

Theta burst stimulation to MT+ versus IPS: effect on behavioral and neural fidelity in short-term memory

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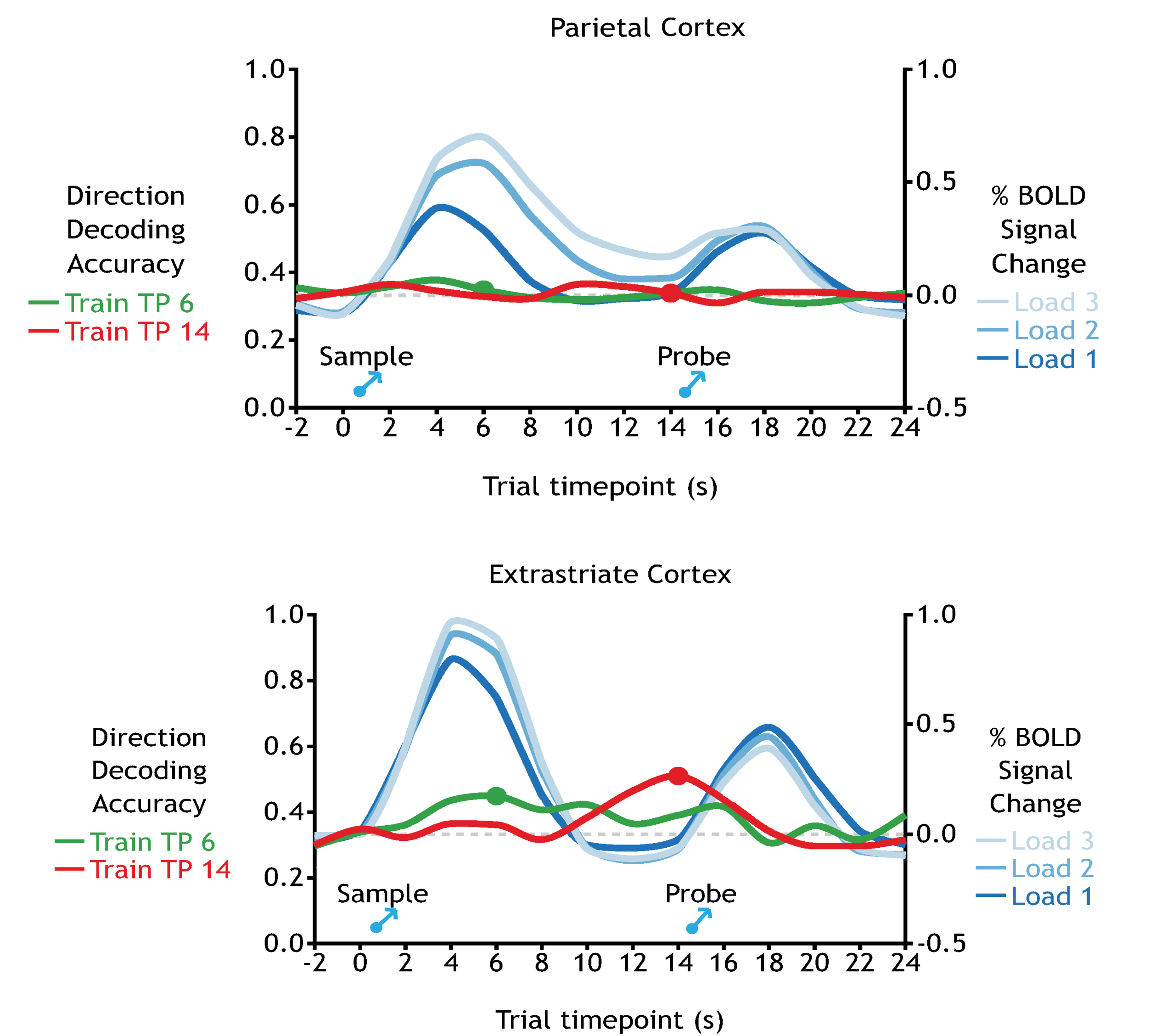
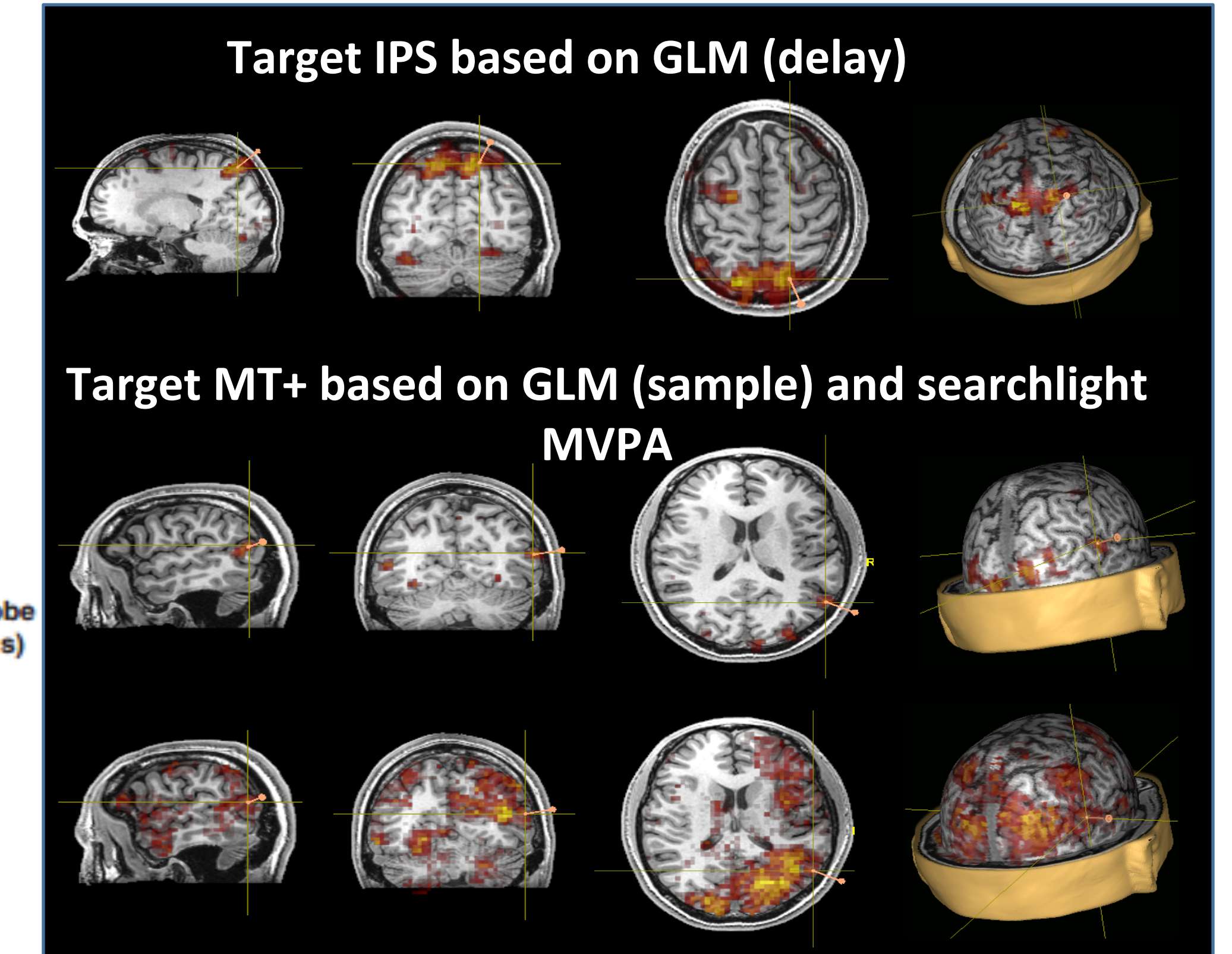
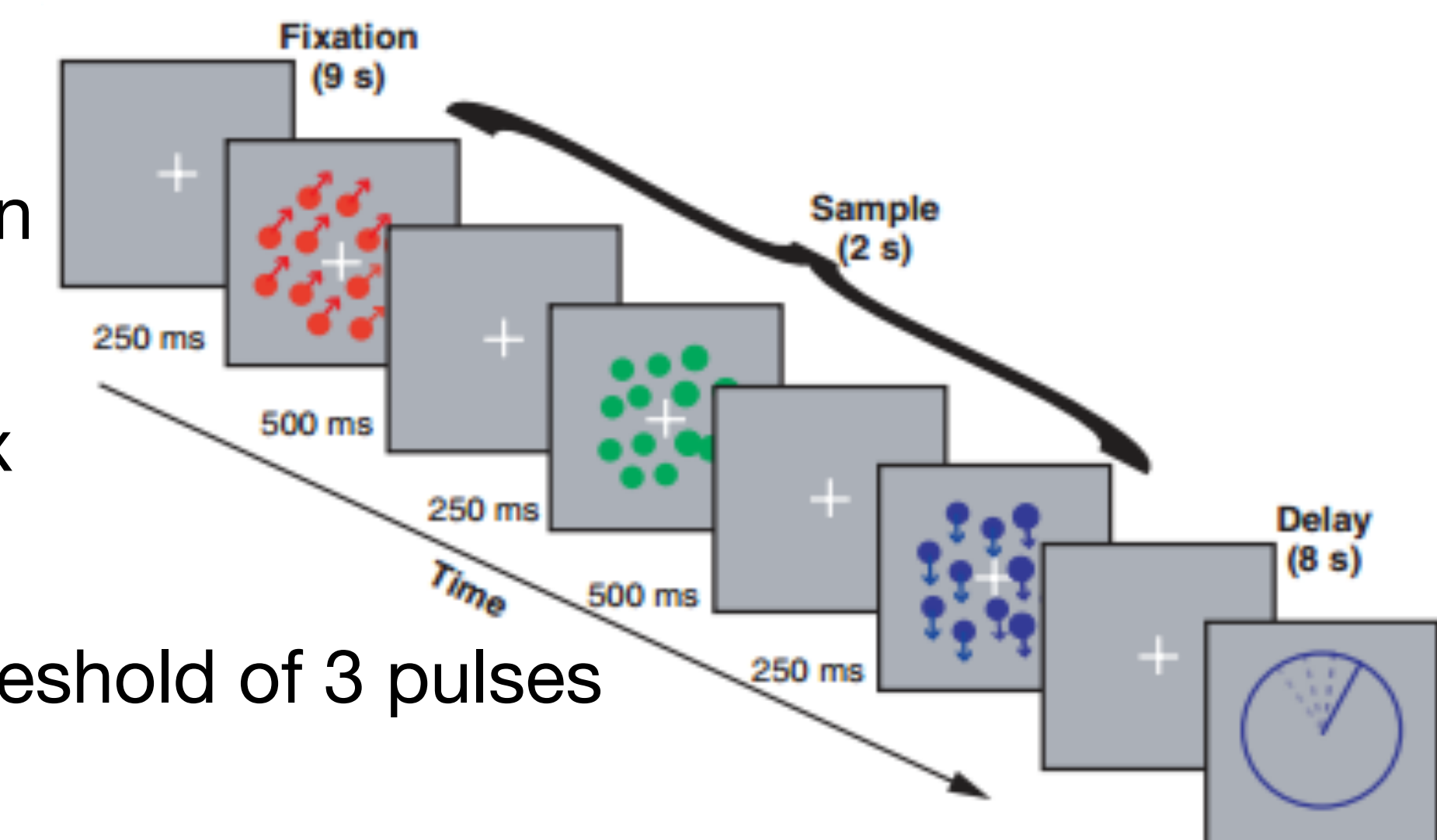
Background

Elevated delay-period fMRI activity is observed in the prefrontal and parietal cortices during short-term memory (STM) for the direction of motion. Multivariate pattern analysis (MVPA) fails to find evidence for stimulus representation in these regions but stimulus identity is decodable from extrastriate cortex¹. When memory load is increased, signal intensity in frontoparietal areas increases and MVPA decoding performance from posterior cortex declines monotonically, as does behavioral measure of mnemonic precision².

Methods

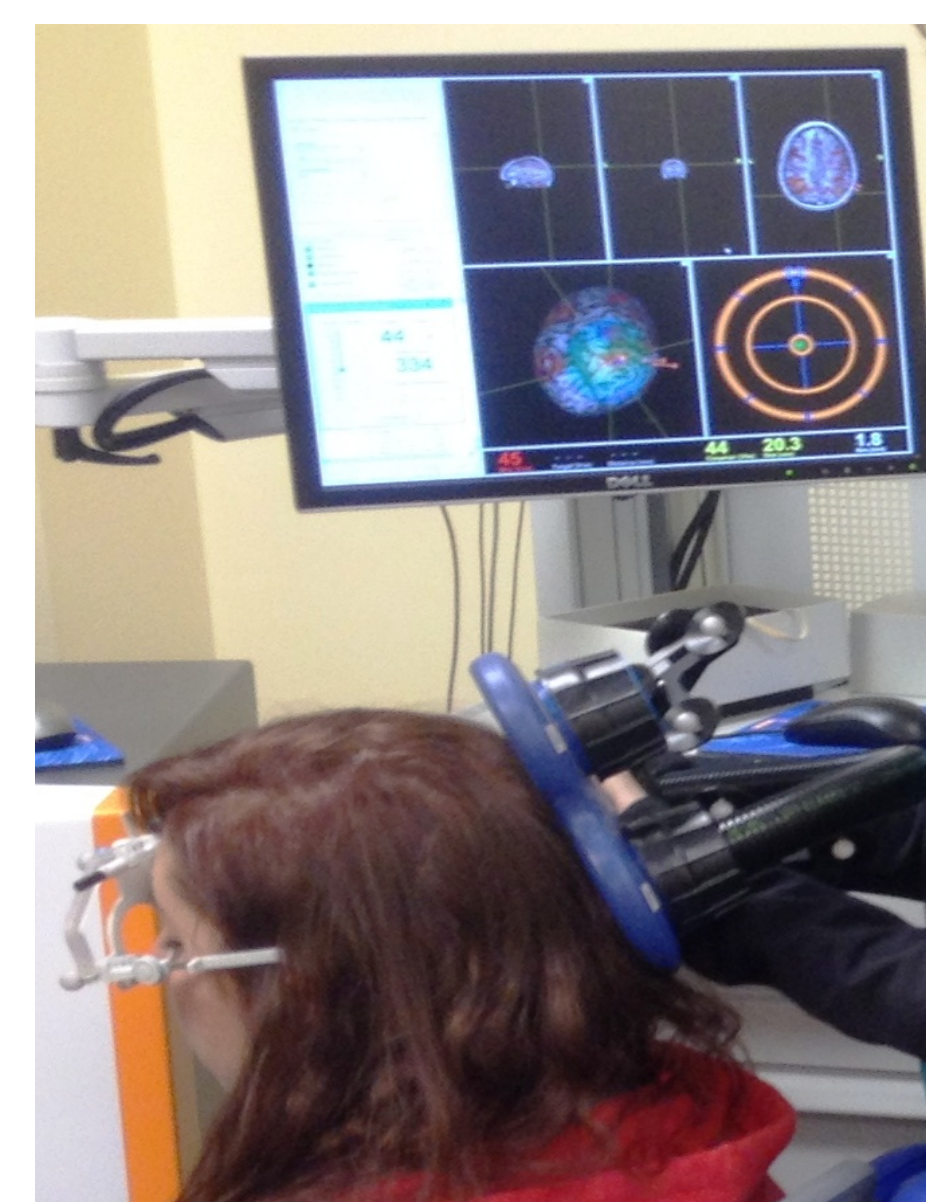
- Procedure: DAY 1 (2h) Structural and functional MRI | DAY 2 (4h) aMT&TBS target 1 - MRI - TBS target 2 - MRI | DAY 3 (3h) TBS target 2 - MRI - TBS target 1 - MRI
- Tasks in 3T MRI: visual perception (2 runs of 60 trials per day) and STM for motion with different loads (6 runs of 180 trials per day).
- Two fMRI STM-related TBS targets: intraparietal (IPS) and middle temporal cortex (MT+) using a neuronavigated system (NBS Nexstim).
- Continuous TBS in 10 participants (2 female, age 19-31yo): 80% active motor threshold of 3 pulses every 200 ms for 40 sec (Magstim SuperRapid²).
- Analyses: mixture-model for behavior^{5,6}. Preprocessing, general linear model and multivariate pattern analysis (MVPA, leave-one-trial-out approach) for fMRI.

STM task



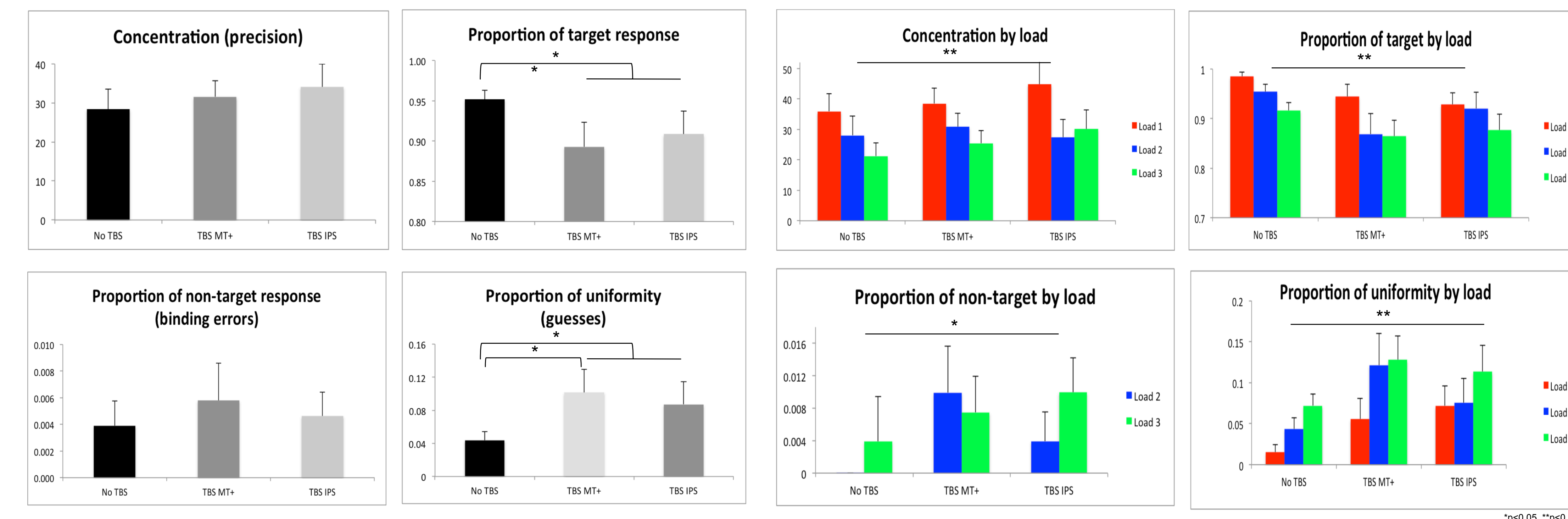
Theta burst transcranial magnetic stimulation (TBS) has been shown to induce performance-impairing effects during working memory tasks^{3,4}.

How are item-specific and load-specific visual STM representations affected by the perturbation of brain areas related to working memory?



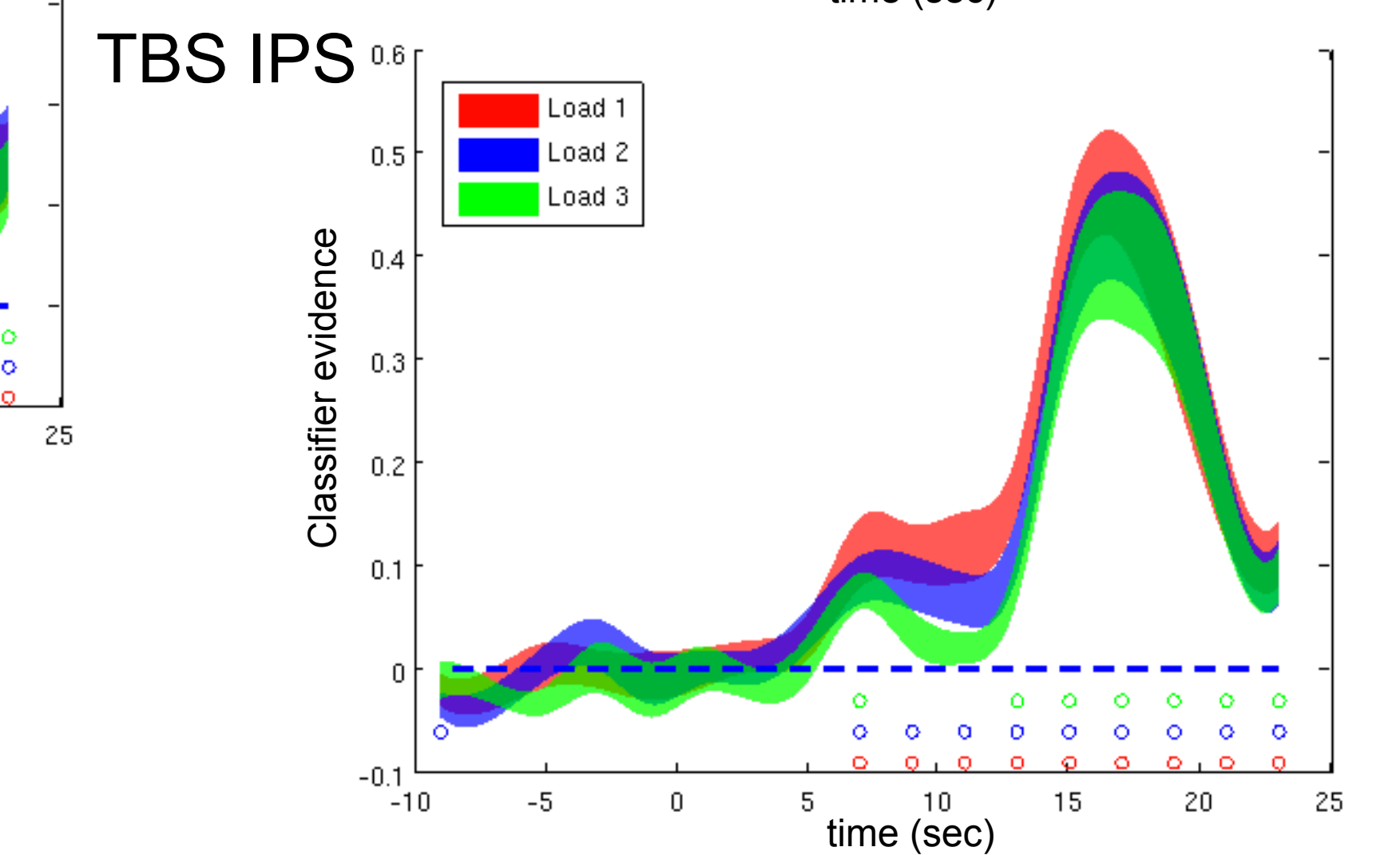
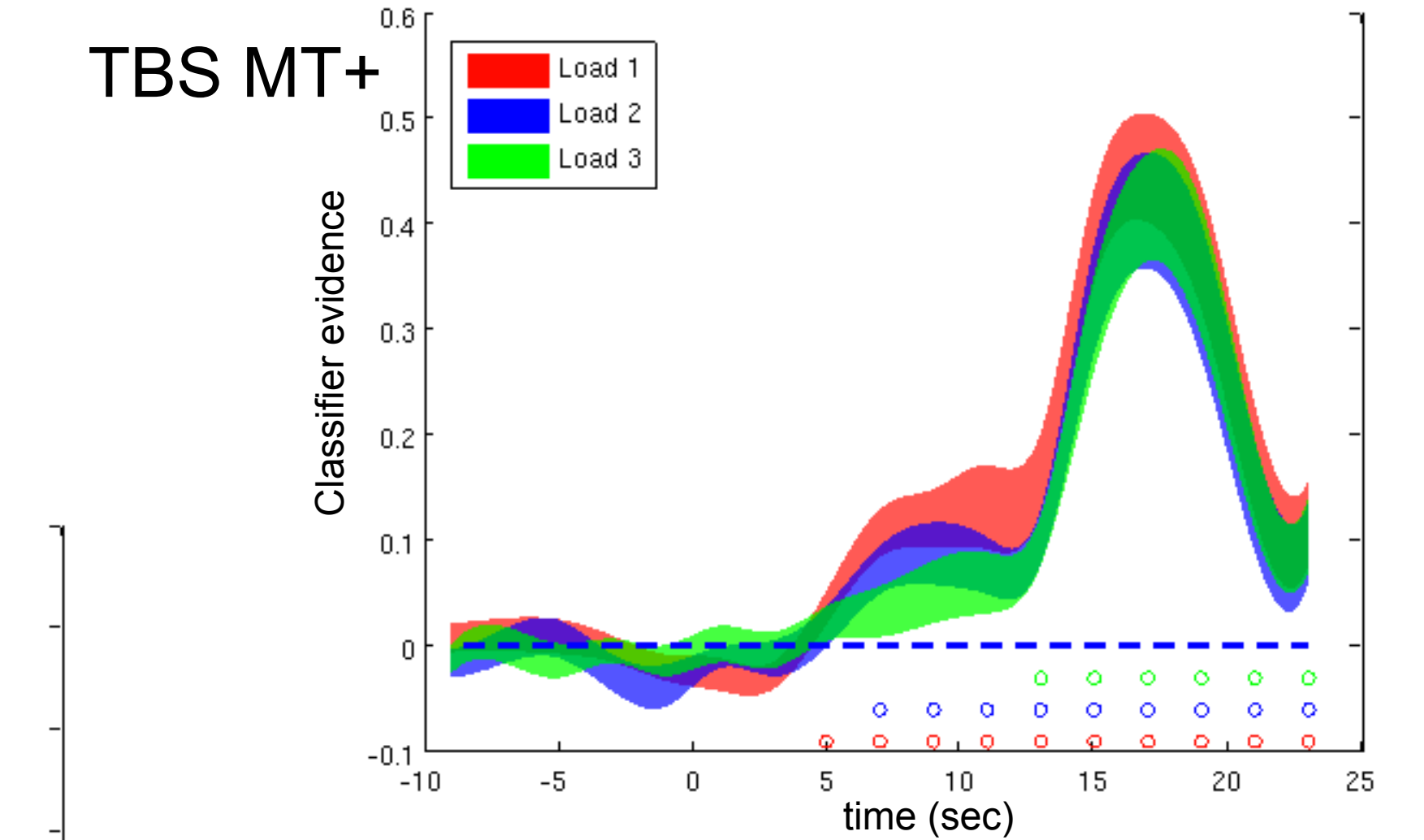
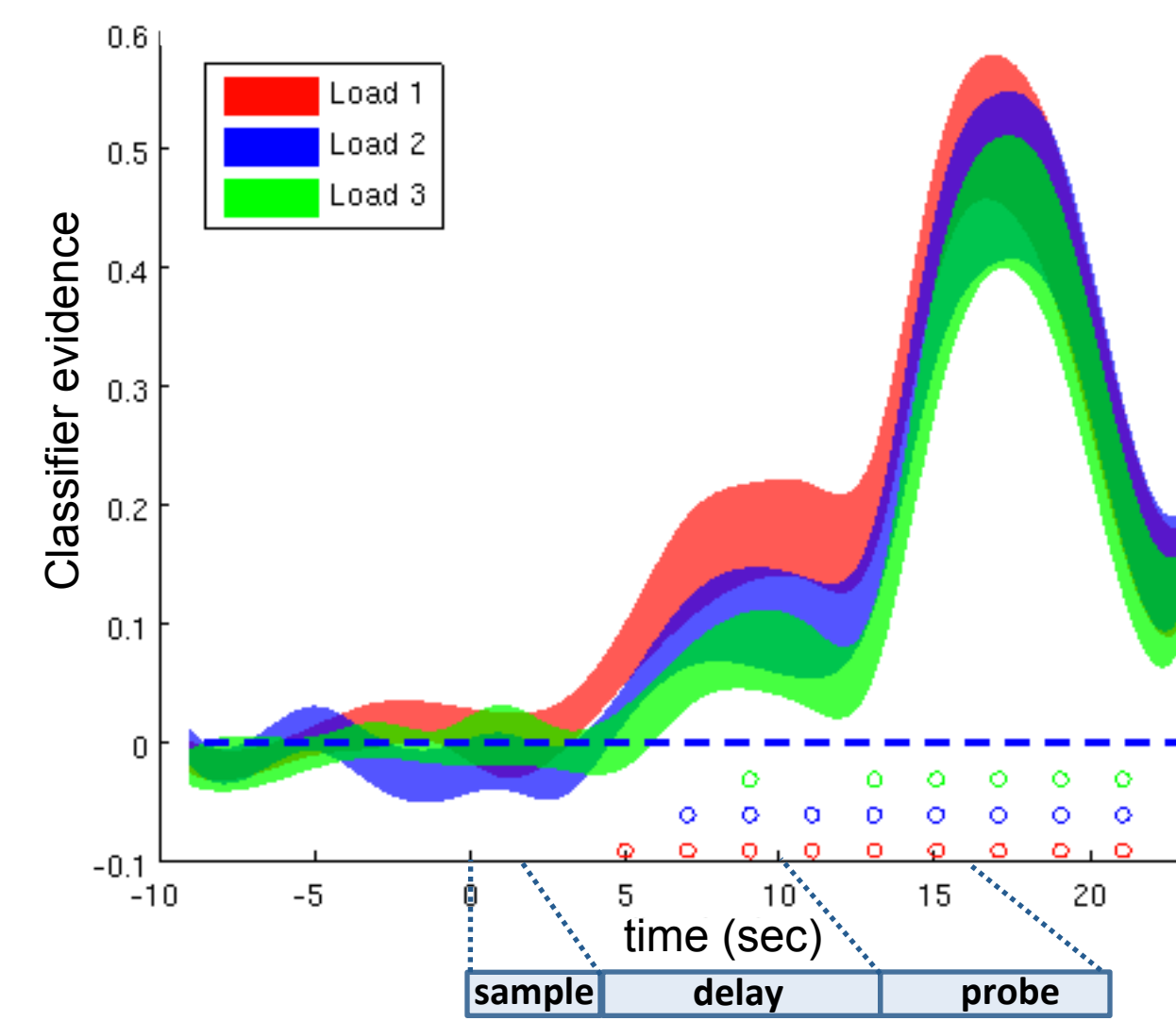
Results

Behavior

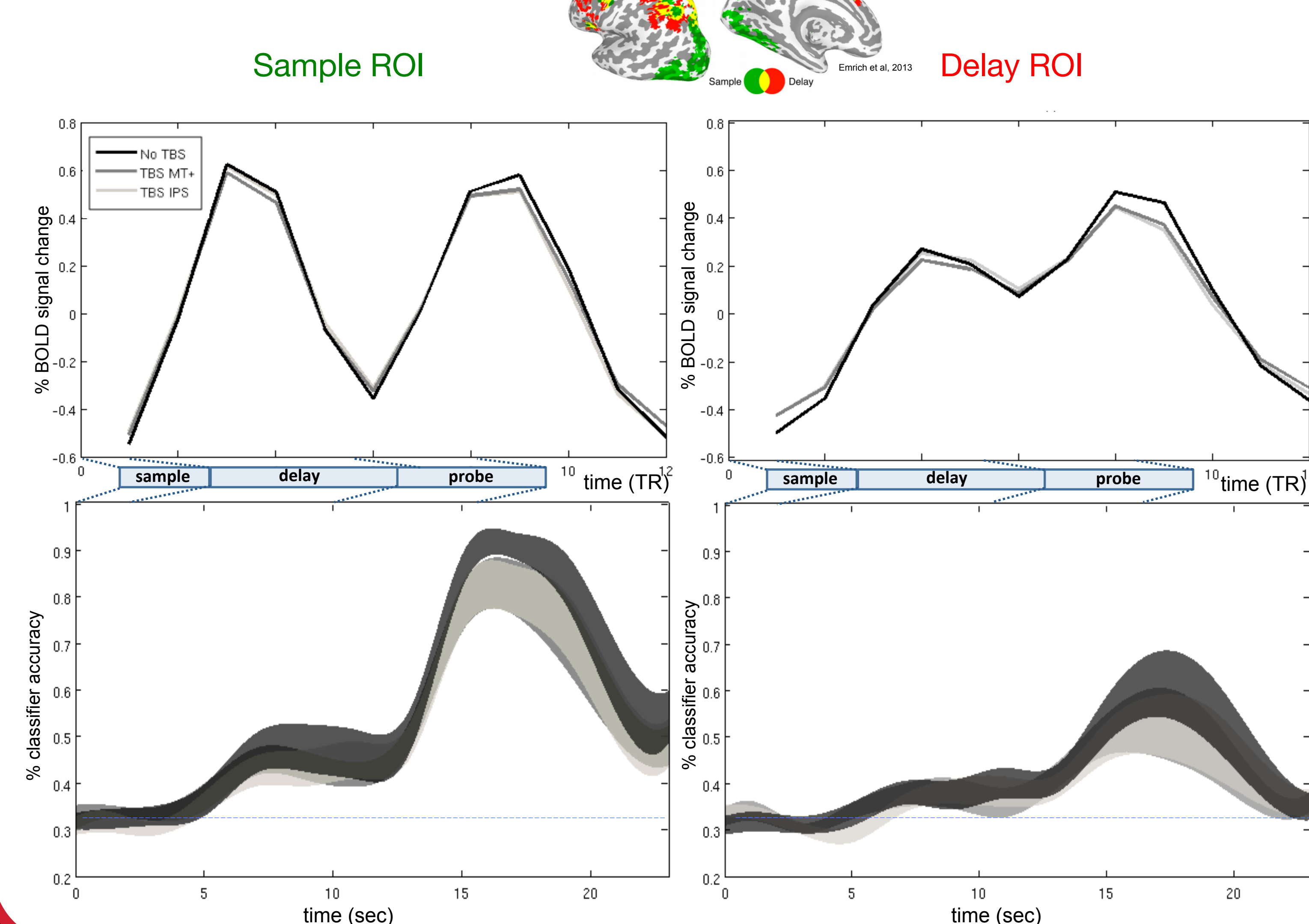


MVPA by load

No TBS

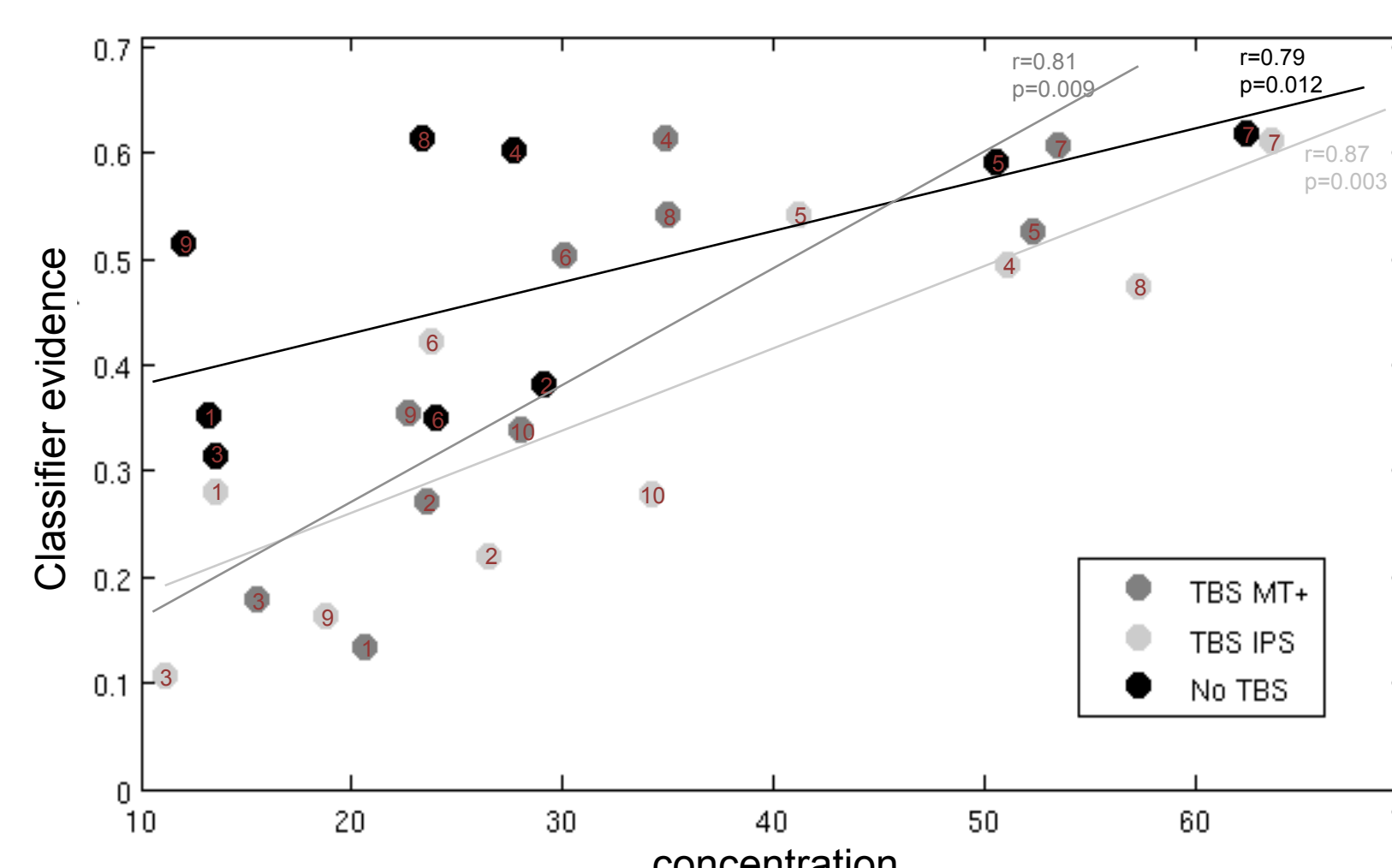


BOLD and MVPA

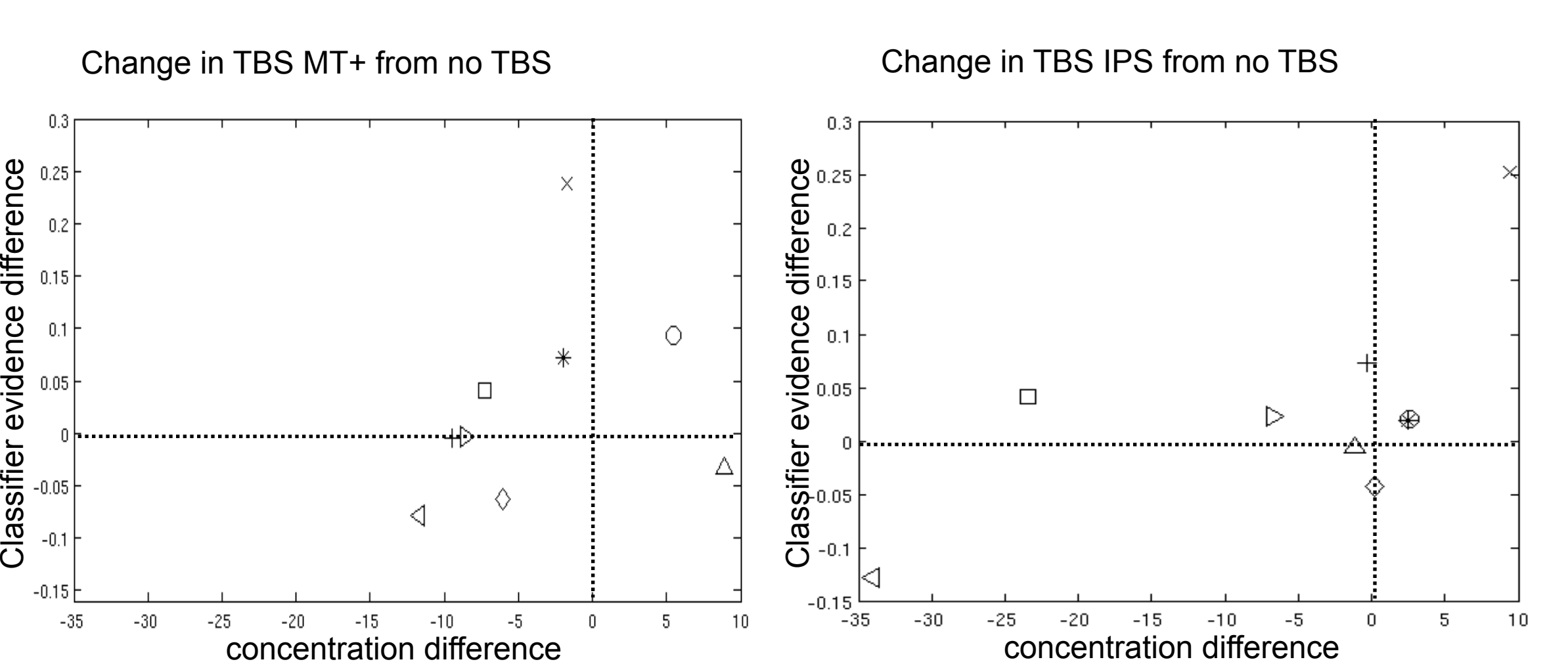


Behavior and MVPA

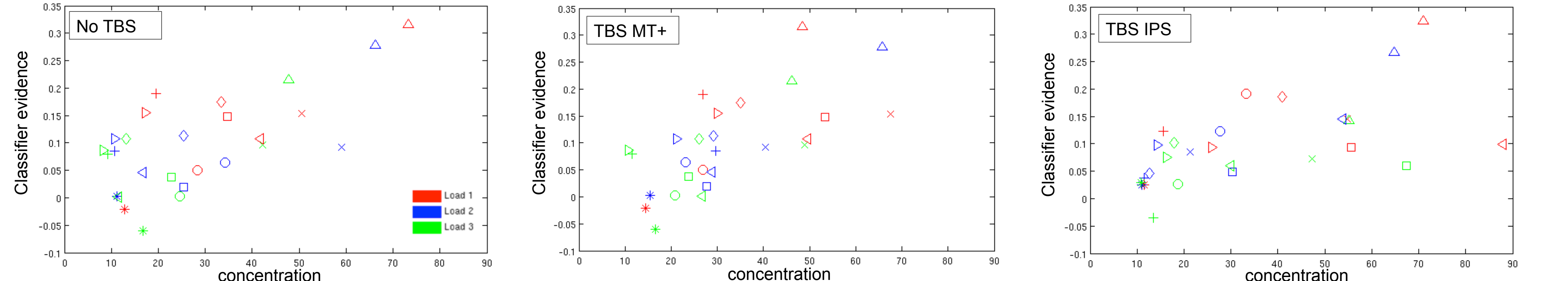
Concentration and classifier evidence by session



Concentration and classifier evidence differences



Concentration and classifier evidence by session and by load



References

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Conclusions

These data suggest a non-specific effect of TBS on behavior with preserved fidelity of stimulus representation but increased guesses during visual STM. The load effect on behavioral precision and multivariate decoding remain the same with TBS. We next will use functional connectivity analyses to understand more subtle differences in the effects of TBS.