**Supplementary data**

**Figure 1:**

**Examples of units specifically responding to the associative stimulus:** Two example units with different firing rates for blue vs. red color associations and for indoor vs. outdoor scene associations, respectively, during the encoding phase (top: raster plots of observed spike times: blue/indoor (blue), red/outdoor (red); middle: average firing rates within consecutive 500 ms windows: blue vs. red/indoor vs. outdoor: increase (blue), decrease (red), overlap (purple); bottom: density plot of all spike waveforms; see also legend of main Figure 2).

**Figure 2:**

**Examples of units from different classes showing continuous firing rate histograms:** Two example units from the classes of stimulus-responsive, novelty, familiarity, item-retrieval-related, source-retrieval-related and auditory beat stimulus-related units are shown (see also legend of main Figure 2). Top: raster plots of spike times relative to stimulus onset for the conditions, which were compared. Novelty and familiarity units: old words (blue), new words (red); retrieval-related units: remembered (blue), forgotten (red); beat stimulus-related units: monaural beats (red), binaural beats (blue), control (green). Middle: Histograms of continuous average firing rates (stimulus onset at t=0). Firing rates were calculated within 1ms time intervals and were subsequently **convolved with a Gaussian kernel** (standard deviation: 100 ms). Bottom: Density plots of all spike waveforms.

**Figure 3:**

**Examples of units specifically responding to the associative stimulus showing continuous firing rate histograms:** Two example units with different firing rates for blue vs. red color associations and for indoor vs. outdoor scene associations, respectively, during the encoding phase (top: raster plots of observed spike times: blue/indoor (blue), red/outdoor (red); middle: histograms of continuous average firing rates (stimulus onset at t=0); bottom: density plot of all spike waveforms; see also legend of main Figure 2).