**Frequency modulation of neural oscillations according to visual task demands**

**Jason Samaha1, Andreas Wutz2,3, Bradley Postle1, David Melcher2;1University of Wisconsin-Madison, 2University of Trento, 3Massachusetts Institute of Technology**

Temporal integration in visual perception is thought to occur within cycles of occipital alpha-band (8-12 Hz) oscillations. Successive stimuli may be integrated when they fall within the same alpha cycle and segregated for different alpha cycles. Consequently, the speed of alpha oscillations correlates with the temporal resolution of perception, such that lower alpha frequencies provide longer time windows for perceptual integration and higher alpha frequencies correspond to faster sampling and segregation. Can the brain’s rhythmic activity be dynamically controlled to adjust its processing speed according to different visual task demands? We recorded magnetoencephalography (MEG) while participants switched between task instructions for temporal integration and segregation, holding stimuli and task difficulty constant. We found that the peak frequency of alpha oscillations decreased when visual task demands required temporal integration as compared to segregation. Alpha frequency was strategically modulated immediately prior to and during stimulus processing, suggesting a preparatory top-down source of modulation. Its neural generators were located in occipital and infero-temporal cortex. The frequency modulation was specific to alpha oscillations and did not occur in the theta (3-7 Hz), beta (15-30 Hz) or gamma (30-50 Hz) frequency range. These results show that alpha frequency is under top-down control to increase or decrease the temporal resolution of visual perception.