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Title: Early impact of the COVID-19 outbreak on sleep in a large Spanish sample

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Abstract

Coronavirus disease 2019 (COVID-19) forced Spain to implement unprecedented lockdown restriction. In this context, different factors could worsen sleep quality, but the impact of the pandemic and lockdown on sleep is still mostly unknown. In this cross-sectional study, we describe self-reported sleep disturbances in people without mental health disorders from a large Spanish sample (n=15070). During the early phase of the lockdown (19-26 March), an online survey was launched using a snowball sampling method and included sociodemographic and clinical data along with the Depression, Anxiety, and Stress Scale (DASS-21) and the Impact of Event Scale (IES). Two items of the IES were employed to assess sleep characteristics. Descriptive and bivariate analysis and logistic regression models were performed. Difficulty initiating or maintaining sleep were reported by 23.9% of the sample and was associated in the regression model with age (OR=1.008, p=0.003), female sex (OR=1.344, p<0.001), an income reduction >50% (OR=1.248, p=0.037), having one (OR=1.208, p=0.029) and two or more (OR=1.299, p=0.035) elderly dependents, drinking alcohol (OR=1.129, p=0.024), and a higher score on DASS-21 depression (OR=1.148, p<0.001), anxiety (OR=1.218, p<0.001), or stress (OR=1.302, p<0.001) subscales, whereas being able to enjoy free time (OR=0.604, p<0.001) and painting or listening to music (OR=0.853, p=0.012) were protective factors. Dreams related to COVID-19 were reported by 12.9% of the sample and were associated in the regression model with female sex (OR=1.617, p<0.001), being married (OR=1.190, p=0.015), self-employed (OR=1.373, p=0.032), or a civil servant (OR=1.412, p=0.010), having been tested for COVID-19 (OR=1.583, p=0.012), having infected family or friends (OR=1.233, p=0.001), reading news about coronavirus (OR=1.139, p=0.023), drinking alcohol (OR=1.251, p<0.001), and higher scores on DASS-21 depression (OR=1.102, p<0.001), anxiety (OR=1.222, p<0.001), or stress (OR=1.213, p<0.001) subscales, while protective factors were older age (OR=0.983, p<0.001) and being retired (OR=0.625, p=0.045). These findings could help clinicians and public health systems design and deliver tailored

interventions, such as internet-delivered campaigns, to promote sleep quality in the general population.

Keywords

Insomnia, Sleep initiation and maintenance disorders, Dreams, Risk factors, Coronavirus, General population

Early impact of the COVID-19 outbreak on sleep in a large Spanish sample

1. Introduction

Sleep health, defined as a multidimensional pattern of sleep-wakefulness adapted to individual, social, and environmental demands, is essential to achieve and maintain physical and mental well-being (Buysse, 2014). Sleep disruption has been widely associated with psychological distress and impairment in daytime functioning (Winkelman, 2015) and can lead to deleterious health outcomes (Itani et al., 2017), including greater susceptibility to viral infections (Prather et al. 2015) and pneumonia (Patel et al., 2012). Nevertheless, in recent years, there is a trend towards an increased prevalence of sleep disturbances (Calem et al., 2012; Pallesen et al., 2014), with up to one in five individuals in the general population of Spain experiencing insomnia symptoms (Ohayon & Sagales, 2010) and about 10% of the European population suffering insomnia disorder (Riemann et al., 2017).

It is known that acute stressors can trigger temporary disruption of sleep patterns (Riemann et al., 2017) and that epidemic outbreaks can lead to an increased rate of sleep disturbances in the at-risk population, especially when facing an unknown infectious disease (Chen et al., 2006; McAlonan et al., 2007). However, the global impact of coronavirus disease 2019 (COVID-19), including its consequences for sleep and mental health, is unprecedented and still mostly unknown. Recent data from web-based surveys reported a high prevalence of poor sleep quality in the general population during the COVID-19 outbreak (Cellini et al., 2020; Huang & Zhao, 2020; Xue et al., 2020). Moreover, recent studies have observed several pandemic-specific dream contents in the general population, such as failures in social distancing or coronavirus contagion, showing an association with increased stress (Pesonen et al., 2020). The presence of distressing dreams related with specific traumatic experiences, as a prolonged treatment in the Intensive Care Unit due to COVID-19, is relevant because it may represent an early symptom of

the onset of stress-related disorders, being considered a diagnostic criterion for Posttraumatic Stress Disorder (PTSD) in the 5th ed. of the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2013).

Psychological distress, consistently described in subjects exposed to the virus or its indirect consequences (Huang & Zhao, 2020; Kang et al., 2020; Lai et al., 2020; Wang et al., 2020), could be a contributing factor to sleep problems, in view of the bidirectional relationship existing between anxiety, depression, and insomnia (Alvaro et al., 2013). Although, in the context of COVID-19 pandemic, other factors could also lead to a deterioration of sleep quality, such as living with uncertainty, feeling insecure and worried about the duration of the pandemic and its consequences, changes in daily routines (Altena et al., 2020), feelings of frustration and boredom (Brooks et al., 2020), and recurring to unhealthy lifestyles (Balanzá-Martínez et al., 2020) or substance consumption (García-Álvarez et al., 2020) as a coping strategy. Moreover, the COVID-19 pandemic could increase unemployment, negatively impact the work-family balance, or generate financial insecurity, significant risk factors for a range of poor sleep outcomes (Mai et al., 2019).

However, literature about sleep quality during the COVID-19 pandemic is still scarce (Rajkumar, 2020) and, to our knowledge, no study to date has examined its impact on the general population in Spain. In this regard, it must be noted that unlike other countries such as China, Spain had barely been touched by recent epidemics such as the SARS or MERS outbreaks, and its population was not used to face infectious disease threats when the first cases of COVID-19 were announced in February 2020. At the beginning of March, the Spanish population was still living in an atmosphere of relative normality, with public events being held and people maintaining their daily routines, but the rapid progression of the crisis forced the government to declare a state of emergency on 14 March 2020, with lockdown restrictions unmatched in the history of the country. The first measures were announced for an initial 14-

days period, extended for an additional 14 days on 22 March (García-Álvarez et al., 2020). Thus, the current research, carried out between 19 and 26 March 2020, represents one of the earliest studies realized in a country after the announcement of national lockdown restrictions due to COVID-19. Also, while other countries initially opted for targeted interventions in the areas of highest incidence of the virus, these measures applied to the whole Spanish territory.

In the current work, we aim to describe the presence of self-reported sleep disturbances in people with no past or current mental health disorders from a large Spanish sample during the early phase of the COVID-19 lockdown. Furthermore, we aim to explore the association between those sleep disturbances, sociodemographic factors, existing medical conditions, and variables related to exposure to COVID-19 and its social, economic, and psychological consequences, with particular attention to those susceptible to intervention. We hypothesized that a high percentage of the population would experience sleep problems and that exposure to COVID-19 and its social, economic, and psychological consequences would represent a risk factor, especially in older adults and those with existing medical conditions.

2. Methods

2.1. Study design

This study is a secondary analysis of data from a larger web-based cross-sectional survey conducted to explore the early psychological impact of the COVID-19 pandemic and the lockdown restrictions in Spain (García-Álvarez et al., 2020). The study consisted of an anonymous questionnaire available online for 7 days (19-26 March 2020). The time when the questionnaire was disseminated is meaningful in the context of the government's declaration of a state of emergency on 14 March 2020. Given the restrictions due to the lockdown, the survey was spread through social networks and e-mails using a virtual snowball sampling method (Baltar & Brunet, 2012) to allow participation by individuals from different regions of the

country (for more details, see García-Álvarez et al., under review). There was no planned sample size.

2.2. Sample

A total of 21,279 people living in Spain answered the questionnaire through the Internet.

We excluded all subjects who failed to meet the minimum age criterion (n=72) or reported past or current mental health disorders (n=6137) to reduce the possible confounding effects of prior psychiatric disorders. No other exclusion criteria were established so as to obtain a broad sample of people living in Spain. Thus, the final sample included 15,070 people.

Inclusion criteria were 1) being older than 17 years and 2) giving informed consent by clicking "I am of legal age and wish to participate in this project" placed after the first web page of the survey, containing the study information.

2.3. Ethical issues

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki, and the Clinical Research Ethics Committee of Hospital Universitario Central de Asturias (Oviedo, Spain) approved the study protocol on 16 March (Ref. 2020.162). Each participant gave informed consent before participating in the study, with the possibility to withdraw from the study at any time without providing any justification.

2.4. Measures

2.4.1. Sociodemographic and clinical information

Patient sociodemographic details included information about sex, age, family composition, and changes in work status or monthly income. Clinical characteristics such as previous physical health issues were also collected. The presence of past or current mental health disorders was explored through the following questions: a) "Have you had a mental health problem in the past?" and b) "Do you currently have a mental health problem?" In both cases, we asked the respondent to specify the kind of mental health disorder, if any, selecting the reply from a list of options. Given that the presence of past or current mental health disorders was an exclusion

criterion for the current study, people who responded affirmatively to any of those questions were excluded from the analysis.

Furthermore, responses to a series of questions related to COVID-19 were recorded, including data regarding coronavirus testing, presence of disease symptoms, and number of family members infected with the virus.

2.4.2. Clinical psychometric instruments

The questionnaire included the Spanish versions of two self-reported psychometric instruments: a) the Depression, Anxiety, and Stress Scale (DASS-21) (Bados et al., 2005) was used to evaluate the three dimensions of depressive, anxious, and stress responses, and b) the Impact of Event Scale (IES) (Báguena Puigcerver et al., 2001), which provides information on intrusive thoughts and avoidant behaviors, was used to assess the presence of sleep disturbances. These instruments measure maladaptive responses over the last seven days. For both scales, the validation process does not provide cut-off scores for the Spanish population and the representativeness of the sample employed in the process is at least doubtful (García-Álvarez et al., 2020). In the case of DASS-21, the sample consisted of 365 psychology graduate students and 35 patients undergoing treatment, while the validation of the IES was carried out with 1,078 students. Therefore, we decided to simplify the original four response options (from "never" to "almost always"), preferring a binary response solution (0 "no" or 1 "yes") to make the survey friendlier for the general public and facilitate completion of the questionnaire on mobile devices. Thus, the three DASS-21 subscales for depression, anxiety, and stress had scores with a range between 0 and 7 (for more details, see García-Álvarez et al., 2020).

2.4.3. Sleep disturbances

Two items from the Impact of Event Scale (IES) were used to assess the presence of disruption in sleep patterns: a) "I had trouble falling asleep or staying asleep because of pictures or thoughts about it that came to my mind", to indicate the presence of difficulty initiating or maintaining sleep and b) "I had dreams about it", to explore the presence of dreams about the

COVID-19 outbreak. It was specified that all answers on the questionnaire should be in relation to COVID-19 pandemic and the lockdown. For both questions, the participants were asked to indicate "Yes" or "No".

2.5. Statistical analysis

Statistical analyses were performed using jamovi 1.1 for Windows (The jamovi project, 2019), an open-source graphical user interface (GUI) for R. The significance was set to $p < 0.05$ (two-tailed). Descriptive analyses were first conducted, with results reported as means and standard deviations (SD) for continuous variables, while frequency distributions and percentages were used for categorical data. Comparisons between groups were performed using a chi-square test (χ^2) for categorical variables and Student's t-test, or Welch's t-test if unequal variances, for continuous measures.

Finally, we built two logistic regression models, one for each question about sleep, to investigate the association between predictive variables and sleep disturbances, which were considered binary dependent outcomes (0 "no" or 1 "yes"). Variables with a significant result in the bivariate analysis were entered in the models after checking for multicollinearity (see Supplementary Material).

3. Results

3.1. Sociodemographic and physical health characteristics

The sociodemographic characteristics of the sample are described in Table 1. **[Table 1 here]** The final sample included 15,070 people, of whom 9,922 were females (65.8%). The mean age of the sample was 40.11 (SD=14.28). Most of the respondents had a university degree (63.6%), and a high proportion of the sample (52.2%) reported a monthly income under €1,499. At the time of the study, most of the sample (84.4%) had not experienced changes in work status or monthly income (75.0%). Despite the fact that almost half of the respondents stated they were

single (45.67%), only 11.4% reported living alone. Most of the participants reported not having dependent children (66.1%) or elderly (91.1%) dependents.

With regard to previous physical health issues, 25.5% of people had current chronic physical conditions and 10.5% had experienced symptoms compatible with the COVID-19 disease. While 21.0% of respondents reported having friends or family members affected by the virus, only a small percentage (1.5%) had been tested for COVID-19 at the time of the study.

3.2. Leisure activities

Table 2 reports on leisure activities during the lockdown. **[Table 2 here]** Despite the forced limitations due to the lockdown measures, the vast majority of respondents (94.2%) were able to enjoy their free time. Approximately 90% of the participants reported spending time on social networks (92.3%), watching TV (90.4%), and painting or listening to music (87.2%). Approximately 20% of the sample acknowledged drinking alcohol as a distraction strategy, while 3.2% resorted to illicit drug use.

3.3. Sleep problems and psychological variables

Difficulty initiating or maintaining sleep was reported by 23.9% of the sample population, while 12.9% revealed having dreams related to COVID-19. Overall, 30.2% responded affirmatively to at least one of the two sleep-related questions, with 6.6% of the total sample reported having both difficulties initiating or maintaining sleep and dreams related to COVID-19. Younger age characterized both the group with difficulty initiating or maintaining sleep and the one with oneiric activity related to COVID-19 as compared to people without these complaints. Similarly, both symptoms were significantly more common in females, who represented 75.6% and 79.2% of the total sample, respectively.

Mean scores with standard deviations on the DASS-21 subscales are shown in Table 3. **[Table 3 here]** Respondents with difficulty initiating or maintaining sleep scored higher on the depression, anxiety, and stress subscales compared with the group without this difficulty.

Similar results were observed when comparing individuals who reported dreaming about COVID-19, with higher scores on all the subscales.

3.4. Risk and protective factors for sleep disturbances

Results of the regression analyses are shown in Table 4. To avoid confusion, only significant associations are shown in the table (full data available on request). **[Table 4 here]**

The model for difficulty initiating or maintaining sleep retained the following variables as risk factors: age (OR=1.008), female sex (OR=1.344), 51-100% reduction in monthly income (OR=1.248), having one (OR=1.208) and two or more (OR=1.299) elderly dependents, drinking alcohol as a distraction (OR=1.129), and a higher score on DASS-21 depression (OR=1.148), anxiety (OR=1.218), or stress (OR=1.302) subscales. To the contrary, being able to enjoy free time (OR=0.604) and use spare time painting or listening to music (OR=0.853) conferred a protective effect.

The second model, with dreams related to COVID-19 as the dependent variable, showed a significant positive association with female sex (OR=1.617), being or living as married (OR=1.190), working as self-employed (OR=1.373) or a civil servant (OR=1.412), having been tested for COVID-19 (OR=1.583), having family or friends infected with COVID-19 (OR=1.233), reading news about the coronavirus (OR=1.139), drinking alcohol (OR=1.251), and higher scores on DASS-21 depression (OR=1.102), anxiety (OR=1.222), or stress (OR=1.213) subscales. Protective factors were older age (OR=0.983) and being retired (OR=0.625).

4. Discussion

To the best of our knowledge, this is the first study that assesses the early impact of the COVID-19 outbreak on sleep quality in a large sample from the Spanish general population with no previous mental health disorders. With the current research, we add further evidence to the existing literature investigating the short-term effects of the pandemic in European countries.

In recent years, the prevalence of insomnia and other sleep disturbances among the general population have produced mixed results (Riemann et al., 2017), probably due to different methodologies. In Spain, it was found that between 3.7% and 17.6% had difficulties initiating sleep, 10.8% had difficulties maintaining sleep, 12.3% reported nightmares, 17.6% had a disrupted sleep pattern (≥3 nights/week), and 6.4% met insomnia disorder criteria in (Ohayon & Sagales, 2010; Vela-Bueno et al., 1999). However, these results did not account for previous mental health disorders, and the inclusion of people with past or present mental illnesses might have led to inflated percentages. Hence, when compared with previous Spanish data, our results seem to indicate a slightly higher prevalence of disturbances in the onset or maintenance of sleep. On the contrary, rates of nightmares seem in line with the previous results by Vela-Bueno and al. (1999), but the authors did not deal with the specific content of the dreams.

Acute stressors represent a well-known trigger for sleep disorders (Riemann et al., 2017), and the actual lockdown restrictions to contain the COVID-19 outbreak (Wilder-Smith et al., 2020) generated a wide array of unprecedented stressful situations with potential negative consequences for sleep (Altena et al., 2020). Recent data from a web-based cross-sectional study conducted in China during the first half of February (Huang & Zhao, 2020) showed an 18.2% rate of poor sleep quality in the general population. It is possible that increased worry after the WHO declaration of the pandemic on 11 March partly contributed to the higher rate in our sample, as observed in Italy in the same period (Cellini et al., 2020).

In our sample, we found that younger people were at increased risk of dreaming about COVID-19. This result contrasts with the previous literature, which found nightmares to become more frequent with advancing age (Sandman et al., 2015). Social and economic factors, such as the fears of young adults for their professional future, could contribute to explaining our findings. Interestingly, the logistic regression model for difficulty initiating or maintaining sleep reversed the direction of this association and found older age to be a risk factor, suggesting that other

psychological variables could mediate the relationship between poor sleep and age. Regarding sex, females showed a higher risk for onset and maintenance of insomnia, replicating findings from previous studies in the general population (Ohayon & Sagales, 2010; Vela-Bueno et al., 1999). Moreover, women tend to report more nightmares than men among young adults (Sandman et al., 2015), who constitute most of our sample. In contrast, data from the current outbreak did not reveal sex differences in the general population in China (Huang & Zhao, 2020; Xue et al., 2020), but these studies did not consider the effect of anxiety, depression, or stress on sleep. Hence, the immediate psychological impact of the outbreak, more significant in women (García-Álvarezet al., 2020; Lai et al., 2020; Liu et al., 2020; Wang et al., 2020), may play a role for both sleep complaints included herein and we found that higher scores on all the DASS-21 subscales were a risk factor for such problems, in agreement with other studies (Cellini et al., 2020; Stanton et al., 2020). Therefore, we support the idea that the psychopathological effects of the pandemic could predict and be predicted by sleep disruptions, given the bidirectional relationship existing between anxiety, depression, and insomnia (Alvaro et al., 2013). However, the cross-sectional nature of our study limits the ability to speculate about a cause-effect association between sleep quality and the explored psychological domains. Nevertheless, we recommend a comprehensive and careful assessment of depression, anxiety, and stress levels in patients seen for sleep disturbances during COVID-19 outbreaks, as they could represent an early symptom of the onset of psychiatric disorders (Liu et al., 2020).

Worry about possible health outcomes of COVID-19, especially when having elderly dependents or infected relatives, may account for the increased odds of onset and maintenance of insomnia or the virus-related oneiric activity. On the contrary, no increased risk of sleep disturbances was found in those participants who experienced coronavirus-like symptoms or were living with infected people. However, given the methodological nature of our study, it is plausible that COVID-19-infected people living with the respondents were clinically stable

outpatients with no life-threatening risk and that symptoms reported by the participants were mild.

Regarding the changes in job continuity and financial security, which could be positively associated with sleep disturbances (Mai et al., 2019), we found that a 51-100% reduction in monthly income was positively associated with difficult sleep onset or maintenance and that being self-employed or work as a civil servant, which included medical staff and public safety workers, were risk factors for coronavirus-related dreams. No significant effects were seen as regards the basic income or changes in work status due to COVID-19, but just a small fraction of the respondents had already experienced contractual adjustments at the time of the study. Existing literature from the 2003 SARS outbreak (Chen et al., 2006; Maunder et al., 2003; McAlonan et al., 2007) and the COVID-19 pandemic (Lai et al., 2020; Xiao, Zhang, Kong, Li, & Yang, 2020) also found complaints of poor sleep in health workers, a category highly vulnerable to sleep disorders (Gustavsson et al., 2020; Zeng et al., 2019). More comprehensive, longer-term studies should further investigate the impact on other at-risk professionals, as we can expect stress and sleep deprivation to sharply increase among groups of other shift workers or those more susceptible to the economic consequences of COVID-19 (Altena et al., 2020).

Another problem for confined people is feelings of frustration and boredom due to the impossibility of engaging in certain activities (Brooks et al., 2020) and the disruption of usual routines (Altena et al., 2020). The data reported here found a positive effect of cultural and creative activities on sleep and, taken together, our results suggest that maintaining the ability to enjoy free time will result in fewer sleep disturbances. In contrast, reading news about COVID-19 increased the odds of dreaming about it, likely motivated by the nonstop flow of coronavirus news, with overwhelming and sensational news headlines that may impact psychological well-being (Asmundson & Taylor, 2020). Also, the lockdown could lead to an increase in unhealthy

lifestyles, such as alcohol misuse as a form of distraction or an avoidance strategy (García-Álvarez et al., 2020), with disruptive effects on sleep homeostasis (Thakkar et al., 2015).

In this context, identifying modifiable protective and risk factors could play a crucial role in designing effective and efficient public health interventions to avoid the onset or exacerbation of sleep disorders and comorbid mental health complications. For example, eHealth and mobile health interventions, carried out remotely to reach a large number of individuals (Balanzá-Martínez et al., 2020), could represent an effective and affordable non-pharmacological strategy to ameliorate sleep quality among people in need, as in the case of internet-delivered sleep hygiene workshops or self-help cognitive behavioral therapy for insomnia (Wong et al., 2020). Furthermore, campaigns through mass media or social media platforms could help disseminate rigorous information about coping strategies and fight the misinformation spread on the web. In agreement with previous recommendations (Altena et al., 2020), our results suggest that these interventions should primarily target modifiable risk factors, stressing out the importance of limiting the excessive exposure to news about the COVID-19, avoiding unhealthy lifestyles such as alcohol misuse, or scheduling the free time to keep busy with relaxing and distracting activities.

The reader should be aware of some limitations when interpreting the current findings. While a web survey allowed the participants to easily take part in the research even during the lockdown, this kind of approach suffers from well-known drawbacks. Selection bias, probably due to the digital divide among diverse social groups, is perhaps the main potential concern because respondents in our sample were mostly females, highly educated, and reported a high monthly income for Spain, limiting generalizability. Furthermore, the use of self-report questionnaires to assess symptoms could lead to response bias, and no information about previous sleep quality was collected. Finally, the percentage of participants with COVID-19 was

small, most likely because the prevalence of the illness was still relatively low in Spain when we started the study, and people were being tested at a slower pace.

Despite these limitations, it is worth pointing out some strengths of our study. These include the size of the collected sample, its multicentre characteristics, as well the wide-ranging factors explored. Moreover, the study took place just after the Spanish government declared a state of emergency and thus represents a significant source of information about the early impact of the pandemic, and will allow medium- and long-term replication of the analysis, to verify the ability of the early-identified factors to predict sleep disruption in the general population during a prolonged and stressful lockdown.

5. Conclusions

This study represents the first attempt to understand the early impact of the COVID-19 outbreak on sleep in a sample from the Spanish general population. We observed a high prevalence of self-reported sleep problems, and different risk factors were identified, such as female sex, professional exposure to stress or economic loss, alcohol misuse as a coping strategy, and experiencing greater psychological distress. In contrast, being able to enjoy free time was a protective factor. If replicated, these findings could help clinicians and public health systems design and deliver tailored interventions to promote sleep quality in the general population, e.g., through smartphone apps or social network campaigns.

Authors' contributions

LGA, LFT, MPGP, PAS, and JB designed the study. All authors reviewed and approved it and acquired the data. FDS, LGB, JRR, and GP conducted the statistical analyses. FDS, LGB, JRR, and PAMG wrote the first draft of the manuscript. All authors reviewed all drafts and gave the final approval.

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Disclosure statement

The authors declare no conflicts of interest for the submitted work.

Data availability statement.

Due to the nature of this research, participants of this study did not agree for their data to be shared publicly, so supporting data is not available.

Altena, E., Baglioni, C., Espie, C. A., Ellis, J., Gavriloff, D., Holzinger, B., … Riemann, D. (2020). Dealing with sleep problems during home confinement due to the COVID-19 outbreak: practical recommendations from a task force of the European CBT-I Academy. *Journal of Sleep Research*. https://doi.org/10.1111/jsr.13052

Alvaro, P. K., Roberts, R. M., & Harris, J. K. (2013). A Systematic Review Assessing Bidirectionality between Sleep Disturbances, Anxiety, and Depression. *Sleep*. https://doi.org/10.5665/sleep.2810

American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.). https://doi.org/10.1176/appi.books.9780890425596

Asmundson, G. J. G., & Taylor, S. (2020). Coronaphobia: Fear and the 2019-nCoV outbreak. *Journal of Anxiety Disorders*. https://doi.org/10.1016/j.janxdis.2020.102196

Bados, A., Solanas, A., & Andrés, R. (2005). Psychometric properties of the Spanish version of Depression, Anxiety and Stress Scales (DASS). *Psicothema*.

Báguena Puigcerver, M., Villarroya Soler, E., Beleña Mateo, M., Díaz, A., Roldán, C., & Reig, R. (2001). Propiedades psicométricas de la versión española de la escala revisada de impacto del estresor (EIE-R). *Análisis y Modificación de Conducta*.

Balanzá-Martínez, V., Atienza-Carbonell, B., Kapczinski, F., & De Boni, R. B. (2020). Lifestyle behaviours during the COVID-19 - time to connect. *Acta Psychiatrica Scandinavica*. https://doi.org/10.1111/acps.13177

Baltar, F., & Brunet, I. (2012). Social research 2.0: Virtual snowball sampling method using Facebook. *Internet Research*. https://doi.org/10.1108/10662241211199960

Brooks, S. K., Webster, R. K., Smith, L. E., Woodland, L., Wessely, S., Greenberg, N., & Rubin, G. J. (2020). The psychological impact of quarantine and how to reduce it: rapid review of the evidence. *The Lancet*. https://doi.org/10.1016/S0140-6736(20)30460-8

Buysse, D. J. (2014). Sleep Health: Can We Define It? Does It Matter? *Sleep*. https://doi.org/10.5665/sleep.3298

Calem, M., Bisla, J., Begum, A., Dewey, M., Bebbington, P. E., Brugha, T., … Stewart, R. (2012). Increased prevalence of insomnia and changes in hypnotics use in England over 15 years: Analysis of the 1993, 2000, and 2007 national psychiatric morbidity surveys. *Sleep*. https://doi.org/10.5665/sleep.1700

Cellini, N., Canale, N., Mioni, G., & Costa, S. (2020). Changes in sleep pattern, sense of time and digital media use during COVID-19 lockdown in Italy. *Journal of Sleep Research*. https://doi.org/10.1111/jsr.13074

Chen, R., Chou, K. R., Huang, Y. J., Wang, T. S., Liu, S. Y., & Ho, L. Y. (2006). Effects of a SARS prevention programme in Taiwan on nursing staff's anxiety, depression and sleep quality: A longitudinal survey. *International Journal of Nursing Studies*. https://doi.org/10.1016/j.ijnurstu.2005.03.006

García-Álvarez, L., de la Fuente-Tomás, L., García-Portilla, M. P., Sáiz, P. A., Moya Lacasa, C., Dal Santo, F., … Bobes, J. (2020). Early psychological impact of the 2019 coronavirus disease (COVID-19) pandemic and lockdown in a large Spanish sample. *Journal of Global Health*. https://doi.org/10.7189/jogh.10.020505

García-Álvarez, L., de la Fuente-Tomás, L., Sáiz, P. A., García-Portilla, M. P., & Bobes, J. (2020). ¿Se observarán cambios en el consumo de alcohol y tabaco durante el confinamiento por COVID-19? *Adicciones*, *32*(2), 85. https://doi.org/10.20882/adicciones.1546

Gustavsson, K., Wierzbicka, A., Matuszczyk, M., Matuszczyk, M., & Wichniak, A. (2020). Sleep among primary care physicians–Association with overtime, night duties and strategies to counteract poor sleep quality. *Journal of Sleep Research*. https://doi.org/10.1111/jsr.13031

Huang, Y., & Zhao, N. (2020). Generalized anxiety disorder, depressive symptoms and sleep

quality during COVID-19 outbreak in China: a web-based cross-sectional survey. *Psychiatry Research*, 112954. https://doi.org/10.1016/j.psychres.2020.112954

Itani, O., Jike, M., Watanabe, N., & Kaneita, Y. (2017). Short sleep duration and health outcomes: a systematic review, meta-analysis, and meta-regression. *Sleep Medicine*. https://doi.org/10.1016/j.sleep.2016.08.006

Lai, J., Ma, S., Wang, Y., Cai, Z., Hu, J., Wei, N., … Hu, S. (2020). Factors Associated With Mental Health Outcomes Among Health Care Workers Exposed to Coronavirus Disease 2019. *JAMA Network Open*. https://doi.org/10.1001/jamanetworkopen.2020.3976

Liu, N., Zhang, F., Wei, C., Jia, Y., Shang, Z., Sun, L., … Liu, W. (2020). Prevalence and predictors of PTSS during COVID-19 outbreak in China hardest-hit areas: Gender differences matter. *Psychiatry Research*. https://doi.org/10.1016/j.psychres.2020.112921

Mai, Q. D., Hill, T. D., Vila-Henninger, L., & Grandner, M. A. (2019). Employment insecurity and sleep disturbance: Evidence from 31 European countries. *Journal of Sleep Research*. https://doi.org/10.1111/jsr.12763

Maunder, R., Hunter, J., Vincent, L., Bennett, J., Peladeau, N., Leszcz, M., … Mazzulli, T. (2003). The immediate psychological and occupational impact of the 2003 SARS outbreak in a teaching hospital. *CMAJ*.

McAlonan, G. M., Lee, A. M., Cheung, V., Cheung, C., Tsang, K. W. T., Sham, P. C., … Wong, J. G. W. S. (2007). Immediate and sustained psychological impact of an emerging infectious disease outbreak on health care workers. *Canadian Journal of Psychiatry*. https://doi.org/10.1177/070674370705200406

Ohayon, M. M., & Sagales, T. (2010). Prevalence of insomnia and sleep characteristics in the general population of Spain. *Sleep Medicine*. https://doi.org/10.1016/j.sleep.2010.02.018

Pallesen, S., Sivertsen, B., Nordhus, I. H., & Bjorvatn, B. (2014). A 10-year trend of insomnia

prevalence in the adult Norwegian population. *Sleep Medicine*. https://doi.org/10.1016/j.sleep.2013.10.009

Patel, S. R., Malhotra, A., Gao, X., Hu, F. B., Neuman, M. I., & Fawzi, W. W. (2012). A Prospective Study of Sleep Duration and Pneumonia Risk in Women. *Sleep*. https://doi.org/10.5665/sleep.1594

Pesonen, A. K., Lipsanen, J., Halonen, R., Elovainio, M., Sandman, N., Mäkelä, J. M., … Kuula, L. (2020). Pandemic Dreams: Network Analysis of Dream Content During the COVID-19 Lockdown. *Frontiers in Psychology*. https://doi.org/10.3389/fpsyg.2020.573961

Rajkumar, R. P. (2020). COVID-19 and mental health: A review of the existing literature. *Asian Journal of Psychiatry*. https://doi.org/10.1016/j.ajp.2020.102066

Riemann, D., Baglioni, C., Bassetti, C., Bjorvatn, B., Dolenc Groselj, L., Ellis, J. G., … Spiegelhalder, K. (2017). European guideline for the diagnosis and treatment of insomnia. *Journal of Sleep Research*. https://doi.org/10.1111/jsr.12594

Sandman, N., Valli, K., Kronholm, E., Revonsuo, A., Laatikainen, T., & Paunio, T. (2015). Nightmares: Risk Factors Among the Finnish General Adult Population. *Sleep*. https://doi.org/10.5665/sleep.4560

Stanton, R., To, Q. G., Khalesi, S., Williams, S. L., Alley, S. J., Thwaite, T. L., … Vandelanotte, C. (2020). Depression, anxiety and stress during COVID-19: Associations with changes in physical activity, sleep, tobacco and alcohol use in Australian adults. *International Journal of Environmental Research and Public Health*. https://doi.org/10.3390/ijerph17114065

Thakkar, M. M., Sharma, R., & Sahota, P. (2015). Alcohol disrupts sleep homeostasis. *Alcohol*. https://doi.org/10.1016/j.alcohol.2014.07.019

The jamovi project. (2019). jamovi. Retrieved from https://www.jamovi.org/

Vela-Bueno, A., de Iceta, M., & Fernández, C. (1999). Prevalencia de los trastornos del sueño en la ciudad de Madrid. *Gaceta Sanitaria*. https://doi.org/10.1016/s0213-9111(99)71404-4

Wang, C., Pan, R., Wan, X., Tan, Y., Xu, L., Ho, C. S., & Ho, R. C. (2020). Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. *International Journal of Environmental Research and Public Health*. https://doi.org/10.3390/ijerph17051729

Wilder-Smith, A., Chiew, C. J., & Lee, V. J. (2020). Can we contain the COVID-19 outbreak with the same measures as for SARS? *The Lancet Infectious Diseases*. https://doi.org/10.1016/S1473-3099(20)30129-8

Winkelman, J. W. (2015). Insomnia disorder. *New England Journal of Medicine*. https://doi.org/10.1056/NEJMcp1412740

Wong, K.-Y., Chung, K.-F., & Au, C.-H. (2020). Low-Intensity Cognitive Behavioral Therapy for Insomnia as the Entry of the Stepped-Care Model in the Community: A Randomized Controlled Trial. *Behavioral Sleep Medicine*, 1–17. https://doi.org/10.1080/15402002.2020.1764000

Xiao, H., Zhang, Y., Kong, D., Li, S., & Yang, N. (2020). The Effects of Social Support on Sleep Quality of Medical Staff Treating Patients with Coronavirus Disease 2019 (COVID-19) in January and February 2020 in China. *Medical Science Monitor : International Medical Journal of Experimental and Clinical Research*. https://doi.org/10.12659/MSM.923549

Xue, Z., Lin, L., Zhang, S., Gong, J., Liu, J., & Lu, J. (2020). Sleep problems and medical isolation during the SARS-CoV-2 outbreak. *Sleep Medicine*, *70*, 112–115. https://doi.org/https://doi.org/10.1016/j.sleep.2020.04.014

Zeng, L. N., Yang, Y., Wang, C., Li, X. H., Xiang, Y. F., Hall, B. J., … Xiang, Y. T. (2019). Prevalence of Poor Sleep Quality in Nursing Staff: A Meta-Analysis of Observational Studies.

Behavioral Sleep Medicine. https://doi.org/10.1080/15402002.2019.1677233

TABLES:

Table 1. Sociodemographic and physical variables for the total sample and according to the presence of sleep disturbance

	Total sample	Difficulty initiating or maintaining sleep			Dreams about COVID-19		
	N = 15070	Yes N = 3602 (23.9%)	No N = 11468 (76.1%)	Statistical test, *P*	Yes N = 1947 (12.9%)	No N = 13123 (87.1%)	Statistical test, *P*
Sociodemographic characteristics							
Age [Mean (SD)]	40.11 (14.28)	38.25 (13.59)	40.69 (14.44)	9.264, <0.001	36.19 (11.68)	40.69 (14.54)	15.342, <0.001
Sex, female [n (%)]	9922 (65.8%)	2723 (75.6%)	7199 (62.8%)	200.370, <0.001	1541 (79.2%)	8381 (63.9%)	176.060, <0.001
Marital status				12.981, 0.002			25.746, <0.001
Never married	6882 (45.67%)	1729 (48.0%)	5153 (44.9%)		968 (49.7%)	5914 (45.1%)	
Married/Living as married	7081 (46.99%)	1641 (45.6%)	5440 (47.4%)		881 (45.2%)	6200 (47.2%)	
Separated/Divorced/Widowed	1107 (7.35%)	232 (6.4%)	875 (7.6%)		98 (5.0%)	1009 (7.7%)	
Education level [n (%)]				7.220, 0.027			4.934, 0.085
Primary	214 (1.4%)	56 (1.6%)	158 (1.4%)		20 (1.0%)	194 (1.5%)	
Secondary	5279 (35.0%)	1324 (36.8%)	3955 (34.5%)		654 (33.6%)	4625 (35.2%)	
University	9577 (63.6%)	2222 (61.7%)	7355 (64.1%)		1273 (65.4%)	8304 (63.3%)	
Work status [n (%)]				76.359, <0.001			109.843, <0.001
Unemployed	1134 (7.53%)	315 (8.7%)	819 (7.1%)		150 (7.7%)	984 (7.5%)	
Working							
Employed	5668 (37.6%)	1278 (35.5%)	4390 (38.3%)		723 (37.1%)	4945 (37.7%)	
Self-employed	1480 (9.8%)	360 (10.0%)	1120 (9.8%)		199 (10.2%)	1281 (9.8%)	
Civil servant	2990 (19.8%)	718 (19.9%)	2272 (19.8%)		460 (23.63%)	2530 (19.3%)	
Retired	964 (6.4%)	150 (4.2%)	814 (7.1%)		30 (1.5%)	934 (7.1%)	
Student/Homemaker	2250 (14.9%)	637 (17.7%)	1613 (14.1%)		328 (16.8%)	1922 (14.6%)	
Other	584 (3.9%)	144 (4.0%)	440 (3.8%)		57 (2.9%)	527 (4.0%)	
Income (€) [n (%)]				70.387, <0.001			27.635, <0.001
No income	2230 (14.8%)	628 (17.4%)	1602 (14.0%)		307 (15.8%)	1923 (14.7%)	
Less than 500	932 (6.2%)	260 (7.2%)	672 (5.9%)		146 (7.5%)	786 (6.0%)	
500-999	1750 (11.6%)	484 (13.4%)	1266 (19.8%)		238 (12.2%)	1512 (11.5%)	
1000-1499	2954 (19.6%)	685 (19.0%)	2269 (19.8%)		403 (20.7%)	2551 (19.4%)	
1500-1999	2822 (18.7%)	628 (17.4%)	2194 (19.1%)		379 (19.5%)	2443 (18.6%)	
More than 1999	3426 (22.7%)	715 (19.9%)	2711 (23.6%)		371 (19.1%)	3055 (23.3%)	
Prefer not to answer	956 (6.3%)	202 (5.6%)	754 (6.6%)		103 (5.3%)	853 (6.5%)	
Change in work status due to COVID-19 [n (%)]				18.437, <0.001			6.697, 0.082
No	12719 (84.4%)	2964 (83.2%)	9755 (85.9%)		1637 (84.8%)	11082 (85.3%)	
ETLA/EPLO#	1309 (8.7%)	356 (10.0%)	953 (8.4%)		156 (8.1%	1153 (8.9%)	

Redundancy	238 (1.6%)	74 (2.1%)	164 (1.4%)		40 (2.1%)	198 (1.5%)	
Furlough	650 (4.3%)	168 (4.7%)	482 (4.2%)		97 (5.0%)	553 (4.3%)	
Change in income due to COVID-19 [n (%)]				37.437, <0.001			9.869, 0.043
No	11298 (75.0%)	2575 (71.5%)	8723 (76.1%)		1411 (72.5%)	9887 (75.3%)	
Reduction, up to 25%	1602 (10.6%)	423 (11.7%)	1179 (10.3%)		220 (11.3%)	1382 (10.5%)	
Reduction, 26-50%	921 (6.1%)	243 (6.7%)	678 (5.9%)		125 (6.4%)	796 (6.1%)	
Reduction, 51-100%	1152 (7.6%)	341 (9.5%)	811 (7.1%)		174 (8.9%)	978 (7.5%)	
Increase	97 (0.6%)	20 (0.6%)	77 (0.7%)		17 (0.9%)	80 (0.6%)	
Living situation [n (%)]				12.569, 0.002			9.162, 0.010
Alone	1718 (11.4%)	389 (10.8%)	1329 (11.6%)		192 (9.9%)	1526 (11.6%)	
Two people	5330 (35.4%)	1203 (33.4%)	4127 (36.0%)		663 (34.1%)	4667 (35.6%)	
Three or more	8022 (53.2%)	2010 (55.8%)	6012 (52.4%)		1092 (56.1%)	6930 (52.8%)	
Dependent children [n (%)]				1.285, 0.526			4.544, 0.103
None	9954 (66.1%)	2352 (65.3%)	7602 (66.3%)		1247 (64.0%)	8707 (66.3%)	
One	2359 (15.7%)	572 (15.9%)	1787 (15.6%)		314 (16.1%)	2045 (15.6%)	
Two or more	2757 (18.3%)	678 (18.8%)	2079 (18.1%)		386 (19.8%)	2371 (18.1%)	
Elderly dependents [n (%)]				10.530, 0.005			1.080, 0.583
None	13722 (91.1%)	3232 (89.7%)	10490 (91.5%)		1769 (90.9%)	11953 (91.1%)	
One	936 (6.2%)	253 (7.0%)	683 (6.0%)		118 (6.1%)	818 (6.2%)	
Two or more	412 (2.7%)	117 (3.2%)	295 (2.6%)		60 (3.1%)	352 (2.7%)	
Physical illness and COVID-19 variables							
Current physical illness*, Yes	3583 (25.5%)	875 (26.1%)	2708 (25.4%)	0.767, 0.381	450 (24.6%)	3133 (25.7%)	1.065, 0.302
Tested for COVID-19				8.601, 0.003			20.898, <0.001
No	14850 (98.5%)	3531 (98.0%)	11319 (98.7%)		1896 (97.4%)	12954 (98.7%)	
Yes	220 (1.5%)	71 (2.0%)	149 (1.3%)		51 (2.6%)	169 (1.3%)	
COVID-19 symptoms, Yes	1579 (10.5%)	482 (13.4%)	1097 (9.6%)	42.547, 0.001	272 (14.0%)	1307 (10.0%)	29.074, <0.001
Family/Friends infected with COVID-19, Yes	3164 (21.0%)	828 (23.0%)	2336 (20.4%)	11.024, <0.001	511 (26.3%)	2653 (20.3%)	36.921, <0.001
Living with people infected with COVID-19, Yes	263 (1.7%)	67 (1.9%)	196 (1.7%)	0.364, 0.546	48 (2.5%)	215 (1.6%)	6.762, 0.009

#ETLA: Employee Temporary Layoff, EPLO: Employee Permanent Layoff

* Physical illness includes: hypertension, diabetes, cardiovascular disease, respiratory disease, or cancer

Table 2. Leisure activities during lockdown for the total sample and according to the presence of sleep disturbance

	Total sample	Difficulty initiating or maintaining sleep			Dreams about COVID-19		
	N = 15070	Yes N = 3602 (23.9%)	No N = 11468 (76.1%)	Statistical test, *P*	Yes N = 1947 (12.9%)	No N = 13123 (87.1%)	Statistical test, *P*
Able to enjoy free time, Yes	14173 (94.2%)	3118 (86.8%)	11055 (96.5%)	477.193, <0.001	1699 (87.4%)	12474 (95.2%)	190.980, <0.001
Working out, Yes	8822 (58.5%)	2016 (56.0%)	6806 (59.3%)	12.894, <0.001	1128 (57.9%)	7694 (58.6%)	0.337, 0.562
Yoga / Meditation, Yes	3004 (19.9%)	726 (20.2%)	2278 (19.9%)	0.146, 0.702	418 (21.5%)	2586 (19.7%)	3.302, 0.069
Watching TV, Yes	13617 (90.4%)	3155 (87.6%)	10462 (91.2%)	41.631, <0.001	1723 (88.5%)	11894 (90.6%)	8.909, 0.003
Reading COVID news, Yes	10571 (70.1%)	2308 (64.1%)	8263 (72.1%)	82.293, <0.001	1283 (65.9%)	9288 (70.8%)	19.283, <0.001
Painting / Listening to music, Yes	13138 (87.2%)	2971 (82.5%)	10167 (88.7%)	93.468, <0.001	1614 (82.9%)	11524 (87.8%)	36.698, <0.001
Cooking, Yes	10875 (72.2%)	2553 (70.9%)	8322 (72.6%)	3.897, 0.048	1413 (72.6%)	9462 (72.1%)	0.187, 0.665
Social networks, Yes	13914 (92.3%)	3271 (90.8%)	10643 (92.8%)	15.410, <0.001	1788 (91.8%)	12126 (92.4)	0.775, 0.379
Working, Yes	9336 (62.0%)	2086 (57.9%)	7250 (63.2%)	32.752, <0.001	1194 (61.3%)	8142 (62.0%)	0.371, 0.542
Smoking, Yes	2512 (16.7%)	690 (19.2%)	1822 (15.9%)	21.079, <0.001	316 (16.2%)	2196 (16.7%)	0.310, 0.578
Drinking alcohol, Yes	3053 (20.3%)	794 (22.0%)	2259 (19.7%)	9.331, 0.002	473 (24.3%)	2580 (19.7%)	22.534, <0.001
Illicit drug usage, Yes	477 (3.2%)	122 (3.4%)	355 (3.1%)	0.760, 0.383	57 (2.9%)	420 (3.2%)	0.412, 0.521

Table 3. Depression, Anxiety, and Stress Scale (DASS-21) for the total sample and according to the presence of sleep disturbance [mean (SD)]

	Total sample	Difficulty initiating or maintaining sleep			Dreams about COVID-19		
	N = 15070	Yes N = 3602 (23.9%)	No N = 11468 (76.1%)	Statistical test, *P*	Yes N = 1947 (12.9%)	No N = 13123 (87.1%)	Statistical test, *P*
DASS-21							
Depression subscale	3.50 (1.03)	3.90 (1.13)	3.37 (0.96)	-25.297, <0.001	3.93 (1.12)	3.44 (0.99)	-18.544, <0.001
Anxiety subscale	0.90 (1.34)	1.64 (1.70)	0.66 (1.11)	-32.626, <0.001	1.77 (1.78)	0.77 (1.21)	-24.144, <0.001
Stress subscale	2.09 (2.24)	3.55 (2.29)	1.63 (2.02)	-45.247, <0.001	3.63 (2.30)	1.86 (2.14)	-32.090, <0.001

DASS-21: Depression, Anxiety, and Stress Scale

Table 4. Factors associated with the presence of sleep disturbance

	Difficulty initiating or maintaining sleep			Dreams about COVID-19		
	B	**OR (95% CI)**	***P***	**B**	**OR (95% CI)**	***P***
Age	0.008	1.008 (1.003; 1.013)	0.003	-0.017	0.983 (0.976; 0.989)	<0.001
Sex, reference: Male, Female	0.295	1.344 (1.218; 1.482)	<0.001	0.481	1.617 (1.428; 1.830)	<0.001
Marital status, reference: Never married						
Married/Living as married				0.174	1.190 (1.034; 1.370)	0.015
Separated/Divorced/Widowed						
Education level, reference: Primary						
Secondary						
University						
Work status, reference: Unemployed						
Working						
Employed						
Self-employed				0.317	1.373 (1.027; 1.836)	0.032
Civil servant				0.344	1.412 (1.084; 1.839)	0.010
Retired				-0.472	0.625 (0.394; 0.990)	0.045
Student/Homemaker						
Other						
Income (€), reference: No income						
Less than 500						
500-999						
1000-1499						
1500-1999						
More than 1999						
Prefer not to answer						
Change in work status due to COVID-19, reference: No						
ETLA/EPLO#						
Redundancy						
Furlough						
Change in income due to COVID-19, reference: No						
Reduction, up to 25%						
Reduction, 26-50%						
Reduction, 51-100%	0.221	1.248 (1.013; 1.536)	0.037			
Increase						
Living situation, reference: Alone						
Two people						

Three or more						
Elderly dependents, reference: No						
One	0.189	1.208 (1.019; 1.431)	0.029			
Two or more	0.262	1.299 (1.019; 1.658)	0.035			
Tested for COVID-19, reference: No, Yes				0.459	1.583 (1.105; 2.267)	0.012
COVID-19 symptoms, reference: No, Yes						
Family/Friends infected with COVID-19, reference: No, Yes				0.209	1.233 (1.094; 1.390)	0.001
Living with people infected with COVID-19, reference: No, Yes						
Able to enjoy free time, reference: No, Yes	-0.504	0.604 (0.510; 0.716)	<0.001			
Working out, reference: No, Yes						
Watching TV, reference: No, Yes						
Reading COVID news, reference: No, Yes				0.130	1.139 (1.018; 1.274)	0.023
Painting / Listening to music, reference: No, Yes	-0.160	0.853 (0.752; 0.966)	0.012			
Cooking, reference: No, Yes						
Social networks, reference: No, Yes						
Working, reference: No, Yes						
Smoking, reference: No, Yes						
Drinking alcohol, reference: No, Yes	0.121	1.129 (1.016; 1.255)	0.024	0.224	1.251 (1.108; 1.413)	<0.001
DASS-21						
Depression subscale	0.138	1.148 (1.098; 1.200)	<0.001	0.097	1.102 (1.045; 1.162)	<0.001
Anxiety subscale	0.197	1.218 (1.178; 1.260)	<0.001	0.201	1.222 (1.177; 1.269)	<0.001
Stress subscale	0.264	1.302 (1.273; 1.332)	<0.001	0.193	1.213 (1.181; 1.247)	<0.001

#ETLA: Employee Temporary Layoff, EPLO: Employee Permanent Layoff

OR: odds ratio; 95% CI: 95% confidence interval

Supplementary Material

Supplementary Table 1: Collinearity Statistics for difficulty initiating or maintaining sleep

	VIF	Tolerance
Age	1.735	0.576
Sex	1.066	0.939
Marital status	1.222	0.819
Education level	1.081	0.925
Work status	1.235	0.810
Income (€)	1.157	0.865
Change in work status due to COVID-19	1.141	0.876
Change in income due to COVID-19	1.141	0.876
Living situation	1.091	0.917
Elderly dependents	1.017	0.984
COVID-19 symptoms	1.043	0.959
Tested for COVID-19	1.036	0.965
Family/Friends infected with COVID-19	1.015	0.986
Able to enjoy free time	1.103	0.907
Working out	1.054	0.949
Watching TV	1.043	0.959
Reading COVID news	1.071	0.933
Painting / Listening to music	1.069	0.936
Cooking	1.046	0.956
Social Networks	1.047	0.956
Drinking alcohol	1.045	0.957
Smoking	1.045	0.957
Working	1.180	0.848
DASS-21 Depression subscale	1.128	0.887
DASS-21 Anxiety subscale	1.187	0.843
DASS-21 Stress subscale	1.248	0.801

DASS-21: Depression, Anxiety, and Stress scale

Supplementary Table 2: Collinearity Statistics for dreams about COVID-19

	VIF	Tolerance
Age	1.561	0.640
Sex	1.036	0.966
Marital status	1.194	0.838
Work status	1.193	0.838
Income (€)	1.149	0.870
Change in income due to COVID-19	1.073	0.932
Living situation	1.072	0.933
COVID-19 symptoms	1.050	0.952
Tested for COVID-19	1.049	0.953
Family/Friends infected with COVID-19	1.030	0.971
Living with people infected with COVID-19	1.039	0.963
Able to enjoy free time	1.118	0.894
Watching TV	1.043	0.959
Reading COVID news	1.047	0.955
Painting / Listening to music	1.070	0.935
Drinking alcohol	1.023	0.977
DASS-21 Depression subscale	1.140	0.877
DASS-21 Anxiety subscale	1.229	0.814
DASS-21 Stress subscale	1.276	0.783

DASS-21: Depression, Anxiety, and Stress scale