

In Search of an Objective Measure of Working Memory

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Presentation Abstract Summary Working memory (WM) is a cognitive system that contains internal representations of recent events for a pending action. With no objective measure of WM available, clinicians subjectively diagnose and treat memory disorders like Alzheimer's Disease and dementia with Lewy bodies. Our study focuses on establishing and characterizing an objective measure. First, we used supervised machine learning on local field potentials (LFPs) from prefrontal and posterior parietal regions of macaque monkeys during a delayed match-to-sample task. This yielded two sets of sparse feature representations of LFP activity during correct and incorrect responses. Next, we developed a discrimination algorithm to predict whether novel trials contain correct or incorrect responses. The correct performance feature set contained significantly different spectral components than the incorrect set. Delay-period LFP activity allowed for successful discrimination between correct and incorrect responses. Correct responses represent healthy WM and incorrect responses represent impaired WM. Thus, our results establish that different spectral components characterize healthy and impaired WM, and that delay activity can discriminate between healthy and impaired WM. An objective measure of WM could provide for new diagnosis and treatment paradigms in the clinic, novel experimental setups and consumer brain-computer-interface applications involving neurofeedback.

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