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Supplemental Information

Sleepers Selectively Suppress Informative Inputs during Rapid Eye Movements

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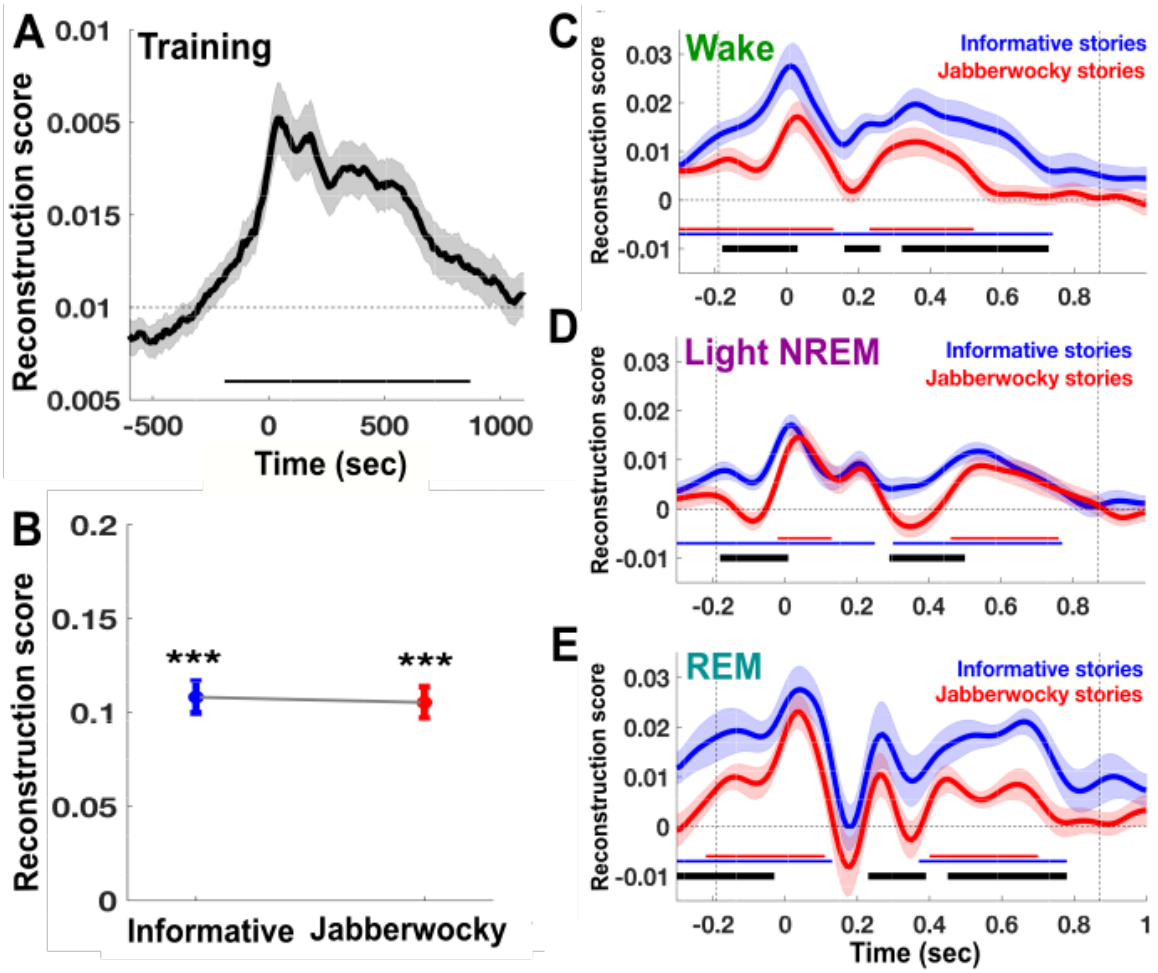

Figure S1. Stimulus reconstruction model during Training and Test phase, related to Figure 2A and STAR Methods. (**A**) To capture the unfolding of brain responses to variations to sound envelope over time, the reconstruction model must be defined on a time-lag window spanning over several hundreds of ms. To define which time lags of the EEG signals contribute to audio processing without selecting them *a priori*, a reconstruction model was trained and tested for each individual time-lag of a large temporal window using trials from the Training phase. EEG data were first detrended to avoid any resulting filtering artefacts. 11 out of 12 trials from the Training phase were selected to train the reconstruction model and was tested on the remaining trial following a leave-one-out procedure. Results for each lag were averaged across participants (N=18). Mean and standard error to the mean (SEM) are represented respectively with a solid line and shaded area. Horizontal bar denotes the significant cluster of lags for which reconstruction scores differ from 0. A significant cluster ([-190, 870] ms) was identified, defining the lags used for building the stimulus reconstruction model. (**B**) To verify that the reconstruction model obtained was unbiased regarding the story type, we obtained reconstruction scores on Training trials during which 6 informative and 6 Jabberwocky stories were played on separate trials in both ears. The model was trained and tested following a leave-one-out procedure. Mean and SEM across participants are represented as respectively filled circles and solid vertical lines. Models were significantly different from 0 (***, P<0.001) for both types of speech but were not different

from one another (P>0.05). (**C**-**E**) To check how the reconstruction model captures the audio processing across vigilance states, reconstruction scores were trained and tested at individual time-lags during wake, light NREM sleep and REM sleep. Mean and standard error to the mean across participants (N=18) are represented respectively as solid lines and shaded areas for each story type. Horizontal bars denote significant clusters (P<0.05, corrected for multiple comparisons) for which reconstruction scores for the informative (blue) and the Jabberwocky (red) speech differ from 0, as well as informative from Jabberwocky speech (black). Vertical dotted lines represent the bounds of the reconstruction model (-190 and +870ms).

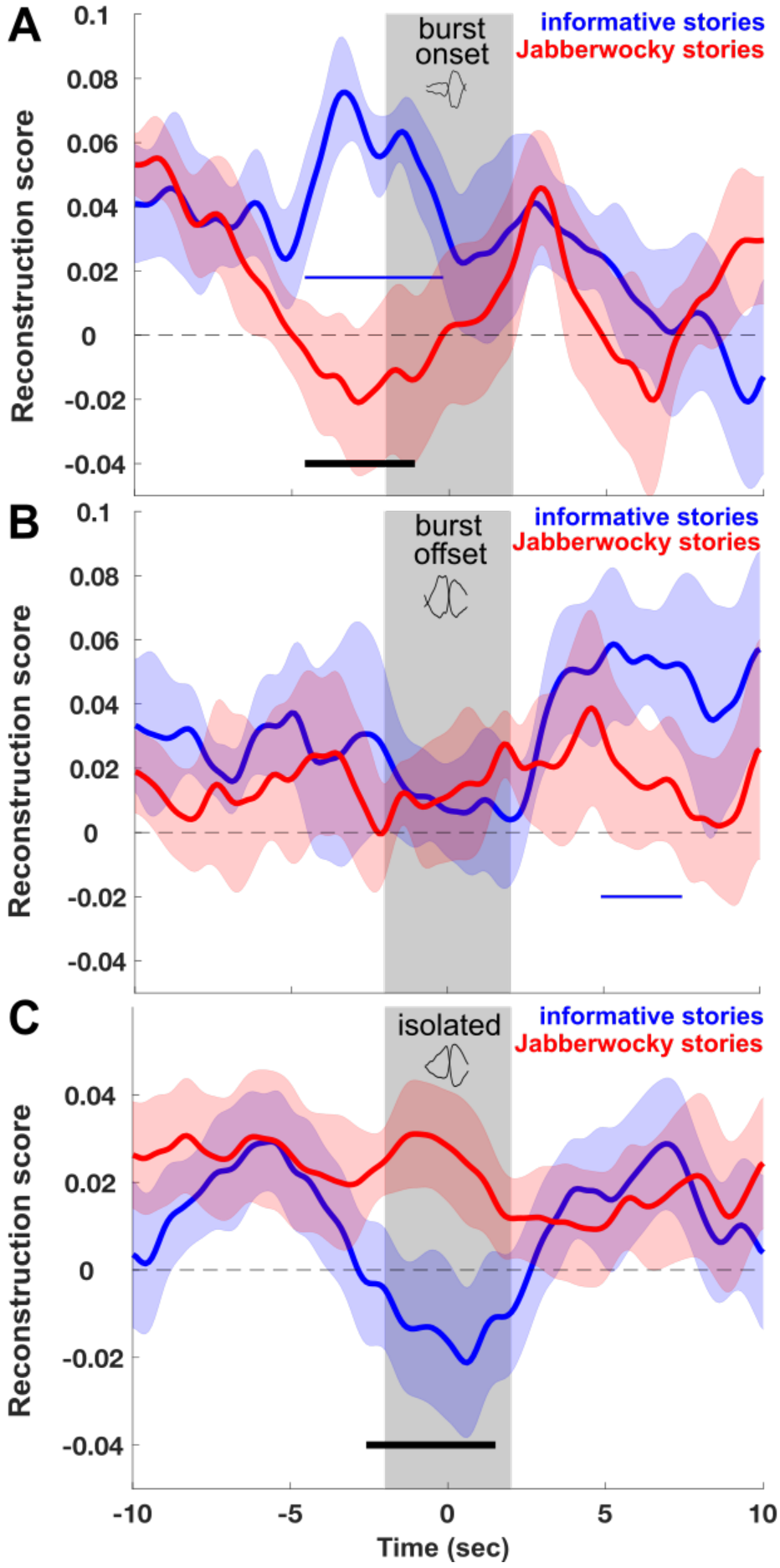
A
B
C
burst onset
burst offset
isolated
informative stories
Jabberwocky stories
Reconstruction score
0.1
0.08
0.06
0.04
0.02
0
-0.02
-0.04
-10
-5
0
5
10
Time (sec)

Figure S2. Suppression of informative speech at the beginning (A) and at the end (B) of burst of eye movements, and during isolated eye movements (C), related to Figure 3C and Figure 4. Reconstruction scores for the informative and the Jabberwocky speech were computed on 4-seconds sliding windows with 100-ms steps between -10 and +10s around the onset of eye movements (t=0s). Mean and standard error to the mean across participants (N=7 for burst onsets, N=7 for burst offsets, N=14 for isolated EMs) are represented respectively with solid lines and shaded areas for the informative (blue) and the Jabberwocky (red) speech. The onset of eye movements was used as time = 0s. Horizontal bars denote significant clusters for which reconstruction scores for informative (blue) speech differ from 0, and informative from Jabberwocky speech (black) ($P<0.05$ after correction for multiple comparisons).

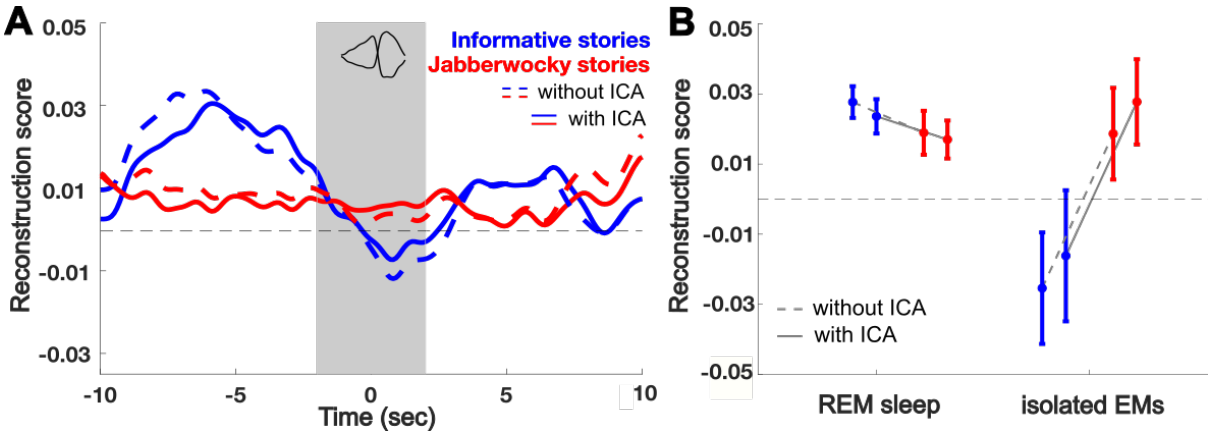

Figure S3. Comparison of stimulus reconstruction around eye movements with and without the Independent Component Analysis (ICA) artefact removal, related to Figure 3C and Figure 4A. (**A**) Reconstruction scores for the informative (blue) and the Jabberwocky (red) speech were computed on 4-seconds sliding windows with 100-ms steps between -10 and +10s around the onset of eye movements (t=0s). Averages across subjects for both story types were reported without ICA (dotted) and with ICA (straight) artefact removal. (**B**) Reconstruction scores for the informative (blue) and the Jabberwocky (red) speech were computed on 4s-scoring windows either on the entire REM period, or centered on the onset of isolated EMs, both without the ICA procedure (dotted) and with the ICA procedure (straight). Mean and SEM across participants (N=14) are represented as respectively filled circles and solid vertical lines.

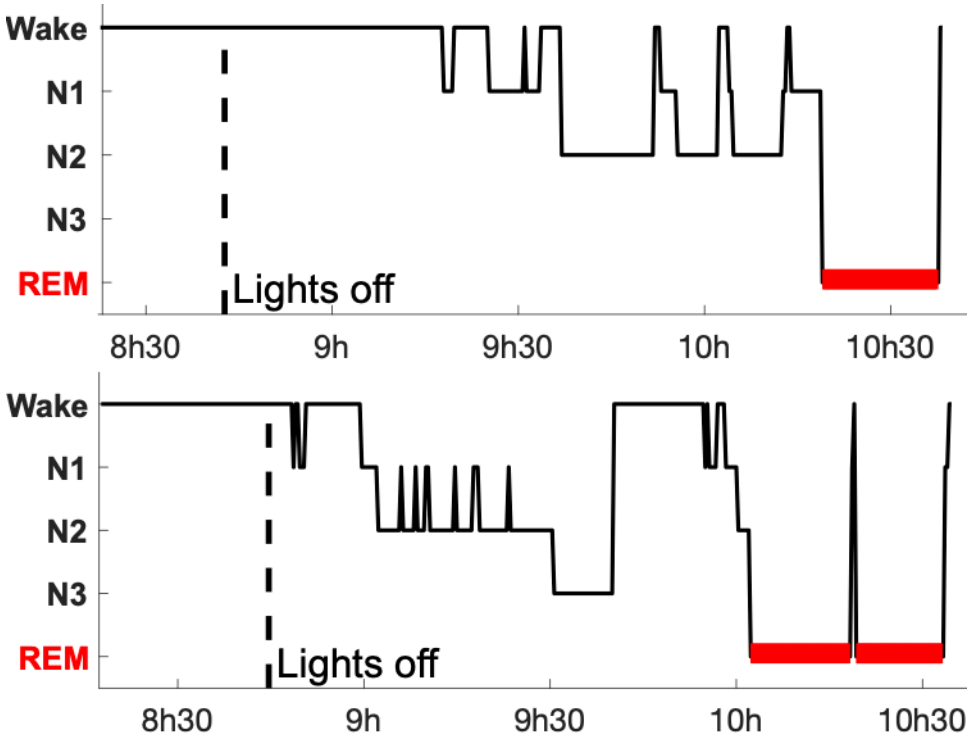

Figure S4. Morning nap hypnograms from two participants, related to Figure 1. The experiment was stopped after circa 90 minutes of sleep (i.e., roughly one sleep cycle) upon spontaneous awakening or entering a light NREM sleep.

	Mean	SEM
Total sleep time (min)	91.5	4.4
Sleep efficiency (% of the session spent asleep)	70	1.8
Sleep onset latency (min)	24.8	2.3
Duration of REM sleep (min)	18.4	1.8
Number of state transitions	38.2	4.7
Percentage of tonic REM sleep (%)	79.9	5.3
Eye movement density (.min^{-1} in REM sleep)	6.0	1.2

Table S1. Sleep statistics during the morning nap, related to Figure 1. Sleep efficiency was calculated as the percentage of time spent in NREM1, NREM2, NREM3 or REM sleep during the sleep phase. The number of awakenings refers to the number of transitions from consolidated sleep (NREM2, NREM3 or REM sleep) to wakefulness. The number of state transitions was computed as the number of changes in the scoring of vigilance state. The sleep onset latency was defined as the first apparition of stage NREM2 since the beginning of the sleep phase. The percentage of tonic REM sleep was computed as the number of scoring windows of 20s classified as tonic REM sleep, i.e., devoid of burst eye movements, divided by the total number of scoring windows scored as REM sleep. Eye movement density corresponds to the number of eye movements detected per minute spent in REM sleep.