Conclusion: Our results suggest that both the left cybma conchae and the left neck vagus nerve stimulation are effective ways to improve the parasympathetic function. And the left neck stimulation might be a priority choice to get stronger effects of elevating HRV.

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P66 Cortical Fingerprinting using Spatial-Temporal Evolution of TMS evoked EEG responses—R. Ozdemir, E. Tadayon, P. Boucher, H. Sun, W. Ganglberger, B. Westover, A. Pascual-Leone, E. Santarnecchi, M. Shafi * (Harvard Medical School, Neurology, Boston, United States)

Transcranial magnetic stimulation (TMS) evokes a series of electro-cortical potentials (TEPs) that evolve in time and space as a function of the stimulation site, and thus can be used to assess a broad range of neurophysiological characteristics such as cortical excitability and effective connectivity in human subjects *in vivo*. Accumulating evidence shows that TEPs are reasonably reproducible within-individuals but highly variable between-individuals. Nevertheless, the majority of studies evaluate conventional amplitude metrics extracted from space-averaged TEPs with latencies of specific peaks in the grand-average (across-subject) TEP. Such a substantial data reduction approach ignores the rich spatial-temporal specificity of TEPs, and discards crucial information that can be used to uniquely characterize individual subjects, and more importantly, develop perturbation-based biomarkers of cortical neurophysiology in clinical populations. Here, we computed a similarity metric (cosine similarity-SI) that utilizes all the spatial-temporal information available in TEPs to fingerprint individuals across identical TMS-EEG sessions one month apart. We delivered a total of 150 single-pulses of TMS to anatomically defined targets in dorsolateral-prefrontal (DLPFC), motor (M1) and parietal (IPL) cortices in the left hemisphere, and resting-state fMRI functionally defined parietal targets of dorsal attention (DAN) and default mode (DMN) networks in the right hemisphere in 24 participants. SI within targets (i.e., LDLPFC in visit-1 vs LDLPFC in visit-2) was significantly higher than the between-target SI (e.g. LDLPFC in visit-1 vs DAN in visit-2), demonstrating the specificity of TEPs between different target sites. Importantly, the SI metric applied to a single site was able to identify individual subjects on repeat sessions with almost 80% accuracy; by combining data collected by stimulating across multiple sites, >90% accuracy was obtained, suggesting that combination of electro-cortical responses from multiple cortical regions reveals unique information regarding the neurophysiological profile of an individual. Thus, our results demonstrate that whole-scalp spatio-temporal evolution of TMS perturbation based brain responses represent an individually unique "fingerprint" of cortical electrophysiology, that could potentially serve as a useful tool in (1) tracking individual's brain function longitudinally across the lifespan, (2) developing neurophysiological biomarkers of behavior and cognition, (3) identifying subjects with or at risk for neuropsychiatric diseases, and (4) providing an objective index of changes in cortical neurophysiology in response to an intervention.

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P67 Transcranial magnetic stimulation induced perturbations of resting-state-networks are reproducible markers of causal network-to-network dynamics—R. Ozdemir *, E. Tadayon, P. Boucher, D. Momi, K. Karakhanyan, M. Fox, M. Halko, A. Pascual-Leone, M. Shafi, E. Santarnecchi * (Harvard Medical School, Neurology, Boston, United States)

Large-scale brain networks are often described using resting-state functional Magnetic Resonance Imaging (fMRI). However, the BOLD signal provides an indirect measure of neuronal firing and reflects slow-evolving hemodynamic activity that fails to capture the faster timescale of normal cortical physiological function. Here we use fMRI-guided Transcranial Magnetic Stimulation (TMS) and simultaneous electroencephalography (EEG) to characterize individual brain dynamics within discrete brain networks with high temporal resolution, and gain insights into causal brain-behavior relations. We used TMS to induce controlled perturbations to individually-defined neighboring right parietal nodes of the default mode network or the dorsal attention network. EEG responses were network-specific and highly reproducible across sessions one month apart. Individual differences in cognitive abilities were highly correlated with the network-specificity of the TMS-EEG perturbations, but not with resting-state EEG dynamics. Our findings illustrate the potential of TMS-EEG perturbations to characterize network-specific individual brain dynamics and assess their behavioral significance.

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P68 Effects of intermittent theta burst stimulation of the primary somatosensory cortex on sensory and motor cortex excitability—S. Tran [a,b,*], J.Y. Kim [c], C. Gunraj [a], J.F. Nankoo [a], Y. Wang [a], N. Drummond [a], R. Chen [a] ([a] University Health Network, Krembil, Toronto, Canada, [b] University of Toronto, Institute of Medical Science, Toronto, Canada, [c] INJE University Paik Hospital, Seoul, South Korea)

Introduction: Motor output is modulated by somatosensory input and processing. Uncovering the influence of the somatosensory cortex (S1) on the motor cortex (M1) may be key to understanding neurophysiological mechanisms involved in sensorimotor control. To examine the relationship between the two cortices, non-invasive intermittent theta-burst stimulation (iTBS) can be used to transiently alter the activity at one node (S1) and probe the influence at another node (M1). Given the close interaction between S1 and M1, it is hypothesized that S1-iTBS will modulate M1 excitability; however, it is unclear whether these changes will be driven by changes in intracortical or corticospinal circuitry.

Objectives: To determine if S1-iTBS induces lasting after-effects on M1 excitability and if this modulation is accounted for by intracortical or corticospinal plasticity.

Materials & **Methods:** Real and sham stimulation were tested in counterbalanced order over two days, separated by a week. iTBS was applied over left S1 (three stimuli at 50 Hz, repeated at 5 Hz, for a total of 600 stimuli) at 80% active motor threshold of the left M1. S1 was located using neuro-navigation by targeting the post-central gyrus posterior to the hand knob area. Motor-evoked potentials (MEPs) of the right first dorsal interosseous (FDI) muscle were recorded at three time points: before stimulation (baseline), immediately after stimulation (T0), and 30 min after stimulation (T30). MEP amplitudes, short-interval intracortical inhibition (SICI), long-interval intracortical facilitation (SICF), short afferent inhibition (SAI) and long afferent inhibition (LAI) were assessed.

Results: Preliminary results from seven subjects suggest that S1-iTBS increases MEP amplitudes from baseline to T30. This increase in