Differences in sleep microstates curves among healthy sleepers and patients after stroke

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| Introduction |

Sleep disorders, whether from disorder or lifestyle, pose a significant risk in daytime performance. Ischemic stroke is a serious disease affecting parts of brain and resulting in possible changes in sleep structure. In the study, functional cluster analysis was used in order to identify potential sources of disturbed sleep in stroke patients.

| Data and methods |

In total, 33 night records of patients after ischemic stroke were used (average age 68 years). A control sample of healthy sleepers was taken from the SIESTA database [2].

In order to identify the microstates, the Hironscan and EEGakso software was used. Derivatives of the PSG data and the sleep architecture were found with the help of the EM-algorithm. Microstates were associated with the cluster with a higher posterior probability value. Differences in sleep microstates curves among healthy sleepers and patients after stroke were found by cluster analysis of posterior curves in patients after stroke and healthy sleepers.

| Probabilistic sleep model |

PSM describes sleep as a continuous process in terms of posterior probabilities of a finite number of sleep stages called sleep microstates. The PSM considers an update of the modeled PSM from EEG signal obtained from 3 pairs of electrodes and a single channel EEG signal. Both signals were partitioned into non-overlapping segments of length 3 s. An autoregressive model (AR) of order 2 was used and the S-Plus software environment was used.

Derived microstates were defined as a set of clusters of posterior curves, each of which is associated with a different probability value.

| Sleep structure and age |

First, we aimed to find a connection between sleep structure and age. In this case, only healthy sleepers were taken into account. By testing differences among clusters we found out that within microstates related to SWS or S2 stage a cluster with a higher posterior probability value was found. Higher probability values were associated with the cluster including people over 60 years old and were observed during the whole night (Figure 3).

| Sleep structure and subjective quality of sleep |

Following the results of the functional cluster analysis we found relations between self-ratings and sleep quality. Healthy subjects with higher posterior curves related to wake (Figure 4). Scores over 10 indicate poor sleep and belong to the cluster with high posterior probability value.

| Differences in sleep structure among healthy sleepers and patients after stroke |

Sleep structure varies in age groups, therefore posterior curves of patients after stroke were compared only with healthy sleepers older than 60 years. Figure 5 shows clustering results within the first 16 microstates. Average posterior curves of clusters are represented by colored lines. Black curves are related to stroke patients (solid) and healthy sleepers (dashed).

| Bibliography |

[2] Klisinskas R, Kemp P, Frens A. (1997) Analogpeg: a Tool for Drive and Dreamness of healthy sleepers. Subjects in cluster with higher probability values were associated with the cluster including elderly healthy subjects (> 60 years old) and were observed during the whole night (Figure 3).

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