Evaluation of rest-activity cycles in patients with severe acquired brain injury. A cohort study

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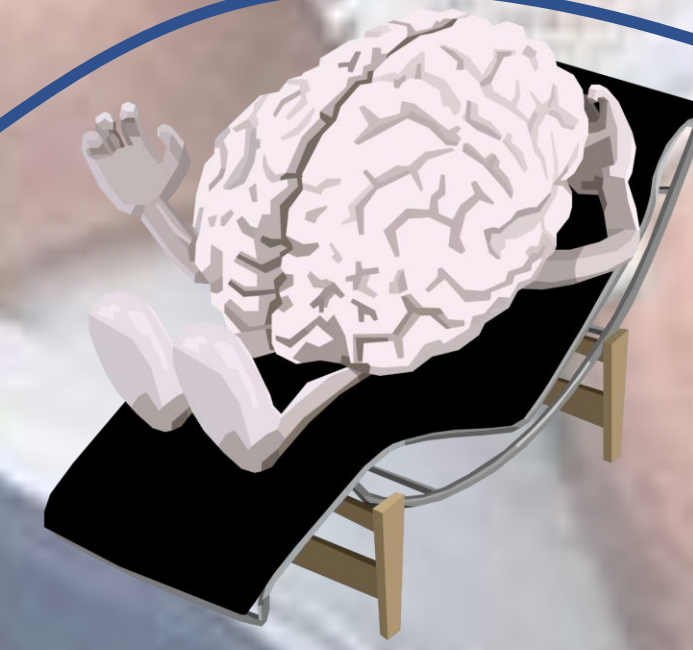
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Conflicts of interest: None to report

Subject of interest

- Sleep and diurnal rhythm assessment in patients with severe acquired brain injury (sABI) is challenging in clinical settings

- Accelerometry (ACC) is a low-cost and non-invasive device offering a practical solution for routine and long-term sleep assessment based on patient movements

- Diurnal rhythm of patients with sABI can be measured by means of an ACC and expressed by the daytime activity ratio (DAR)

- Knowledge of diurnal rhythm in individual patients is critical to treatment planning

Knowledge gap

- Do patients with sABI have consolidated diurnal rhythm upon admission to in-hospital neurorehabilitation

- Does their diurnal rhythm develop over time after admission to in-hospital neurorehabilitation

Questions

- **How many patients with sABI exhibit consolidated rest-activity cycles at beginning of in-hospital rehabilitation?**

- **How do rest-activity cycles change over time?**

Actigraph wGT3X-BT
(*Photo with permission from Actigraph*)

How we did it?

Design
- Prospective observational cohort study

Study population
- Patients with severe acquired brain injury admitted to a specialized neurorehabilitation hospital

- Recruited consecutively from the same ward

Measures
- DAR is derived from ACC measurements of least affected upper extremity aggregated in counts of activity per minute. Motor active minutes were defined as ≥ 10 counts

- The DAR is defined as the proportion of motor-active minutes during the daytime relative to total amount of active minutes during the entire 24 hours

What we found
- **Consolidated DAR within first week achieved in 50% of patients**

- **A significantly linear increase in the median DAR was found (Figure 1)**

Conclusion

- DAR consolidates in half of patients within one week and in most patients within 3 weeks. Intervention planning must be adjusted accordingly

- Identification of patients still lacking diurnal rhythm is imperative to guide relevant interventions targeting consolidation of rest-activity cycles and to correctly set expectations in regards of short-term rehabilitation goals.

Table 1: Characteristics of patients included in the study

Factor	Level	Value
N		20
Age, mean (SD)		56 (15)
Sex, n(%)	Female	6 (30%)
	Male	14 (70%)
Time from injury to data recording start, mean days (SD)		70 (52)
Type of acquired brain injury, n (%)	Anoxia	1 (5%)
	Infections	2 (10%)
	Stroke	12 (60%)
	Traumatic Brain Injury	5 (25%)
Most affected side, n (%)	Equally affected	3 (15%)
	Left	7 (35%)
	Right	10 (50%)
Dominant hand	Left	2 (10%)
	Missing	1 (5%)
	Right	17 (85%)
Premorbid Modified rankin scale, n (%)	0 No symptoms at all	17 (85%)
	1 No significant disability	2 (10%)
	2 Slight disability	1 (5%)
BMI, mean (SD)		27 (5)
Time from admission to rehab to recording start, mean days (SD)		5 (2)
Functional Independence measure at baseline, median (IQR)		21 (19, 24)

Figure 1: Results from the final random coefficient model containing data from all 20 subjects when availability allowed. The model is adjusted for time since injury and type of brain injury. Circle-line indicate median, box indicate 95%CI. DAR consolidation threshold is 80%.