



Contents lists available at ScienceDirect

Sleep Medicine

journal homepage: www.elsevier.com/locate/sleep

Brief Communication

Would we recover better sleep at the end of Covid-19? A relative improvement observed at the population level with the end of the lockdown in France



Francois Beck^a, Damien Leger^{b, c, *}, Sebastien Cortaredona^d, Pierre Verger^{d, e},
Patrick Peretti-Watel^e, the COCONEL group¹

^a CESP (Centre de recherche en Épidémiologie et Santé des Populations), Université Paris-Saclay, UVSQ, Univ. Paris-Sud, Inserm U1018, Villejuif, 94807, France

^b Université de Paris, EA 7330 VIFASOM (Vigilance Fatigue Sommeil et Santé Publique), Paris, France

^c APHP, Hôtel-Dieu, Centre du Sommeil et de la Vigilance, Consultation de pathologie professionnelle Sommeil Vigilance et Travail, Paris, France

^d Southeastern Health Regional Observatory (ORS Paca), Marseille, France

^e AMU, UMR Vitrome, IHU Méditerranée, IRD, France

ARTICLE INFO

Article history:

Received 30 September 2020

Received in revised form

27 November 2020

Accepted 29 November 2020

Available online 8 December 2020

Keywords:

COVID-19

Sleep

Sleep disorders

Epidemiology

Insomnia

ABSTRACT

Background: The outbreak of the Covid-19 pandemic and the accompanying lockdown measures have had a major impact on societies around the world, leading to sleep problems for a large part of the population. In order to assess the sustainability of sleeping troubles related to the sanitary crisis, it was crucial to measure its prevalence after the end of the Covid-19 confinement.

Methods: As part of an epidemiological survey on Covid and Confinement (COCONEL), we enquired on sleep disorders using two items in 4 repetitive cross-sectional surveys. The first took place during the first week of the French confinement (March 31 to April 2; N = 1005 participants). The second took place in the middle of this period (April 15–17; N = 1005). The two last surveys were held at the end of the confinement (May 7–10; N = 2003) and one month after the end (June 10–12; N = 1736). Using a random constant, the mixed model took into account the longitudinal character of the last two waves (intra-individual correlations for individuals surveyed in waves 3 and 4).

Results: The prevalence of sleep problems significantly decreased during the last weeks of the confinement, and this trend was confirmed one month after the end of confinement. One quarter of the population reported that their sleep was better one month after the end of the confinement. Sleep improvement was reported more often by women and people aged less than 65. Such improvement was less frequent among those who were still highly exposed to the pandemic's media coverage after the end of the confinement.

Conclusion: The possibility of recovering a good sleep largely depends on the type of sleep disorder. The decrease in sleep problems occurred mainly among people with mild sleep problems during the confinement. Further research is needed to assess the long-term effects of the Covid-19 pandemic and its confinement period on sleep quality in the general population.

© 2020 Elsevier B.V. All rights reserved.

* Corresponding author. Université de Paris, EA 7330 VIFASOM, Centre du Sommeil et de la Vigilance, Hôtel Dieu-APHP, 1, Place du Parvis Notre-Dame, 75181, Paris, Cedex 04, France.

E-mail address: damien.leger@aphp.fr (D. Leger).

¹ Members of the COCONEL group are listed in Appendix section.

1. Introduction

The outbreak of the Covid-19 pandemic has had a major impact on societies around the world. Governments have taken unprecedented lockdown measures to curb the spread of the SARS-CoV-2 virus, suddenly urging the population to modify their daily activities. Together with the fear of the disease itself, the lockdown has affected the economy, increased social inequalities, and has brought about mental health consequences in the general population [1–4], including sleep problems [5,6].

The psychological stress induced by the Covid-19 pandemic and the associated changes in lifestyle due to the lockdown have resulted in symptoms of insomnia, which are among the main hallmarks of posttraumatic stress disorder, anxiety and/or depression [7]. During the SARS-CoV-1 epidemic (2002–2003), such indirect effects of the pandemic on general mental health were associated with psychiatric complications [8].

In France, the confinement began on March 17, 2020, and lasted for 8 weeks, until May 11. This period had negative effects on many health behaviors [9] and was especially marked by a deterioration in sleep quality in the general population. From the very beginning of the confinement, three-quarters of the people reported trouble sleeping, compared with about one-half in the last general population survey conducted before the confinement [5,10].

Since disturbed sleep during the Covid-19 pandemic might represent a risk for the development of chronic insomnia or other major sleep disorders, and may be a symptom of psychiatric disorders, we sought to measure the evolution of its prevalence during and after the end of the Covid-19 confinement.

2. Methods

At the end of March 2020, the COCONEL group launched a series of repeated national cross-sectional web-based surveys in order to monitor risk perceptions, lifestyle habits, living conditions, mental health, and sleep habits among the population of France. Representative samples of the French population aged 18 years and older were drawn from an online research panel of more than 750,000 households stratified for sex, age, occupational status, education level, size of town, and region. In four of these surveys, we asked questions about sleeping disorders and their impact on daily activities. Surveys were conducted during the first week of the confinement (from March 31 to April 2; $N = 1,005$ participants), and again in the middle of the confinement period (from April 15–17; $N = 1,005$ participants). We repeated the questions at the end of the confinement (from May 7–10; $N = 2,003$ participants) and one month after the end of the confinement (from June 10–12; $N = 1,736$ participants). The third and fourth surveys were implemented using the same participants with the same questionnaire, in order to be able to track trends at an individual level.

In each wave, participants were asked the following questions. Q1: Did you have sleep problems during the previous week: a) not at all; b) a little bit; c) a lot? If the response to Q1 was b) or c), and if these problems had an impact on their daily activities, a follow-up question (Q2) was asked. Q2: Did these sleep problems and the resulting fatigue have an impact on your daily activities (work or leisure): a) not at all; b) a little bit; c) a lot? We considered individuals with sleep problems and suffering from daily impact to be the most severe cases.

These items originated with the “Duke health profile” [11], and have been used since 1995 in the French Health Barometer survey to assess sleep problems, and we found them to correlate highly with the claim of insomnia (according to ICSD-2 and DSM-IV) [12,13]. The comparison of sleep problems between the 4 waves

was carried out using a univariate mixed logistic regression. Thanks to a random constant, the mixed model takes into account the longitudinal character of the last two waves (intra-individual correlations for individuals surveyed in waves 3 and 4).

3. Results

The prevalence of sleep problems significantly decreased after the end of the confinement, and this trend was confirmed one month after the end of confinement (Fig. 1). This prevalence was higher in women than in men, and young people reported a higher rate than their older counterparts, both during and after the confinement (67% vs. 61%, $p > 0.01$). However, the evolution of an indicator of severe sleep problems – e.g., sleep problems with impairment on daily activities (Fig. 1) – appeared more stable during the lockdown.

These trends show that part of the population was able to quickly return to a better sleep after the lifting of the confinement, although the sleeping trouble prevalence (61%) remained high in comparison to what was observed before the confinement. Since 1995, this prevalence has ranged from a minimum of 44% in 1995 and a maximum of 49% in 2017 [5].

With the data from the last two waves, we were able to identify respondents who saw their sleep improve after the end of the confinement (i.e. those who no longer had a sleeping problem or who no longer experienced any impact on their daily activities from it). One quarter of the subjects were categorized in the latter case (Table 1).

Women and people aged less than 65 more often reported sleep improvement since the end of the confinement, although education level, housing conditions, and occupation were not associated. However, those who were still highly exposed to the pandemic's media coverage after the end of the confinement (>4 h per day) reported less frequently an improved sleep in comparison to the other respondents (see Table 1).

4. Discussion

Most studies conducted during the confinement found a marked deterioration in the quality of sleep in the general population [5,10,14], while others observed a concomitant increase in sleep duration. However, this increase was associated with a worsening in sleep quality [15,16] and insomnia symptoms [17]. Several studies conducted in China were dedicated to people returning to work during the Covid-19 pandemic. One such study found a high prevalence of poor sleep quality [18], while another one observed relatively low levels of anxiety, depression and insomnia [19]. This was partly attributed to confidence built up by the psychoneuro-immunity prevention measures implemented before returning to work, such as a good ventilation and the generalization of the use of facemasks in the workplace [16].

In line with what has been described in the literature, the prevalence of sleeping disorders was higher in women than in men. However, contrary to previous observations among the general population, young people reported a higher rate than their older counterparts did. Other studies have found that the impact of confinement among young adults was greater in students than in workers [17,20].

The COCONEL study was launched very rapidly, only several days after the start of the confinement, and data collection was repeated three times then. This allowed us to study the extent to which Covid-19 sleep-related disorders may be reversible. The possibility of recovering a good sleep largely depends on the type of sleep disorder [21]. It has been shown that certain sleeping disorders, such as acute insomnia, may be a normal biopsychosocial

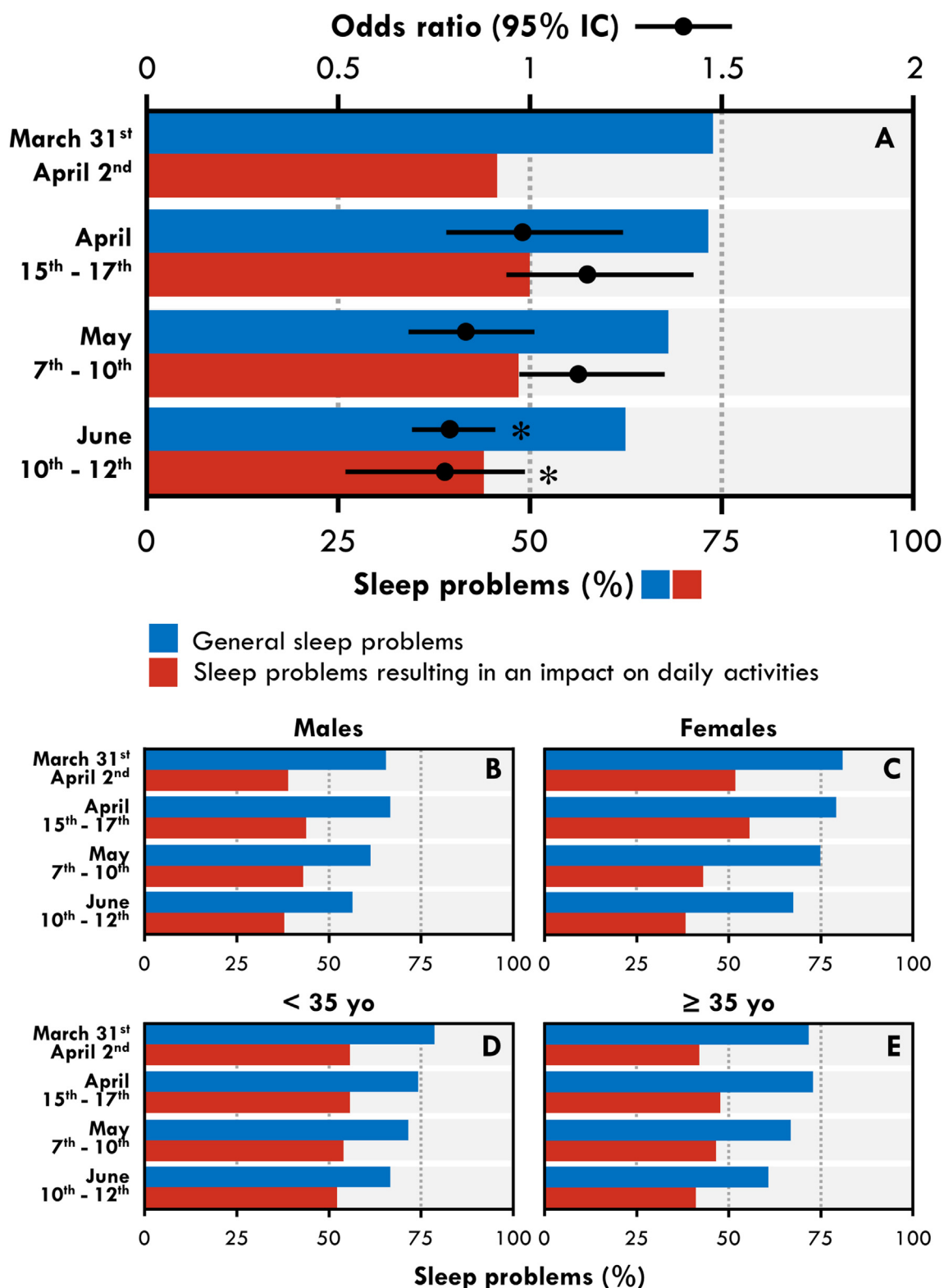


Fig. 1. Sleep problems observed at different COVID-19 periods, and sleep problems with an impact on daily activities in the French general population during the last week across and after the lockdown (%). Legend: N = number of subjects interviewed, OR = odds ratio, % = percentages, IC = confidence interval, yo = years old.

response to a perceived or actual stressor [22,23]. On the other hand, in our study, the relative stability of severe sleep problems in France during the confinement suggested that the decrease in sleep problems occurred mainly among people with mild sleep problems during this period.

The end of the confinement may have given the population a feeling that the health crisis was over or at least less acute, thus relieving them from a stressful situation. It might have also increased opportunities to engage in sleep-enhancing practices such as sport or other physical activities. It can also be hypothesized

Table 1
Factor associated with improved sleep one month after the end of the confinement – (COCONEL survey, France, n=1736).

	%	p*	OR 95% CI**	p***
All	25.6			
Gender				
Male	22.1	ref.		
Female	28.8	0.001	1.40 1.12-1.74	0.003
Age (in years)				
18–25	29.2	ref.		
26–45	27.5	0.338	0.91 0.63-1.33	0.454
46–65	25.6	0.900	0.84 0.57-1.24	0.961
>65	21.4	0.019	0.67 0.44-1.02	0.043
Education level				
<High-School	24.5	ref.		
High-school, 1st university degree	26.6	0.668	1.05 0.81-1.37	0.676
>2 years completed at university	26.8	0.646	1.00 0.71-1.40	0.861
Confined in an overcrowded dwelling				
No	25.4	ref.		
Yes	28.4	0.439	1.11 0.74-1.67	0.624
Occupation				
Still working full time out of home	23.7	ref.		
Teleworking	28.7	0.196	1.33 0.88-1.99	0.281
Not working, other	25.5	0.799	1.19 0.88-1.62	0.798
Daily media exposure to COVID-19 (May, 7th–10th)				
0–2 h	26.5	ref.		
2–4 h	22.4	0.139	0.84 0.62-1.14	0.102
>4 h	26.2	0.469	1.15 0.86-1.54	0.111
Daily media exposure to COVID-19 (June, 10th–12th)				
0–2 h	26.7	ref.		
2–4 h	27.3	0.206	1.05 0.78-1.42	0.121
>4 h	21.0	0.027	0.69 0.50-0.96	0.015

*P-value (versus reference category) estimated with univariate logistic regression.

**Odds ratio with 95% confidence interval (versus reference category) estimated with multivariate logistic regression.

***: P-value (versus reference category) estimated with multivariate logistic regression.

that media exposure, which caused distress and sleep problems during the confinement [10,24], was lower after the end of confinement, resulting in a decrease in sleeping disorders.

The emergence of new sleep difficulties during the confinement was associated with women, being employed and family responsibilities, among other factors [25]. We found that improved sleep quality observed after the end of the confinement was more frequent in women and working-age people than in the rest of the population. During the confinement, these categories of the population had to handle childcare and homeschooling at home and were forced to follow irregular and stressful schedules [26]. The end of the confinement thus allowed them to recover a more personalized sleep-wake rhythm, which was profoundly impacted during the confinement [27].

5. Conclusion

The general population will certainly recall for years how public health policies against Covid-19 affected their lives from societal, educational and economic perspectives. Sleep is a crucial issue to consider, as it may be both a consequence and a cause of poor health. With the end of the confinement, psychoneuroimmunity prevention measures in public places (and in the workplace in particular) have appeared as promising approaches to improve the mental health and sleep of the population [15]. However, further research is needed to assess the long-term effect of the Covid-19 pandemic and its confinement period on the quality of sleep in the population.

Funding information

The COCONEL survey has been funded by the National Agency for Research (ANR), the National Research Institute for Sustainable

Development (IRD), and the France Foundation (Fondation de France).

Author contributions

All authors are justifiably credited with authorship and participated in the conception, design, analyses, interpretation, manuscript drafting and final approval.

Conflict of interest

The authors declare no conflicts of interest

The ICMJE Uniform Disclosure Form for Potential Conflicts of Interest associated with this article can be viewed by clicking on the following link: <https://doi.org/10.1016/j.sleep.2020.11.029>.

Appendix. Members of the COCONEL group

Patrick Peretti-Watel¹⁻² (scientific coordinator), Valérie Seror¹, Sébastien Cortaredona¹, Lisa Fressard¹, Odile Launay³, Jocelyn Raude⁴, Pierre Verger² (research consortium), François Beck⁵, Stéphane Legleye⁵, Olivier L'Haridon⁶, Jeremy Ward¹⁻⁷, Damien Léger⁸⁻⁹ (Steering Committee).

1 Aix Marseille Université, IRD, AP-HM, SSA, VITROME, Marseille, France.

2 Southeastern Health Regional Observatory (ORS Paca), Marseille, France.

3 Inserm CIC 1417; Univ Paris, Faculté de médecine Paris Descartes; AP-HP, Hôpital Cochin; Paris, France.

4 EHESP School of Public Health, Rennes, France.

5 CESP, Univ Paris Sud, Faculté de médecine UVSQ, Inserm, Univ Paris-Saclay, Villejuif, France.

6 Univ Rennes, CNRS, CREM UMR 6211, Rennes, France

7 GEMASS, CNRS, Université Paris Sorbonne, Paris, France

8 Université de Paris, EA 7330 VIFASOM (Vigilance Fatigue Sommeil et Santé Publique), Paris, France

9 APHP-5, Hôtel-Dieu, Centre du Sommeil et de la Vigilance, Consultation de pathologie professionnelle Sommeil Vigilance et Travail, Paris, France.

References

- [1] Rubin GJ, Wessely S. The psychological effects of quarantining a city. *BMJ* 2020;368:m313. <https://doi.org/10.1136/bmj.m313>.
- [2] Wang C, Pan R, Wan X, et al. A longitudinal study on the mental health of general population during the COVID-19 epidemic in China. *Brain Behav Immun* 2020;87:40–8.
- [3] Li Z, Ge J, Yang M, et al. Vicarious traumatization: a psychological problem that cannot be ignored during the COVID-19 pandemic. *Brain Behav Immun* 2020;87:74. <https://doi.org/10.1016/j.bbi.2020.04.047>. Epub 2020 Apr 20.
- [4] Zhu S, Wu Y, Zhu CY, et al. The immediate mental health impacts of the COVID-19 pandemic among people with or without quarantine management. *Brain Behav Immun* 2020;87:56–8.
- [5] Beck F, Léger D, Fressard L, et al. Covid-19 health crisis and lockdown associated with high level of sleep complaints and hypnotic uptake at the population level. *J Sleep Res* 2020 Jun 28:e13119.
- [6] Kantermann T. Behavior: how a global social lockdown unlocks time for sleep. *Curr Biol* 2020;20(14):R822–3. <https://doi.org/10.1016/j.cub.2020.06.037>.
- [7] Weber FC, Norra C, Wetter TC. Sleep disturbances and suicidality in post-traumatic stress disorder: an overview of the literature. *Front Psychiatry* 2020;11:167. <https://doi.org/10.3389/fpsy.2020.00167>.
- [8] Vindegaard N, Benros ME. COVID-19 pandemic and mental health consequences: systematic review of the current evidence. *Brain Behav Immun* 2020;159(120):30954–5.
- [9] Rossinot H, Fantin R, Venne J. Behavioral changes during COVID-19 confinement in France: a web-based study. *Int J Environ Res Publ Health* 2020 Nov 14;17(22):E8444.
- [10] Léger D, Beck F, Fressard L, et al. Poor sleep associated with overuse of media during the COVID-19 lockdown. *Sleep* 2020;25. zsa125. Online ahead of print.
- [11] Pakerson GR, Broadhead WE, Tse CK. Development of the 17-item Duke health profile. *Fam Pract* 1991;8:396–401.

- [12] Beck F, Léon C, Léger D. Sleep disorders in the general population. (French). *Med Sci* 2009;25:201–16.
- [13] Léger D, Zeghnoun A, Faraut B, et al. Total sleep time, sleep debt, sleep restriction and insomnia in adults (18-75 years old). Results from the Santé publique France 2017 Health Barometer. (French). *Bull Epidemiol Hebd*. 2019;8–9:149–60.
- [14] Innocenti P, Puzella A, Mogavero MP, et al. Letter to editor: CoVID-19 pandemic and sleep disorders-a web survey in Italy. *Neurol Sci* 2020;30:1–2.
- [15] Blume C, Schmidt MH, Cajochen C. Effects of the COVID-19 lockdown on human sleep and rest-activity rhythms. *Curr Biol* 2020;20(30):R795–7.
- [16] Cellini N, Canale N, Mioni G, et al. Changes in sleep pattern, sense of time and digital media use during COVID-19 lockdown in Italy. *J Sleep Res* 2020; e13074. <https://doi.org/10.1111/jsr.13074>.
- [17] Marelli S, Castelnuovo A, Somma A, et al. Impact of COVID-19 lockdown on sleep quality in university students and administration staff. *J Neurol* 2020;11:1–8. <https://doi.org/10.1007/s00415-020-10056-6>.
- [18] Yang Y, Zhu JF, Yang SY, et al. Prevalence and associated factors of poor sleep quality among Chinese returning workers during the COVID-19 pandemic. *Sleep Med* 2020;14(73):47–52.
- [19] Tan W, Hao F, McIntyre RS, et al. Is returning to work during the COVID-19 pandemic stressful? A study on immediate mental health status and psychoneuroimmunity prevention measures of Chinese workforce. *Brain Behav Immun* 2020;87:84–92.
- [20] Cao W, Fang Z, Hou G. The psychological impact of the COVID-19 epidemic on college students in China. *Psychiatr Res* 2020;287:112934.
- [21] Thorpy MJ. Classification of sleep disorders. *Neurotherapeutics* 2012;9:687–701.
- [22] Ellis JG, Gehrman P, Espie CA, et al. Acute insomnia: current conceptualizations and future directions. *Sleep Med Rev* 2012;16:5–14.
- [23] Morin CM. Definition of acute insomnia: diagnostic and treatment implications. *Sleep Med Rev* 2012;16:3–4.
- [24] Gao J, Zheng P, Jia Y, et al. Mental health problems and social media exposure during COVID-19 outbreak. *PLoS One* 2020;15(4):e0231924. <https://doi.org/10.1371/journal.pone.0231924>.
- [25] Robillard R, Dion K, Pennestri MH, et al. Profiles of sleep changes during the COVID-19 pandemic: demographic, behavioural and psychological factors. *J Sleep Res* 2020 Nov;17:e13231.
- [26] Altena E, Baglioni C, Espie CA, et al. 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. *J Sleep Res* 2020 Aug;29(4):e13052.
- [27] Pérez-Carbonell L, Meurling JJ, Wassermann D, et al. Impact of the novel coronavirus (COVID-19) pandemic on sleep. *J Thorac Dis* 2020;12(Suppl 2):S163–75.