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Recovery of cognitive performance from sleep debt: do a short rest pause and a single recovery night help?

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Abstract

We studied the recovery of multitask performance and sleepiness from acute partial sleep deprivation through rest pauses embedded in performance sessions and an 8 h recovery sleep opportunity the following night. Sixteen healthy men, aged 19-22 yrs, participated in normal sleep (two successive nights with 8 h sleep) and sleep debt (one 2 h night sleep followed by an 8 h sleep the following night) conditions. In both conditions, the participants performed four 70 min multitask sessions, with every other one containing a 10 min rest pause with light neck-shoulder exercise. The multitask consisted of four simultaneously active subtasks, with the level of difficulty set in relation to each participant's ability. Physiological sleepiness was assessed with continuous electroencephalography/electro-oculography recordings during themultitask sessions, and subjective sleepiness was self-rated with the Karolinska Sleepiness Scale. Results showed that multitask performance and physiological and subjective sleepiness were impaired by the sleep debt ($p > .001$). The rest pause improved performance and subjective sleepiness for about 15 min, regardless of the amount of prior sleep ($p > .01$-$.05$). Following recovery sleep, all outcome measures showed marked improvement ($p < .001$), but they failed to reach the levels observed in the control condition ($p < .001$-$.05$). A correlation analysis showed the participants whose multitask performance deteriorated the most following the night of sleep loss tended to be the same persons whose performance was most impaired following the night of the recovery sleep ($p < .001$). Taken together, our results suggest that a short rest pause with light exercise is not an effective countermeasure in itself for sleep debt-induced impairments when long-term effects are sought. In addition, it seems that shift arrangements that lead to at least a moderate sleep debt should be followed by more than one recovery night to ensure full recovery. Persons whose cognitive performance is most affected by sleep debt are likely to require the most sleep to recover.

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