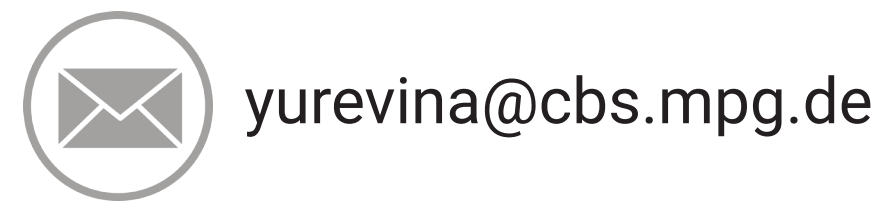


# Effects of pain location expectations on pain discrimination

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## Introduction

- In any sensory domain, perception benefits from prior knowledge being combined with incoming sensory input<sup>1,2</sup>.
- Across different modalities, expectations can improve performance on perceptual discrimination tasks.
- Expectation effects are particularly strong in pain (e.g. placebo effect), but so far have only been assessed for “simple” effects such as changes in the perceived intensity.
- Research question: can expectations also improve perceptual discrimination between different pain stimuli?**
- To probe this question, we translated a paradigm from vision science<sup>3,4</sup> (where a cue indicated the more likely upcoming stimulus) to the domain of nociception and assessed perceptual discrimination performance for heat-pain stimuli.

## Methods

### Participants:

- N = 43 (21 female)

### Stimuli:

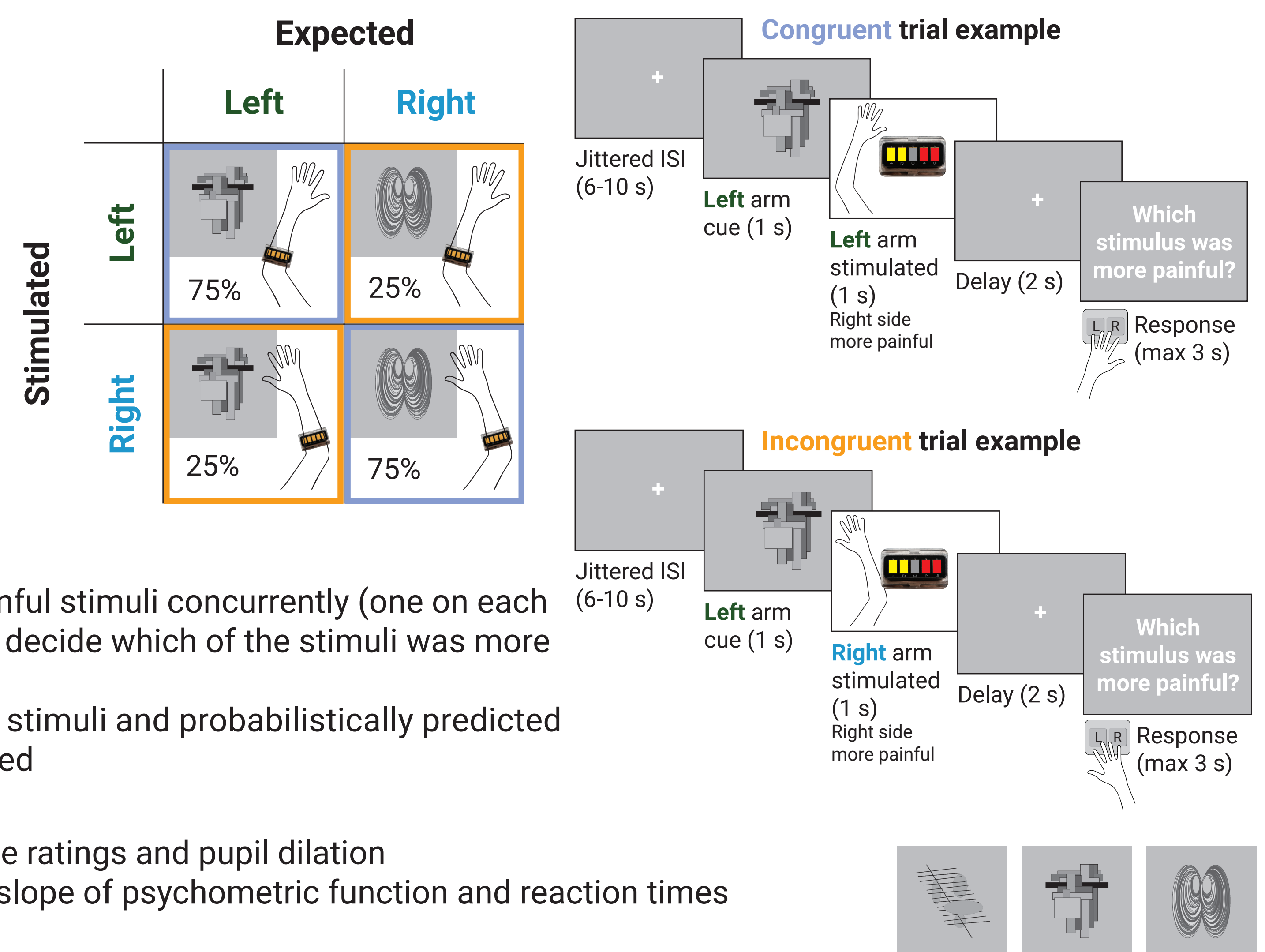
- Abstract visual cues
- Heat-pain stimuli to fore-arms
- Temperatures calibrated for each participant
- Five temperatures spaced between pain threshold and moderate pain

### Experimental paradigm:

- Participants received two painful stimuli concurrently (one on each side of a forearm) and had to decide which of the stimuli was more painful
- Visual cues preceded painful stimuli and probabilistically predicted which arm would be stimulated

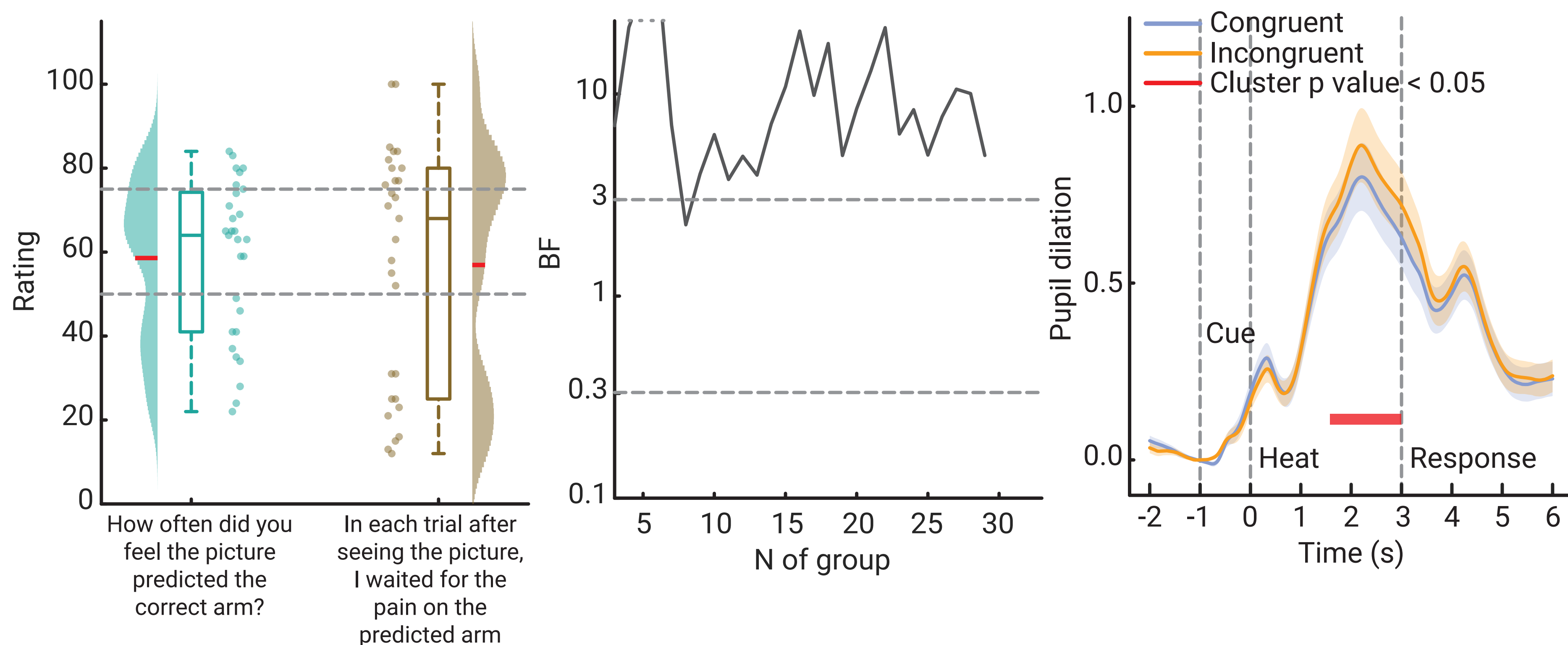
### Analysis:

- Expectation effects: subjective ratings and pupil dilation
- Discrimination performance: slope of psychometric function and reaction times



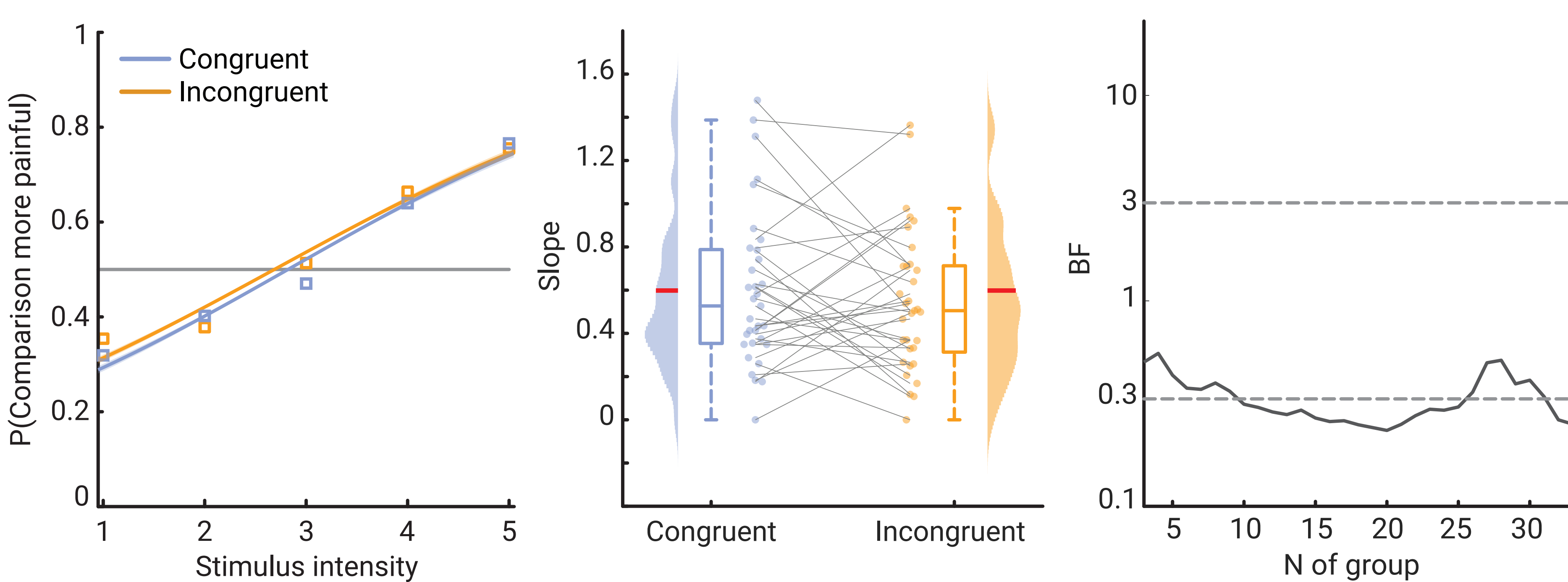
## Results

### 1 Expectation effects



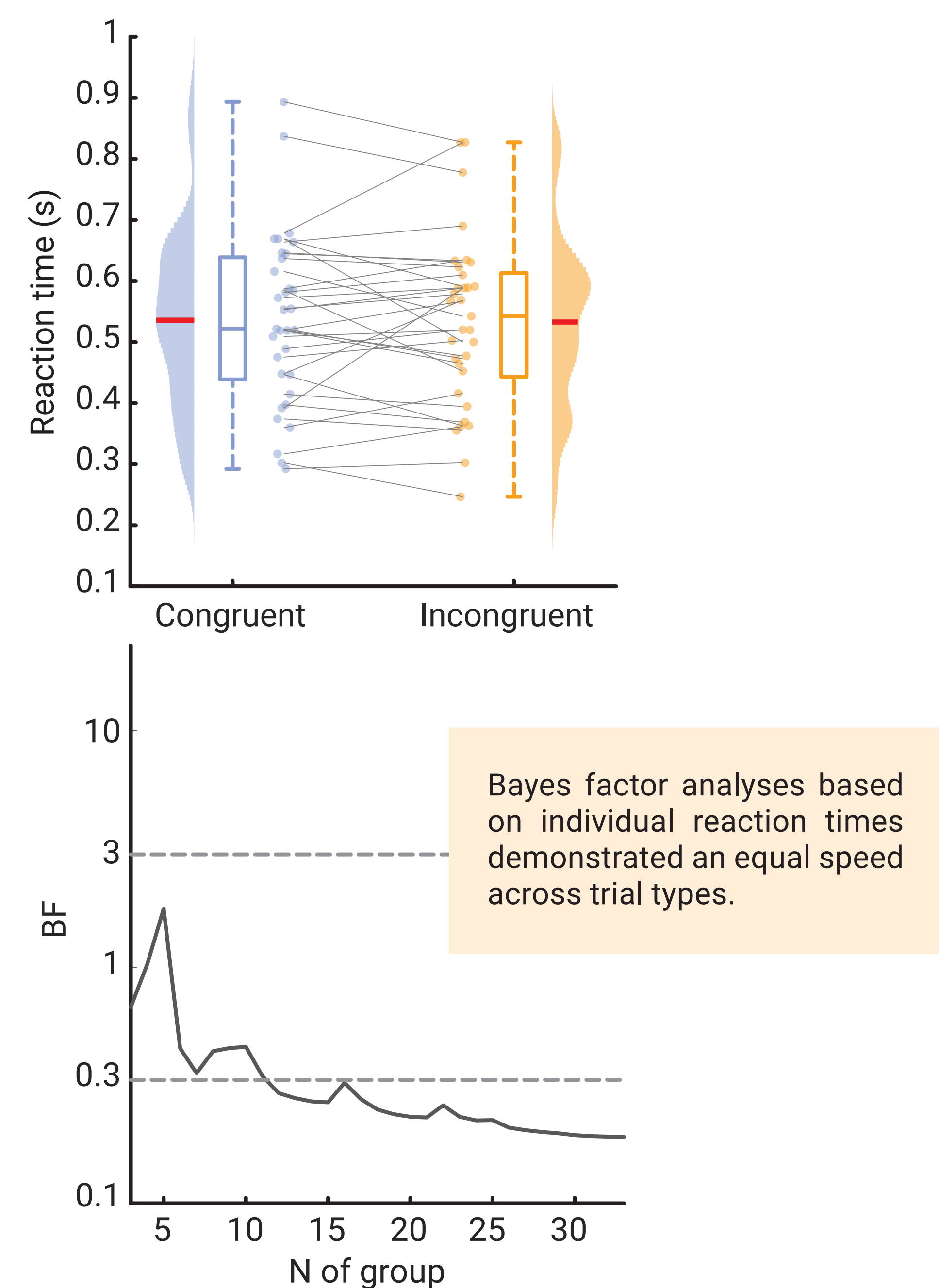
Across the group, there was a clear effect of expectation in the subjective ratings (cue-outcome prediction). Pupil dilation in response to pain was larger when pain occurred at an unexpected location (incongruent trials).

### 2 Perceptual discrimination performance - accuracy



Group psychometric functions showed equal discrimination performance (similar slopes) across trial types, which is statistically supported by Bayes factor analyses based on individual slope values.

### 3 Perceptual discrimination performance - speed



Bayes factor analyses based on individual reaction times demonstrated an equal speed across trial types.

## Discussion

- We observed robust expectation effects in both subjective ratings of cue-stimulus predictions (although participants underestimated the true ratio) and pain-induced pupil dilation responses (larger for unexpected location, mirroring prediction error signals).
- Despite our paradigm eliciting expectations, Bayesian analyses provided evidence for equal perceptual discrimination performance for expected and unexpected locations (as observed in both psychometric function slopes and reaction times).
- Our results suggest that valid foreknowledge regarding the location of impending pain does not boost discrimination performance for the cued location, which might be due to the “orthogonality” of the cue with respect to the task-relevant stimulus features.
- Further research could investigate if more task-relevant expectations would help perceptual discrimination, e.g. expectations about the intensity of one of the stimuli, rather than the overall location.

## References

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