Alpha sleep and fatigue

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Alpha activity (frequency 7.5-13 Hz) can be part of the normal sleep EEG but is also often found during sleep in disorders such as psychophysiological insomnia, inadequate sleep- and wake hygiene, fibromyalgia, rheumatoid arthritis, chronic fatigue syndrome and after sleep deprivation. The presence of alpha activity in sleep, “alpha sleep”, is not limited to one specific sleep-stage or one particular part of the night. Patients with alpha sleep do not perform worse on tests that measure attention, concentration, memory, and reaction time. Alpha-sleepers overestimate their sleep length and underestimate the intermittent waking periods during sleep. There is no relationship between alpha sleep, number of awakenings and sleep efficiency. The clinical significance of alpha sleep is not clear.

The results of our previous pilot-study showed that 15 out of 21 patients having a clear alpha-peak during NREM sleep felt tired and not rested. Because of the shortcomings of that pilot study (retrospective character) we performed a prospective study on a larger population and increased the amount of questionnaires to encompass the patients’ fatigue.

PATIENTS
We included 100 consecutive insomnia patients from our outpatient sleep clinic (38 male and 62 female, age between 15 and 69) that underwent two 24-hour polysomnography tests (PSGs) at home. Exclusion criteria were an abnormal PSG macrostructure (for example not enough REM or delta sleep), Periodic Limb Movement Disorder (Periodic Limb Movement Index >15) and or Obstructive Sleep Apnea Syndrome (Apnea Index >10).

METHOD
Fpz-Cz EEG was Fourier analyzed during the first 20 minutes of continuous NREM sleep in both nights (stages 2, 3 and/or 4). Our sleeplab uses Fpz-Cz and Pz-Oz derivations to measure sleep. We opted for Fpz-Cz because alpha activity during sleep occurs predominantly in frontal derivations. The peak frequency
in the alpha band was determined from the resulting amplitude spectrum. The normalized alpha amplitude was obtained by dividing the amplitude at the peak by the amplitude of the background.5

Quantification of fatigue was based on the following questionnaires:
- the Groningen Sleep Quality scale6 at the mornings following each PSG night;
- the Multidimensional Fatigue Inventory (MVI-20)9 was assessed once, preceding the first PSG night;
- the Profile Of Mood Scale (POMS)10 at the evenings before and the mornings after both PSG nights.

The Groningen Sleep Quality scale includes two items related to fatigue:
- “this morning, when I got up, I felt tired” (yes: score 1, no: score 0)
- “this morning, when I got up, I was not rested” (yes: score 1, no: score 0)

The MVI-20 includes one score each of general fatigue, physical fatigue, mental fatigue, reduction in daily activity and reduction of motivation (score range 4-20).

The POMS scale provides a total score (score range 5-20) and one question each on tiredness (question 6), anxiety (question 1) and depressive mood (question 2) both in the morning and evening (score range 1-5).

These items sum up to a total of 15 parameters on fatigue during daytime for each PSG night per person.

In order to compare the 15 characteristics between subjects with alpha sleep and those without, we performed a linear regression analysis as well as a correlation analysis between normalized alpha amplitude and the fatigue parameters. This was done separately for both nights and also on the summed (over both nights) normalized alpha amplitude and fatigue parameters.

Ten fatigue parameters (those from the Groningen Sleep Quality scale and those from the POMS) were obtained on both nights. In order to assess any correlation between normalized alpha amplitude and those characteristics, we computed the inter-night difference of normalized alpha amplitude and these ten characteristics. We performed a linear regression analysis as well as correlation analysis with the inter-night difference of normalized alpha amplitude and these ten characteristics. We found that the factor was more pronounced in patients with less alpha sleep.

Despite the large number of subjects, this study does not confirm the suspected relationship between alpha sleep and fatigue. The same is true for reduction in motivation, anxiety and depressive mood. Patients with alpha sleep are not more fatigued during the day than patients without alpha sleep.

Why patients without alpha sleep feel less active than those with alpha sleep is not clear. Perhaps tiredness provokes alpha sleep and not the reverse, as was the hypothesis for our study.

**REFERENCES**


