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Selective attention and adaptation in an audio-visual temporal order judgment task



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1. Introduction - Sensory events timing

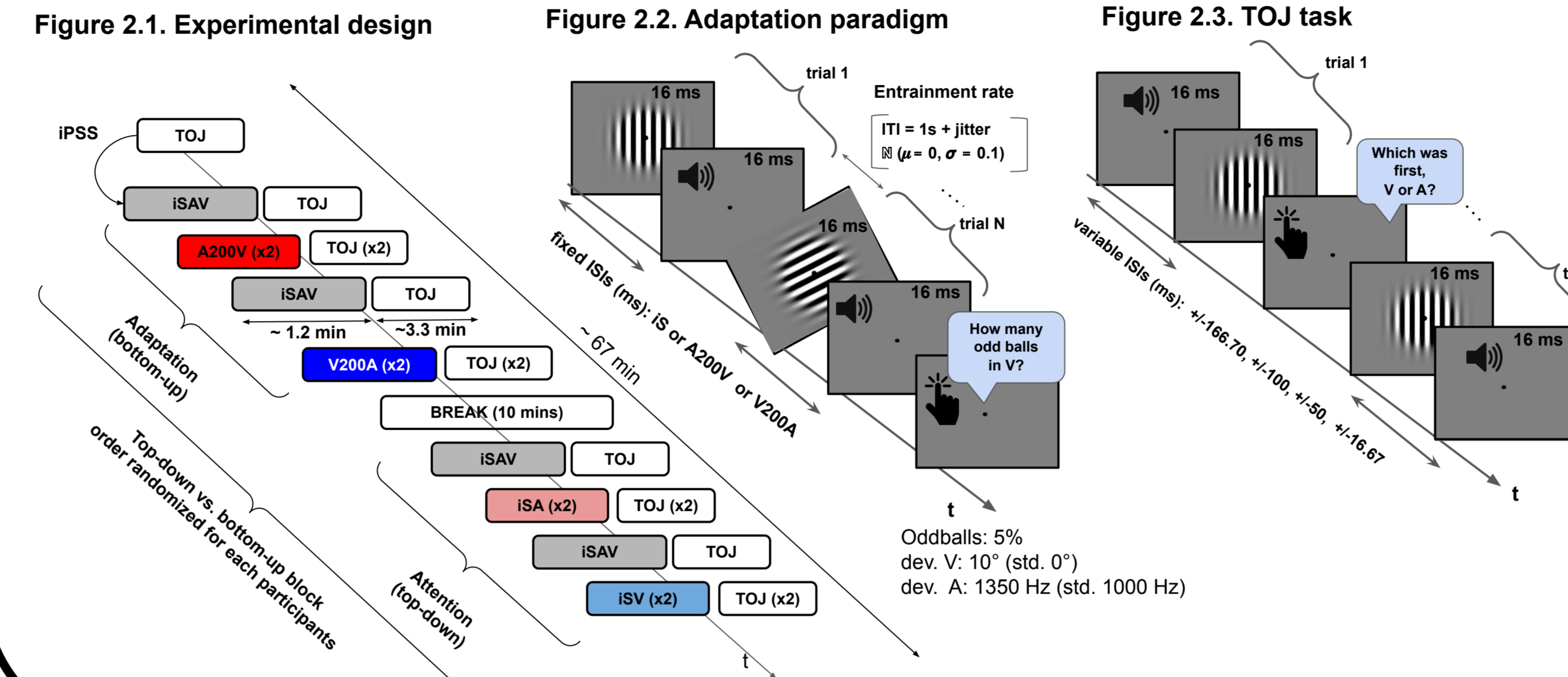
What we **know** from the psychophysical experiments?

- TOJ/SJ tasks:** Humans could tell the temporal order and simultaneity between sensory events [Hirsh and Sherrick 1961; Dixon and Spitz 1980; Sternberg and Knoll 1973]
- Prior entry:** Titchener (1908, p. 251): "the object of attention comes to consciousness more quickly than the objects which we are not attending to." [Spence, Shore, and Klein, 2001]
- Temporal recalibration:** By repeated exposures to desynchronized AV stimuli (eg., A200V), point of subjective simultaneity (PSS) shifts towards sound. [Fujisaki et al, & Vroomen et al 2004]
- Rapid recalibration:** Shift in PSS on trial-by-trial basis [Van der Burg et al 2013; 2015]

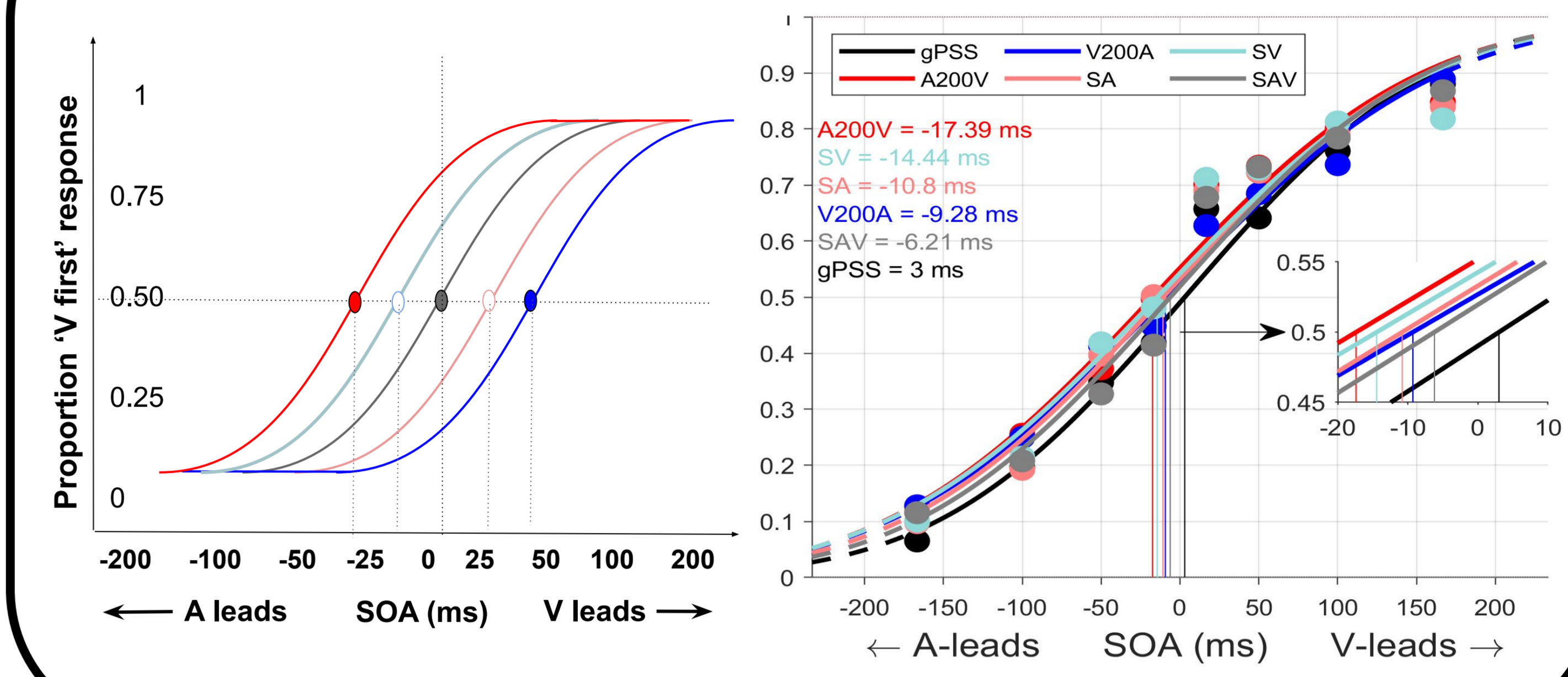
What we **don't know** from the psychophysical experiments?

- The role of **selective attention** and top-down mechanisms (cf. prior entry effect).
 - The role of **subjectivity** and inter-subject variability in the simultaneity perception (iPSS)
- To answer these, we used an experimental design of a previous study [Kosem et al 2014] which was modified to suit the current research questions.

2. Materials and Methods



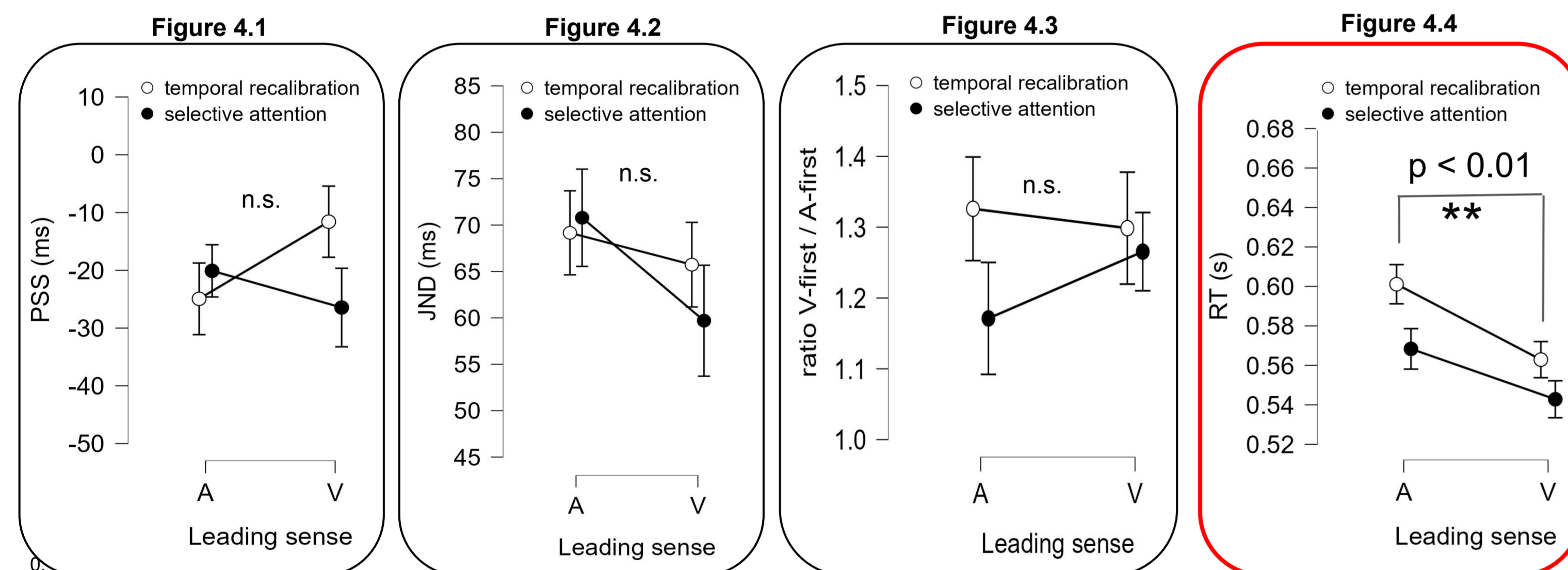
3. Predictions and actual outcomes (N = 23)



4. Results (N = 23) and Discussions

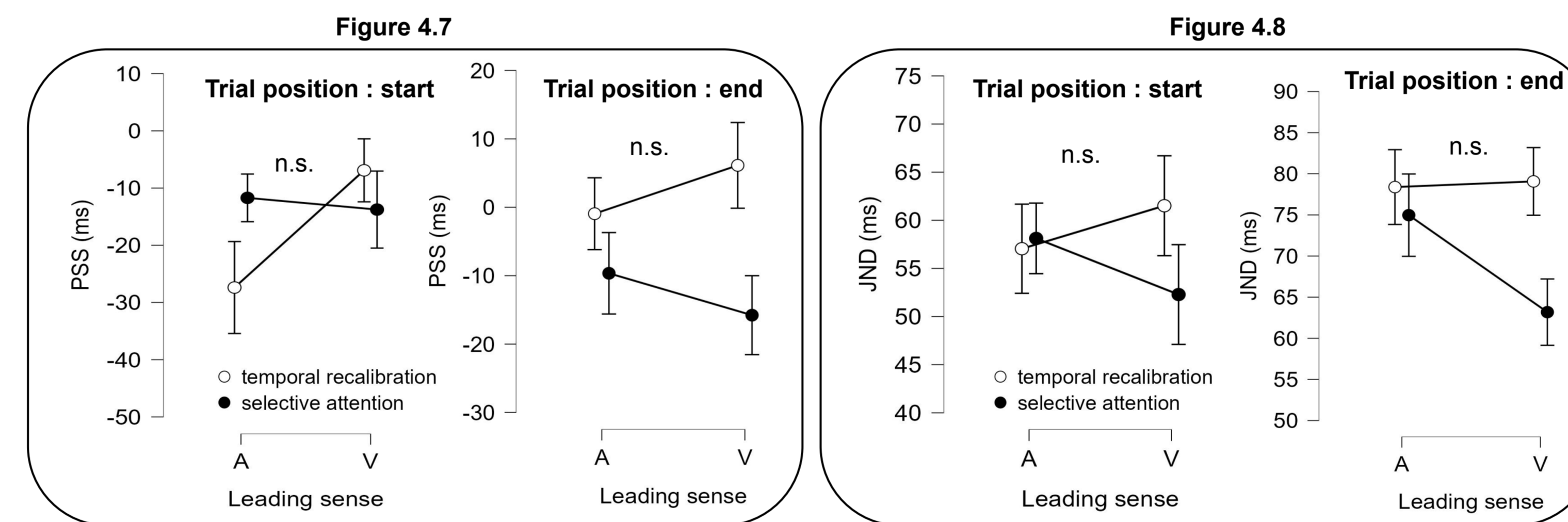
4a. 2x2 repeated measures ANOVA (experimental conditions (2); leading sense (2))

Factor 1: experimental conditions (temporal recalibration or selective attention)
 Factor 2: leading sense (A or V)
 Dependent variables: PSS, JND, response ratio (V-first / A-first)

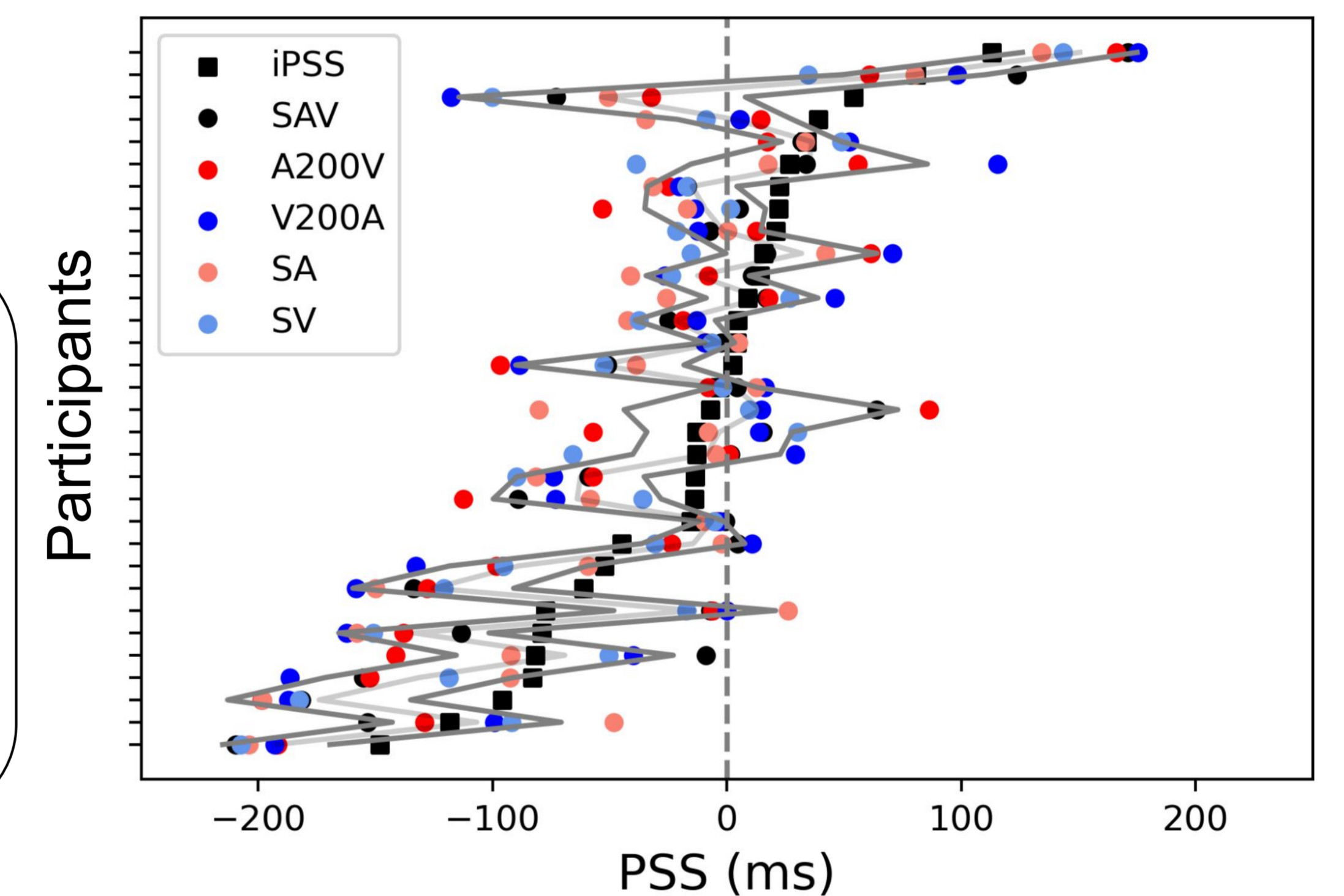


4c. 2x2x2 repeated measures ANOVA (experimental conditions (2); leading sense (2); trial position (2))

Factor 1: experimental conditions (temporal recalibration or selective attention)
 Factor 2: leading sense (A or V)
 Factor 3: Trial position: start or end
 Dependent variables: PSS, JND, response ratio (V-first / A-first) (not shown here)



Distribution of PSS across conditions across participants



4b. 2x2x2 repeated measures ANOVA (experimental conditions (2); leading sense (2); previous trial (2))

Factor 1: experimental conditions (temporal recalibration or selective attention)
 Factor 2: leading sense (A or V)
 Factor 3: Previous trial (t - 1): A or V
 Dependent variables: PSS, JND (not shown here), response ratio (V-first / A-first)

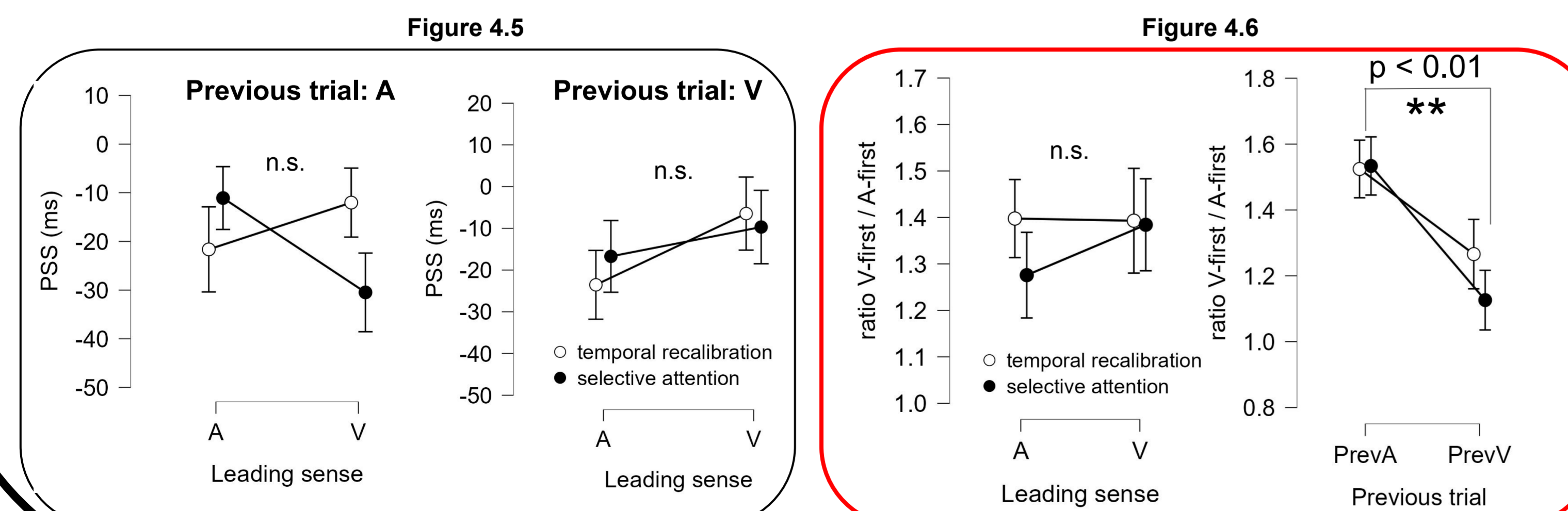
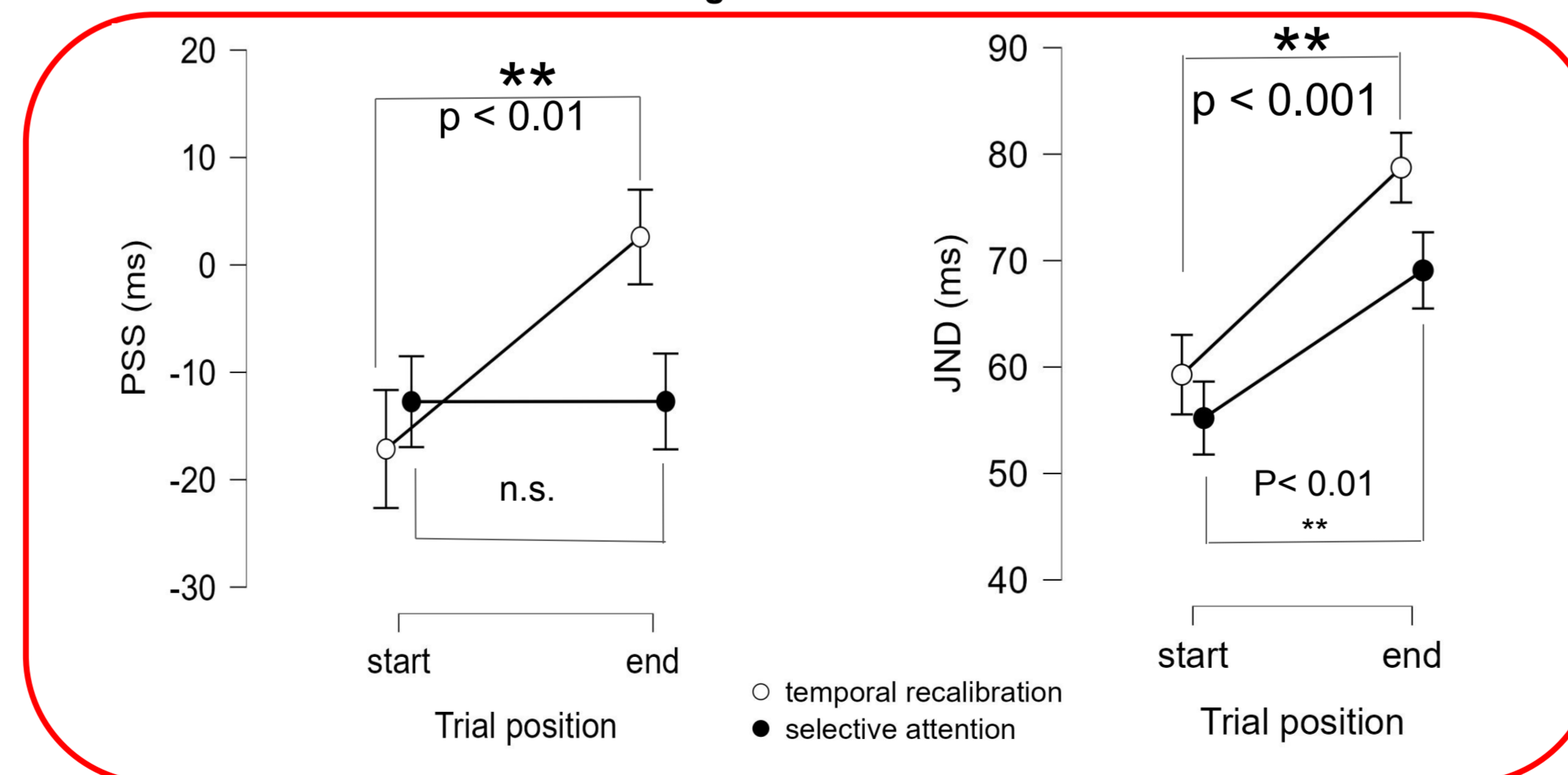


Figure 4.9



Discussions

- The results of classical temporal recalibration effect (Fujisaki et al 2004 and Vroomen et al 2004) were not replicated (but see Yamamoto et al., 2012, Kosem et al 2014, Ikumi and Soto-Faraco 2014, etc)
- The results of rapid recalibration effect (van der Burg et al 2013) were not replicated. (see Recio et al 2019)
- The results of sequential (or progressive) effect is statistically significant! Significant effect seen in both PSS and JND for A200V, V200A, while a significant effect seen only in JND for SA, SAV conditions!
- Additional control experiment is needed to make solid conclusions.

Limitations

- Using TOJ instead of SJ task.
- Response bias of the participants: the choice of button press were not randomized across participants.
- There could be a saliency mis-matching of audio-visual stimuli.

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