Received: 14.02.2026 | Revision: 24.02.2026 | Accepted: 24.02.2026 | Published: 25.06.2026

Veterinary Sciences

doi: 10.31210/spi2026.29.01.40
UDC 616.853-07:636.7

ORIGINAL ARTICLE

Scientific Progress & Innovations
ISSN: 2786-8842 (Print)
2786-8850 (Online)

29 (1)
2026

The impact of idiopathic epilepsy on sleep quality in dogs: A replication study and validation of the SNoRE questionnaire in Ukraine

A. Bohdan | N. Suslova

Article info

Correspondence Author
A. Bohdan
E-mail:
12286234@student.dsau.dp.ua

Dnipro State Agrarian and Economic University,
Serhii Efremov Str., 25, Dnipro, 49600, Ukraine

Citation: Bohdan, A., & Suslova, N. (2026). The impact of idiopathic epilepsy on sleep quality in dogs: A replication study and validation of the SNoRE questionnaire in Ukraine. *Scientific Progress & Innovations*, 29(1), 261–265. doi: 10.31210/spi2026.29.01.40

This replication study evaluated the specific characteristics of sleep quality in dogs diagnosed with idiopathic epilepsy compared to clinically healthy animals within the context of Ukrainian veterinary practice. The study is grounded in the hypothesis of a complex bidirectional relationship between epilepsy and sleep disorders, a phenomenon well-documented in human medicine but remaining insufficiently investigated in the veterinary field. The research was conducted between 2024 and 2025 at the "ANIMALIA" veterinary clinic in Dnipro, Ukraine. The study sample consisted of sixty-four dogs distributed into two equal groups using a case-control design: the main group (n=32) comprising dogs with a confirmed idiopathic epilepsy diagnosis matching the Tier II confidence level according to the International Veterinary Epilepsy Task Force guidelines, and a control group (n=32) of healthy dogs, strictly matched by age, sex, and breed characteristics. Data collection was performed using the owner-based validated Sleep and Nighttime Restlessness Evaluation questionnaire. The results revealed statistically significant differences in total sleep quality scores between the two groups. Dogs with idiopathic epilepsy demonstrated a significantly higher median total score of 12 with an interquartile range of 6–33, compared to a median score of 8 with an interquartile range of 6–22 in the control group ($p<0.001$), indicating substantial sleep impairment. Detailed factor analysis clarified that the decrease in sleep quality was driven exclusively by Factor 1 (Sleep Quality), which includes the ability to fall asleep and sleep continuity; the median score in the study group was 9 against 5 in the control group ($p<0.001$). Conversely, no significant differences were found for Factor 2 (Sleep Interruption due to Dreaming), with both groups showing a median score of 2 ($p=0.99$), suggesting the preservation of rapid eye movement sleep stability. Furthermore, the study investigated potential correlations with clinical variables. No statistically significant association was found between sleep quality scores and seizure frequency ($p=0.73$), the presence of cluster seizures ($p=0.22$), or the number and type of antiseizure medications administered ($p=0.77$). However, subjective owner reports indicated that 68.8% of dogs experience changes in sleep patterns during the postictal phase, with the majority (59.5 %) showing hypersomnia, likely reflecting a compensatory neural recovery mechanism. The findings confirm the clinical utility of the Sleep and Nighttime Restlessness Evaluation questionnaire as a sensitive screening tool for detecting non-motor comorbidities in canine epilepsy. The study highlights that sleep disturbances in dogs with idiopathic epilepsy should be regarded as an independent pathological feature rather than a direct consequence of pharmacotherapy. These results emphasize the necessity of integrating routine sleep assessment into standard management protocols for veterinary neurological patients to improve their overall quality of life.

Keywords: idiopathic epilepsy, dogs, sleep quality, Sleep and Nighttime Restlessness Evaluation questionnaire, antiseizure medications, translational research.

Вплив ідіопатичної епілепсії на якість сну у собак: реплікаційне дослідження та валідація запитальника SNoRE в Україні

А. А. Богдан | Н. І. Суслова

Дніпровський державний аграрно-економічний університет,
м. Дніпро, Україна

У дослідженні оцінювалися специфічні характеристики якості сну у собак з діагнозом ідіопатична епілепсія порівняно з клінічно здоровими тваринами в умовах української ветеринарної практики. Робота базується на гіпотезі про двонаправлений зв'язок між епілепсією та розладами сну – явищем, добре вивченим у гуманній медицині, проте потребує деталізації у ветеринарії. Дослідження проводили протягом 2024–2025 років на базі ветеринарної клініки «ANIMALIA» (м. Дніпро). Вибірка охоплювала 64 собаки, розділені за дизайном «випадок-контроль»: основна група (n=32) із підтвердженою ідіопатичною епілепсією (рівень Tier II за критеріями IVETF) та контрольна (n=32) із клінічно здорових тварин, підібраних за віком, статтю та породою. Дані збирали за допомогою валідованого опитувальника власників SNoRE (Sleep and Nighttime Restlessness Evaluation). Встановлено достовірні відмінності у загальних балах якості сну між групами. У хворих тварин зафіксовано вищий медіанний загальний бал – 12 (міжквартильний розмах 6–33) порівняно з 8 (6–22) у контролі ($p<0,001$), що вказує на суттєве погіршення сну. Факторний аналіз довів, що зниження якості сну зумовлене виключно Фактором 1 (здатністю заснути та безперервністю сну); медіанний бал у дослідній групі становив 9 проти 5 у контролі ($p<0,001$). Для Фактора 2 (переривання сну через сновидіння) відмінностей не виявлено (медіана 2 в обох групах, $p=0,99$), що свідчить про стабільність фази швидкого сну (REM). Також оцінювалися кореляції з клінічними змінними. Достовірного зв'язку між балами SNoRE та частотою нападів ($p=0,73$), кластерними судомами ($p=0,22$) чи схемою антиепілептичної терапії ($p=0,77$) не виявлено. Проте 68,8 % власників фіксували зміни патернів сну у постіктальній фазі, де 59,5 % випадків припадало на гіперсомнію як компенсаторний механізм відновлення ЦНС. Результати підтверджують клінічну корисність SNoRE як чутливого інструменту для скринінгу немоторних коморбідностей. Розлади сну при ідіопатичній епілепсії слід розглядати як самостійну патологію, а не як прямий наслідок фармакотерапії. Це обґрунтовує необхідність інтеграції оцінки сну в стандартні протоколи ведення неврологічних пацієнтів для покращення якості їхнього життя.

Ключові слова: ідіопатична епілепсія, собаки, якість сну, запитальник SNoRE, антиепілептичні препарати, трансляційне дослідження.

OPEN ACCESS

Бібліографічний опис для цитування: *Богдан А. А., Суслова Н. І.* Вплив ідіопатичної епілепсії на якість сну у собак: реплікаційне дослідження та валідація запитальника SNoRE в Україні. *Scientific Progress & Innovations*. 2026. № 29 (1). С. 261–265.

Introduction

Idiopathic epilepsy (IE) is one of the most common chronic neurological disorders in dogs, with a general prevalence in primary care practices ranging from 0.62 % to 0.82 % [1, 4, 5, 9, 11]. Despite significant progress in understanding genetic factors and seizure control methods, non-motor manifestations of the disease, particularly sleep disorders, remain insufficiently studied in veterinary medicine.

In human medicine, the bidirectional relationship between epilepsy and sleep has long been well-documented [8, 15, 19]. Patients with epilepsy are 2–3 times more likely to suffer from sleep disorders, such as insomnia and restless legs syndrome [12, 13], compared to the general population. This creates a pathological "vicious cycle" where sleep deprivation triggers seizures [10, 14, 18], and epileptic activity, in turn, leads to sleep fragmentation and disruption of its architecture.

An additional influencing factor is antiseizure medications (ASMs): while first-line drugs such as phenobarbital can negatively affect sleep quality, newer ASMs (e.g., gabapentin) sometimes promote increased sleep depth [2, 3, 6, 7, 16, 17, 20]. Dogs, like humans, are prone to a wide range of sleep disorders. However, the interaction between sleep and epilepsy in veterinary medicine remains a subject of discussion.

Previous attempts to assess sleep in dogs with IE using objective methods (actigraphy) [22] did not reveal significant differences in sleep metrics compared to the control group. However, actigraphy is an indirect method of assessing motor activity, which may not capture specific qualitative disturbances occurring at different time intervals.

Currently, the standard for subjective assessment is the developed and validated SNoRE (Sleep and Nighttime Restlessness Evaluation) questionnaire [21]. Using this tool allows assessing the owners' perception of sleep quality, which is critical for clinical management. Given the urgency of the problem, there was a need to conduct a replication study to confirm global data on a local patient cohort.

The aim of the study

The aim of the paper is to test and apply the SNoRE questionnaire for a comparative assessment of sleep quality in dogs with IE and healthy dogs in Dnipro. To achieve this goal, the following tasks were set: to determine the differences in SNoRE scores between the groups, analyze specific sleep factors, and investigate possible associations between sleep parameters, seizure characteristics, and medication regimens.

Materials and methods

The study was conducted from 2024 to 2025 at the "ANIMALIA" veterinary clinic (Dnipro, Ukraine). The subjects of the study were 64 dogs of various breeds, distributed into two equal groups using the case-control method.

Study group formation

The main group (n = 32) included dogs with a confirmed diagnosis of idiopathic epilepsy. The diagnostic protocol corresponded to the Tier II confidence level according to the International Veterinary Epilepsy Task Force (IVETF) recommendations [23], which included history taking, physical and neurological examinations, complete blood count and biochemistry, as well as brain magnetic resonance imaging (MRI) and cerebrospinal fluid analysis. The control group (n = 32) consisted of clinically healthy dogs with no history of seizures or neurological disorders. Control animals were matched to the main group by age, sex, and breed group.

Sleep assessment tool

The validated SNoRE (Sleep and Nighttime Restlessness Evaluation) questionnaire was used for data collection [21]. Owners evaluated the animals' behavior over the last 7 days on 6 items using a scale from 1 to 10, where a higher score corresponded to more severe disturbances. The total SNoRE score could range from 6 to 60. The questionnaire structure involved division into two factors: Factor 1 (Sleep Quality), assessing the ability to fall asleep and sleep continuity; and Factor 2 (Sleep Interruption due to Dreaming), including vocalization and twitching.

Statistical analysis

Data processing was performed using the Microsoft Excel 2021 package. Data normality was tested using the Shapiro-Wilk test. Since the distribution was not normal, data are presented as median and interquartile range (IQR). The Wilcoxon signed-rank test was used to compare SNoRE scores between the matched groups. The Kruskal-Wallis test was used to compare subgroups by clinical characteristics. The level of statistical significance was established at $p<0.05$.

Results and discussion

The main group (n = 32) included dogs with a mean age of 5.6 years (11 females, 21 males), and the control group (n = 32) was fully balanced by age (mean age 5.4 years), sex, and breed composition (***Table 1***).

Table 1

Demographic characteristics of the study groups (n = 32)

Indicator	IE Group (n = 32)	Control Group (n = 32)	*P*-value
Age (years), Median (IQR)	5.6 (3.1–7.5	5.4 (2.8–8.5)	0.9
Sex: Males / Females	21 / 11	21 / 11	1.0
Most Common Breeds:			
Labrador Retriever	5 (15.6%)	4 (12.5%)	–
German Shepherd	4 (12.5%)	3 (9.4%)	–
Mixed Breeds	6 (18.8%)	7 (21.9%)	–

Note. Data for quantitative variables (age) are presented as Median (IQR). For qualitative variables, data are presented as absolute numbers (n) and percentages (%). No statistically significant differences were found between the groups ($p>0.05$).

Analysis of the SNoRE questionnaire results revealed statistically significant differences between animals with epilepsy and clinically healthy dogs. It was established

that dogs with IE demonstrate significantly higher sleep disturbance scores compared to the control group. The median total SNoRE score in the main group was 12 (IQR: 6–33), while in the control group, this indicator was at the level of 8 (IQR: 6–22; p<0.001; ***Fig. 1***). These data indicate that the presence of epileptic activity is associated with a deterioration in the overall quality of the animal's night rest.

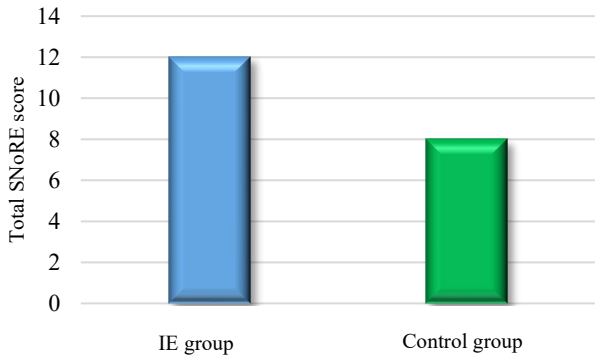

Fig. 1. Comparison of total SNoRE scores between control group and dogs with epilepsy.
Note. Bars represent median values; the difference is statistically significant (p<0.001).

Factor analysis showed that the main contribution to the increase in the total score is made by Factor 1 (Sleep Quality). The median score for this factor in dogs with IE was 9, which is almost double the score of healthy dogs, which stood at 5 (p<0.001). For Factor 2 (Interruption due to Dreaming), no statistically significant differences were found: the median in both groups was 2 (p=0.99). This suggests that IE primarily affects the non-rapid eye movement (NREM) sleep phase, rather than the rapid eye movement (REM) sleep phase.

Unexpectedly, no direct correlation was found between sleep quality and seizure frequency (p=0.73), the presence of cluster seizures (p=0.22), or disease duration. Furthermore, regarding medication therapy, dogs receiving monotherapy or combinations of ASMs (phenobarbital, levetiracetam, potassium bromide) did not show significant differences in sleep scores compared to untreated dogs (p=0.77; ***Table 2***).

Table 2
Association between SNoRE scores and clinical characteristics of epilepsy

Characteristic	*n*	Total Score (Median)	Factor 1 (Quality)	*P*-value
Seizure Frequency				0.73
Daily/Weekly	8	12.5	9.5	
Monthly	14	12.0	9.0	
Less than once a month	10	11.5	8.5	
Cluster Seizures				0.22
Yes	24	12.0	9.0	
No	8	13.0	9.5	
Number of ASMs				0.77
Monotherapy (1 drug)	12	12.0	9.0	
Polytherapy (≥2 drugs)	20	12.5	9.0	

Note. ASMs – antiseizure medications. *P*-values calculated using the Wilcoxon signed-rank test (for two subgroups) and the Kruskal-Wallis test (for three subgroups). In all cases, p>0.05, indicating no significant impact.

Regarding postictal changes, 68.8 % of owners confirmed the presence of visible changes in the sleep/wake cycle. Among them, 59.5 % reported that the dog sleeps significantly more than usual.

The diagnosis and management of idiopathic epilepsy (IE) in dogs traditionally focus on controlling the frequency and severity of seizures. However, our study confirms that IE is a complex systemic disease accompanied by significant non-motor comorbidities, particularly the deterioration of sleep quality. The obtained results on the local cohort of patients in Dnipro demonstrate that the median SNoRE score in dogs with epilepsy is 50% higher than in healthy animals (12 vs. 8, respectively), which fully correlates with the findings of the translational study by Mondino et al. [21].

In human medicine, it is established that patients with epilepsy are 2–3 times more likely to suffer from sleep disorders, such as insomnia, which creates conditions for a lowered seizure threshold. A similar pattern is observed in veterinary practice. However, it is interesting to note that previous objective studies using actigraphy [22] did not record a significant difference in sleep architecture between affected and healthy dogs. This may be due to the fact that actigraphy only captures overall motor activity, without taking into account the qualitative aspects of night rest. Our study highlights the higher sensitivity of the validated SNoRE questionnaire specifically for detecting qualitative disturbances, such as difficulty falling asleep and sleep fragmentation.

Analysis of the specific SNoRE factors showed that the main contribution to the increase in the total score is made by Factor 1 (Sleep Quality). This indicates that epileptic activity affects the animal's ability to maintain continuous sleep, while Factor 2 (Sleep Interruption due to Dreaming) showed no significant differences. This suggests that IE primarily affects the non-rapid eye movement (NREM) sleep phase, rather than the rapid eye movement (REM) sleep phase, which is also discussed in the original study by Mondino.

The lack of a statistically significant association between sleep quality and seizure frequency or the antiseizure medication (ASM) regimen was somewhat unexpected. In humans, sleep stability often directly depends on the success of seizure control. However, as noted by Mondino et al. [21], the absence of such a correlation in dogs may be due to the limited sample size (an underpowered effect) for detecting the subtle effects of specific drugs, such as phenobarbital or potassium bromide. This indicates that sleep disturbances in IE may be an independent component of the disease pathogenesis, independent of current seizure activity.

Postictal changes deserve special attention. The majority of owners (68.8%) noted a change in sleep duration after seizures, with 59.5% reporting prolonged sleep periods. This may indicate the development of compensatory inhibition in the central nervous system following excessive excitation. It should be noted that owners often try to create the calmest possible environment for the dog to rest after a seizure, which can also influence these subjective assessments.

Thus, the results of our study emphasize the importance of an integrated approach to managing

patients with epilepsy. Sleep quality should be considered a distinct clinical marker of the animal's welfare, and its monitoring using the SNoRE questionnaire can be a valuable addition to standard diagnostic and treatment protocols.

Conclusions

This study confirmed significant sleep disturbances in dogs with idiopathic epilepsy, as evidenced by a significantly higher total SNoRE score (median 12) in affected animals compared to the healthy control group (median: 8; $p<0.001$). This deterioration of night rest is driven primarily by Factor 1 (Sleep Quality), whereas Factor 2 (Sleep Interruption due to Dreaming) remains unaffected ($p=0.99$). Notably, these canine sleep disturbances appear to be independent of seizure frequency, the presence of cluster seizures, disease duration, or antiseizure medication (ASM) regimens; however, the postictal phase is subjectively characterized by increased sleep duration in 59.5 % of cases. Consequently, subjective sleep monitoring using the validated SNoRE questionnaire provides a highly sensitive tool that should be integrated into the standard clinical management and quality-of-life assessment of canine epilepsy.

Prospects for Further Research. Future studies should focus on expanding the sample size to conduct a more detailed analysis of the impact of specific antiseizure medications on sleep architecture. Additionally, combining subjective tools like the SNoRE questionnaire with objective instrumental modalities, such as non-invasive polysomnography, is promising to gain a comprehensive understanding of neurophysiological changes in dogs with epilepsy.

DECLARATIONS

Ethical Statement

The authors declare that all clinical and diagnostic investigations complied with generally accepted standards of humane animal treatment and bioethical principles. The clinical part of the study was conducted in strict accordance with the legislation of Ukraine, specifically the Law of Ukraine "On the Protection of Animals from Cruelty" (No. 3447-IV), as well as Directive 2010/63/EU of the European Parliament and of the Council of September 22, 2010, on the protection of animals used for scientific purposes.

All diagnostic procedures (including complete blood count and biochemistry, brain magnetic resonance imaging, and cerebrospinal fluid analysis) were performed solely for clinical indications and after obtaining official informed consent from the animal owners for study participation and completion of the SNoRE questionnaire. During their stay at the veterinary clinic, the animals were provided with appropriate housing, high-quality care, and minimization of any stressful, painful, or uncomfortable factors through adequate anesthetic management during invasive procedures.

Funding

This research received no external funding.

Conflict of Interest

The authors declares no conflict of interest.

Acknowledgements

None.

Declaration of AI and AI-assisted technologies

The authors declares that no artificial intelligence or AI-assisted technologies were used in the preparation of this manuscript.

References

1. Barry, M., Cameron, S., Kent, S., Barnes-Heller, H., & Grady, K. (2021). Daytime and nocturnal activity in treated dogs with idiopathic epilepsy compared to matched unaffected controls. *Journal of Veterinary Internal Medicine*, 35 (4), 1826–1833. https://doi.org/10.1111/jvim.16205
2. Bazil, C. W., Battista, J., & Basner, R. C. (2005). Effects of levetiracetam on sleep in normal volunteers. *Epilepsy & Behavior*, 7 (3), 539–542. https://doi.org/10.1016/j.yebeh.2005.08.001
3. Bell, C., Vanderlinden, H., Hiersemenzel, R., Otoul, C., Nutt, D., & Wilson, S. (2002). The effects of levetiracetam on objective and subjective sleep parameters in healthy volunteers and patients with partial epilepsy. *Journal of Sleep Research*, 11 (3), 255–263. https://doi.org/10.1046/j.1365-2869.2002.00301.x
4. Berendt, M., Gredal, H., Pedersen, L. G., Alban, L., & Alving, J. (2002). A cross-sectional study of epilepsy in Danish Labrador retrievers: Prevalence and selected risk factors. *Journal of Veterinary Internal Medicine*, 16 (3), 262–268. https://doi.org/10.1111/j.1939-1676.2002.tb02367.x
5. Berendt, M., Gulløv, C. H., Christensen, S. L. K., Gudmundsdottir, H., Gredal, H., Fredholm, M., & Alban, L. (2008). Prevalence and characteristics of epilepsy in the Belgian shepherd variants Groenendael and Tervueren born in Denmark 1995–2004. *Acta Veterinaria Scandinavica*, 50 (1), 51. https://doi.org/10.1186/1751-0147-50-51
6. Carvalho, B. M. S., Chaves, J., & Silva, A. M. d. (2022). Effects of antiepileptic drugs on sleep architecture parameters in adults. *Sleep Science*, 15 (02), 224–244. https://doi.org/10.5935/1984-0063.20220045
7. Cicolin, A., Magliola, U., Giordano, A., Terreni, A., Bucca, C., & Mutani, R. (2006). Effects of levetiracetam on nocturnal sleep and daytime vigilance in healthy volunteers. *Epilepsia*, 47 (1), 82–85. https://doi.org/10.1111/j.1528-1167.2006.00376.x
8. De Risio, L., Bhatti, S., Muñana, K., Penderis, J., Stein, V., Tipold, A., Berendt, M., Farqhuar, R., Fischer, A., Long, S., Mandigers, P. J., Matiasek, K., Packer, R. M., Pakozdy, A., Patterson, N., Platt, S., Podell, M., Potschka, H., Batlle, M. P., Rusbridge, C., & Volk, H. A. (2015). International veterinary epilepsy task force consensus proposal: diagnostic approach to epilepsy in dogs. *BMC Veterinary Research*, 11 (1), 148. https://doi.org/10.1186/s12917-015-0462-1
9. Erlen, A., Potschka, H., Volk, H. A., Sauter-Louis, C., & O'Neill, D. G. (2018). Seizure occurrence in dogs under primary veterinary care in the UK: prevalence and risk factors. *Journal of Veterinary Internal Medicine*, 32 (5), 1665–1676. https://doi.org/10.1111/jvim.15290
10. Frucht, M. M., Quigg, M., Schwaner, C., & Fountain, N. B. (2000). Distribution of seizure precipitants among epilepsy syndromes. *Epilepsia*, 41 (12), 1534–1539. https://doi.org/10.1111/j.1499-1654.2000.001534.x
11. Gulløv, C. H., Toft, N., Baadsager, M. M. N., & Berendt, M. (2011). Epilepsy in the Petit Basset Griffon Vendeen: prevalence, semiology, and clinical phenotype. *Journal of Veterinary Internal Medicine*, 25 (6), 1372–1378. https://doi.org/10.1111/j.1939-1676.2011.00791.x

12. Heske, L., Nødtvedt, A., Jäderlund, K. H., Berendt, M., & Egenvall, A. (2014). A cohort study of epilepsy among 665,000 insured dogs: Incidence, mortality and survival after diagnosis. *The Veterinary Journal*, 202 (3), 471–476. https://doi.org/10.1016/j.tvjl.2014.09.023
13. Hülsmeyer, V.-I., Fischer, A., Mandigers, P. J. J., DeRisio, L., Berendt, M., Rusbridge, C., Bhatti, S. F. M., Pakozdy, A., Patterson, E. E., Platt, S., Packer, R. M. A., & Volk, H. A. (2015). International veterinary epilepsy task force's current understanding of idiopathic epilepsy of genetic or suspected genetic origin in purebred dogs. *BMC Veterinary Research*, 11 (1). https://doi.org/10.1186/s12917-015-0463-0
14. Kearsley-Fleet, L., O'Neill, D. G., Volk, H. A., Church, D. B., & Brodbelt, D. C. (2013). Prevalence and risk factors for canine epilepsy of unknown origin in the UK. *Veterinary Record*, 172 (13), 338. https://doi.org/10.1136/vr.101133
15. Kokkinos, V., Koupparis, A. M., Koutroumanidis, M., & Kostopoulos, G. K. (2022). Editorial: Brain mechanisms linking sleep and epilepsy. *Frontiers in Human Neuroscience*, 16. https://doi.org/10.3389/fnhum.2022.922372
16. Krishnan, P., Sinha, S., Taly, A. B., Ramachandraiah, C. T., Rao, S., & Satishchandra, P. (2012). Sleep disturbances in juvenile myoclonic epilepsy: A sleep questionnaire-based study. *Epilepsy &Amp; Behavior*, 23 (3), 305–309. https://doi.org/10.1016/j.yebeh.2011.12.018
17. Legros, B., & Bazil, C. W. (2003). Effects of antiepileptic drugs on sleep architecture: a pilot study. *Sleep Medicine*, 4 (1), 51–55. https://doi.org/10.1016/s1389-9457(02)00217-4
18. Malow, B. A., Lin, X., Kushwaha, R., & Aldrich, M. S. (1998). Interictal spiking increases with sleep depth in temporal lobe epilepsy. *Epilepsia*, 39 (12), 1309–1316. https://doi.org/10.1111/j.1528-1157.1998.tb01329.x
19. Manni, R., & Terzaghi, M. (2010). Comorbidity between epilepsy and sleep disorders. *Epilepsy Research*, 90 (3), 171–177. https://doi.org/10.1016/j.eplepsyres.2010.05.006
20. Minecan, D., Natarajan, A., Marzec, M., & Malow, B. (2002). Relationship of epileptic seizures to sleep stage and sleep depth. *Sleep*, 25 (8), 56–61. https://doi.org/10.1093/sleep/25.8.56
21. Mondino, A., Ludwig, C., Menchaca, C., Russell, K., Simon, K. E., Griffith, E., Kis, A., Lascelles, B. D. X., Gruen, M. E., & Olby, N. J. (2023). Development and validation of a sleep questionnaire, SNoRE 3.0, to evaluate sleep in companion dogs. *Scientific Reports*, 13 (1). https://doi.org/10.1038/s41598-023-40048-1
22. Yuan, X., & Sun, M. (2020). The value of rapid eye movement sleep in the localization of epileptogenic foci for patients with focal epilepsy. *Seizure*, 81, 192–197. https://doi.org/10.1016/j.seizure.2020.06.009
23. Zhou, J.-Y., Tang, X.-D., Huang, L.-L., Zhong, Z.-Q., Lei, F., & Zhou, D. (2012). The acute effects of levetiracetam on nocturnal sleep and daytime sleepiness in patients with partial epilepsy. *Journal of Clinical Neuroscience*, 19 (7), 956–960. https://doi.org/10.1016/j.jocn.2011.09.032

ORCID

A. Bohdan https://orcid.org/0009-0006-8196-4320
N. Suslova https://orcid.org/0000-0001-9500-9224