

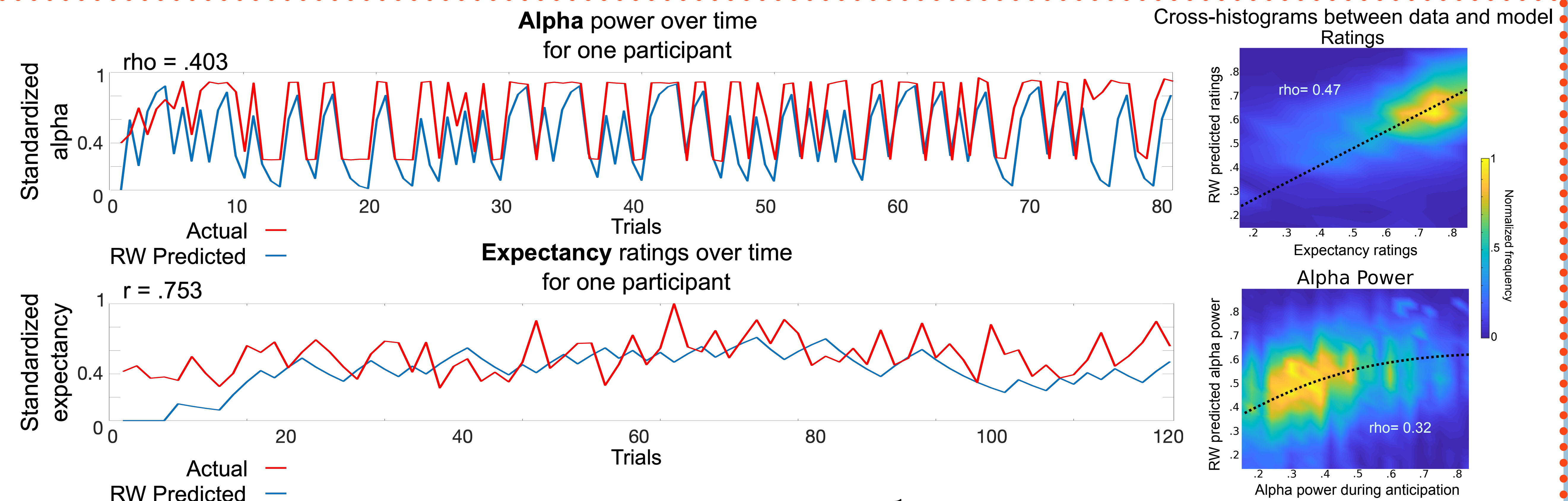
Background

- Formations of contingency awareness are expressed at the behavioral level in the form of outcome expectancy.
- Neural oscillations in the alpha band (8-13 Hz) are associated with a range of cognitive processes, such as working memory, mental imagery, and anticipation.
- The present study examined the trial-by-trial covariance between occipital alpha power, time-varying associative strength, and self-reported expectancy of aversive events in a conditioning paradigm.

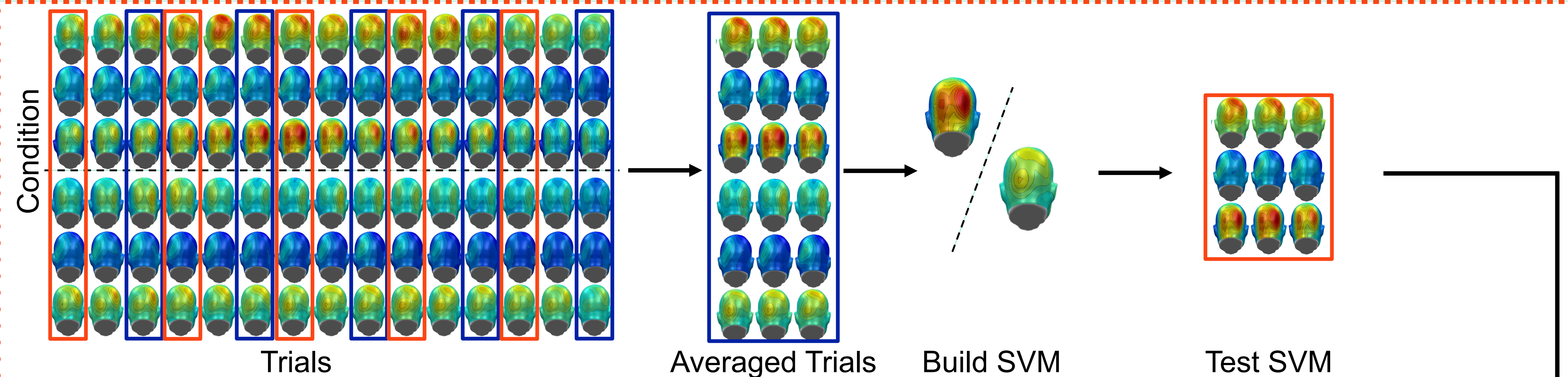
Hypotheses:

- Single trial alpha oscillation data can be used as an objective measure of associative learning and US expectancy.
- Traditional learning models will be able to predict single trial alpha power in the same way it can predict behavioral output.
- Single trial alpha topographies can be accurate distinguishing features in automatic binary classifier algorithms.

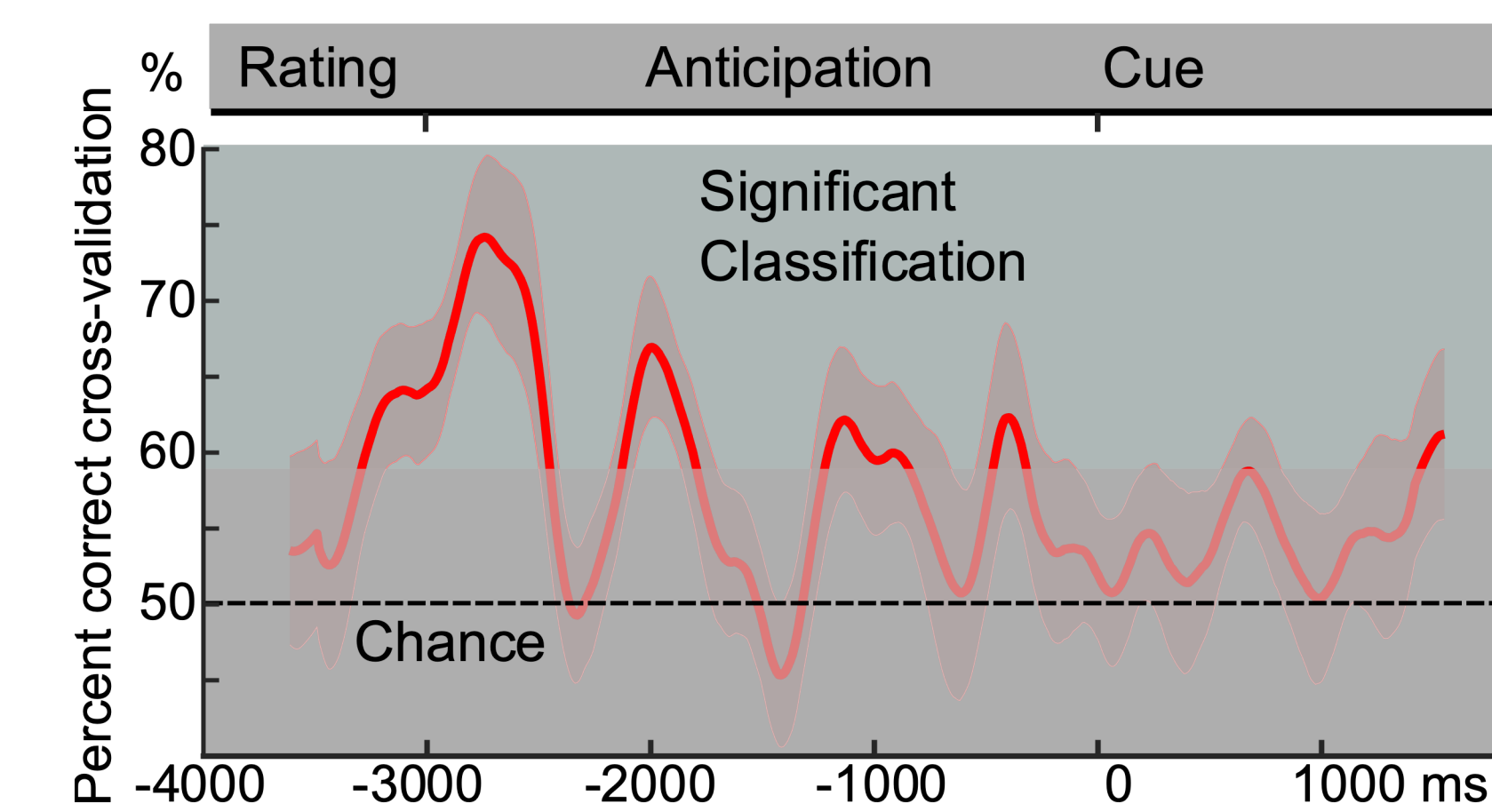
Results



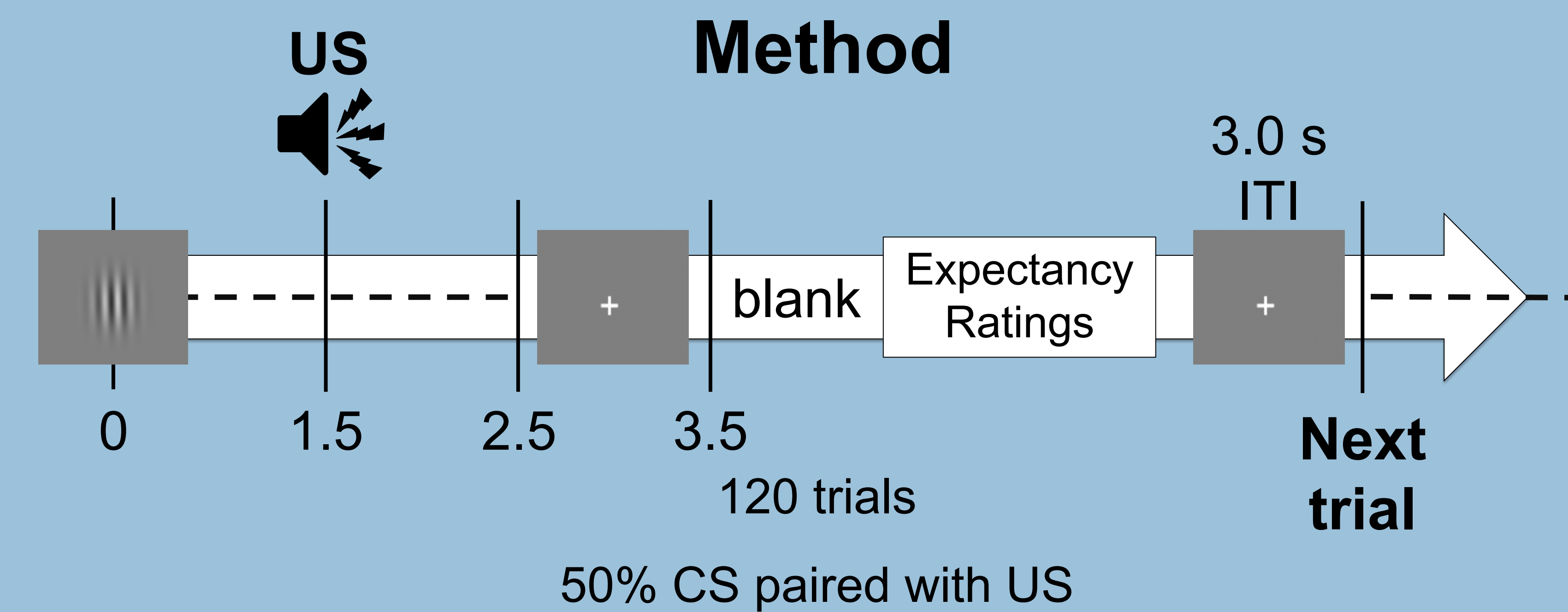
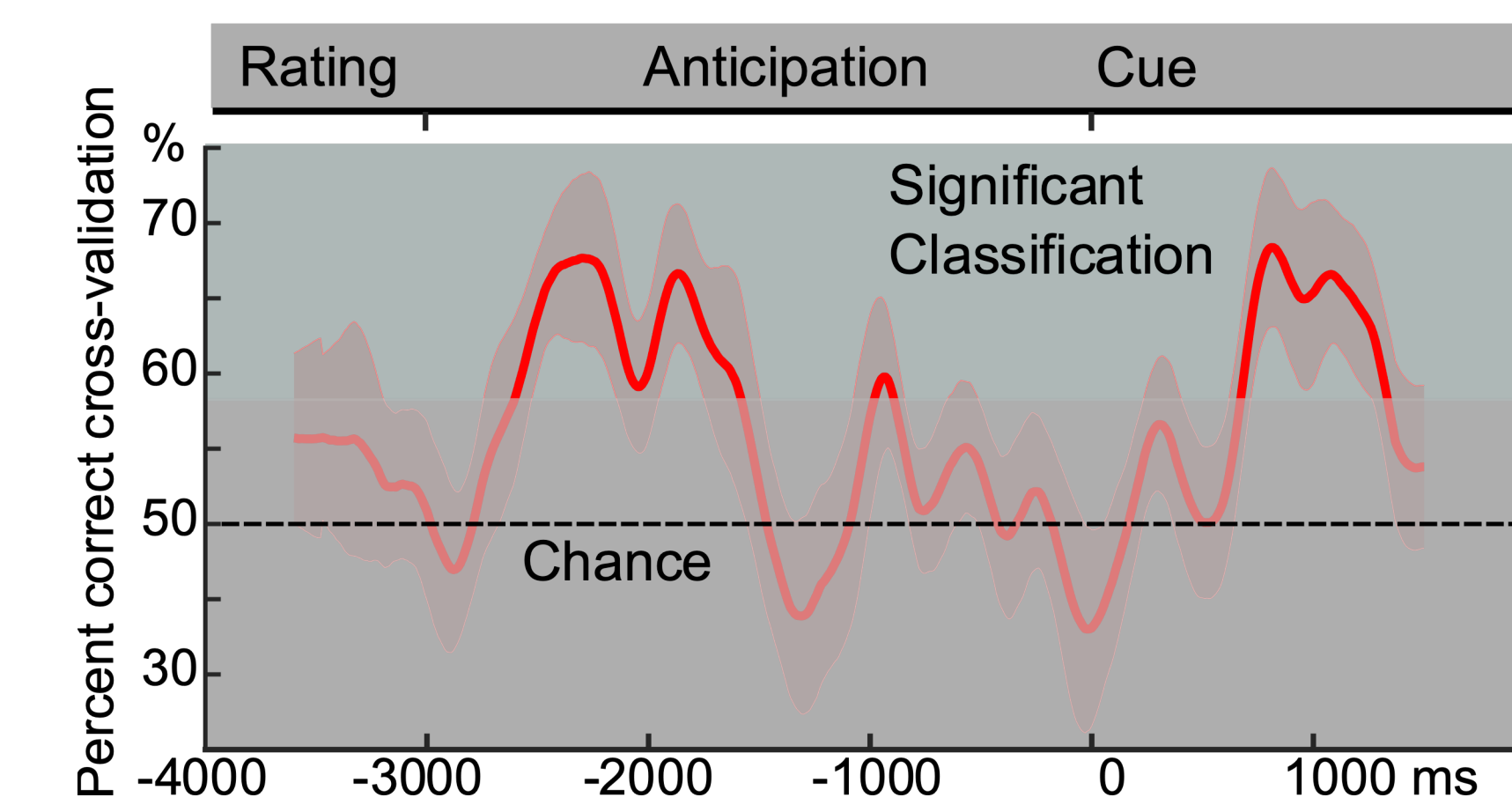
$$\text{Rescorla-Wagner Learning rule: } \Delta V_X^{n+1} = \alpha_X \beta (\lambda - V_{tot})$$



Decoding expectancy



Decoding experience



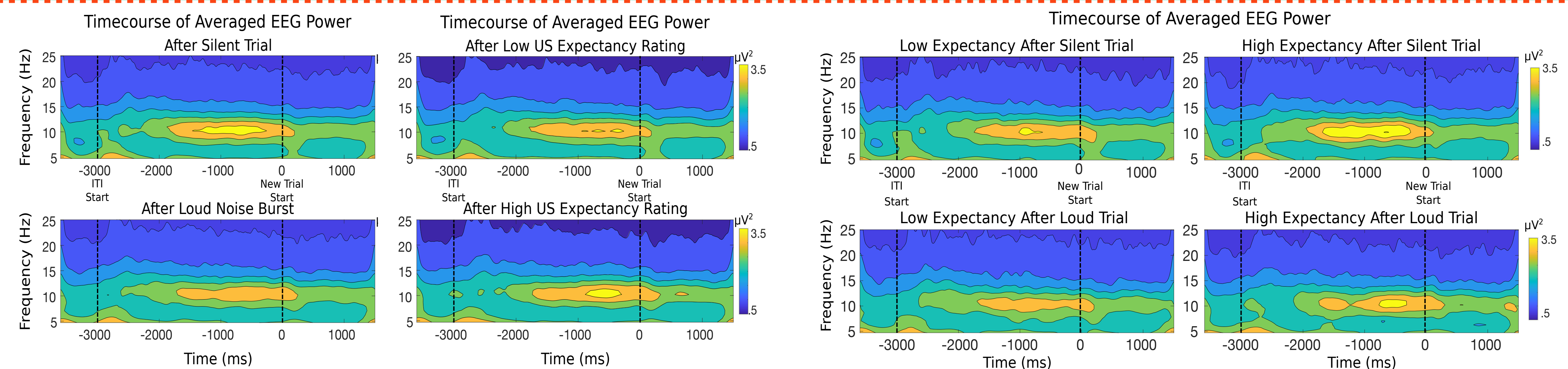
CS: Gabor patch 1.5 degree left tilt presented for 2.5 seconds

US: 1 second 96 dB white noise burst. Begins 1.5 seconds after the start of the CS. Co-terminates with CS.

Participants: 20 students (15 female), $M_{age} = 19$

Conclusion

- Alpha plays a role in the trial-by-trial adjustment of expectancy
- Expectancy can be successfully predicted both in terms of behavior and alpha power.
- The topography of alpha power has meaningful information that can be decoded under conditions of high and low expectancy as well as after a US+ or US- trial.



Alpha power: US- → US+ High = Low in conditions of high US expectancy after US- trials