Linking the quality of sleep and cognitive performance in stroke patients

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INTRODUCTION

The goal of our study is to examine correlations between individual characteristics in the sleep profile and cognitive performance in patients after acute cerebrovascular accident (stroke). It is well known that targeted patients are strongly vulnerable to sleep disturbances that often lead to their day-time cognitive and attentional performance.

COGNITIVE TESTS

Lateralised attention network test (LANT) [4]

- Separately measures 3 independent behavioural components of attention: [5]
  - spatial orientation (the benefit or cost of spatial pre-cue)
  - alerting (the benefit of temporal pre-cue)
  - conflict resolution (ability to overcome distracting stimuli)

- Task: 5 arrows briefly flashed in the left or right visual field middle arrow = target
  - A surrounding arrows = distractors (with congruent or incongruent orientation to the target)
  - Presentation side is indicated by a pre-cue = valid, invalid, no-cue or double-cue

- Goal: to determine the orientation of the target (middle arrow)

METHODS

Subjects
- 25 stroke patients (16 males, 5 females)
- age 58 ± 13 years (mean ± SD)
- self-reported right-handed
- different stroke location: subcortical (subcortical, subcortical)
- subcortical (cerebellar, brain-stem)
- inclusion criteria: intact facts (speech functions)
- motor impairment enabling participation

Design
- Sleep EEG
  - measured within a week after stroke
- The AASM sleep scoring model (3)
- Probabilistic sleep model (PSM) [2]
- Cognitive Testing
  - administered the very next morning
  - starting: approx. 1 hour

Statistical analysis
- Spearman rank correlation (r = 0.05)

RESULTS

LATERALISED ATTENTION NETWORK TEST (LANT)

- Orienting facilitatory (Of)
  - We found that Of is significantly related to wake periods during the night. The strongest correlation was found for the number of awakenings (r = -0.694, p < 0.005) and the positivity during the total sleep time (r = 0.685, p < 0.005).
  - In addition, Of is also positively correlated with the entropy of the wave sleep (SW) estimated from the PSM (r = 0.53, p < 0.05).
  - Overall, these findings indicate that patients with more sleep benefit better of the spatial pre-cue orienting.

- Orienting inhibitory (Oi)

  - The sleep latency to N1 is the major sleep component which correlates with Oi (r = 0.507, p < 0.05).
  - The significant correlations of the N2 and SWS entropy computed from the PSM supports this finding (r = 0.05, p < 0.05).

- Alerting (A)
  - According to our findings, A significantly correlates with SWS (r = 0.06, p = 0.05).
  - The more time spent in SWS the better they benefit of temporal pre-cue alerting.

- Conflict (C)

  - We found no significant correlation between sleep and C. It suggests that there is no relationship between the considered sleep measures and this behavioural LANT component.

CONCLUSION

Our results indicate that there may exist an association of certain sleep characteristics of stroke patients with a specific behavioural component of attention measured in the morning following the examined sleep night. Besides the standard AASM scoring, the PSM brings complementary information about the relationships between sleep and laterality effects, it needs to be confirmed by considering a larger data sample.

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