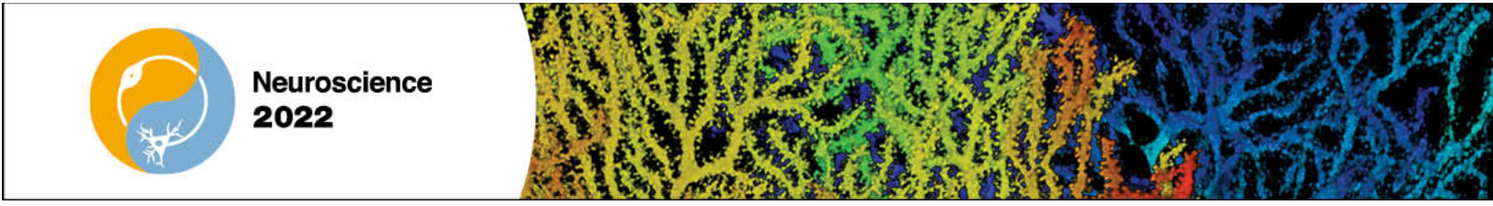


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**Temporal evolution of brain connectivity upon awakening from slow wave sleep varies by cognitive task:**

**AUTHOR BLOCK: *L. O. JIMENEZ**[1,2], K. BANSAL[3,2,1], C. L. HILDITCH[4], N. L. SHATTUCK[5], J. O. GARCIA[1,2], E. E. FLYNN-EVANS[6];
[1]DEVCOM Army Res. Lab., Aberdeen, MD; [2]Cognitive Sci., Univ. of California, Irvine, Irvine, CA; [3]Biomed. Engin., Columbia Univ., New York, NY; [4]Dept. of Psychology, San José State Univ., San Jose, CA; [5]Operations Res. Department,, Naval Postgraduate Sch., Monterey, CA; [6]Human Systems Integration Div., NASA Ames Res. Ctr., Moffett Field, CA

**Abstract:**
Sleep inertia refers to the state of transition between sleep and wake characterized by impaired alertness, confusion, and reduced cognitive and behavioral performance. While the neurobehavioral symptoms of sleep inertia are well-described, less is known about the temporal evolution of brain connectivity that characterize sleep inertia and the cognitive specificity of these effects. Previously, using electroencephalography (EEG), we have shown during a psychomotor vigilance task (PVT), that upon awakening, global power within lower frequency bands returns to baseline levels before higher frequencies. This observation was also accompanied by changes in network metrics in the lower frequency bands, specifically, change in average *clustering coefficient*, which measures how likely two neighbors of a node are connected to one another, and average *path length*, which measures the average shortest path between every node pair. Here we extend these findings to a restful awake segment (Karolinska Drowsiness Test; KDT), a Go/No-Go task (GNG), and an arithmetic task (MATH), to understand the specificity and task interactions of these effects. After mild restriction the night before (5h time-in-bed), participants were brought to the laboratory and participated in a baseline assessment of task performance and neural metrics before sleep. Participants were then allowed to sleep and were woken up in slow wave sleep (SWS) by an experimenter who gave them an intervention (blue-enriched light, dim red light) and then led them through the four tasks (PVT, MATH, GNG, KDT) consecutively four times (T1-4). Similar to our previous findings, for the KDT, GNG, and MATH tasks, high frequency differences in global

power between baseline and other test bouts were largely retained. Interestingly, clustering and path length differences between baseline and the test bouts (T1-4) were largely absent in the low frequencies; however, within the beta band whilst participants were engaged in the MATH task, we observed a significant change from baseline in T2-4 for both clustering and path length. This effect was largely attenuated with an intervention of blue-enriched light; however, the blue-enriched light intervention also significantly increased clustering coefficient in the delta band above baseline levels. Considering the stability of the power effects across tasks and the specificity of the network metrics effects to tasks, these two approaches suggest that two different neural schemes underlying sleep inertia, one that gradually recovers and impacts all that we do (i.e., power) and one that is sensitive to task and intervention, reconfiguring the brain as new task demands emerge.

**Author Disclosure Information: L.O. Jimenez:** None. **K. Bansal:** None. **C.L. Hilditch:** None. **N.L. Shattuck:** None. **J.O. Garcia:** None. **E.E. Flynn-Evans:** None.

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