



Attentive tracking of multiple objects modulates neuronal responses in area V4 of macaque.

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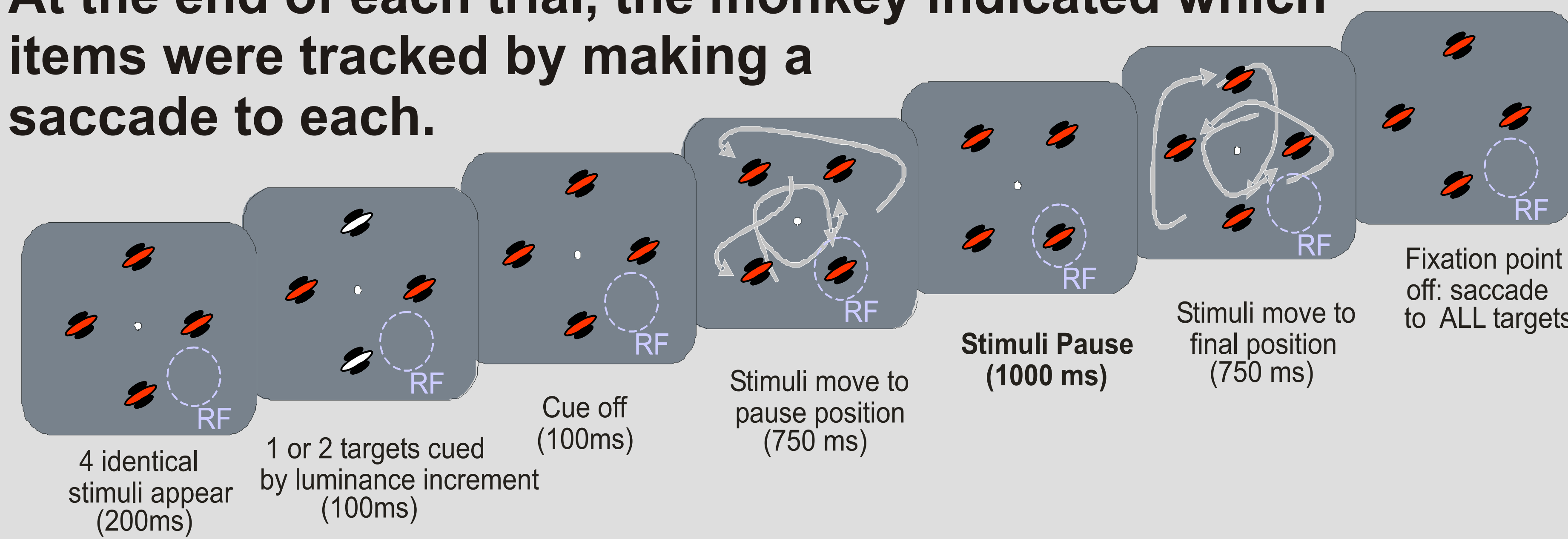
Jude F. Mitchell, Kristy A. Sundberg & John H. Reynolds

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Multiple-Object Tracking Task:

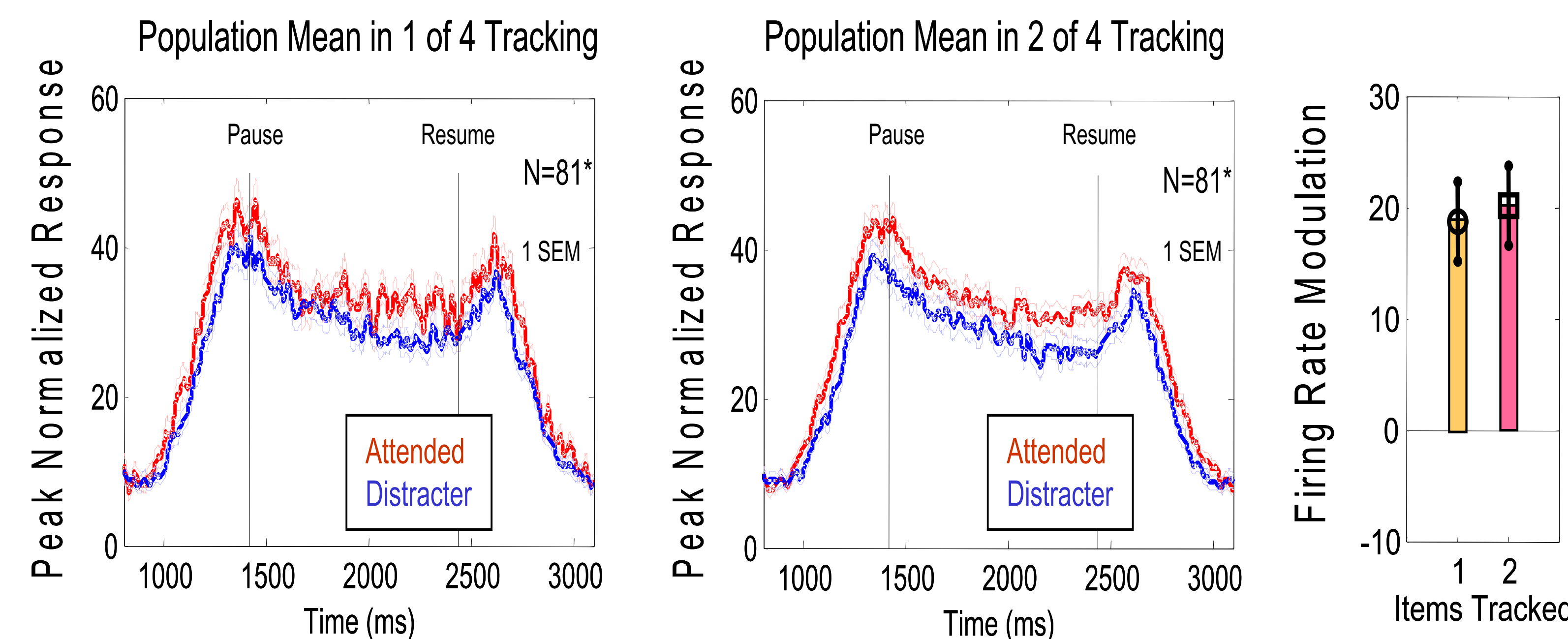
Monkeys tracked either 1 or 2 of 4 identical items. Stimulus color and orientation were matched to the preferences of an isolated unit in V4. During tracking, an attended or distracter item entered and paused inside the receptive field for 1000ms. At the end of each trial, the monkey indicated which items were tracked by making a saccade to each.



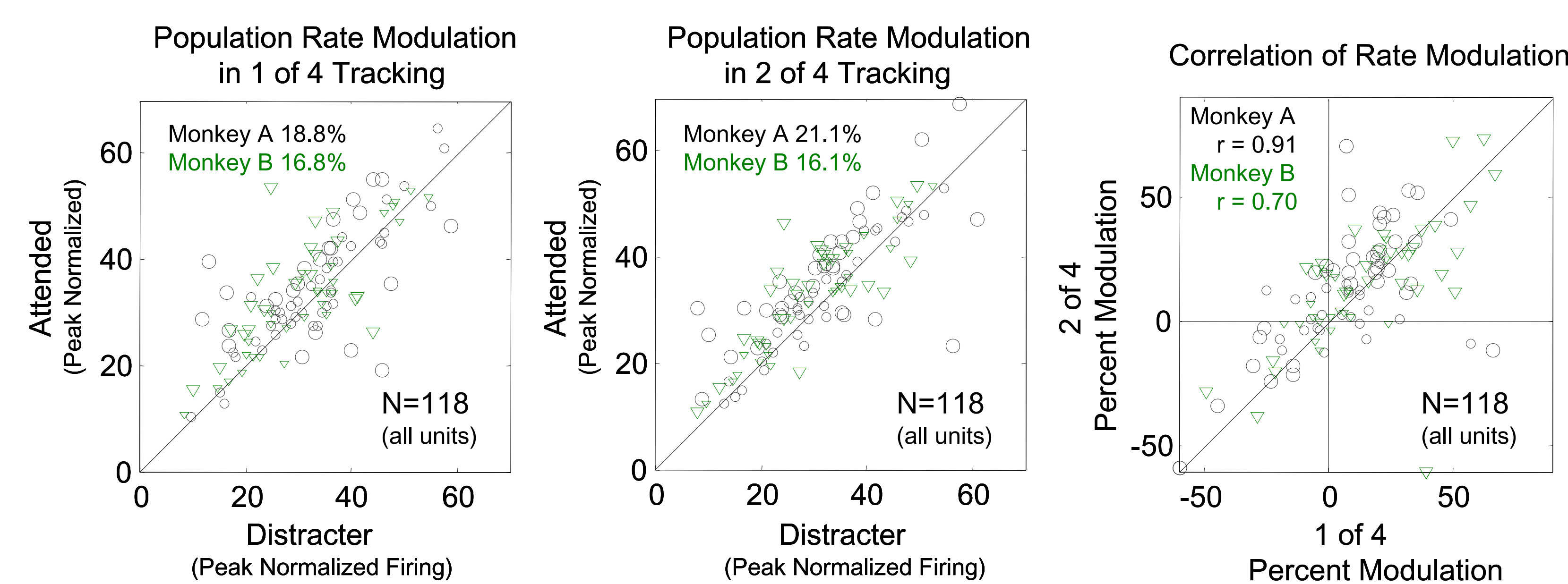
Are V4 Unit's Rates Modulated?

YES

Firing Rate Modulation is Similar for Tracking 1 or 2 Items



Population Summary:

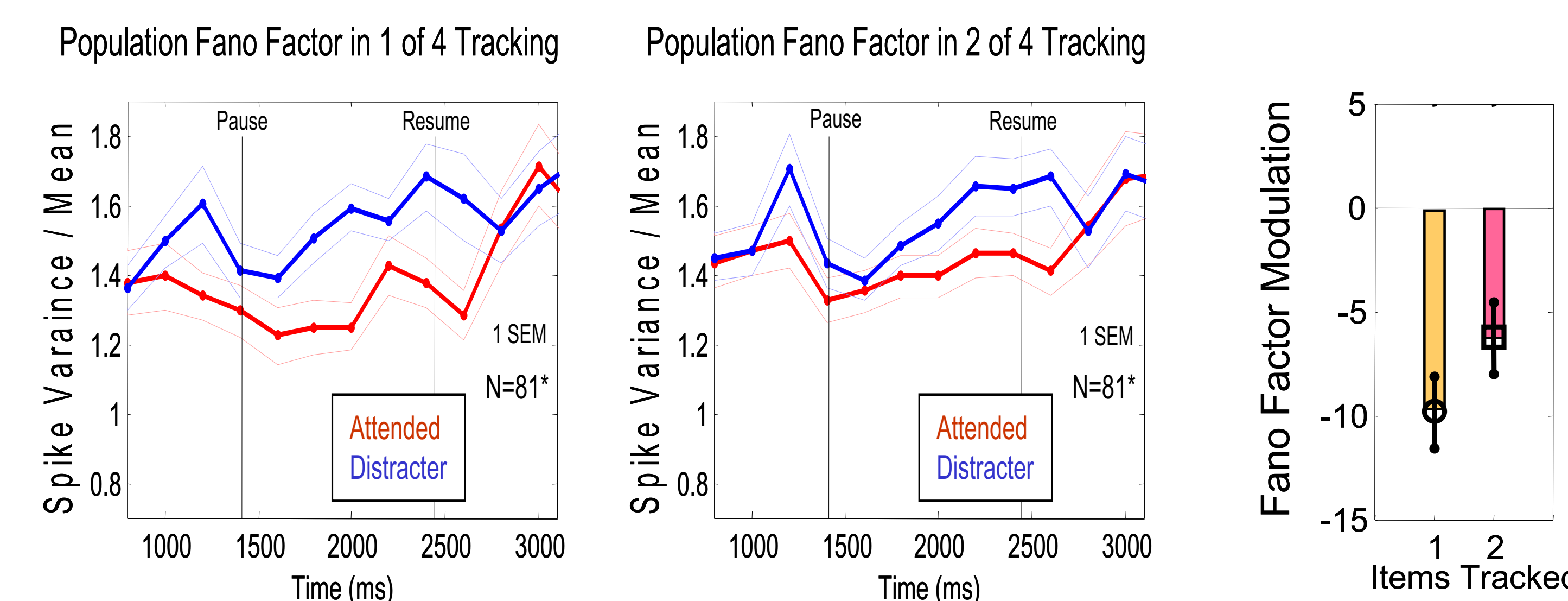


* Systems Neurobiology Laboratory, The Salk Institute for Biological Studies. Funding provided by NIH Training Grant in Cognitive Neuroscience (J.M.), NSF Graduate Research Fellowship (K.S.), and NEI grant 1R01EY13802 (J.R.).

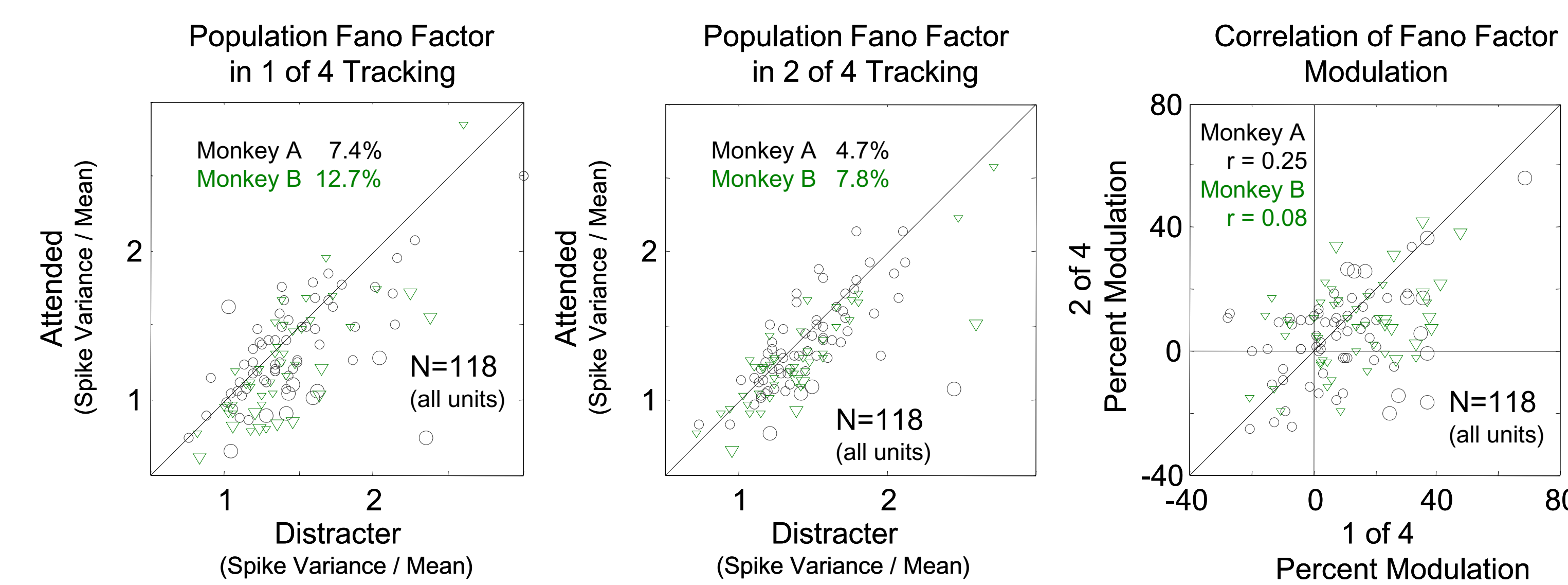
Does the Signal to Noise Ratio Improve for Tracked Items?

YES

The Fano Factor Decreases for Tracked Items



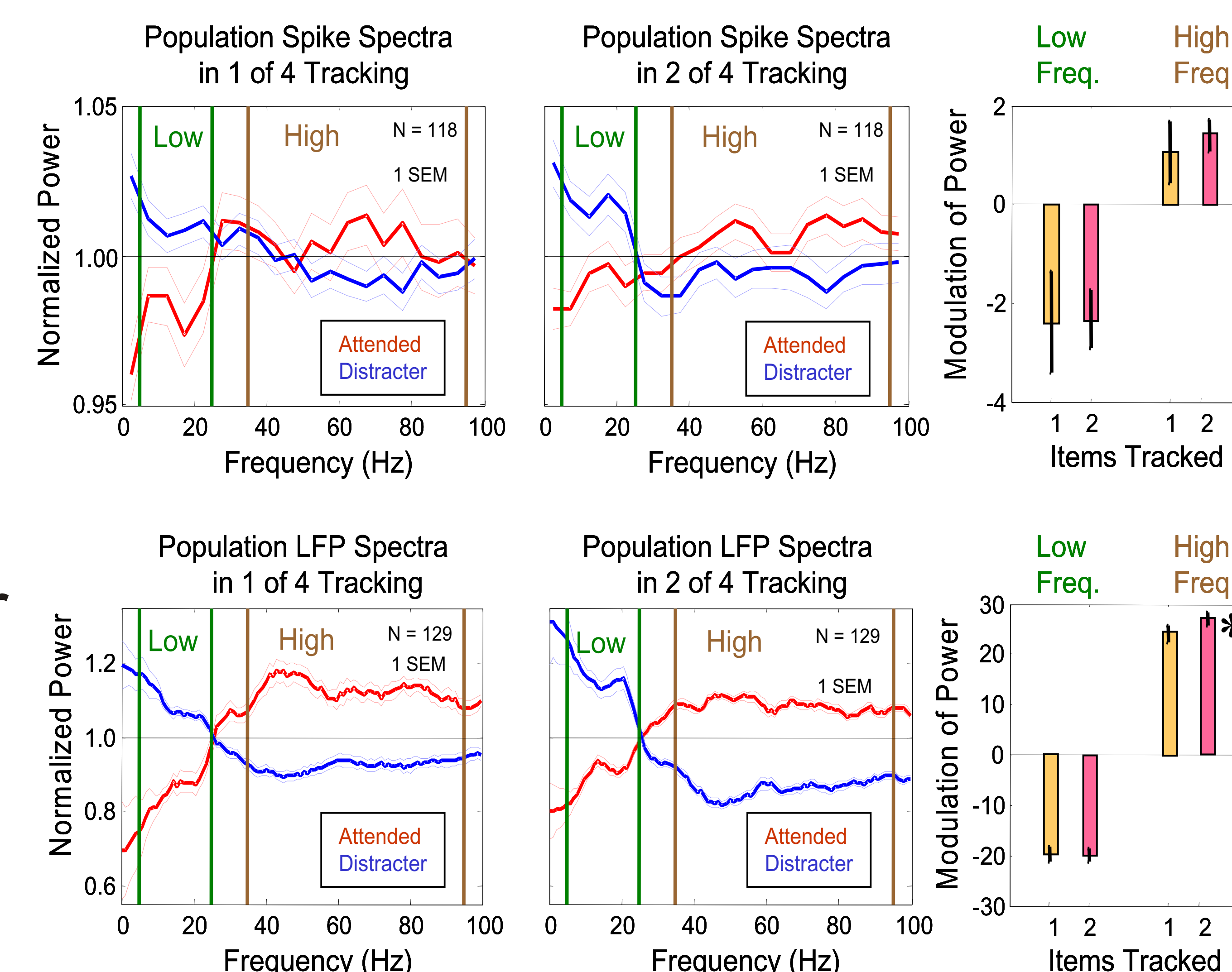
Population Summary:



Do power spectra of spikes and LFPs change for tracked items?

YES

Both Spike and LFP Power Spectra are Modulated: High Freq. Power Increases and Low Freq. Power Decreases

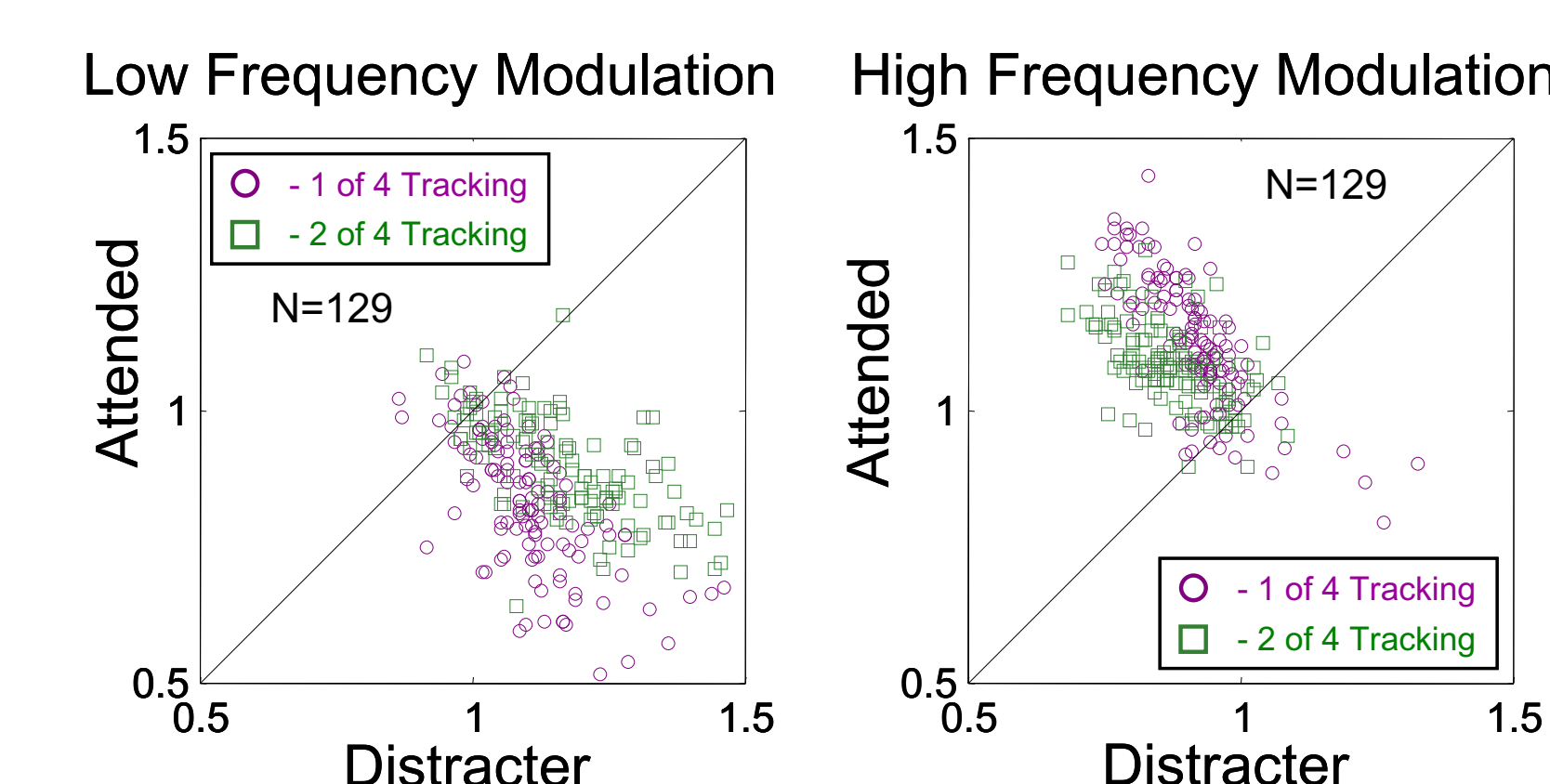


What is the time course of change in the power spectrum of LFPs?

Power spectra were computed using a sliding window of 200ms with a step of 50ms with five Slepian Tapers (W = 6Hz) using Chronux software. Power was then normalized at each frequency across trial duration and all tracking conditions. Significant attention differences (black dots) were computed, with a Bonferonni correction.

Changes in Power are not Different Between 1 or 2 Target Tracking

Population Summary:



Conclusions

- 1) Firing rate is enhanced (~18%) in V4 for tracked stimuli.
- 2) The fano factor is decreased (~7.5%) for tracked stimuli.
- 3) The modulation of rate is similar in tracking 1 or 2 items.
- 4) The signal to noise ratio is better in tracking 1 item though.
- 5) Both spike and LFP power spectra are modulated similarly.
- 6) For tracked items, low frequency(5-25Hz) power decreases and high frequency (35-95Hz) power increases.

References

1. Pylyshyn ZW and Storm RW (1988) Tracking multiple independent targets: evidence for a parallel tracking mechanism. Spat Vis. 3(3):179-97.
2. Sears CR and Pylyshyn ZW (2000) Multiple object tracking and attentional processing. Can J Exp Psychol. 54(1):1-14.
3. Fries P, Reynolds JH, Rorie AE, and Desimone R (2001) Modulation of oscillatory neuronal synchronization by selective visual attention. Science 291:1560-63.