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Introduction

The temporal relationship between signals from different modalities is a key factor for multisensory integration. In a series of recent studies [1,2] we demonstrated that the similarity in temporal fine-structure between visual and auditory stimuli plays a leading role in solving the multisensory correspondence problem. Here we investigate the role of cross-correlation in multisensory integration by combining standard psychophysical techniques with reverse correlation analyses [3,4].

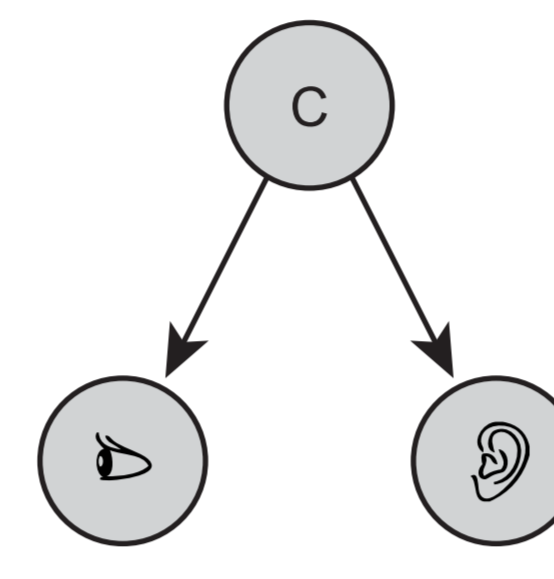
Tasks

Temporal order judgment



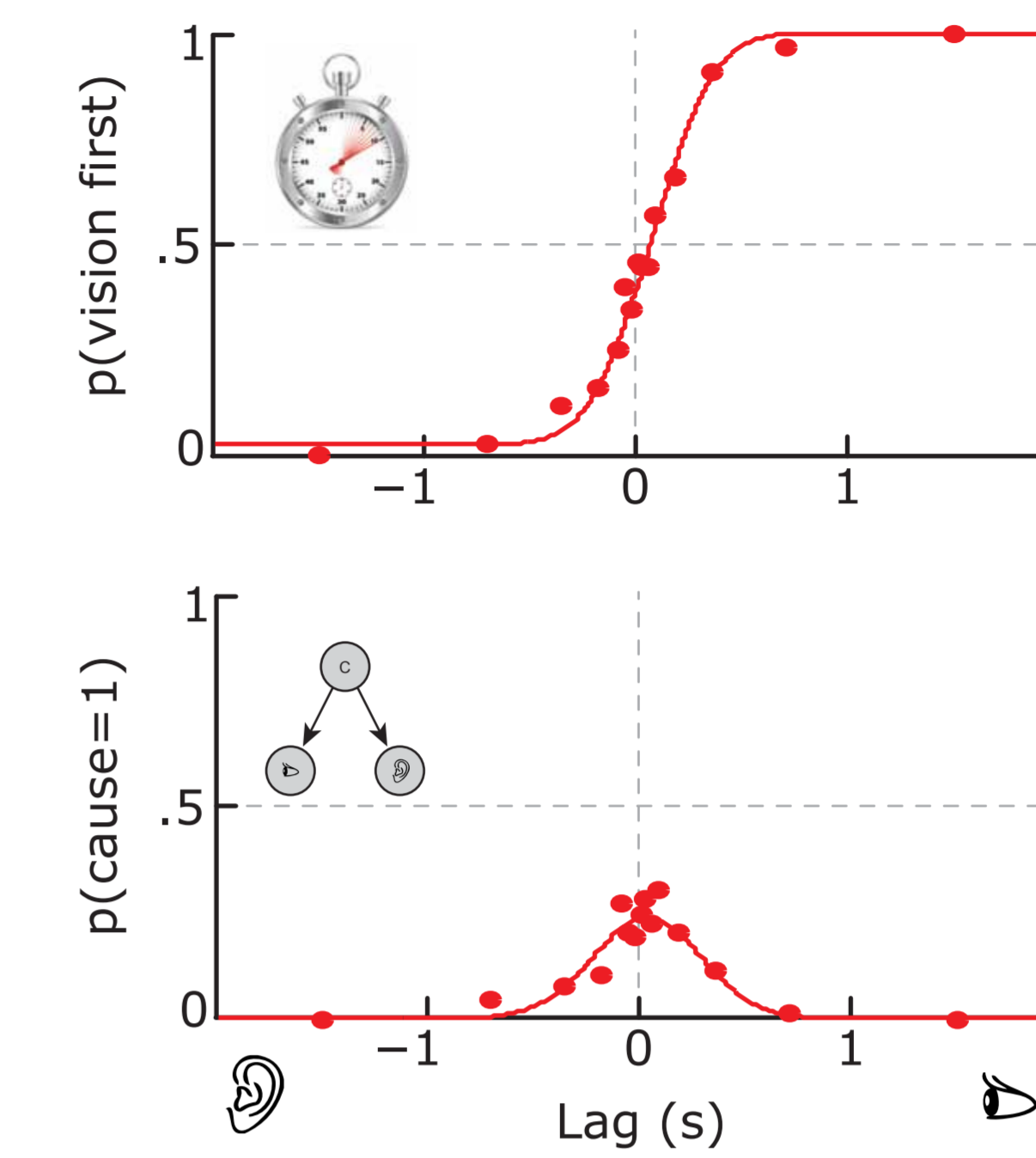
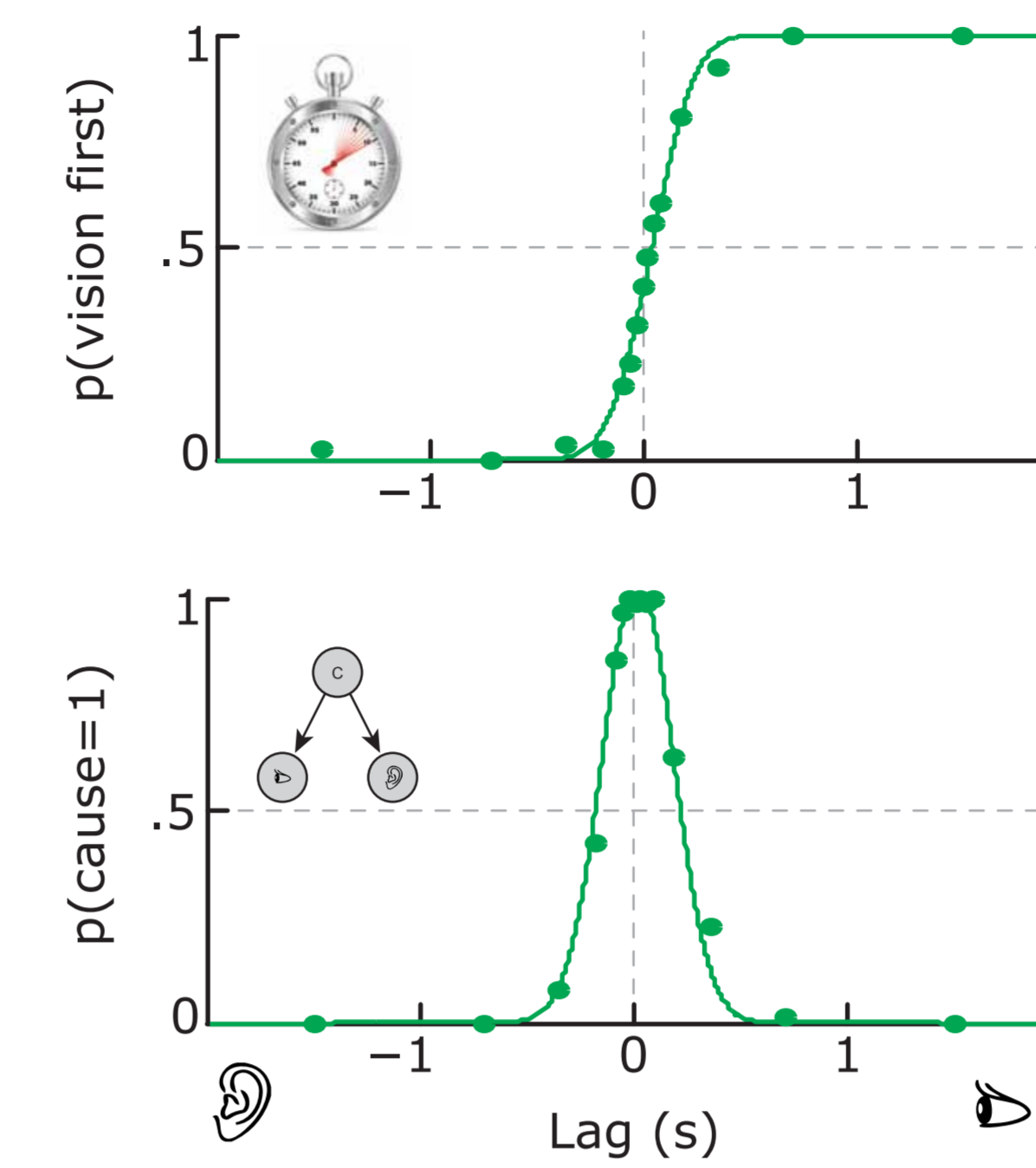
Vision or audition first?

Causality judgment



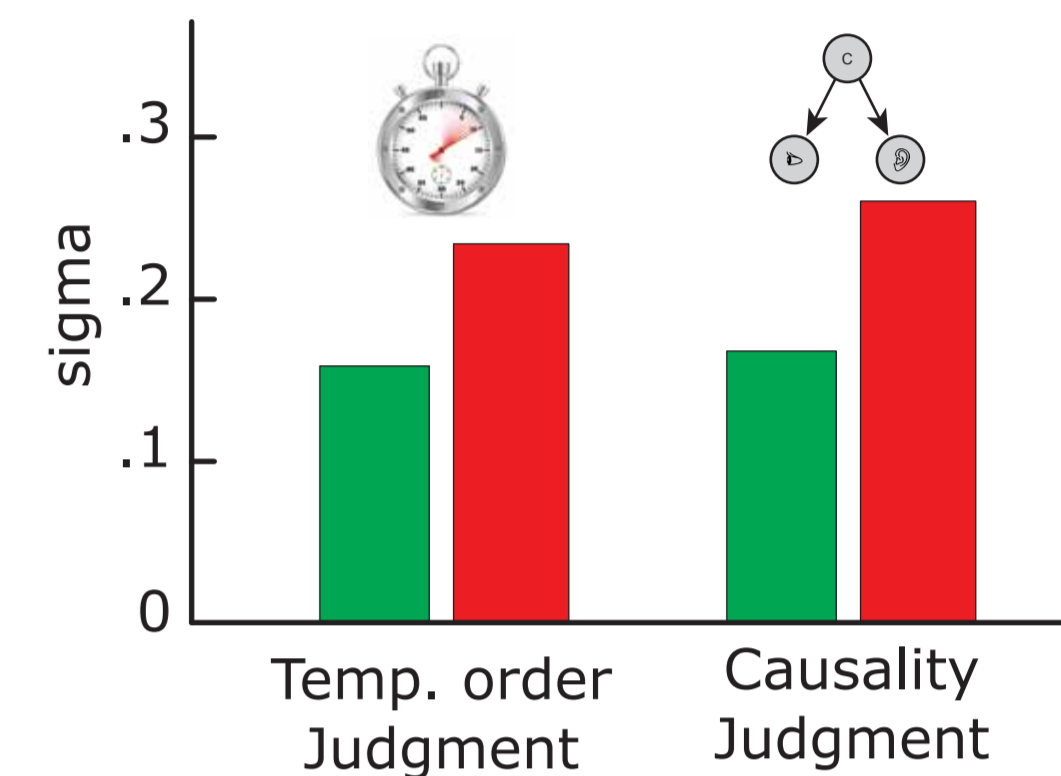
One or two causes?

Psychometric curves analyses



Signals:
— Correlated
— Uncorrelated

Sensitivity to temporal lags

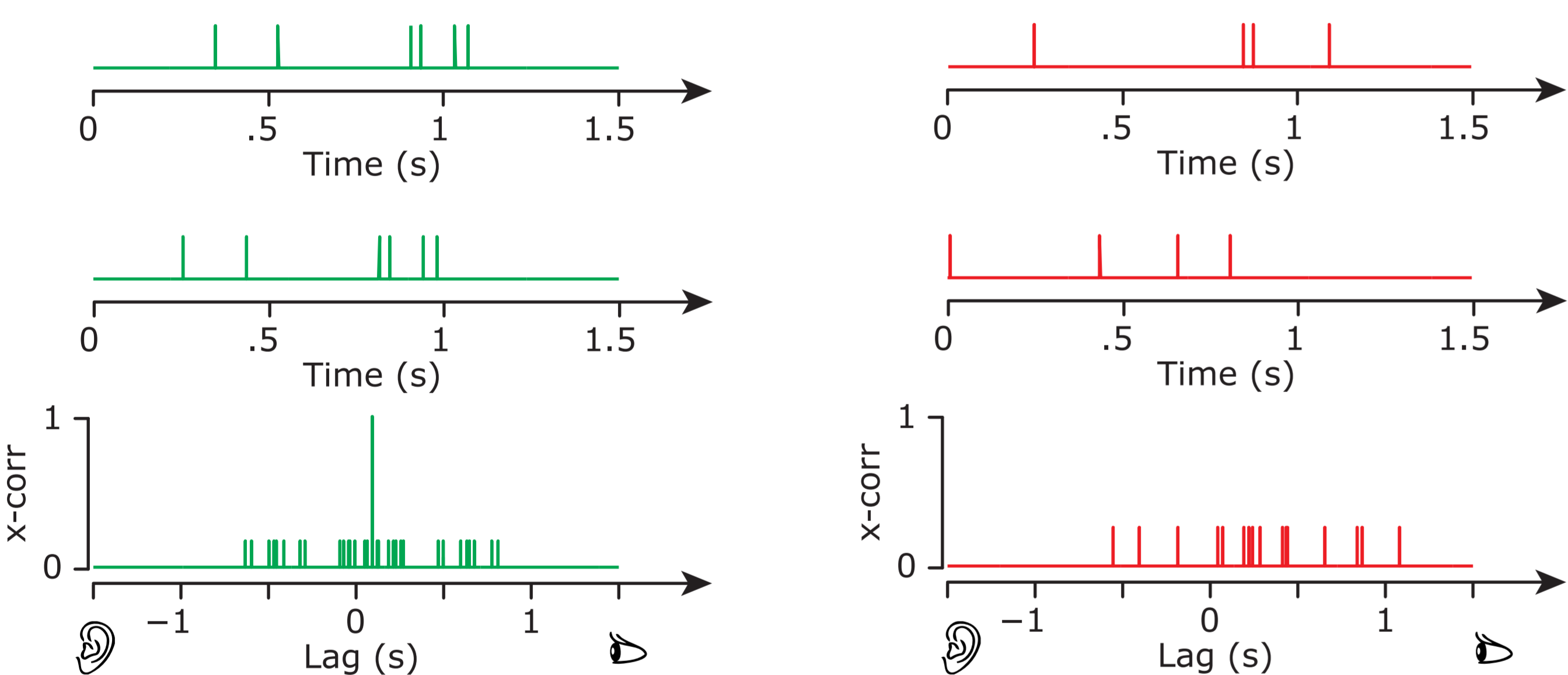


Stimuli

Trains of audiovisual impulses (flashed & clicks) with a stochastic temporal structure.

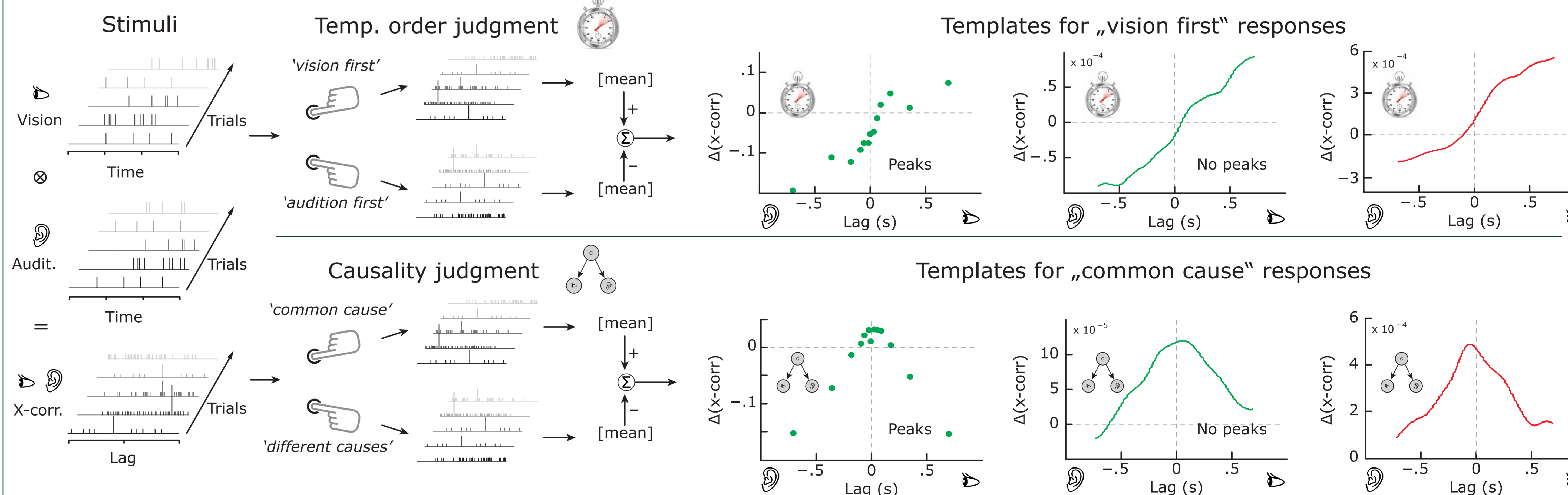
Correlated

Uncorrelated



Audiovisual lags=[-1.5, -0.7, -0.35, -0.18, -0.09, -0.06, -0.03, 0; 0.03, 0.06, 0.09, 0.18, 0.35, 0.7, 1.5] (negative: audition leads)

Reverse correlation analyses



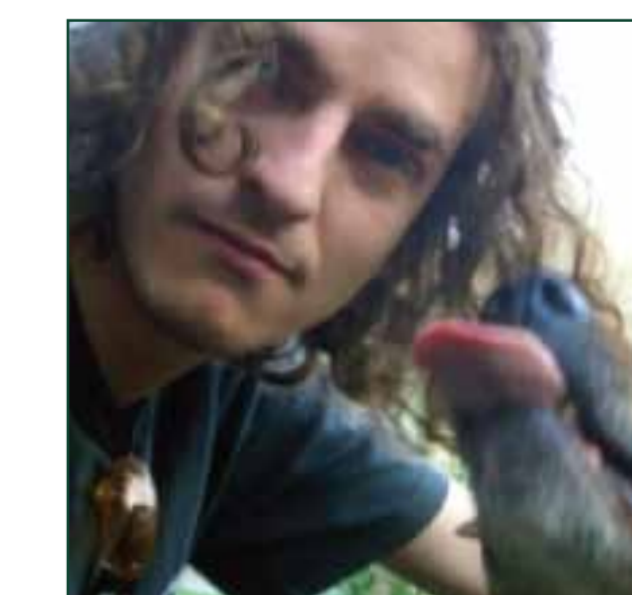
Conclusions

- Higher sensitivity to temporal delays for correlated signals in both causality and temporal order judgment
- Sensitivity to temporal delays is virtually identical in the temporal order judgment and causality judgment
- The sign of the lag of the cross-correlation peak correlates with temporal order judgments
- The amount of cross-correlation at short lags correlates with causality judgments

The present results demonstrate the primary role of cross-correlation cues in multisensory temporal processing

References

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- Parise, C., Harrar, V., Ernst, M. O. & Spence, C. Cross-correlation between auditory and visual signals promotes multisensory integration. *Multisensory Research* 26, 307-316 (2013).
- Ahumada, A. Perceptual classification images from Vernier acuity masked by noise. *Perception* 26, 1831-1840 (1996).
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