reports of wild and vivid dreams increased during the pandemic, prompting research into the content, frequency, and tone of these dreams.¹⁻³ Vivid and bizarre dreams can be described as dreams that contain powerful imagery. Nightmares are a subcategory of vivid dreams, characterized by both vivid imagery and heightened negative affective tones.⁴ In the wake of the pandemic, higher levels of distress and the presence of vivid dreams are evident in recent literature.^{5,6} The reports on dreams and nightmares during the COVID-19 pandemic illustrate a link between dreams, life events, and psychological distress.

Research emerging during the pandemic has only begun to explore the negative consequences of the COVID-19 crisis on sleep and emotional distress. While COVID-19 has a more direct impact on certain individuals, like medical workers and inpatients, a shift in sleep patterns appears widespread even in the general population.⁷ Self-reports of sleep habits from Italy during

lockdown demonstrate a change in sleep patterns among university students and working professionals. Bedtimes and wake up times have been delayed significantly with exacerbated effects on university students.^{8,9} Changes in sleep habits consequently reduce quality of sleep, which may increase susceptibility to emotional distress.^{9,10}

In this article, we explore the combined impact of life stressors and altered sleep behaviours during COVID-19 on the long-term psychological well-being of the general population. We propose that pandemic-related changes in stress and sleep compromise the brain's ability to regulate emotions, which may have further consequences on psychological health. We discuss how the underlying functional connectivity of emotion-related brain areas are altered in the face of stress, and thus also propose the unique role of dreams as an early indicator of emotion dysregulation.

Previous research has uncovered a significant link between our waking life stressors and dreams. It appears that the experiences and stimuli we encounter every day in the real world influence the kinds of dreams we have and how frequently we have them. Indeed, research has highlighted that traumatic experiences, such as natural disasters, vehicle accidents, and violent attacks, heavily influence dream content.^{11,12} One example comes from a study conducted on the 1989 San Francisco earthquake. Following the catastrophe, the incidence of nightmares in individuals living in San Francisco was doubled compared to individuals living in Arizona who were at a greater distance from the earthquake.¹² These results highlight a link between life events, dream content, and nightmare frequency, and are suggestive of a pattern that may be similarly seen during the pandemic.²

Neuroscience research can explain why individuals experience more nightmares during times of stress. Dreams serve an important purpose — they help us process our emotions.¹⁰ Research has shown that our emotion centres in the brain, including the amygdala, ventromedial prefrontal cortex, and hippocampus, are activated during sleep.^{10,13} As we sleep, the amygdala and hippocampus work in tandem to revisit and store memories from our waking lives.¹⁴ During sleep, when the brain replays memories, the functional connectivity between the amygdala and hippocampus is downregulated. As a result, the activity of the amygdala, normally activated by stressful events, is also downregulated thereby allowing the emotional tones to be dissociated from the memory. This allows the amygdala to be less reactive when we face similar stressors in the future.¹⁴ Stripping the emotional context of memories is the brain's method of regulating our emotions.¹³

In addition to downregulated activation between the hippocampus and the amygdala during sleep, the functional connectivity of the amygdala and the ventromedial prefrontal cortex increases after sleep. This helps us regulate our emotional and behavioural responses to a stressor.^{13,14} In particular, the ventromedial

Corresponding Author:
Rachelle A. Ho
homr@mcmaster.ca

prefrontal cortex is involved in the evaluation of whether events are threatening and require attention. It also allows us to appraise situations in our waking lives in adaptive ways, which is why our response to stressors may be less reactive when facing them a second time.¹⁴ These neurobiological processes during sleep are the brain's mechanisms for managing stress.

However, during COVID-19, individuals are experiencing inadequate or disrupted sleep.⁷⁻⁹ Sleep deprivation interferes with the neurobiological processes of sleep, making individuals increasingly sensitive to environmental stressors and altering the ways in which they understand, express, and modify their emotional responses.¹⁵ Thus, the cumulative effects of suboptimal sleep and elevated stress likely underlie the rise in negative emotionality observed during the COVID-19 pandemic.^{5,10} Specifically, recent reports show that anxiety, stress, and depression have increased in the general population as a result of the spread of COVID-19.^{8,16} While these negative emotions can often lead to more cautionary avoidance behaviours in the short-term, such as staying at home to avoid contracting COVID-19, they can be maladaptive in the long-term as lack of sleep compromises emotional processing.^{17,18}

Given the uncertainty of how lifestyles could change in response to the spread of the virus, the stress imposed by COVID-19 is unpredictable and persistent. The elevated levels of distress currently experienced by the general population may last months longer than the stressor itself, potentially characterizing COVID-19 as a chronic stressor. Since chronic stress and sleep disruptions are associated with mental health, we may see a continued rise in psychological illness within the general population with considerable public health implications—a possible secondary impact of the pandemic.^{19,20}

While current research has already highlighted the immediate psychological impacts of COVID-19, we have yet to discover the full extent of the secondary, long-term impacts of the pandemic as a chronic stressor on different populations. For example, one study showed that women were twice as likely to experience depression under chronic stress compared to men.²¹ Other studies have shown that individuals with pre-existing health conditions may experience exacerbated psychological effects under chronic stress.²² Certain personality traits such as high emotional reactivity and sensitivity to sensory processes and environmental stimuli may contribute to the nightmare susceptibility.²³ These studies underscore the importance of not only investigating the long-term effects of COVID-19-related chronic stress, but also identifying groups that are especially vulnerable to its negative psychological outcomes.

Evidently, the reciprocal relationship between heightened emotional distress and sleep disruptions is a vicious cycle that may result in poor long-term psychological outcomes.^{13,14} The pandemic has undoubtedly caused greater levels of stress. To process the flood of emotions in our waking lives, the brain requires the regulatory role of sleep. With disrupted sleep, the brain is less effective at carrying out emotion regulation processes. This can lead to further emotional distress and interfere with our ability to handle stressful situations in our waking lives. Without intervention, the cycle repeats and may increase the likelihood of negative long-term outcomes on our psychological well-being.

In summary, we have outlined the importance of vivid dreams and nightmares in signaling an increased emotional load in our waking lives. Yet, the increase in vivid dreams is just the tip of the iceberg. The persistence of such dreams and nightmares showcases the role

of COVID-19 as a chronic population stressor. As this pandemic continues, researchers should leverage the unique opportunity of the pandemic to further explore and understand how our dreams and sleeping habits are tied to waking emotional states. In doing so, we may better position ourselves to understand the long-term impacts of COVID-19 on the mental health of the general public.

References

- MacKay C, DeCicco TL. Pandemic dreaming: the effect of COVID-19 on dream imagery, a pilot study. *Dreaming*. 2020;30(3):222. <https://doi.org/10.1037/drm0000148>.
- Schredl M, Bulkeley K. Dreaming and the COVID-19 pandemic: a survey in a U.S. sample. *Dreaming*. 2020;30(3):189. <https://doi.org/10.1037/drm0000146>.
- Barrett D. Dreams about COVID-19 versus normative dreams: trends by gender. *Dreaming*. 2020;30(3):216. <https://doi.org/10.1037/drm0000149>.
- Levin R, Nielsen T. Nightmares, bad dreams, and emotion dysregulation: a review and new neurocognitive model of dreaming. *Curr Dir Psychol Sci*. 2009;18(2):84-8. <https://doi.org/10.1111/j.1467-8721.2009.01614.x>
- Wang H, Xia Q, Xiong Z, et al. The psychological distress and coping styles in the early stages of the 2019 coronavirus disease (COVID-19) epidemic in the general mainland Chinese population: a web-based survey. *PLoS One*. 2020;15(5):e0233410. <https://doi.org/10.1371/journal.pone.0233410>.
- Mota NB, Weissheimer J, Ribeiro M, et al. Dreaming during the Covid-19 pandemic: computational assessment of dream reports reveals mental suffering associated with negative feelings and contagion fear. *medRxiv*. 2020. <https://doi.org/10.1101/2020.05.19.20107078>.
- Lin LY, Wang J, Ou-yang XY, et al. The immediate impact of the 2019 novel coronavirus (COVID-19) outbreak on subjective sleep status. *Sleep Med*. 2020. <https://doi.org/10.1016/j.sleep.2020.05.018>
- Marelli S, Castelnovo A, Somma A, et al. Impact of COVID-19 lockdown on sleep quality in university students and administration staff. *J Neurol*. 2020. <https://doi.org/10.1007/s00415-020-10056-6>
- Cellini N, Canale N, Mioni G, et al. Changes in sleep pattern, sense of time and digital media use during COVID-19 lockdown in Italy. *J Sleep Res*. 2020;29. <https://doi.org/10.1111/jsr.13074>
- Vandekerckhove M, Wang YL. Emotion, emotion regulation and sleep: an intimate relationship. *AIMS Neurosci*. 2018;5(1):1-17. <https://doi.org/10.3934/Neuroscience.2018.1.1>
- Mellman TA, David D, Bustamante V, et al. Dreams in the acute aftermath of trauma and their relationship to PTSD. *J Trauma Stress*. 2001;14(1):241-7. <https://doi.org/10.1023/A:1007812321136>.
- Wood JM, Bootzin RR, Rosenhan D, et al. Effects of the 1989 San Francisco earthquake on frequency and content of nightmares. *J Abnorm Psychol*. 1992;101(2):219-224. <https://doi.org/10.1037/0021-843X.101.2.219>
- Walker MB, van der Helm E. Overnight therapy? The role of sleep in emotional brain processing. *Psychol Bull*. 2009;135(5):731-48. <https://doi.org/10.1037/a0016570>
- van der Helm E, Yao J, Dutt S, et al. REM sleep depotentiates amygdala activity to previous emotional experiences. *Curr Biol*. 2011;21(23):2029-32. <https://doi.org/10.1016/j.cub.2011.10.052>
- Palmer CA, Alfano CA. Sleep and emotion regulation: an organizing, integrative review. *Sleep Med Rev*. 2017;31:6-16. <https://doi.org/10.1016/j.smrv.2015.12.006>
- Li S, Wang Y, Xue J, et al. The impact of COVID-19 epidemic declaration on psychological consequences: a study on active Weibo users. *Int J Environ Res Public Health*. 2020;17(6):2032. <https://doi.org/10.3390/ijerph17062032>
- Terrizzi Jr JA, Shook NJ, McDaniel MA. The behavioral immune system and social conservatism: a meta-analysis. *Evol Hum Behav*. 2013;34(2):99-108. <https://doi.org/10.1016/j.evolhumbehav.2012.10.003>
- Yoo SS, Gujar N, Hu P, et al. The human emotional brain without sleep—a prefrontal amygdala disconnect. *Curr Biol*. 2007;17(20):R877-8. <https://doi.org/10.1016/j.cub.2007.08.007>
- Brady KT, Sinha R. Co-occurring mental and substance use disorders: the neurobiological effects of chronic stress. *Am J Psychiatry*. 2005;162(8):1483-93. <https://doi.org/10.1176/appi.ajp.162.8.1483>
- Conner KR, Phillips MR, Meldrum SC. Predictors of low-intent and high-intent suicide attempts in rural China. *Am J Public Health*. 2007;97(10):1842-6. <https://doi.org/10.2105/AJPH.2005.077420>
- McGonagle KA, Kessler RC. Chronic stress, acute stress, and depressive symptoms. *Am J Community Psychol*. 1990;18(5):681-706. <https://doi.org/10.1007/BF00931237>
- Rath B, Donato J, Duggan A, et al. Adverse health outcomes after Hurricane Katrina among children and adolescents with chronic conditions. *J Health Care Poor Underserved*. 2007;18(2):405-17. <https://doi.org/10.1353/hpu.2007.0043>
- Carr M, Nielsen T. A novel differential susceptibility framework for the study of nightmares: Evidence for trait sensory processing sensitivity. *Clin Psychol Rev*. 2017;58:86-96. <https://doi.org/10.1016/j.cpr.2017.10.002>.



Undergraduate Medical Education
UNIVERSITY OF TORONTO

Office of Health Professions Student Affairs

Supporting Your Success

<http://www.md.utoronto.ca/OHPSA>

WELLNESS

- Prevention, Self-care, Stress Management, Wellness workshops
- Events and group sessions
- Short-term counselling
- Private location and after-hours appointments available

LEARNING

- Academic Success workshops
- Study skills seminars
- Study Strategies, Time Management
- Learning Assessments
- Group and individual appointments

CAREER COACHING

- Group and individual sessions
- Lunch & Learn/Evening workshops
- Careers in Medicine Program (CaRMS) preparation
- Career Fairs and Sampling
- Skills for interviews, resume and letter writing
- Weekend/telephone appointments available

LIFE

- Leadership, Volunteerism, Charity
- Community Involvement, Special Events
- Access and Outreach
- Social Responsibility

Students We Serve

Doctor of Medicine Program
Occupational Therapy, Physical Therapy, Speech-Language Pathology
Medical Radiation Sciences
Physician Assistant Program

Contact

Visit our website for online information and forms
<http://www.md.utoronto.ca/OHPSA>

E-mail: OHPSA.reception@utoronto.ca

Telephone: **416.978.2764**

C. David Naylor Building, 6 Queen's Park Crescent West, 3rd Floor, Room 306