Therapeutic potential of bright light therapy for the non-motor symptoms in Parkinson’s disease

Yun Shen¹, Si-Yi Gong², Yu-Lu Liu¹, Jie Li¹, Kang-Ping Xiong¹, Cheng-Jie Mao¹, Ya-Li Wang³, Dan Li⁴, Fen Wang², Hua Hu¹, Chun-Feng Liu²,⁴

¹Department of Neurology, Suzhou Clinical Research Center of Neurological Disease, The Second Affiliated Hospital of Soochow University, Suzhou, Jiangsu 215004, China; ²Jiangsu Key Laboratory of Neuropsychiatric Diseases, Institute of Neuroscience, Soochow University, Suzhou, Jiangsu 215123, China; ³Department of Neurology, Suzhou Municipal Hospital of Nanjing Medical University, Suzhou, Jiangsu 215008, China; ⁴Department of Neurology, Suqian First Hospital, Suqian, Jiangsu 223899, China.

To the Editor: Alterations of circadian rhythms seem to be the casual contribution to sleep disturbances, depression, and other non-motor symptoms in Parkinson’s disease (PD).¹,² By restoring the circadian rhythm, bright light therapy (BLT) might be a potentially new treatment option for PD. However, no studies have conclusively demonstrated the effects of BLT on the non-motor symptoms in PD.

Twenty-seven PD patients signed written informed consent and were included in this study. All the patients received 1 h of BLT (10,000 lux) daily within a time frame of 09:00 AM and 11:00 AM for 7 consecutive days. Participants were evaluated for motor and non-motor symptoms before and after the treatment, followed by the assessment of non-motor symptoms on day 28.

Finally, 23 PD patients completed the study [Figure 1]. Compared with the baseline, BLT significantly improved daytime sleepiness as assessed by Epworth Sleepiness Scale (ESS, 8.91 ± 5.43 vs. 8.26 ± 4.51, P = 0.032), sleep quality as assessed by Pittsburgh Sleep Quality Index (PSQI, 9.22 ± 4.74 vs. 7.65 ± 3.79, P = 0.042), and Parkinson’s Disease Sleep Scale-2 (PDSS-2, 33.65 ± 13.78 vs. 35.96 ± 11.93, P = 0.043). In addition, there were significant differences in Montreal Cognitive Assessment (MoCA) scores (22.17 ± 4.44 vs. 22.91 ± 3.84, P = 0.002) and delayed recall section (1.74 ± 1.91 vs. 2.48 ± 1.75, P = 0.000) between pre- and post-light exposure. There was no significant change in motor symptoms and other non-motor symptoms like depression, anxiety, and autonomic functions. At follow-up, most rating scales that reflected improvement after light exposure were not statistically significant from baseline, except Hamilton Depression Rating Scale (HAMD, 7.96 ± 4.25 vs. 8.52 ± 4.03, P = 0.006). PD patients were divided into PD with EDS and PD without EDS based on ESS scores. Further analysis demonstrated significant improvement in daytime sleepiness in PD with the EDS group after light exposure.

The strengths of this study lie in the comprehensive assessments of the efficacy of BLT on the non-motor symptoms in PD patients. Besides, scores for each subscale were analyzed for spotting minor improvement of BLT. Finally, to the best of our knowledge, there is no similar report in China yet.

There are several limitations to this study. First, the sample size is relatively small and selection bias should be considered. Second, the control group is not included in this study; thus, the possibility of placebo effects could not be excluded. Besides, the place where patients received BLT is not a closed space; therefore, the external light environment changing with seasons could interfere with our experiment. Finally, our study lacks more objective data for clinical assessment, such as data from polysomnography, actigraphy, or data on dynamic changes of cortisol and melatonin.

To conclude, BLT for the PD population is still in its infancy. BLT might be a feasible treatment for ameliorating the sleep and cognitive functions in PD patients. Due to the relatively short intervention time and small sample size, the effects of BLT seemed to be mild and temporal. Further

Yun Shen and Si-Yi Gong contributed equally to this work.

Correspondence to: Dr. Chun-Feng Liu, Jiangsu Key Laboratory of Neuropsychiatric Diseases, Institute of Neuroscience, Soochow University, Suzhou, Jiangsu 215123, China; Department of Neurology, Suqian First Hospital, 120 Suzhi Road, Suqian 223899, China
E-Mail: liuchunfeng@suda.edu.cn
Dr. Hua Hu, Department of Neurology, The Second Affiliated Hospital of Soochow University, 1055 Sanxiang Road, Suzhou 215004, China
E-Mail: sz_huhua@126.com

Copyright © 2021 The Chinese Medical Association, produced by Wolters Kluwer, Inc. under the CC-BY-NC-ND license. This is an open access article distributed under the terms of the Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 (CCBY-NC-ND), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.

Chinese Medical Journal 2021;Vol(No)
randomized controlled trials with larger samples are warranted to clarify the optimal parameters of photobiomodulation and objectively evaluate its effects in the PD population.

**Funding**

This work was supported by grants from the Jiangsu Provincial Key R&D Program (No. BE2018658), the Jiangsu Provincial Medical Key Discipline Project (No. ZDXKB2016022), Discipline Construction Program of the Second Affiliated Hospital Soochow University (No. XKTJ-XK202001), the National Natural Science Foundation of China (No. 81801253) and the Natural Science Foundation of Jiangsu Province (BK 20180214).

**Inclusion criteria:**
- Met PD diagnostic criteria
- Had stable medications ≥ 3 months

**Exclusion criteria:**
- Had severe dementia
- Had uncontrolled psychosis
- Had visual impairments
- Had sedative or depressant drugs
- Had night shift works

**Comprehensive assessment**

**Motor symptoms:** UPDRS, H&Y

**Non-motor symptoms:** MMSE, MoCA, HAMD, HAMA, SCOPA-AUT, NMSQ, PDQ-39, FSS, ESS, PSQI, PDSS-2, RBDSQ, RBD-HK, MEQ-SA

**Non-motor symptoms assessment:**
- HAMD, HAMA, SCOPA-AUT, NMSQ, PDQ-39, FSS, ESS, PSQI, PDSS-2, RBDSQ, RBD-HK, MEQ-SA

---

**Figure 1:** The flowchart of study design and patient enrolment. BLT: Bright light therapy; ESS: Epworth Sleepiness Scale; HAMD: Hamilton Depression Rating Scale; MoCA: Montreal Cognitive Assessment; PD: Parkinson’s disease; PDSS-2: Parkinson’s Disease Sleep Scale-2; PSQI: Pittsburgh Sleep Quality Index. UPDRS: Unified Parkinson’s Disease Rating Scale; H&Y: Hoehn & Yahr staging; MMSE: Mini Mental State Examination; HAMA: Hamilton Anxiety Rating Scale; PDQ-39: Parkinson’s Disease Questionnaire-39; SCOPA-AUT: Scales for Outcomes in Parkinson’s disease- Autonomic; NMSQ: Non-Motor Symptom Questionnaire; FSS: Fatigue Severity Scale; ESS: Epworth Sleepiness Scale; RBDSQ: Rem sleep Behavior Disorder Screening Questionnaire; RBD-HK: Rem sleep Behavior Disorder questionnaire - Hong Kong; MEQ-SA: Morningness - Eveningness questionnaire Self-Assessment version.

**Conflicts of interest**

None.

**References**
