Frontal task performance in demented elderly is related to the circadian amplitude in the rest-activity rhythm

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Tasks relying on (pre)frontal functioning are performed disproportionately worse with aging. There is also an intriguing relation of frontal functioning to sleep. EEG delta activity predominates in the frontal derivations during the first two sleep cycles, and is enhanced especially in these derivations after sleep deprivation. Sleep deprivation also disproportionally attenuates frontal functioning, as shown e.g. on a verbal fluency task. In animals, disruption of the circadian rhythm furthermore affects memory retrieval processes. Sleep deprivation also disproportionally attenuates frontal functioning, as shown e.g. on a verbal fluency task. In animals, disruption of the circadian rhythm furthermore affects memory retrieval processes. Since disturbances in the sleep-wake cycle frequently occur in healthy elderly, and even more demented elderly, we hypothesized that these disturbances might contribute to the worsening of frontal function at high age.

We investigated the relation between frontal functioning and the circadian sleep-wake cycle in 66 demented elderly by assessing their verbal fluency (animals) and an actigraphic recording for two weeks continuously (Actiwatch-L, Cambridge Neurotechnology). Sleep duration was calculated using the SleepWatch software (Cambridge Neurotechnology) and the stability, fragmentation and amplitude of the rest-activity rhythm were quantified nonparametrically. Stepwise regression analysis was used to assess the association of the sleep-wake variables with fluency. Two likely contributors to the fluency performance were included in the analysis as covariates: the general cognitive functional level (MMSE) and the use of psychotropic drugs.

In the present sample of demented elderly (MMSE mean±SD 16±7), fluency was positively associated only with the MMSE (β=0.68, p<0.0001) and the amplitude of the circadian rest-activity cycle (β=0.20, p<0.03).

The results support the involvement of sleep-wake rhythms in frontal functioning. In healthy elderly, exercise has been shown to selectively improve performance on frontal tasks, as well as the circadian activity rhythm. It remains to be investigated whether enhancement of the daytime activity level-and thus the circadian amplitude in the rest-activity cycle-in demented elderly could attenuate the progressive decline in frontal functioning.

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