Decoding Feature-Independent Visual Working Memory Load from Human EEG

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Introduction

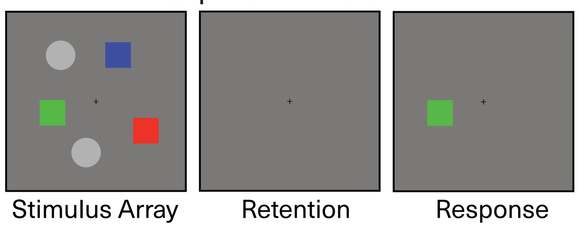
Working memory load can be decoded from raw EEG on a single-trial basis (Adam et al, in prep)

If load decoding tracks the number of individuated items, it will generalize across feature values and feature loads

Task Design

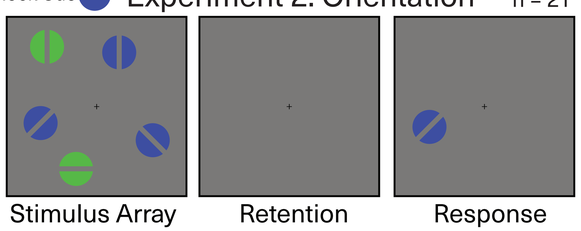
Whole field change detection task with luminance- and area-balanced displays across set size and experiment

Experiment 1: Color n = 23

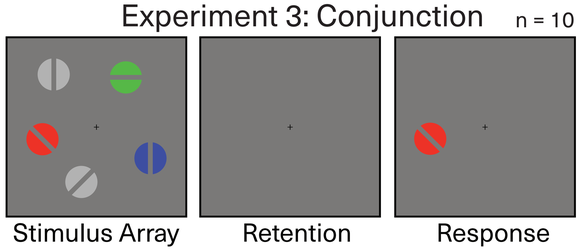


Block Cue

Experiment 2: Orientation n = 21



Experiment 3: Conjunction n = 10

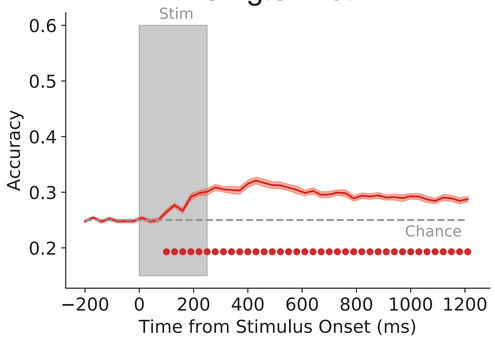


14 subjects completed both exp. 1 and 2. 10 subjects completed all three. Cross-training is within-subject.

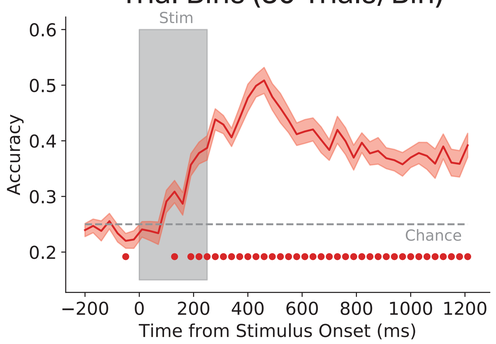
Single Feature Load Decoding

Can we decode load while balancing displays?

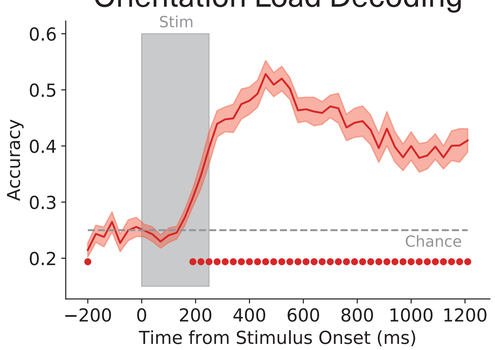
Color Load Decoding
Single Trial



Color Load Decoding
Trial Bins (30 Trials/Bin)



Orientation Load Decoding

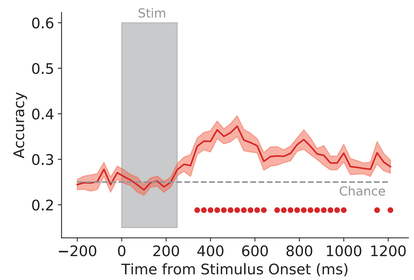


Display imbalances do not solely drive load decoding

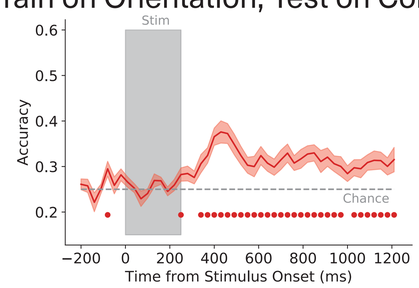
• *P* < 0.05

Decoding Across Features

Train on Color, Test on Orientation



Train on Orientation, Test on Color

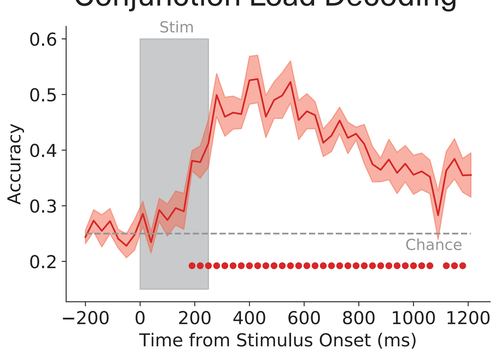


A common model decodes color and orientation loads

Conjunction Load Decoding

Can we decode load for items with multiple features?

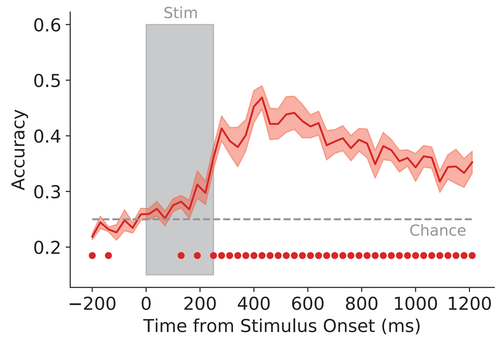
Conjunction Load Decoding



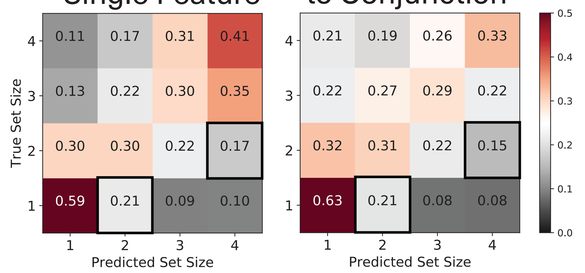
Load decoding works for items with multiple features

Single Feature to Conjunction

Color and Orientation to Conjunction



Confusion Matrix



Load decoding tracks number of items, not number of feature values

Conclusions

A common model decodes load for items with different features and with different numbers of features

Load decoding tracks the number of individuated items, not the total number of feature values maintained