

## Journal Pre-proof

### Impact of COVID-19 outbreak on subjective sleep during lockdown: relation with resilience characteristics

Maria Ntafouli, Rigas Soldatos, Dimitris Dikeos

DOI: <https://doi.org/10.22365/jpsych.2024.004>

To appear in: Psychiatriki Journal

Received date: 5 February 2023

Accepted date: 27 November 2023

**Please cite this article as:** Maria Ntafouli, Rigas Soldatos, Dimitris Dikeos, Impact of COVID-19 outbreak on subjective sleep during lockdown: relation with resilience characteristics, Psychiatriki (2024), doi: <https://doi.org/10.22365/jpsych.2024.004>

This is a PDF file of an article that has undergone enhancements after acceptance, such as the addition of a cover page and metadata, and formatting for readability, but it is not yet the definitive version of record. This version will undergo additional copyediting, typesetting and review before it is published during the production process, errors, may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

## RESEARCH ARTICLE

### Impact of COVID-19 outbreak on subjective sleep during lockdown: relation with resilience characteristics

Maria Ntafouli,<sup>1</sup> Rigas Soldatos,<sup>2</sup> Dimitris Dikeos<sup>1</sup>

1. *Sleep Research Unit, First Department of Psychiatry, National and Kapodistrian University of Athens, Athens, Greece*
2. *First Department of Psychiatry, National and Kapodistrian University of Athens Medical School, Eginition Hospital, Athens, Greece*

**ARTICLE HISTORY:** Received 5 February 2023 / Revised 16 July 2023 / Published Online 27 February 2024

#### ABSTRACT

The SARS-CoV-2 pandemic had a considerable impact on both the physical and mental health of people. Resilience is a psychological characteristic reflecting the ability to overcome or adapt to difficulties such as adversity, trauma, or extremely stressful situations. People with high resilience have been shown to exhibit lower levels of anxiety, stress and depression when faced with a stressful event. Sleep is particularly sensitive to anxiety and stress. The aim of this study was to investigate the impact of COVID-19 pandemic on sleep quantity, quality, and habits, while considering resilience as a factor. A total of 1260 individuals were recruited through an online survey. The variables that were assessed were socio-demographic, sleep habits and sleep disorders history, the Athens Insomnia Scale (AIS), the 25-item version of the Connor-Davidson Resilience Scale (CD-RISC), and any work/financial consequences during the first COVID-19 lockdown. The results showed that sleep habits during the lockdown changed for many of the participants. Their sleep schedule moving towards earlier or later for 9% and 67% of them, respectively; 38% of the participants were found to suffer from insomnia, based on the AIS score. A higher score on the CD-RISC was associated with better sleep. In conclusion, our study confirmed previous studies identifying quantitative and qualitative changes in sleep during the COVID-19 lockdown. It also expanded on the previous findings by identifying the correlation between sleep and resilience during the stressful period of the COVID-19 lockdown.

**KEYWORDS:** Sleep quality, insomnia, pandemic, COVID-19, sleep habits, resilience.

**Corresponding Author:** Maria Ntafouli, Sleep Research Unit, 1st Department of Psychiatry, Eginition Hospital, Medical School, National and Kapodistrian University of Athens, Vas.Sophias 72, 115 28, Athens, Greece, Email: [marynt@med.uoa.gr](mailto:marynt@med.uoa.gr)

## Introduction

Throughout history, crises have had a considerable impact on people's mental health. More recently, the COVID-19 pandemic has been a period of great health concern that altered people's lives all around the world in several aspects, including their economic situation, personal

happiness and mental health.<sup>1-3</sup> The coronavirus disease 2019 (COVID-19) was first identified in late 2019 in Wuhan, China. On 30th December 2019, China alerted the World Health Organization (WHO) to several severe cases of pneumonia of unknown etiology; on 11th March 2020 the WHO declared this disease outbreak to be a pandemic.<sup>4</sup> Several studies have reported on the impact of the previous epidemics, such as the one in 2000 by the severe acute respiratory syndrome (SARS), on public mental health globally. Depression and post-traumatic stress disorder were the most dominant mental problems among health workers<sup>5</sup> and SARS survivors.<sup>6</sup> Furthermore, as known from previous epidemics (SARS, MERS, Ebola, H1N1), fear of contracting the disease as well as the restrictive measures which were implemented to fight the epidemic (quarantine, social distancing) were found to affect mental health negatively, causing nervousness, anxiety, stress, anger, depression, grief, numbness and insomnia.<sup>7-13</sup>

The COVID-19 outbreak has affected many lives all over the world, and it has had a notable impact on people's mental health. According to some recent studies, the general population suffer from stress, anxiety, depression, fear and sleep disruption.<sup>14-16</sup> Restriction measures that were enforced, were found to have had an impact on the sleep of individuals, in some studies.<sup>12,13</sup> To the best of our knowledge, two studies have been published<sup>17,18</sup> examining sleep in the Greek population during the 2020 period of complete lockdown. They both used online questionnaires and their sample sizes were 1271 and 2427, respectively. In the study by Trakada et al.,<sup>17</sup> a self-designed, not previously validated, questionnaire was used and in the study by Voitsidis et al.<sup>18</sup> four validated scales were used; Trakada et al.<sup>17</sup> found that 30% of the individuals reported poor sleep quality during the lockdown period and that sleep duration was longer in the same period; relevantly, in the study of Voitsidis et al.,<sup>18</sup> sleep quality worsened during the lockdown period for 37% of the participants; none of these two studies included any measure of resilience.

Resilience is a psychological characteristic reflecting the ability to overcome or adapt to difficulties such as adversity, trauma or major stressful situations.<sup>19</sup> People with high resilience have been shown to manifest lower levels of anxiety, stress and depression when faced with situations such as accidents, loss of family members, and natural disasters,<sup>20</sup> including the COVID-19 pandemic.<sup>21</sup> No studies have examined the role of resilience on sleep during crises during the COVID pandemic. Not even in southeastern countries like Greece, which have specific temperamental and socioeconomic characteristics.

The aim of the present study was to investigate the impact of COVID-19 pandemic on sleep habits, quantity and quality, considering differences regarding resilience among individuals. The hypothesis is that sleep is affected by the COVID-19 pandemic and this effect is influenced by resilience.

## Methods

### **Sample and Data collection**

A total of 1,260 out of 1,285 individuals responded to an online survey uploaded on the Google survey platform (Google Docs) from April 14 to June 13, 2020. The participants were approached through social media and email to the contact lists of the authors. The participants' responses were anonymous, according to the Google privacy policy (<https://policies.google.com/privacy>). The Ethics Committee of the National and Kapodistrian University of Athens, Eginition Hospital, approved the study protocol as well as the informed consent document (protocol number 2732/24-3-2020), which was also uploaded to be read by participants before answering the questionnaire.

### **Material**

The online survey included a general questionnaire on: socio-demographic variables; sleep habits and sleep disorders history; and any work/financial consequences due to the first COVID-19 lockdown, which had started in Greece on the 23<sup>rd</sup> of March 2020. Sleep was assessed through the

Athens Insomnia Scale (taking into account the total score as a measure of severity of insomnia symptoms and the cut-off score of 6 or higher as indicative of the diagnosis of insomnia) and resilience through the Connor and Davidson Resilience Scale.

The *Athens Insomnia Scale (AIS)* is an 8-item self-administered psychometric instrument. It assesses the severity and effects of insomnia, and all items are rated on a 4-point (0-3) scale. The total score ranges from 0 to 24 and the cut off for the diagnosis of insomnia is 6 or more.<sup>22,23</sup>

The *Connor and Davidson Resilience Scale (CD-RISC)* is a self-rating scale consisting of 25 items each of which is rated on a 5-point (0–4) scale. The total score ranges from 0 to 100, with higher scores reflecting greater resilience.<sup>24</sup>

### **Statistical Analysis**

Descriptive statistics of the responses to the general questionnaire, CD-RISC and AIS single items and total scores are presented in relative frequencies and in mean  $\pm$  standard deviation (SD) form for the total sample of participants. Due to the large sample size, the distribution of the sample means is considered to be approximately normally distributed (based on the central limit theorem). To determine whether several independent groups had differences in the total AIS score, t-test (when appropriate, ANOVA) were computed. Univariate and multivariate linear regression models were used to evaluate the association between different independent factors (i.e., gender, age, education, residence, work status, unemployed due to covid-19, sleep habits, Connor-Davidson Resilience Scale total score, time during the national lockdown) and total AIS score. All variables which were statistically significant in the univariate linear regression models and those which were considered as they might convey important information were entered into the multivariable model. Statistical analysis was performed using the SPSS software Version 24 (IBM Corp, Armonk, NY, USA) and the STATA v.13 (StataCorp LP, College Station, TX, USA) software.

## **Results**

### **Sociodemographic & clinical characteristics**

The prevalence of basic characteristics (socio-demographic), sleep habits, AIS and CD-RISC scores for the total sample is presented in Tables 1 and 2. Of the 1.260 responders, 70.2% (885/1260) female and 29.2% (368/1260) were male. The most frequent age categories were: 20-29 [in 19.3% (244/1260)], 30-39 [in 26.7% (336/1260)], 40-49 [in 26.6% (335/1260) and 50-59 [in 16.1% (203/1260)]. Tertiary and secondary education was reported for 90.1% (1135/1260) and 9.9% (125/1260) of the participants, respectively. Among participants, 60.2% (759/1260) were residing in Athens and 28.5% (359/1260) in cities other than Athens. The population mainly consisted of employed [75.7% (954/1260)], unemployed [7.5% (95/1260)], students [6.7% (84/1260)] and pensioners [6.0% (76/1260)]. Out of 1.260 responders, 263 (20.9%) individuals had temporarily lost their job due to the lockdown whilst 14 (1.1%) had faced redundancy. Regarding sleep habits, 150 (11.9%) participants had experienced sleep disorders for the first time during the pandemic. Duration of sleep after the COVID-19 lockdown measures were put in place was increased for 37% of the participants, whilst it was decreased for 17.5%. Sleep schedule had been altered towards later sleeping time (compared to the pre-lockdown period) for 66.6% of the participants and towards earlier for 8.5% of them. Cronbach's alpha coefficient of the AIS and CD-RISC were 0.85 and 0.89, respectively, suggesting that for both of them internal consistency was appropriate. According to the AIS, among the respondents, 38% suffered from insomnia (AIS total score  $\geq$  6).

**Table 1., Table 2.**

### **Univariate analysis**

Results from univariate analysis, as reported in Tables 3 and 4, show that women had significantly higher average AIS score compared to that of men. Higher AIS scores were reported by those who were unemployed vs. employed, had recently experienced sleep problems for the first time during the lockdown compared to those who has never experienced sleep problems and were younger (<40 years old). Statistically significant higher average total score on AIS was also found among subjects reporting that their sleep schedule had been altered in the past few days and among those who were sleeping less after the lockdown was imposed. There was a non-significant trend indicating that people who lost their job permanently due to the COVID-19 pandemic tended to have higher mean AIS score than the ones who lost their job temporarily, whereas the ones who did not lose their job have the lowest average AIS score. No statistically significant relationship was found between level of education or place of residence and AIS total score.

**Table 3., Table 4.**

***Multivariate analysis***

Through multivariate linear regression analysis of socio-demographic characteristics, sleep habits and Connor-Davidson Resilience Scale total score on the AIS score (Table 5), all the important associations which are described in the previous paragraph were confirmed, after adjusting for all other variables in the model. After adjustment, it was found that women's average AIS total score was higher by 0.47 points than that of men's, that the unemployed compared to employed participants had significantly higher AIS score by 1.36 points and that the higher the resilience, the less likely was for an individual to suffer from sleep difficulties; one point increase in CD-RISC total score was associated with 0.08 points (95% confidence interval: 0.32 to 1.14) decrease in the AIS total score.

**Table 5.**

**Discussion**

The current study identified a high prevalence of sleep disorders in the Greek population during the first (2020) lockdown of the COVID-19 pandemic. In a few words, sleep disturbances were more likely to occur in females, the unemployed and the young adults. Sleep schedule was delayed for 67% of the participants, 38% suffered from insomnia (AIS total score > 6) during the lockdown and over 50% reported changes in subjective sleep duration. These higher prevalence rates of sleep disturbance have been explained by the fear associated with a pandemic, containment measures, high numbers of people infected and deaths.<sup>25</sup> The proportion of our subjects suffering from insomnia is similar to the 37.6% reported by Voitsidis et al.<sup>18</sup> Moreover, this is in accordance with other studies where the prevalence of sleep disturbances during the COVID-19 pandemic in the general population ranged from 30% to 56% as measured by the AIS.<sup>16,26-28</sup> It must be noted that various studies have identified different effects of a lockdown on sleep, some indicating decrease of sleep quality<sup>29-32</sup> while others found an improvement in sleep duration and a reduced prevalence of insomnia.<sup>33</sup> The latter study, however examined sleep in the early stages of the pandemic in the USA, something that may explain their findings, in conjunction with our observation that a positive correlation existed between AIS scores and time spent in lockdown, with a coefficient of 0.06 (increase in points of AIS total score per passing day); this can be attributed to a progressive deterioration of insomnia symptoms during lockdown conditions.

This study also attempted to clarify the association between resilience and sleep disorders. So far, a positive correlation has been identified between sleep quality and resilience in healthy

individuals.<sup>34</sup> In keeping with this correlation, our data indicates that increased levels of resilience were associated with less sleep problems during the COVID-19 pandemic: Higher scores in the resilience scale (CD RISC-25) were associated with less sleep disturbances (lower scores in the AIS). Numerous studies have been published thus far examining resilience during the COVID-19 pandemic worldwide.<sup>35</sup> These vary in terms of methodology and population examined. We found no studies which have examined the association between sleep and levels of resilience in periods of crisis.

Our results show that younger people reported worse sleep than older generation, in keeping with prior studies during the COVID-19 pandemic where the prevalence of anxiety and depressive symptoms was found to be significantly higher in participants younger than 35 years of age.<sup>36-39</sup> Other studies like that of Trakada et al.,<sup>17</sup> have found that people in the age range of 25-54 are more likely to develop sleep disturbance during the COVID-19 pandemic<sup>40</sup>, compared to those over 55 years of age. These age differences, which are somewhat surprising given that the elderly are the ones who are known to suffer more from insomnia,<sup>41</sup> have been attributed to dramatic changes to daily life and reduced outdoor activity of younger adults<sup>16</sup> and to the greater impact of complete lockdown restrictions on the daily functioning of younger individuals, including work and social stress, in comparison to older people.<sup>42-46</sup> This could be explained further by the fact that younger people tend to spend more time in front of blue-light appliances, which according to the literature, creates more risk for worse sleep.<sup>44</sup> Moreover, younger people were more likely to spend time focusing on the news of the COVID-19 outbreak, something that might have created anxiety, and as a result, affected sleep quality.

As mentioned above, gender and employment were also found to impact sleep in our study. Specifically, women and the unemployed scored higher in the AIS. This was also previously found in the Greek population both by Trakada et al.<sup>17</sup> and Voitsidis et al.,<sup>18</sup> which concurs with other studies that identified worse sleep quality during lockdown in women compared to men.<sup>26,45-49</sup>

Focusing on sleep habits, stratifying AIS scores according to sleep habits reveals interesting details. Firstly, it becomes evident that people who experienced sleep problems for the first time in their life during lockdown were affected the most as they had the highest AIS scores. Secondly, people whose sleep duration decreased also scored the highest in the AIS. Finally, individuals whose sleep schedule was altered, either towards being earlier or later, both scored significantly higher on the AIS compared to those whose sleep schedule remained unchanged.

This study has some strengths, most notably, the evaluation of the association between resilience, crisis and sleep, which has not been examined in the past. Other advantages are the large number of participants as well as the use of standardized questionnaires. The limitations of our study include the following: a) assessment of sleep was done only through subjective measures. Subjective measures of sleep are widely used in large studies; however, self-assessment of sleep quality/quantity, especially in older subjects, often differs from actual sleep structure,<sup>50</sup> b) depression diagnosis was not available in our sample, something that may have an impact on the results, since the prevalence of depression is rather high in the general population, and depression (as well as psychopathology in general) is significantly associated with sleep and insomnia symptoms,<sup>51</sup> c) no information was obtained on psychotropic drugs, especially benzodiazepines and other hypnotics, d) finally, it should be taken into account that there may be a possible bias towards technologically skilled people with internet access, when extrapolating these findings to the general population. Future research could also focus on the association between sleep and resilience in a longitudinal design to elucidate the relationship between resilience and sleep quality in the case of major stressful events.

Since the definition of resilience is usually understood as the ability to bounce back from 'adverse circumstances', there are several studies indicating the importance of increasing resilience. There are some training programs based on relaxation techniques such as mindfulness

and other cognitive and behavioral interventions, which may be able to enhance resilience.<sup>52</sup> Furthermore, there are also online e-health interventions targeting resilience in the workplace.<sup>52,53</sup>

In conclusion, our study confirmed previous studies in identifying quantitative changes in sleep during the COVID-19 lockdown, using validated scales such as the AIS. In addition, it expanded on these by identifying the correlation of sleep and resilience during the stressful period of lockdown measures. Finally, specific changes in normal sleep habits were identified during the lockdown, providing a useful outline of which of these changes increase the likelihood of developing sleep disturbances and insomnia. These factors should be taken into account when considering primary health interventions for supporting the general population in times of crisis.

## References

1. Onyeaka H, Anumudu CK, Al-Sharify ZT, Egele-Godswill E, Mbaegbu P. COVID-19 pandemic: A review of the global lockdown and its far-reaching effects. *Sci Prog* 2021, 104: 1-18, doi:10.1177/00368504211019854
2. Prati G, Mancini AD. The psychological impact of COVID-19 pandemic lockdowns: A review and meta-analysis of longitudinal studies and natural experiments. *Psychol Med* 2021, 51: 201-211, doi:10.1017/S0033291721000015
3. Kaye AD, Okeagu CN, Pham AD, Silva RA, Hurley JJ, Aron BL et al. Economic impact of COVID-19 pandemic on healthcare facilities and systems: International perspectives. *Best Pract Res Clin Anaesthesiol* 2021, 35: 293-306, doi:10.1016/j.bpa.2020.11.009
4. World Health Organization. COVID 19 Public Health Emergency of International Concern (PHEIC) Global Research and Innovation Forum: Towards a Research Roadmap. *Global Research Collaboration for Infectious Disease Preparedness*, 2020.
5. McAlonan GM, Lee AM, Cheung V, Cheung C, Tsang KWT, Sham PC et al. Immediate and sustained psychological impact of an emerging infectious disease outbreak on health care workers. *Can J Psychiatry* 2007, 52: 241-247, doi:10.1177/070674370705200406
6. Lee AM, Wong JGWS, McAlonan GM, Cheung V, Cheung C, Sham PC et al. Stress and psychological distress among SARS survivors 1 year after the outbreak. *Can J Psychiatry* 2007, 52: 233-240, doi:10.1177/070674370705200405
7. DiGiovanni C, Conley J, Chiu D, Zaborski J. Factors influencing compliance with quarantine in Toronto during the 2003 SARS outbreak. *Biosecur Bioterror* 2004, 2: 265-272 doi:10.1089/bsp.2004.2.265
8. Cava MA, Fay KE, Beanlands HJ, McCay EA, Wignall R. The experience of quarantine for individuals affected by SARS in Toronto. *Public Health Nurs* 2005, 22: 398-406, doi:10.1111/j.0737-1209.2005.220504.x
9. Pan PJD, Chang SH, Yu YY. A support group for home-quarantined college students exposed to SARS: Learning from practice. *J Spec Group Work* 2005, 30: 363-374, doi:10.1080/01933920500186951
10. Reynolds DL, Garay JR, Deamond SL, Moran MK, Gold W, Styra R. Understanding, compliance and psychological impact of the SARS quarantine experience. *Epidemiol Infect* 2008, 136: 997-1007, doi:10.1017/S0950268807009156
11. Wang Y, Xu B, Zhao G, Cao R, He X, Fu S. Is quarantine related to immediate negative psychological consequences during the 2009 H1N1 epidemic? *Gen Hosp Psychiatry* 2011, 33: 75-77, doi:10.1016/j.genhosppsych.2010.11.001
12. Desclaux A, Badji D, Ndione AG, Sow K. Accepted monitoring or endured quarantine? Ebola contacts' perceptions in Senegal. *Soc Sci Med*, 2017, 178: 38-45, doi:10.1016/j.socscimed.2017.02.009
13. Brooks S K, Webster R K, Smith L E, Woodland L, Wessely S, Greenberg N. et al. The psychological impact of quarantine and how to reduce it: rapid review of the evidence. *Lancet* 2020, 395, 912-920, doi: 10.1016/S0140-6736(20)30460-8.

14. Li W, Yang Y, Liu ZH, Zhao Y-J, Zhang Q, Zhang L. et al. Progression of mental health services during the COVID-19 outbreak in China. *Int J Biol Sci* 2020, 16: 1732-1738, doi:10.7150/ijbs.45120
15. Shigemura J, Kurosawa M. Mental Health Impact of the COVID-19 Pandemic in Japan. *Psychol Trauma* 2020, 12: 478-479, doi:10.1037/tra0000803
16. Lin YN, Liu ZR, Li SQ, Li CX, Zhang L, Li N et al. Burden of sleep disturbance during COVID-19 pandemic: A systematic review. *Nat Sci Sleep* 2021, 13:933-966, doi:10.2147/NSS.S312037
17. Trakada A, Nikolaidis PT, Andrade MDS, Puccinelli PJ, Economou NT, Steiropoulos P et al. Sleep during "lockdown" in the COVID-19 pandemic. *Int J Environ Res Public Health* 2020, 17, doi:10.3390/ijerph17239094
18. Voitsidis P, Gliatas I, Bairachtari V, Papadopoulou K, Papagoergiou G, Parlapani E et al. Insomnia during the COVID-19 pandemic in a Greek population. *Psychiatry Res* 2020, 289. doi:10.1016/j.psychres.2020.113076
19. Tugade MM, Fredrickson BL. Resilient Individuals Use Positive Emotions to Bounce Back From Negative Emotional Experiences. *J Pers Soc Psychol.* 2004, 86:320-333, doi:10.1037/0022-3514.86.2.320
20. Kalisch R, Baker DG, Basten U, Boks MP, Bonanno GA, Brummelman E et al. The resilience framework as a strategy to combat stress-related disorders. *Nat Hum Behav.* 2017, 1: 784-790, doi:10.1038/s41562-017-0200-8
21. Veer IM, Riepenhausen A, Zerban M, Wackerhagen C, Puhlmann LMC et al. Psycho-social factors associated with mental resilience in the Corona lockdown. *Transl Psychiatry* 2021, 11: 67, doi:10.1038/s41398-020-01150-4
22. Soldatos CR, Dikeos DG, Paparrigopoulos TJ. Athens Insomnia Scale: Validation of an instrument based on ICD-10 criteria. *J Psychosom Res* 2000, 48: 555-560, doi:10.1016/S0022-3999(00)00095-7
23. Soldatos CR, Dikeos DG, Paparrigopoulos TJ. The diagnostic validity of the Athens Insomnia Scale. *J Psychosom Res* 2003,55: 263-267, doi:10.1016/S0022-3999(02)00604-9
24. Connor KM, Davidson JRT. Development of a new Resilience scale: The Connor-Davidson Resilience scale (CD-RISC). *Depress Anxiety.* 2003, 18: 76-82, doi:10.1002/da.10113
25. Moghanibashi-Mansourieh A. Assessing the anxiety level of Iranian general population during COVID-19 outbreak. *Asian J Psychiatr* 2020, 51. doi:10.1016/j.ajp.2020.102076
26. Fu W, Wang C, Zou L, Guo Y, Lu Z, Yan S et al. Psychological health, sleep quality, and coping styles to stress facing the COVID-19 in Wuhan, China. *Transl Psychiatry* 2020, 10: 225, doi:10.1038/s41398-020-00913-3
27. Janati Idrissi A, Lamkaddem A, Benouajjit A, Bouaazzaoui MBL, Houari FE, Alami M et al. Sleep quality and mental health in the context of COVID-19 pandemic and lockdown in Morocco. *Sleep Med* 2020,74: 248-253, doi:10.1016/j.sleep.2020.07.045
28. Parlapani E, Holeva V, Nikopoulou VA, Sereslis K, Athanasiadou M, Godosidis A et al. Intolerance of Uncertainty and Loneliness in Older Adults During the COVID-19 Pandemic. *Front Psychiatry* 2020, 11: 842, doi:10.3389/fpsy.2020.00842
29. Li M, Zhang XW, Hou WS, Tang ZY. Insomnia and risk of cardiovascular disease: A meta-analysis of cohort studies. *Int J Cardiol* 2014, 176: 10044-1047, doi:10.1016/j.ijcard.2014.07.284
30. Barrea L, Pugliese G, Framondi L, Matteo RD, Laudisio D, Savastano S et al. Does Sars-Cov-2 threaten our dreams? Effect of quarantine on sleep quality and body mass index. *J Transl Med* 2020,18: 318, doi:10.1186/s12967-020-02465-y
31. Stanton R, To QG, Khaledi S, Williams SL, Alley SJ, Thwaite TL et al. Depression, anxiety and stress during COVID-19: Associations with changes in physical activity, sleep, tobacco and alcohol use in Australian adults. *Int J Environ Res Public Health* 2020, 17: 4065, doi:10.3390/ijerph17114065



32. Cellini N, Canale N, Mioni G, Costa S. Changes in sleep pattern, sense of time and digital media use during COVID-19 lockdown in Italy. *J Sleep Res* 2020, 29:13074, doi:10.1111/jsr.13074
33. Gao C, Scullin MK. Sleep health early in the coronavirus disease 2019 (COVID-19) outbreak in the United States: integrating longitudinal, cross-sectional, and retrospective recall data. *Sleep Med* 2020;73: 1-10, doi:10.1016/j.sleep.2020.06.032
34. Arora T, Grey I, Östlundh L, Alammoodi A, Omar OM, Hubert Lam KB et al. A systematic review and meta-analysis to assess the relationship between sleep duration/quality, mental toughness and resilience amongst healthy individuals. *Sleep Med Rev* 2022, 62: 101593, doi:10.1016/j.smr.2022.101593
35. Manchia M, Gathier AW, Yapici-Eser H, Schmidt MV, Quervain D van Amelsvoort Tet al. The impact of the prolonged COVID-19 pandemic on stress resilience and mental health: A critical review across waves. *Eur Neuropsychopharmacol* 2022, 55: 22-83, doi:10.1016/j.euroneuro.2021.10.864
36. Huang Y, Zhao N. Generalized Anxiety Disorder, Depressive Symptoms and Sleep Quality during COVID-19 Outbreak in China: a web-based cross-sectional survey. *Psychiatry Res* 2020 Jun;288:112954. doi: 10.1016/j.psychres.2020.
37. Marelli S, Castelnuovo A, Somma A, Castronovo V, Mombelli S, Bottoni D et al. Impact of COVID-19 lockdown on sleep quality in university students and administration staff. *J Neurol* 2021, 268: 8-15, doi:10.1007/s00415-020-10056-6
38. Romero-Blanco C, Rodríguez-Almagro J, Onieva-Zafra MD, Parra-Fernández ML, Prado-Laguna MDC, Hernández-Martínez A. Sleep pattern changes in nursing students during the COVID-19 lockdown. *Int J Environ Res Public Health* 2020, 17: 52222, doi:10.3390/ijerph17145222
39. Kaparounaki CK, Patsali ME, Mousa DP v., Papadopoulou EVK, Papadopoulou KKK, Fountoulakis KN. University students' mental health amidst the COVID-19 quarantine in Greece. *Psychiatry Res* 2020, 290:113111, doi:10.1016/j.psychres.2020.113111
40. Kim HJ, Kim REY, Kim S, Kim SA, Kim SE, Lee SK et al. Sex differences in deterioration of sleep properties associated with aging: A 12-year longitudinal cohort study. *Journal of Clinical Sleep Medicine* 2021;17(5). doi:10.5664/jcsm.9072
41. van de Straat V, Bracke P. How well does Europe sleep? A cross-national study of sleep problems in European older adults. *Int J Public Health* 2015, 60:643-650, doi:10.1007/s00038-015-0682-y
42. Pieh C, Budimir S, Probst T. The effect of age, gender, income, work, and physical activity on mental health during coronavirus disease (COVID-19) lockdown in Austria. *J Psychosom Res* 2020, 136: 110186, doi:10.1016/j.jpsychores.2020.110186
43. Kazmi SSH, Hasan K, Talib S, Saxena S. COVID-19 and Lockdwon: A Study on the Impact on Mental Health. *SSRN Electronic Journal* Published online 2020. doi:10.2139/ssrn.3577515
44. Gentry NW, Ashbrook LH, Fu YH, Ptáček LJ. Human circadian variations. *J Clin Invest* 2021, 131: 148282, doi:10.1172/JCI148282
45. Wang J, Gong Y, Chen Z, Wu J, Feng J, Yan S et al. Sleep disturbances among Chinese residents during the Coronavirus Disease 2019 outbreak and associated factors. *Sleep Med* 2020, 74:199-203, doi:10.1016/j.sleep.2020.08.002
46. Ara T, Rahman MM, Hossain MA, Ahmed A. Identifying the Associated Risk Factors of Sleep Disturbance During the COVID-19 Lockdown in Bangladesh: A Web-Based Survey. *Front Psychiatry* 2020, 11: 580268 doi:10.3389/fpsy.2020.580268
47. Casagrande M, Favieri F, Tambelli R, Forte G. The enemy who sealed the world: effects quarantine due to the COVID-19 on sleep quality, anxiety, and psychological distress in the Italian population. *Sleep Med* 2020, 75: 12-20. doi:10.1016/j.sleep.2020.05.011

48. Gualano MR, Io Moro G, Voglino G, Bert F, Siliquini R. Effects of COVID-19 lockdown on mental health and sleep disturbances in Italy. *Int J Environ Res Public Health* 2020, 17:4779, doi:10.3390/ijerph17134779
49. Rossi R, Soggi V, Talevi D, Mensi S, Niuolu C, Pacitti F et al. COVID-19 Pandemic and Lockdown Measures Impact on Mental Health Among the General Population in Italy. *Front Psychiatry* 2020, 11:790, doi:10.3389/fpsy.2020.00790
50. Åkerstedt T, Knutsson A, Westerholm P, Theorell T, Alfredsson L, Kecklund G. Sleep disturbances, work stress and work hours: A cross-sectional study. *J Psychosom Res* 2002, 53: 741-748, doi:10.1016/S0022-3999(02)00333-1
51. Vgontzas AN, Lin HM, Papaliaga M, Calhoun S, Bueno AV, Chrousos GP et al. Short sleep duration and obesity: The role of emotional stress and sleep disturbances. *Int J Obes* 2008, 32:801-809, doi:10.1038/ijo.2008.4
52. Aikens KA, Astin J, Pelletier KR, Levanovich K, Baase CM, Park YY et al. Mindfulness Goes to Work: Impact of an Online Workplace Intervention. *J Occup Environ Med* 2014, 56: 721-731, doi:10.1097/JOM.0000000000000209
53. Joyce S, Shand F, Tighe J, Laurent SJ, Bryant RA, Harvey SB. Road to resilience: A systematic review and meta-analysis of resilience training programmes and interventions. *BMJ Open* 2018, 8, doi:10.1136/bmjopen-2017-017858

**Table 1.** Socio-demographic characteristics (N=1260)

	n	%
Gender		
	Male	368 (29.2)
	Female	885 (70.2)
	NA	7 (0.6)
Age (years)		
	<20	11 (0.9)
	20 – 29	244 (19.3)
	30 – 39	336 (26.7)
	40 – 49	335 (26.6)
	50 – 59	203 (16.1)
	60 – 69	98 (7.8)
	≥ 70	33 (2.6)
Education		
	Up to Secondary	125 (9.9)
	Tertiary	1135 (90.1)

Residence		
	Athens	759 (60.2)
	City other than Athens	359 (28.5)
	Rural area	62 (4.9)
	Outside Greece	80 (6.4)
Work status		
	Employed	954 (75.7)
	Student	84 (6.7)
	Pensioner	76 (6.0)
	Unemployed	95 (7.5)
	Other	49 (3.9)
	NA	2 (0.2)
Unemployed due to covid-19 pandemic		
	No	978 (77.6)
	Yes	14 (1.1)
	Temporarily	263 (20.9)
	NA	5 (0.4)

**Table 2.** Sleep habits, Athens Insomnia Scale and Connor-Davidson Resilience Scale of the whole study sample (N=1260)

<i>Sleep Habits</i>	<i>Descriptive statistics</i>	
	n	%
When was the first time you experienced sleep disorders? (n, %)		
	Never	320 (25.4)
	Many years ago	613 (48.7)
	One year ago	115 (9.1)
	6 months ago	51 (4.0)
	Recently	150 (11.9)
	NA	11 (0.9)
Duration of sleep after the COVID-19 lockdown measures were put in place, compared to before (n, %)		
	Less	220 (17.5)
	Same	571 (45.3)

	More	466 (37)
	NA	3 (0.2)
Has your sleep schedule been altered lately? (n, %)	No	313 (24.8)
	Yes, towards later	839 (66.6)
	Yes, towards earlier	107 (8.5)
	NA	1 (0.1)
		Mean, SD
<hr/>		
<i>Connor-Davidson Resilience Scale (CD-RISC-25); selected items and total score</i>		
CD-RISC-1: I am able to adapt when changes occur (Mean, SD)		2.9 (0.9)
CD-RISC-4: I can deal with whatever comes my way (Mean, SD)		2.9 (0.7)
CD-RISC-19: I am able to handle unpleasant or painful feelings like sadness, fear, and anger (Mean, SD)		2.5 (0.9)
CD-RISC total score (Mean, SD)		66.4 (12.1)
<i>Athens Insomnia Scale (AIS)</i>		
Total score (Mean, SD)		5.8 (4.2)
<hr/>		
<i>Abbreviation: SD, standard deviation</i>		

**Table 3.** Comparison of Athens Insomnia Scale (AIS) total score between the subgroups of socio-demographic characteristics and sleep habits

Variables		AIS	Test Statistic	Df	p
Gender (Mean, SD)					
	Male	5.27 (3.88)	-2.8054	1248	0.01 (T)
	Female	6.00 (4.32)			
Age (Mean, SD)			3.63	6	0.001 (A)
	<20	7.51 (4.46)			
	20 – 29	6.15 (3.97)			
	30 – 39	6.31 (4.48)			
	40 – 49	5.65 (4.21)			
	50 – 59	4.88 (3.90)			
	60 – 69	5.74 (4.40)			
	≥ 70	4.52 (3.73)			
Education (Mean, SD)			1.2284	1255	0.17 (T)
	Up to Secondary	6.23 (4.15)			
	Tertiary	5.74 (4.23)			
Residence (Mean, SD)			0.79	3	0.77 (A)
	Athens	5.65 (4.05)			
	City other than Athens	6.03 (4.56)			

Work status (Mean, SD)	Rural area	6.14 (4.13)	4.62	4	0.001 (A)
	Abroad	5.81 (4.26)			
	Employed	5.54 (4.15)			
	Student	6.42 (3.83)			
	Pensioner	5.92 (4.35)			
	Unemployed	7.27 (4.50)			
	Other	6.47 (4.83)			
Unemployed due to covid-19 (Mean, SD)	No	5.67 (4.13)	1.53	2	0.41 (A)
	Temporary	6.15 (4.55)			
	Yes	6.49 (4.45)			
When was the first time you experienced sleep disorders? (Mean, SD)			53.06	4	0.001 (A)
	Never	3.07 (2.80)			
	Many years ago	6.62 (4.28)			
	One year ago	6.74 (4.25)			
	6 months ago	6.45 (4.64)			
	Recently	7.28 (3.78)			
Duration of sleep after the covid-19 measures were put in place (Mean, SD)			162.90	2	0.001 (A)
	Less	9.97 (4.04)			
	Same	4.97 (3.59)			
	More	4.80 (3.84)			
Has your sleep schedule been altered lately? (Mean, SD)			51.76	2	0.001 (A)
	No	3.77 (3.29)			
	Yes, towards later	6.41 (4.32)			
	Yes, towards earlier	5.79 (4.22)			

Abbreviations: SD, standard deviation; T, T-test; A, ANOVA.

The p-value is based on t-test or ANOVA (variables with three or more levels). Statistically significant values are marked in bold.

**Table 4.** Association of AIS score with socio-demographic characteristics, sleep habits and Connor-Davidson Resilience Scale total score through univariable linear regression models

	Category vs Reference	Mean absolute AIS score	OLS estimates				p
			Beta <sup>a</sup>	Standard Error	95% CI <sup>b</sup>		
					Lower Limit	Upper Limit	
Gender	Female vs. Male	6.08 vs. 5.32	0.76	0.27	0.23	1.29	0.005

Age	≥40 vs. <40	5.46 vs. 6.33	-0.87	0.25	-1.35	-0.39	<0.001
Education	Up to Secondary vs. Tertiary	6.41 vs. 5.81	0.60	0.41	-0.20	1.40	0.139
Residence	Abroad vs. Athens	5.78 vs. 5.72	0.06	0.50	-0.91	1.04	0.901
	City other than Athens vs. Athens	6.15 vs. 5.72	0.43	0.28	-0.12	0.98	0.124
	Rural area vs. Athens	6.07 vs. 5.72	0.34	0.56	-0.76	1.44	0.540
Work status	Unemploy ed vs. Employed	7.52 vs. 5.58	1.94	0.46	1.05	2.83	<0.001
	Pensioner vs. Employed	5.93 vs. 5.58	0.35	0.51	-0.65	1.36	0.489
	Student vs. Employed	6.60 vs. 5.58	1.02	0.48	0.07	1.96	0.035
	Other vs. Employed	6.73 vs. 5.58	1.15	0.63	-0.09	2.39	0.069
Unemployed due to covid-19	Yes vs. No	6.16 vs. 5.78	0.39	0.30	-0.20	0.97	0.198
When was the first time you experienced sleep disorders?	6 months ago vs. Recently	6.44 vs. 7.50	-1.06	0.67	-2.39	0.27	0.117
	One year ago vs. Recently	6.77 vs. 7.50	-0.73	0.52	-1.75	0.28	0.157
	Many years ago vs. Recently	6.75 vs. 7.50	-0.75	0.39	-1.53	0.02	0.056
	Never vs. Recently	3.05 vs. 7.50	-4.45	0.31	-5.07	-3.83	<0.001

Duration of sleep after the covid-19 measures were put in place	Same vs. Less	4.95 vs. 10.24	-5.29	0.30	-5.88	-4.70	<0.001
	More vs. Less	4.90 vs. 10.24	-5.34	0.33	-5.98	-4.69	<0.001
Has your sleep schedule been altered lately?	Yes, towards later vs. No	6.51 vs. 3.85	2.66	0.28	2.11	3.20	<0.001
	Yes, towards earlier vs. No	6.80 vs. 3.85	2.95	0.41	2.15	3.75	<0.001
Connor-Davidson Resilience Scale total score	Continuous		-0.88	0.23	-1.32	-0.42	<0.001

<sup>a</sup> Beta represents the difference in the mean scores between category and reference groups.

<sup>b</sup> Abbreviations: CI, confidence interval; OLS, ordinary least squares

**Table 5.** Estimates of multivariable linear regression models with socio-demographic characteristics, sleep habits and Connor-Davidson Resilience Scale total score on AIS score

Parameter	Category vs. Reference	Mean absolute AIS score	OLS estimates				p-value
			Betas <sup>a</sup>	Standard Error	95% CI <sup>b</sup>		
					Lower Limit	Upper Limit	
Gender	Female vs. Male	7.292 vs. 6.825	0.47	0.23	0.02	0.92	0.041
Age	≥40 vs. <40	6.696 vs. 7.421	-0.73	0.22	-1.16	-0.29	0.001
Work status	Unemployed vs. Employed	7.548 vs. 6.184	1.36	0.39	0.60	2.12	<0.001
	Student vs. Employed	6.768 vs. 6.184	0.58	0.42	-0.25	1.42	0.169
When was the first time you experienced sleep disorders?	Never vs. Recently	4.928 vs. 7.720	-2.79	0.37	-3.51	-2.08	<0.001

Duration of sleep after the covid-19 measures were put in place	More vs. Less	5.294 vs. 10.069	-4.78	0.30	-5.36	-4.19	<0.001
	Same vs. Less	5.811 vs. 10.069	-4.26	0.30	-4.84	-3.67	<0.001
Has your sleep schedule been altered lately?	Yes, towards earlier vs. No	7.509 vs. 6.063	1.45	0.42	0.62	2.27	<0.001
	Yes, towards later vs. No	7.603 vs. 6.063	1.54	0.26	1.02	2.06	<0.001
Connor-Davidson Resilience Scale total score	Continuous		-0.79	0.23	-1.14	-0.32	0.001

---

*The AIS score was the outcome variable. Multivariate linear regression models were employed to test all variables presented in Table 2b whose p-values were less than 0.05.*

*<sup>a</sup> Betas represent the difference in the mean scores between category and reference groups.*

*<sup>b</sup> Abbreviation: CI, confidence interval; OLS, ordinary least squares*

---



## ΕΡΕΥΝΗΤΙΚΗ ΕΡΓΑΣΙΑ

**Ο αντίκτυπος της πανδημίας COVID-19 στον ύπνο κατά την περίοδο του κατ' οίκον περιορισμού: Σχέση με την ψυχική ανθεκτικότητα**

**Μαρία Νταφούλη,<sup>1</sup> Ρήγας Σολδάτος,<sup>2</sup> Δημήτρης Δικαίος<sup>1</sup>**

<sup>1</sup>Μονάδα Μελέτης Ύπνου, Α΄Ψυχιατρική Κλινική ΕΚΠΑ, Αιγινήτειο Νοσοκομείο, Αθήνα, Ελλάδα

<sup>2</sup>Α΄Ψυχιατρική Κλινική ΕΚΠΑ, Αιγινήτειο Νοσοκομείο, Αθήνα, Ελλάδα

**ΙΣΤΟΡΙΚΟ ΑΡΘΡΟΥ:** Παραλήφθηκε 5 Φεβρουαρίου 2023 / Αναθεωρήθηκε 16 Ιουλίου 2023 / Δημοσιεύθηκε Διαδικτυακά 27 Φεβρουαρίου 2024

### -----ΠΕΡΙΛΗΨΗ-----

Πέρα από τον αντίκτυπο στη σωματική υγεία, η πανδημία SARS-CoV-2 είχε επίσης σημαντικό αντίκτυπο στην ψυχική υγεία των ανθρώπων. Η ανθεκτικότητα είναι ένα ψυχολογικό χαρακτηριστικό το οποίο ορίζεται ως η ικανότητα του ατόμου να ξεπερνά ή να προσαρμόζεται σε δυσκολίες όπως αντιξοότητες, ψυχικά τραύματα ή σημαντικές στρεσογόνες καταστάσεις. Τα άτομα με υψηλή ανθεκτικότητα έχει αποδειχθεί ότι εκδηλώνουν χαμηλότερα επίπεδα άγχους, στρες και κατάθλιψης όταν έρχονται αντιμέτωπα με τέτοια γεγονότα. Ο ύπνος, από την άλλη, αποτελεί μια σημαντική λειτουργία του οργανισμού που είναι ιδιαίτερα ευαίσθητη στο άγχος και το στρες. Ο στόχος αυτής της μελέτης ήταν να διερευνήσει τον αντίκτυπο της πανδημίας COVID-19 στην ποσότητα, ποιότητα και τις συνήθειες του ύπνου, λαμβάνοντας υπόψη την ψυχική ανθεκτικότητα. Συνολικά 1.260 άτομα συμπεριελήφθησαν στην διαδικτυακή έρευνα που διεξήχθη. Οι μεταβλητές που αξιολογήθηκαν ήταν κοινωνικο-δημογραφικές, συνήθειες ύπνου, ιστορικό διαταραχών ύπνου, η Κλίμακα Αϋπνίας Αθηνών (AIS), η Κλίμακα Ανθεκτικότητας Connor-Davidson (CD-RISC) και εργασιακές/οικονομικές συνέπειες κατά την περίοδο του πρώτου κατ' οίκον περιορισμού του COVID -19, το 2020. Τα αποτελέσματα έδειξαν ότι ο ύπνος κατά τη διάρκεια του κατ' οίκον περιορισμού άλλαξε για πολλούς από τους συμμετέχοντες, με το ωράριο του ύπνου τους να μετακινείται νωρίτερα ή αργότερα για το 9% και το 67% των συμμετεχόντων, αντίστοιχα. Το 38% των συμμετεχόντων βρέθηκε ότι υποφέρει από αϋπνία, με βάση τη βαθμολογία στην AIS. Επιπλέον, η υψηλότερη βαθμολογία στην CD-RISC συσχετίστηκε με καλύτερο ύπνο παρέχοντας στοιχεία για την επίδραση της ανθεκτικότητας στην ανάδυση της παθολογίας του ύπνου. Συμπερασματικά, η εργασία μας επιβεβαίωσε προηγούμενες μελέτες για τις ποσοτικές και ποιοτικές αλλαγές στον ύπνο κατά τη διάρκεια του κατ' οίκον περιορισμού την περίοδο του COVID-19. Επεκτάθηκε επίσης και πέραν αυτών, εντοπίζοντας τη σχέση του ύπνου και της ψυχικής ανθεκτικότητας κατά τη διάρκεια της ψυχοπνευστικής περιόδου του κατ' οίκον περιορισμού.

**ΛΕΞΕΙΣ ΕΥΡΕΤΗΡΙΟΥ:** Ποιότητα ύπνου, αϋπνία, πανδημία, COVID-19, συνήθειες ύπνου, ψυχική ανθεκτικότητα.

**Επιμελητής συγγραφέας:** Μαρία Νταφούλη, Μονάδα Μελέτης Ύπνου, Α΄Ψυχιατρική Κλινική ΕΚΠΑ, Αιγινήτειο Νοσοκομείο, Βασιλίσσης Σοφίας 72, 11528 Αθήνα, Ελλάδα, Email: [marynt@med.uoa.gr](mailto:marynt@med.uoa.gr)