REVIEW PAPER

Actigraphy Derived Sleep and Circadian Rest-Activity Rhythms After Stroke: A Systematic Review

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ABSTRACT

Background: Post-stroke sleep disorders and circadian rhythms are more commonly recognized which may affect the recovery and quality of life. Actigraphy is an accurate and easily applied measure of sleep-wake activity and rest-activity rhythm or circadian rest-activity rhythm. A systematic review was undertaken to determine the evidence about post-stroke actigraphy- derived sleep and circadian rest-activity rhythm.

Methods: A systematic review was performed following the PRISMA 2020 guidelines. Scopus, PubMed, Google Scholar, and Web of Science were searched for relevant articles published between 2011 and 2026. Studies reporting actigraphy-derived sleep and circadian rest-activity measures in post-stroke populations were included. The quality of included articles was evaluated through the Joanna Briggs Institute (JBI) Critical Appraisal Checklists.

Results: A total of 14 studies were included in this review. Sleep disturbances like sleep quality, number of wake periods during the night, number of nocturnal awakenings, sleep latency were frequently mentioned. Circadian rest-activity rhythm disturbances such as decreased amplitude and stability, increased sleep fragmentation and decreased relative amplitude were often documented. The disturbances in the sleep and circadian rhythm were correlated to functional, cognitive, psychological and quality of life outcomes in various studies.

Conclusion: Disruptions in sleep and the circadian rest-activity rhythms are common in stroke patients and might be a contributing factor to the overall recovery after stroke. Actigraphy appears to be a convenient means of quantifying sleep and circadian abnormalities for effective evaluation and management during rehabilitation. More prospective studies using standardized actigraphy protocol are needed to understand their prognostic significance.

Keywords: Stroke; Actigraphy; Sleep disturbance; Circadian rhythm; Sleep quality.

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INTRODUCTION

Novel Stroke is a most prevalent cause of death which can be associated with long-term disability on a global level. Although there has been extensive research in terms of management and rehabilitation of the acute stroke, the vast number of stroke survivors endure the long-term physical, cognitive and emotional deficits. These deficits will have detrimental effects upon the individual's recovery and general well-being. Disturbances of sleep and circadian rhythms have been identified as important but, undervalued factors affecting post stroke outcomes [1,2].

Sleep problems are common post-stroke, presenting as insomnia, fragmented sleep, hypersomnolence, altered sleep duration or disturbances in sleep-wake rhythmicity. There is evidence from earlier studies suggesting that sleep impairment may negatively influence neuroplasticity, cognition, mood, compliance in rehabilitation and functional recovery. Additionally sleep disturbances may exist secondary to stroke or secondary to neurological deficits. Besides the effects on sleep disturbances, circadian rhythm dysfunction can also have a key role during stroke rehabilitation. Circadian rhythms are the endogenously driven periodic changes that govern various physiological and behavioural events in humans, such as motor activity, sleep-wake cycle, body temperature, and hormone levels. Stroke can lead to alterations in these rhythms, including a loss of the rhythm's stability and amplitude, altered day-night activity patterns, and circadian misalignment. Circadian rhythm disruption has also been associated with various

adverse post-stroke consequences, such as poor functional recovery, cognitive impairment, and depression [3-6].

We need an accurate measure of sleep and rest-activity rhythms to know the extent of their involvement in stroke recovery. Polysomnography, despite being the golden standard for sleep measurement, is complex and too expensive for use on a day-to-day basis, especially in clinical and rehabilitation settings. Actigraphy allows a non-invasive, objective and feasible measurement of sleep-wake and rest-activity patterns over a longer time span and in natural environments. Sleep can be quantified using measures such as sleep latency (SL), sleep efficiency (SE), total sleep time (TST), wake after sleep onset (WASO), sleep fragmentation (SF), sleep regularity (SR) as well as other rest-activity cycle measures including interdaily stability (IS), intradaily variability (IVA) [7,8].

Despite numerous studies which have utilised actigraphy in an attempt to define sleep and circadian rest-activity patterns after stroke, there is a need to extract thorough evidence based on targeted sleep and circadian rhythms from actigraphy. The aim of the systematic review was to integrate the available evidence that has defined sleep and circadian rest activity post-stroke through actigraphy, and provide an overall picture of the potential post stroke recovery implications.

METHODS

Search Strategy and Study Selection

A systematic review was performed using PRISMA 2020 guidelines to analyze sleep and circadian rest activity rhythms measured by actigraphy post-stroke. By using the sources like Scopus, PubMed, Google Scholar, and Web of Science a comprehensive search was performed. The search terms related to wearable sleep monitoring, sleep characteristics, and stroke were used, such as “actigraphy,” “sleep efficiency,” “sleep duration,” “sleep disturbance,” “sleep regularity,” “sleep regularity index,” “sleep quality,” “sleep pattern,” “sleep fragmentation,” “rest-activity rhythm,” “circadian rhythm,” “stroke,” and “post-stroke.” The use of Boolean operators (AND, OR) allowed combining the terms and retrieving most relevant articles.

This review aimed to evaluate published research studies by investigating the application of actigraphy measures of sleep patterns and circadian rest activity rhythm in the post-stroke population. The study designs included were a cohort study, cross sectional study, case control study, prospective observational study, longitudinal study or observational studies reporting on an objective measure of actigraphy derived sleep and rest activity rhythm outcome. Therefore, we included all forms of observational studies, which investigate outcomes of stroke survivors based on the data obtained from actigraphic measurements of sleep and circadian rest activity rhythms. The databases were searched for studies published from 2011 to 2026 for providing an up-to-date review of actigraphy measured sleep and circadian rest–activity rhythms after stroke.

Study Inclusion and Screening Process

Based on the aim of this review, titles and abstracts were searched from the databases by the two independent reviewers and then included. Studies which appeared to be relevant and meeting the inclusion criteria were retrieved to full text for assessment. Studies were included according to pre-defined inclusion criteria of studies using actigraphy-derived sleep and circadian rest-activity rhythms post stroke. Discrepancies in decisions of included/excluded papers between two reviewers were ruled out through conversation and consensus, or a third reviewer if needed. A PRISMA flowchart depicting the number of studies recognized, evaluated, omitted, and integrated at each stage of the study selection was produced to enhance transparency and reproducibility (Figure 1).

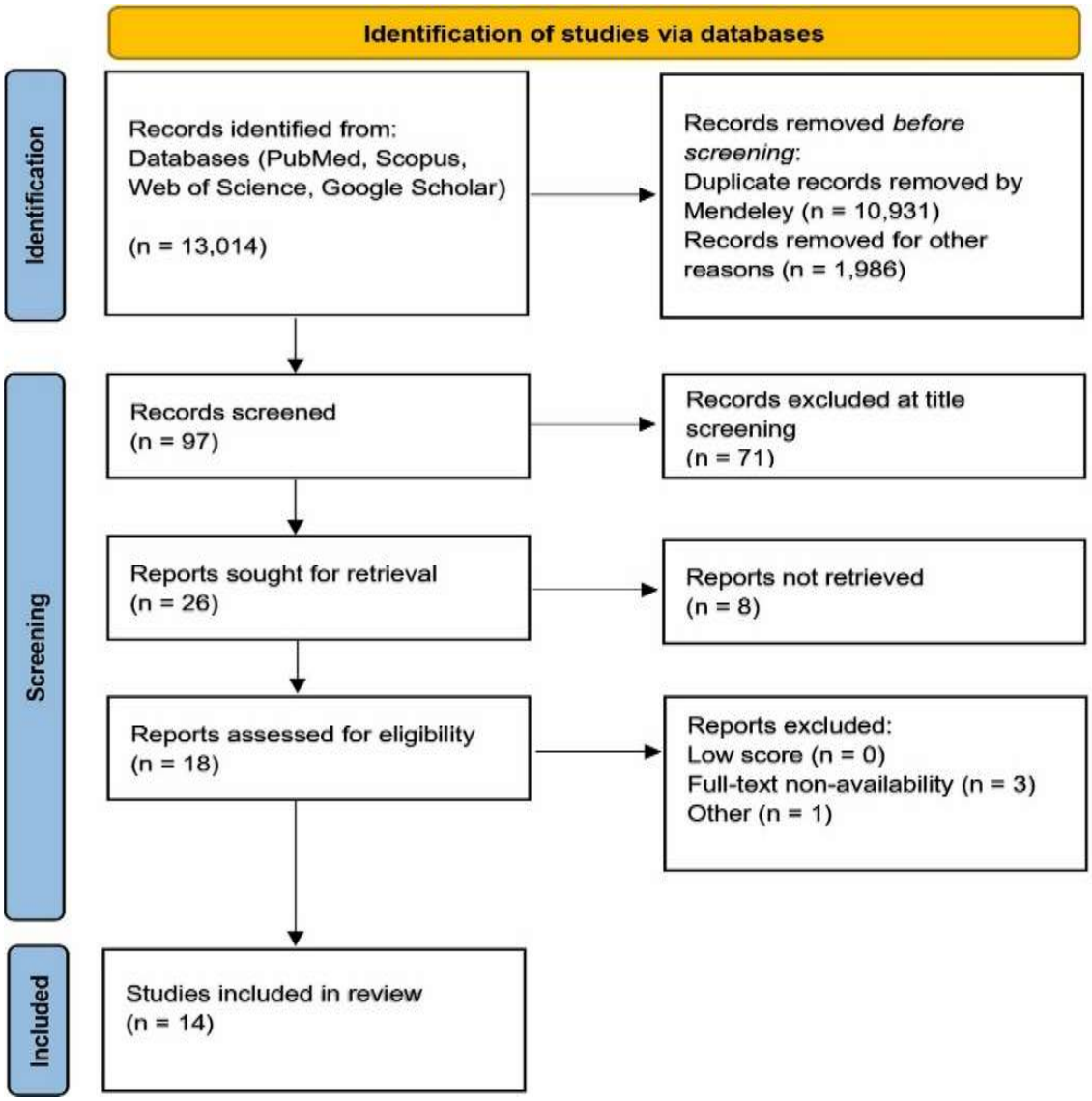


Fig. 1. Process of study identification and selection according to PRISMA guidelines 2020.

Data Extraction

Systematic data extraction from studies measuring actigraphy-based sleep and circadian rest-activity rhythms after stroke was performed. Data were collected by using a regulated extraction form to enhance uniformity and comparability across studies. Data about study characteristics such as author, year of publication, country of origin, study design and sample size were extracted. Information about participant characteristics such as age, sex and stroke specific features were extracted, these included stroke type, stage of recovery (acute, subacute, chronic) and rehabilitation status.

Details related to actigraphy assessment was extracted; this included type of actigraphy device used, monitoring duration, and the sleep and circadian rhythm variables that were recorded. These variables included sleep latency, total sleep duration, sleep efficiency, wake after sleep onset (WASO), sleep fragmentation, sleep periodicity and number of wake periods after sleep onset; circadian rest-activity variables consisted of relative amplitude, intra-daily variability, interdaily stability, M10 and L5 activity measures. The major findings of each study were extracted and synthesized for patterns of post stroke sleep and circadian rhythm disruption, and associations with functional recovery, cognitive outcomes, fatigue, psychological health, quality of life and post stroke outcomes. A summary of the extracted data is presented in Table 1.

Table 1. Characteristics and key findings of the included studies

Author (year, region)	Study design	Sample size	Stroke characteristics	Mean age & sex	Actigraphy device	Monitoring duration	Measured sleep variables
Sung *et al.*,[15] (2025, Taiwan)	Prospective observational study	70	Sub-acute stroke patients; ischemic and hemorrhagic stroke included	67.1 ± 12.2 years; Males: 47, Females: 23	MiCor™ A100	7 consecutive days	Interdaily Stability (IS), Intradaily Variability (IV), Relative Amplitude (RA), M10, L5 (circadian rest-activity rhythm measures)
Smith *et al.*,[10] (2024, Australia)	Cross-sectional observational study	18	Stroke patients undergoing inpatient rehabilitation; ≤ 3 months post-stroke	72 ± 10 years; Males: 12, Females: 6	Philips Actiwatch Spectrum 2	1 night	Sleep latency, sleep efficiency, total sleep time, number of awakenings, awake time during sleep
Gao *et al.*,[16] (2024, UK)	Prospective cohort study	1101	Ischemic, hemorrhagic, and unspecified stroke; median 5.7 years since stroke at actigraphy assessment	67.5 ± 6.3 years; Males: 653, Females: 448	Axivity AX3	6-7 days	Relative Amplitude (RA), Interdaily Stability (IS), Intradaily Variability (IV), M10 activity, M10 midpoint, L5 activity, L5 midpoint
Liang *et al.*,[17] (2024, Taiwan)	Prospective comparative study	Stroke group: 25, Control group: 25	Post-stroke patients undergoing inpatient rehabilitation; ischemic and hemorrhagic stroke included	Stroke group: 56 (IQR 46-71) years; Males: 16, Females: 9 Control group: 57 (IQR 46.5-68.5) years; Males: 10, Females: 15	MiCor A100	7 days	Relative Amplitude (RA), Interdaily Stability (IS), Intradaily Variability (IV), M10, L5

Table 1. (continued)

Author (year, region)	Study design	Sample size	Stroke characteristics	Mean age & sex	Actigraphy device	Monitoring duration	Measured sleep variables
Pellegrini *et al*.,[23] (2023, Australia)	Cross-sectional within-subject cohort study	18	Adults with stroke undergoing inpatient rehabilitation	72.2 ± 10.0 years; Males: 12, Females: 6	Philips Actiwatch Spectrum 2	1 night	Number of awakenings, wake after sleep onset (WASO), sleep efficiency (SE), sleep onset latency (SOL), total sleep time (TST)
Sindorf *et al*.,[20] (2025, USA)	Prospective observational study	103	Acute inpatient rehabilitation stroke patients	60.86 ± 15.85 years; Males: 54, Females: 49	Philips Actiwatch Spectrum & ActiGraph wGT3X-BT	Throughout inpatient rehabilitation stay (1,475 total nights recorded)	Total Activity Count (overnight activity), Sleep Quality, Overnight Sleep Disruptions, Total Sleep Time (TST), Sleep Efficiency, Sleep Fragmentation, Wake After Sleep Onset (WASO)
Wang *et al*.,[22] (2024, USA)	Prospective observational study	27	Inpatient rehabilitation stroke patients	63.22 ± 3.04 years; Males: 8, Females: 19	Actiwatch Spectrum & ActiGraph wGT3X-BT	173.5 hours	Daytime sleep occurrence, sleep/wake status, activity levels (active, sedentary, asleep)
Schruers *et al*.,[19] (2025, UK)	Cross-sectional observational study	222 total (162 stroke survivors, 60 controls)	Community-dwelling stroke survivors; subacute to chronic phase; mean 5 ± 5 years post-stroke	Stroke group: 61 ± 14 years; Males: 89, Females: 73; Control group: 57 ± 17 years; Males: 32, Females: 28	MotionWatch 8	7 days	Sleep Regularity Index (SRI), Total Sleep Time (TST), Sleep efficiency, Sleep fragmentation index, Wake After Sleep Onset (WASO), average sleep time/24h

Table 1. (continued)

Author (year, region)	Study design	Sample size	Stroke characteristics	Mean age & sex	Actigraphy device	Monitoring duration	Measured sleep variables
Williams-Cooke *et al.*,[11] (2021, USA)	Longitudinal observational study	37	Acute stroke patients undergoing inpatient rehabilitation	62.5 ± 11.8 years; Males: 20, Females: 17	ActiGraph (ActiLife)	First 3 nights & last 3 nights of inpatient rehabilitation	Total Sleep Time (TST), Sleep Efficiency (SE)
Edgley *et al.*,[21] (2023, UK)	Prospective observational study	25	Stroke or probable brain transient ischemic attack (TIA)	64 ± 10 years; Males: 13, Females: 12	GENEActiv smartwatch	≥7 days per wear-period; 42 wear periods analyzed	Sleep duration, sleep efficiency, sleep onset/offset, night waking, circadian rhythm, wrist temperature features
Cavalcanti *et al.*,[13] (2012, Brazil)	Cross-sectional observational study	46 total (22 stroke survivors, 24 controls)	First-ever chronic stroke (>6 months post-stroke); neurological status assessed using National Institute Health Stroke Scale	Stroke group: 55 ± 12 years; Control group: 57 ± 11 years; both sexes	Actiwatch-16 (Mini Mitter)	5 consecutive days of valid data (within 7-day wear)	Actual sleep time, sleep latency, sleep fragmentation index, mean total activity, daily activity, light-phase activity
Pajediene *et al.*,[18] (2022, Lithuania)	Prospective case-control study	Stroke group: 27, Control group: 25	Acute ischemic stroke (first-ever)	Stroke group: Median age 56 years; Males: 20, Females: 7; Control group: Median age 55 years; Males: 17, Females: 8	Actiwatch Spectrum PRO	Median 7 days	TST, sleep efficiency, sleep onset, WASO, awakenings, rest-activity rhythm

Table 1. (continued)

Author (year, region)	Study design	Sample size	Stroke characteristics	Mean age & sex	Actigraphy device	Monitoring duration	Measured sleep variables
Bakken *et al.*,[12] (2011, Norway)	Cross-sectional observational study	110	First-ever stroke; acute phase after admission; hospitalized patients; mixed stroke types (ischemic/hemorrhagic)	68.3 ± 13.2 years; Males: 72, Females: 38	Motion logger Actigraph	3 nights + 2 days (continuous actigraphy)	Total sleep time (TST), nap time, wake episodes, WASO, sleep fragmentation, daytime activity patterns
Falck *et al.*,[14] (2019, Canada)	Comparative cross-sectional study	70 total (35 stroke survivors, 35 controls)	Ischemic or hemorrhagic stroke; chronic stage (≥1-year post-stroke; community-dwelling)	Stroke group: 69.86 ± 1.13 years; Control group: 69.83 ± 1.12 years (sex-matched)	MotionWatch8 © (MW8)	14 days	Sleep duration, sleep efficiency, sleep latency, fragmentation index, number of awakenings

Quality Assessment

The research reliability across the included studies was evaluated through the Joanna Briggs Institute (JBI) Critical Appraisal Checklists according to their study design such as cohort, analytical cross-sectional and case-control studies [9].

The overall quality of the included studies was assessed to inspect the methodological rigor and risk of bias and to support the interpretation of review findings. The quality assessment outcomes are shown in Tables 2-4.

Table 2. Critical appraisal results of cohort studies using the JBI cohort checklist

	Criteria no. (items included to appraise cohort studies)											
Study	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**Overall appraisal**
Sung *et al*.,[15] (2025)	*	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Include
Gao *et al*.,[16] (2024)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Include
Liang *et al*.,[17] (2024)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Include
Pellegrini *et al*.,[23] (2023)	✓	✓	✓	×	×	✓	✓	✓	✓	✓	✓	Include
Sindorf *et al*.,[20] (2025)	*	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Include
Wang *et al*.,[22] (2024)	*	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Include
Williams-Cooke *et al*.,[11] (2021)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Include
Edgley *et al*.,[21] (2023)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Include

✓: Yes, ×: No, *: Unclear.

Criterion 1: Were the two groups similar and recruited from the same population? **Criterion 2:** Were the exposures measured similarly to assign people to both exposed and unexposed groups? **Criterion 3:** Was the exposure measured in a valid and reliable way? **Criterion 4:** Were confounding factors identified? **Criterion 5:** Were strategies to deal with confounding factors stated? **Criterion 6:** Were the groups/participants free of the outcome at the start of the study (or at the moment of exposure)? **Criterion 7:** Were the outcomes measured in a valid and reliable way? **Criterion 8:** Was the follow up time reported and sufficient to be long enough for outcomes to occur? **Criterion 9:** Was follow up complete, and if not, were the reasons to loss to follow up described and explored? **Criterion 10:** Were strategies to address incomplete follow up utilized? **Criterion 11:** Was appropriate statistical analysis used?

Table 3. Critical appraisal results of cross-sectional studies using the JBI analytical cross-sectional checklist

Study	**Criteria no. (items included to appraise cross-sectional studies)**								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Overall appraisal**
Smith *et al*.,[10] (2024)	✓	✓	✓	✓	✓	✓	✓	✓	Include
Schruers *et al*.,[19] (2025)	✓	✓	✓	✓	✓	✓	✓	✓	Include
Cavalcanti *et al*.,[13] (2012)	✓	✓	✓	✓	×	×	✓	✓	Include
Falck *et al*.,[14] (2019)	✓	✓	✓	✓	✓	*	✓	✓	Include
Bakken *et al*.,[12] (2011)	✓	✓	✓	✓	✓	✓	✓	✓	Include

✓: Yes, ×: No, *: Unclear.

Criterion 1: Were the criteria for inclusion in the sample clearly defined? **Criterion 2:** Were the study subjects and the setting described in detail? **Criterion 3:** Was the exposure measured in a valid and reliable way? **Criterion 4:** Were objective, standard criteria used for measurement of the condition? **Criterion 5**: Were confounding factors identified? **Criterion 6:** Were strategies to deal with confounding factors stated? **Criterion 7:** Were the outcomes measured in a valid and reliable way? **Criterion 8:** Was appropriate statistical analysis used?

Table 4. Critical appraisal results of case-control studies using the JBI case-control checklist

Study	Criteria no. (items included to appraise case-control studies)										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Overall appraisal**
Pajediene *et al*.,[18] (2022)	✓	✓	✓	✓	✓	×	*	✓	✓	✓	Include

✓: Yes, ×: No, *: Unclear.

Criterion 1: Were the groups comparable other than the presence of disease in cases or the absence of disease in controls? **Criterion 2:** Were cases and controls matched appropriately? **Criterion 3:** Were the same criteria used for identification of cases and controls? **Criterion 4:** Was exposure measured in a standard, valid and reliable way? **Criterion 5:** Was exposure measured in the same way for cases and controls? **Criterion 6:** Were confounding factors identified? **Criterion 7:** Were strategies to deal with confounding factors stated? **Criterion 8:** Were outcomes assessed in a standard, valid and reliable way for cases and controls? **Criterion 9:** Was the exposure period of interest long enough to be meaningful? **Criterion 10:** Was appropriate statistical analysis used?

DISCUSSION

Sleep Disturbances After Stroke

Sleep disturbances were consistently reported across the included studies, indicating that disturbed sleep is extremely prevalent in the post-stroke population. Sleep problems and fatigue were present among patients on a rehabilitation program in a study by Smith et al.,[10] suggesting a potential relationship between sleep, fatigue, and motor performance. Williams-Cooke et al.,[11] found that most patients slept sub-optimally while in inpatient rehabilitation, while Bakken et al.,[12] found fragmented sleep characterized by numerous awakenings and greatly variable time asleep in the acute stroke population. This is further supported by evidence from Cavalcanti et al.,[13] who showed sleep fragmentation and increased sleep latency in stroke compared to control patients, and that Falck et al.,[14] who stated that greater sleep fragmentation is associated with poorer cognition. These results collectively provide evidence that sleep disturbance is present across all different stages of stroke recovery.

Circadian Rest-Activity Rhythm Alterations After Stroke

In various studies, distinct changes in the circadian rhythm of rest activity after stroke were detected. Among them, greater stability, specifically inter-daily stability, of the circadian rhythm was correlated with functional outcome in Sung et al.,[15]. Gao et al.,[16] suggested that suppressed circadian rhythm pattern was associated to a higher risk of stroke and poor functional recovery after stroke, and Liang et al.,[17] found lower relative amplitude and higher nighttime activity among post-stroke patients. According to Pajediene et al.,[18] circadian desynchronisation occurred even though the majority of the clock-gene circadian rhythms were preserved, and Schruers et al.,[19] reported that individuals with stroke showed significantly reduced Sleep Regularity Index (SRI) values compared to controls. These observations suggest that circadian rhythm disruption after stroke is frequent, and may impact on the progression of stroke.

Sleep and Rehabilitation Outcomes

The association between sleep and rehabilitation outcome results are varied. Sung et al.,[15] reported that greater circadian stability was an independent predictor of functional outcome at discharge. Sindorf et al.,[20] however, found improvement in sleep quality over the rehabilitation period; these improvements were not significantly associated with functional recovery. Similarly, Williams-Cooke et al.,[11] found no significant relationship between sleep measures and Functional Independence Measure (FIM) scores at discharge. Such differences may be due to variations in study populations, rehabilitation settings, monitoring durations, and outcome measures employed across various studies.

Sleep, Cognitive Function and Psychological Outcomes

The role of various sleep features was addressed in several articles examining cognitive and psychological effects of stroke. Falck et al.,[14] found that increased sleep fragmentation was associated with diminished cognitive performance and suggested sleep disruption could influence the evolution of stroke associated cognitive impairments. Additionally, Schruers et al.,[19] reported a link between poor sleep regularity and greater levels of depression and lower quality of life, and Edgley et al.,[21] found relationships between the features derived from actigraphy based sleep measures and wrist-temperature with stroke symptoms and psychiatric variables. In post stroke patients, the findings of these studies indicate that the sleep dysregulation and circadian rhythms can also play a role beyond physical rehabilitation.

Clinical Utility of Actigraphy

The present studies provided the benefits of using actigraphy as a suitable, feasible, and objective tool to assess stroke-related sleep and circadian parameters. All relevant measures of sleep and circadian variables, such as sleep latency, sleep efficiency, total sleep duration, wakefulness after sleep onset, fragmentation index, regularity of sleep, intra-daily variability, inter-daily stability, relative amplitude, M10 and L5 indices were successfully recorded with actigraphy. Wang et al.,[22] showed that ActiGraph wGT3X-BT was a more reliable indicator of nocturnal sleep than the Actiwatch Spectrum, whereas Pellegrini et al.,[23] demonstrated poor agreement between cheap under-mattress sleep monitors and actigraphy. Collectively, these results highlight actigraphy as an acceptable, feasible tool for the objective measurement of sleep patterns and circadian rhythm abnormalities in stroke patients and may assist in identifying targeted interventions to facilitate post-stroke recovery.

REVIEW FINDINGS

In this review of 14 studies, evidence indicates that fragmented sleep patterns and disturbed circadian rhythms are prevalent after stroke. Through Actigraphic measures, poor sleep quality and/or increased sleep fragmentation, sleep latency, sleep duration, and number of wake-ups were found in acute, subacute and chronic stroke populations. The reported findings are in line with those in many other studies showing disrupted circadian rest-activity patterns in post-stroke patients. These disruptions included the loss of rhythm stability, rhythm fragmentation and diminished day/night amplitude. Greater circadian rhythm stability was positively correlated with improved functional recovery and the more disrupted circadian rhythms were correlated to poorer post-stroke outcomes.

Furthermore, impaired sleep regularity and increased sleep fragmentation were associated with negative cognitive and psychological outcomes. Also, this should be noted that not all of sleep measures had consistent associations with the rehabilitation outcomes, but it is clear that disturbance in sleep and circadian system is indeed a factor affecting post-stroke recovery. In summary, actigraphy is a practical and objective tool to evaluate the rest-activity cycles and characteristics in sleep in the stroke population and may help in monitoring and managing post-stroke recovery.

STUDY LIMITATIONS

There are limitations to the current systematic review. Firstly, due to the highly variable nature of studies, including differing designs, participants, stage of stroke, actigraphy devices, monitoring periods, and outcome measures, direct comparison between individual studies was challenging. Secondly, most of them were observational studies in this review, thus they can highlight correlation between the state of sleep/circadian rhythm and outcomes after stroke, however there can be no inference of direct cause and effect. Thirdly, in several studies the sample sizes were small, thus may restrict the generalizability of the findings. Moreover, variability in the sleep and circadian measures collected in various studies might have contributed to variations in reported findings. Finally, the review is limited to studies published between 2011-2026 and may have missed relevant evidence published outside this period.

Future Research Directions

Future research should concentrate on large, prospective and longitudinal studies to increase our understanding of the sleep-circadian rest-activity relationship and its impact on stroke recovery. Increased standardization of actigraphy protocols, monitoring times and outcome measures would allow comparison of findings and increase power. Research also needs to explore the prognostic utility of actigraphy-determined sleep and circadian variables in relation to functional, cognitive and psychological recovery post stroke. Further, the delivery of an intervention for sleep and circadian disturbance would allow investigation of whether improved sleep and circadian function impacts on stroke rehabilitation and recovery.

CONCLUSION

Disruptions in sleep patterns and circadian rest-activity cycles are prevalent after stroke and may represent important, yet potentially modifiable, factors influencing recovery. Evidence from the included studies indicates that actigraphy can effectively identify alterations in sleep quality, sleep regularity, fragmentation, and circadian rhythm organization, with several measures showing associations with functional, cognitive, and psychological outcomes. As a feasible and objective monitoring tool, actigraphy may have valuable clinical utility in post-stroke assessment and rehabilitation. In future, there is a need to focus on the standardization of the actigraphy protocol and conduct prospective trials to elucidate the role of sleep and circadian rhythm regulation in post stroke recovery.

Declaration of Conflicting Interests

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CRediT authorship contribution statement

Lakshmi Himaja Bandaru: Data curation, Investigation, Methodology, Writing-original draft. **Vimala Ananthy**: Formal analysis, Supervision,

conceptualization**. Boddu V S Chandrasekhar:** Writing-review & editing, Validation, Supervision.

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