Letter to the Editor

Increased use of digital tools in sleep disorders research in response to the COVID-19 challenge: implications for the present and future

Sleep problems and related emotional difficulties have gained significant attention during COVID-19's global spread [1]. Digital tools utilizing smartphones have played an important role in characterizing the prevalence and severity of insomnia, anxiety and depression in response to the pandemic. For example, an online survey after initial epidemic outbreak in China indicated that insomnia is more severe in individuals who are young, female, living in the epicenter and facing greater threat of infection [2]. Comparable findings, as well as other negative impacts on sleep, have been reported in many other populations [3,4].

Similarly, using crowdsourced smartphone data of more than 1 million sleep records from 25,000 Android app users in the US and 16 European countries before and after country-level lockdown during COVID-19, Lee and colleagues found an average increase of 11.3–18.6 min of sleep on weekday nights [5]. This suggests that the COVID-19 lockdown can not only disrupt sleep but may also be associated with increased overnight sleep duration or time spent in bed.

A recent PubMed search using "covid-19 online survey sleep" yielded 361 citations. Most of them utilized an online questionnaire to assess how the epidemic impacted the amount and quality of sleep and related mental health in a wide variety of populations and special communities. The work by Lee et al. is a rare example of an investigation based on objective records from an app [5], although the app has not been validated as a medical tool.

In 2015 an American Academy of Sleep Medicine Taskforce published a position paper for the use of telemedicine for the diagnosis and treatment of sleep disorders. However, well-validated and highly recognized tools for remote practice remain lacking. For example, sleep diary and affective changes can be easily collected by available apps for digital delivered cognitive behavior therapy for insomnia (dCBT-I) but no transducer or software product is available that can readily collect actigraphy via smartphone; a major technical barrier for remote assessment of sleep and sleep disorders and widespread dissemination of dCBT-I.

The near-ubiquitous use of smartphones makes it a clear candidate to facilitate the growth of sleep telemedicine. In addition to objectively recording sleep, smartphone recording of breathing patterns, electrocardiograms and body movements would further facilitate the remote objective evaluation of sleep quality and disorder. The technology for assessing these physiological parameters through smart wearable devices is already available [5]. To date, however, there is no smartphone application that can replace clinical assessments by professionals of the Sleep Medicine area. In addition, relevant industry standards for these applications need to be established. Given these facts, it is essential to unite healthcare professionals, researchers, companies, investors, and international communities to achieve two important goals. First, to develop validated smartphone-based sleep recording to facilitate widespread dissemination of dCBT-I and effective treatment of insomnia. Comparison studies between digital tools/applications and polysomnography/actigraphy could quantify their validity. Second, integrate such validated smartphone-based sleep assessment with validated assessment of other physiological parameters to facilitate remote diagnosis and treatment of other sleep disorders.

Conflict of interest

The authors do not have any conflicts of interest to disclose.

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.2021.08.015.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.sleep.2021.08.015.

References

[1] Dzierzewski JM, Dautovich ND, Ravyts SG, et al. Insomnia symptoms during the COVID-19 pandemic: an examination of biopsychosocial moderators. Sleep Med 2021;16(21):S1389–9457. https://doi.org/10.1016/j.sleep.2021.02.018. 00116-7.
[2] Lin LY, Wang J, Ou-Yang XY, et al. The immediate impact of the 2019 novel coronavirus (COVID-19) outbreak on subjective sleep status. Sleep Med 2021;77: 348–54. https://doi.org/10.1016/j.sleep.2020.05.018.
[3] Casagrande M, Favieri F, Tambelli R, et al. The enemy who sealed the world: effects quarantine due to the COVID-19 on sleep quality, anxiety, and psycholog-

ical distress in the Italian population. Sleep Med 2020;75:12—20. https://doi.org/10.1016/j.sleep.2020.05.011.

[4] Shillington KJ, Vanderloo LM, Burke SM, et al. Not so sweet dreams: adults' quantity, quality, and disruptions of sleep during the initial stages of the COVID-19 pandemic. Sleep Med 2021;(21):S1389—9457. https://doi.org/10.1016/j.sleep.2021.02.028. 00127-1. Advance online publication.

[5] Lee PH, Marek J, Nálevka P. Sleep pattern in the US and 16 European countries during the COVID-19 outbreak using crowdsourced smartphone data. Eur J Publ Health 2021;31(1):23—30. https://doi.org/10.1093/eurpub/ckaa208.

Fengyi Hao

Sleep Medicine Center, Department of Respiratory and Critical Care Medicine, Mental Health Center, Translational Neuroscience Center, and State Key Laboratory of Biotherapy, West China Hospital, Sichuan University, Chengdu, China

The First People's Hospital of Chongqing Liang Jiang New Area, Chongqing, China

Rong Ren, Ye Zhang

Sleep Medicine Center, Department of Respiratory and Critical Care Medicine, Mental Health Center, Translational Neuroscience Center, and State Key Laboratory of Biotherapy, West China Hospital, Sichuan University, Chengdu, China

Michael V. Vitiello

Department of Psychiatry and Behavioral Sciences, University of Washington School of Medicine, Seattle, WA, USA

Xiangdong Tang[*]

Sleep Medicine Center, Department of Respiratory and Critical Care Medicine, Mental Health Center, Translational Neuroscience Center, and State Key Laboratory of Biotherapy, West China Hospital, Sichuan University, Chengdu, China

[*] Corresponding author. Sleep Medicine Center, West China Hospital, Sichuan University, Dian Xin Nan Jie 28#, Chengdu, 610041, China.
E-mail address: 2372564613@qq.com (X. Tang).

1 April 2021
Available online 18 August 2021