Poster Presentations

P001 COMMUNICATION FROM THE CEREBELLUM TO THE NEOCORTEX DURING SLEEP SPINDLES

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Introduction Surprisingly little is known about neural activity in the sleeping cerebellum.[5 17] Using long-term wireless recordings, we have made routine recordings of local field potentials (LFPs) and action potentials for the entirety of natural sleep in non-human primates.

Methods We were able to record simultaneously from the primary motor cortex (M1), the thalamus and the cerebellum using both rigid multi-contact linear electrode arrays and flexible microwires.[11 12] Recording for the entirety of the natural sleep was achieved using a custom-made wearable device.

Results We find that the M1 and cerebellum communicate with each other during sleep,[13 14] with cerebellum-to-M1 signals passing via the thalamus. We find that both M1 and cerebellar neuronal firings are broadly synchronous and phase-locked to the sleep cycle.[7] Additionally, both spikes and LFPs in M1 and cerebellum also show coherence at slow (<1Hz), delta (1-4Hz) and alpha (7–15Hz) frequencies.[8 15 16] We also see phase-locking between the spikes of M1 and the LFPs of the cerebellum (and vice versa) at these same frequencies. Using Granger causality analysis on the LFPs we were able to observe directed connectivity from motor cortex to the cerebellum in deep sleep. This suggested a neocortical origin of slow oscillations. By contrast, sleep spindles (in the alpha frequency range) in light sleep revealed a causal influence from the cerebellum to motor cortex, going via the thalamus.

Discussion Our results shed new light on the mechanisms of sleep spindle generation[9] and show that the cerebellum is an active participant of sleep. We postulate that the cerebello-thalamo-neocortical pathways is implicated in sleep-dependent consolidation of procedural learning.[1-4 6 18-20]

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P002 USING ANTHROPOMETRIC MEASUREMENTS TO DETERMINE THE IDEAL MATTRESS FIRMNESS

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Introduction There is limited evidence to suggest that a 'one-size fits all' mattress provides the appropriate support in individuals with diverse body shapes, a greater understanding of how different mattresses affect the human body is required. By having a more objective approach to choosing a mattress, individuals may improve quality of sleep.

Materials A ten-camera infrared movement analysis system recorded Upper-Mid Thoracic, Mid-Lower Thoracic, Lower Thoracic–Upper Lumbar, Upper-Lower Lumbar and Lower Lumbar–Pelvic areas of the spine in side lying. Deviations away from a neutral position were assessed under different conditions. Three aesthetically identical mattresses were tested, internally each mattress contained a different firmness of spring unit (soft, medium, firm). In addition, height, weight, shoulder width and hip circumference measurements were taken to determine differences in body types.

Results Spinal alignment was assessed on sixty healthy participants and no significant differences were seen between the different mattress configurations. However further analysis showed significant differences in spinal alignment between the different mattress conditions within different body shape subgroups. Subgroups were defined using body weight, height, BMI, shoulder width and hip circumference. Those with a higher body weight had a more neutral spinal alignment when on a firmer mattress, whereas those with a lower body weight were better suited to a softer mattress. Shorter people were better aligned on a softer mattress, and a medium mattress kept the spine in a more neutral position amongst taller individuals.