## Supplemental Material

## Sleep selectively enhances memory expected to be of future relevance

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## Experiment 1

## Learning Performance

Performance during the learning phase before the retention intervals of sleep and wakefulness was closely comparable between the six experimental groups ( $\mathrm{P}>0.17$, for all comparisons). The number of recalled word pairs at the criterion learning trial was in the Expected and Unexpected groups, respectively, $27.17 \pm 0.81$ and $26.89 \pm 0.79$ before the sleep retention interval, $26.60 \pm 0.61$ and $25.67 \pm 0.43$ before the daytime wake interval, and $25.76 \pm 0.62$ and $26.63 \pm 0.82$ before the night-time wake interval. The number of trials to reach the criterion (of $60 \%$ recalled word pairs) was for the Expected and Unexpected groups, respectively, $2.22 \pm 0.21$ and $1.83 \pm 0.20$ (sleep), $2.40 \pm 0.21$ and $2.00 \pm 0.24$ (daytime wakefulness) and $2.24 \pm 0.20$ and $2.25 \pm 0.31$ (night-time wakefulness).

## Subjective Ratings

The groups did not differ in self-rated tiredness, concentration and motivation at learning ( P > 0.14 ) or retrieval testing ( $\mathrm{P}>0.15$, for all comparisons) except that, as expected, subjects at retrieval after the nocturnal wake interval felt more tired, less concentrated and less motivated than after the daytime wake or nocturnal sleep interval ( $\mathrm{P}<0.01$, for all three dimensions).

## Experiment 2

## Learning Performance

Learning performance before the retention interval was similar between the two experimental groups on both, the 2D object location task and the finger sequence tapping task (Expected vs. Unexpected group - number of recalled card pair locations on criterion trial: $10.25 \pm 0.39$ vs. $10.09 \pm 0.59$, number of trials to criterion: $4.5 \pm 0.81$ vs. $3.82 \pm 0.82$, number of correctly tapped finger sequences on last 3 training blocks: $14.56 \pm 1.02$ vs. $16.33 \pm 1.04$; $\mathrm{P}>0.23$, for all comparisons).

## Subjective Ratings and Salivary Cortisol

Subjective feelings of tiredness, concentration and motivation did not differ between groups at learning or retrieval testing ( $\mathrm{P}>0.10$ ). There were also no differences in salivary cortisol levels assessed in this experiment as a physiological marker of stress at learning and retrieval testing (Expected group: learning $0.074 \pm 0.01 \mu \mathrm{~g} / \mathrm{dl}$, retrieval $0.66 \pm 0.06 \mu \mathrm{~g} / \mathrm{dl}$, Unexpected group: learning $0.071 \pm 0.01 \mu \mathrm{~g} / \mathrm{dl}$, retrieval $0.69 \pm 0.06 \mu \mathrm{~g} / \mathrm{dl}, \mathrm{P}>0.72$, for all comparisons).

Table S1. Subject characteristics in the different groups

## Experiment 1

|  | Night-time Sleep |  |  | Night-time Wake |  |  | Daytime Wake |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Exp | Unexp | Susp | Exp | Unexp | Susp | Exp | Unexp | Susp |
| N | 18 | 18 | 10 | 17 | 16 | 11 | 15 | 15 | 17 |
| Age | 22.00 | 24.33 | 24.00 | 22.71 | 21.94 | 21.36 | 24.00 | 22.93 | 21.71 |
|  | $\pm 2.76$ | $\pm 4.37$ | $\pm 4.17$ | $\pm 2.64$ | $\pm 4.12$ | $\pm 2.19$ | $\pm 4.69$ | $\pm 4.30$ | $\pm 3.71$ |
| Females | 11 | 10 | 5 | 9 | 9 | 9 | 6 | 11 | 10 |

Experiment 2

|  | 2D object location |  |  | Finger sequence tapping |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Exp | Unexp | Susp | Exp | Unexp | Susp |
| N | 12 | 11 | 10 | 16 | 16 | 10 |
| Age | 23.00 | 22.64 | 24.40 | 22.69 | 23.25 | 24.40 |
|  | $\pm 2.74$ | $\pm 2.95$ | $\pm 4.81$ | $\pm 2.64$ | $\pm 3.52$ | $\pm 4.81$ |
| Females | 6 | 3 | 4 | 8 | 5 | 4 |

Number of subjects ( N ), mean $\pm$ s.d. age (in years) and the number of females in each group of Experiment 1 and 2.

Table S2. Distribution of sleep stages in the first six 20-minutes interval of NonRem sleep and the real time spent in each interval

|  |  | Expected |  | Unexpected |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Interval 0-20 min | Stage 2 | 71.8 | $\pm 5.7$ | 88.6 | $\pm 3.5$ * |
|  | Stage 3 | 18.4 | $\pm 4.2$ | 11.4 | $\pm 3.6$ |
|  | Stage 4 | 9.8 | $\pm 4.2$ | 0 | $\pm 0.0$ * |
|  | Time covered | 22.1 | $\pm 1.2$ | 21.4 | $\pm 0.7$ |
| Interval 21-40 min | Stage 2 | 18.9 | $\pm 7.2$ | 19.6 | $\pm 6.9$ |
|  | Stage 3 | 31.6 | $\pm 8.3$ | 65.5 | $\pm 6.6$ ** |
|  | Stage 4 | 49.6 | $\pm 10.3$ | 15.0 | $\pm 4.9$ ** |
|  | Time covered | 20.3 | $\pm 0.2$ | 21.6 | $\pm 1.5$ |
| Interval 41-60 min | Stage 2 | 50.2 | $\pm 10.6$ | 51.6 | $\pm 11.8$ |
|  | Stage 3 | 19.6 | $\pm 5.9$ | 36.8 | $\pm 9.5$ |
|  | Stage 4 | 30.2 | $\pm 11.0$ | 11.6 | $\pm 6.4$ |
|  | Time covered | 27.6 | $\pm 4.0$ | 23.2 | $\pm 1.3$ |
| Interval 61-80 min | Stage 2 | 54.6 | $\pm 10.8$ | 74.1 | $\pm 9.7$ |
|  | Stage 3 | 17.7 | $\pm 5.9$ | 22.5 | $\pm 8.2$ |
|  | Stage 4 | 27.7 | $\pm 8.0$ | 3.4 | $\pm 2.3$ ** |
|  | Time covered | 25.2 | $\pm 2.7$ | 24.3 | $\pm 1.8$ |
| Interval 81-100 min | Stage 2 | 70.7 | $\pm 11.5$ | 76.8 | $\pm 8.6$ |
|  | Stage 3 | 22.3 | $\pm 9.3$ | 17.5 | $\pm 6.6$ |
|  | Stage 4 | 7.1 | $\pm 4.5$ | 5.7 | $\pm 3.3$ |
|  | Time covered | 28.1 | $\pm 3.8$ | 22.8 | $\pm 1.6$ |
| Interval 101-120 min | Stage 2 | 75.2 | $\pm 8.6$ | 77.5 | $\pm 8.3$ |
|  | Stage 3 | 15.2 | $\pm 4.0$ | 17.73 | $\pm 6.8$ |
|  | Stage 4 | 9.6 | $\pm 5.8$ | 4.7 | $\pm 3.6$ |
|  | Time covered | 23.8 | $\pm 2.2$ | 21.77 | $\pm 1.2$ |

Percentage of sleep stages S2, S3 and S4 in each of the six 20-minutes intervals of NonREM sleep that were used for the analyses of slow oscillation activity in Experiment 1. For these analyses, fourty subsequent 30 -sec intervals of stage 2, stage 3 and stage 4 sleep were stringed together, while epochs of wakefulness, stage 1 sleep, REM sleep or movement arousals were omitted. The variable 'Time covered' represents for the six 20-min intervals the real time (in minutes) that elapsed in an individual night until the respective 20-min interval was completely filled with either stage 2,3 or 4 sleep. * $\mathrm{P}<0.05$, ** $\mathrm{P}<0.01$ for differences between groups.

