Learning faces as concepts rather than percepts improves face recognition by engaging the social brain network

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Background

Faces can be described both by their social and perceptual attributes

Conceptual - Social
Intelligent?
Trustworthy?
Dominant?

Perceptual
Hair color?
Eye color?
Round face?

Previous findings have shown that making social, but not perceptual, evaluations during learning, enhance face recognition [1]

Two hypotheses were proposed to account for this conceptual-social benefit in face recognition:

The feature elaboration hypothesis

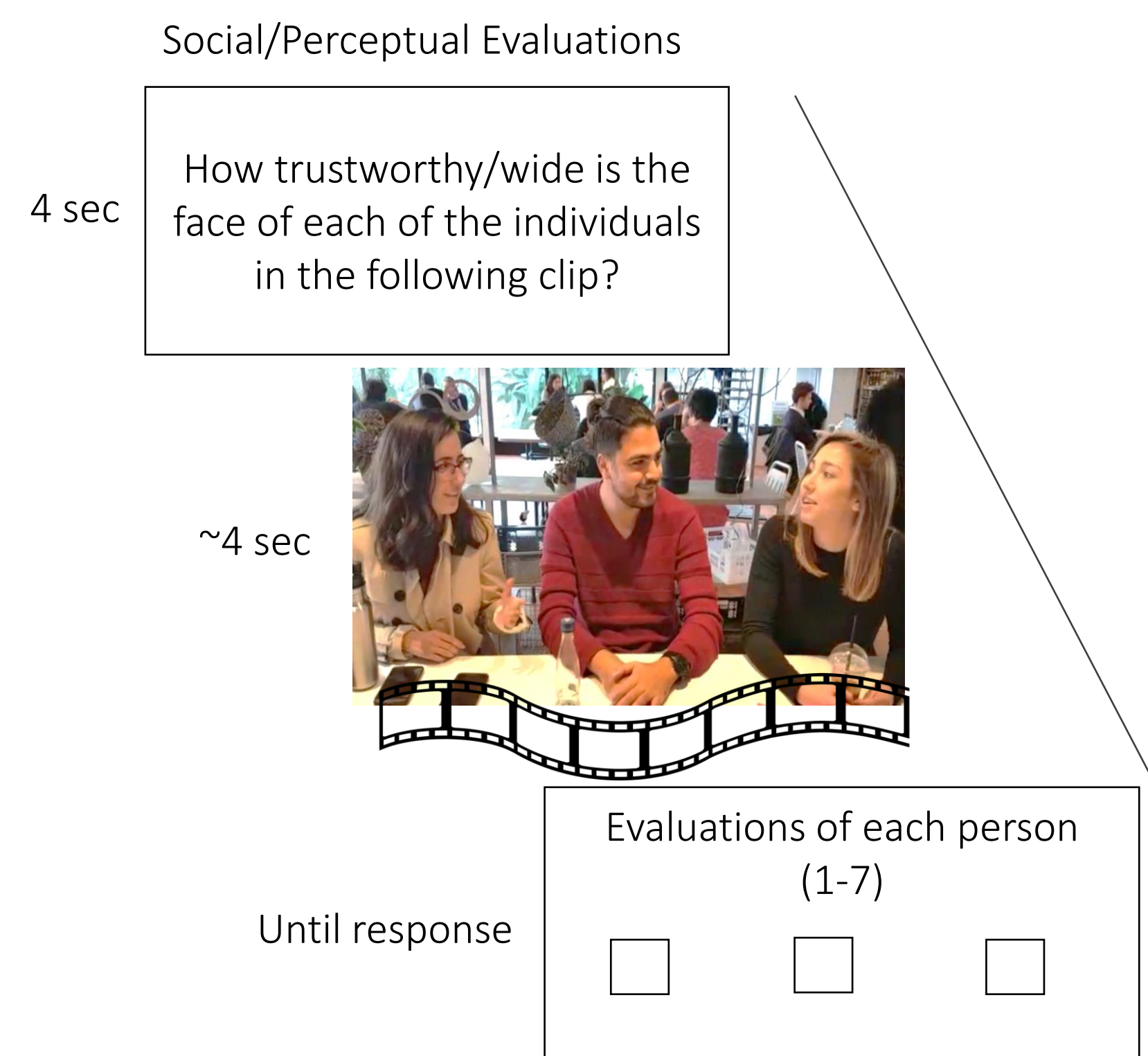Social evaluations encourage elaborated processing of perceptual information from faces

The conceptual-social hypothesis

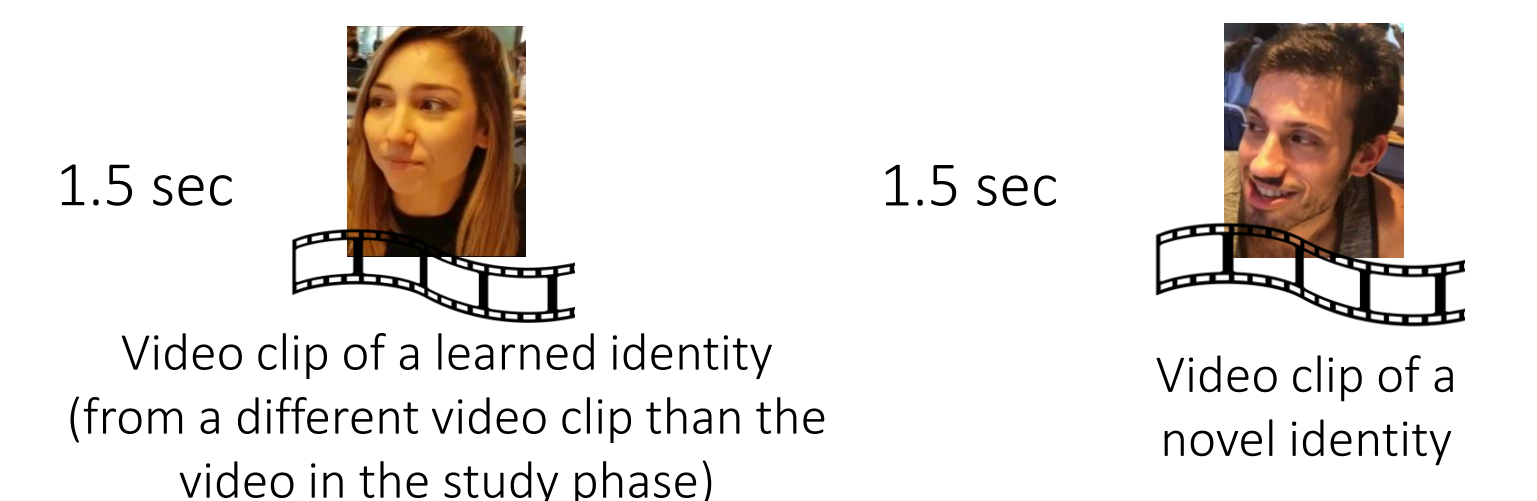Social evaluations convert faces to socially-meaningful representations

To decide between these two hypotheses we performed an fMRI experiment that examines the representation of socially and perceptually learned-faces in social and perceptual brain areas.

Experimental Design

<u>Prior to fMRI scan – Familiarization/Learning phase</u>

Social/Perceptual Evaluations

4 sec — How trustworthy/wide is the face of each of the individuals in the following clip?

~4 sec

Until response — Evaluations of each person (1-7)

<u>During the fMRI scan - Recognition phase Old\New Task</u>

1.5 sec — Video clip of a learned identity (from a different video clip than the video in the study phase)

1.5 sec — Video clip of a novel identity

Behavioural results:
A conceptual-social benefit in face recognition
Better recognition of socially than perceptually learned faces

Condition: ■ Conceptual ■ Perceptual ■ New
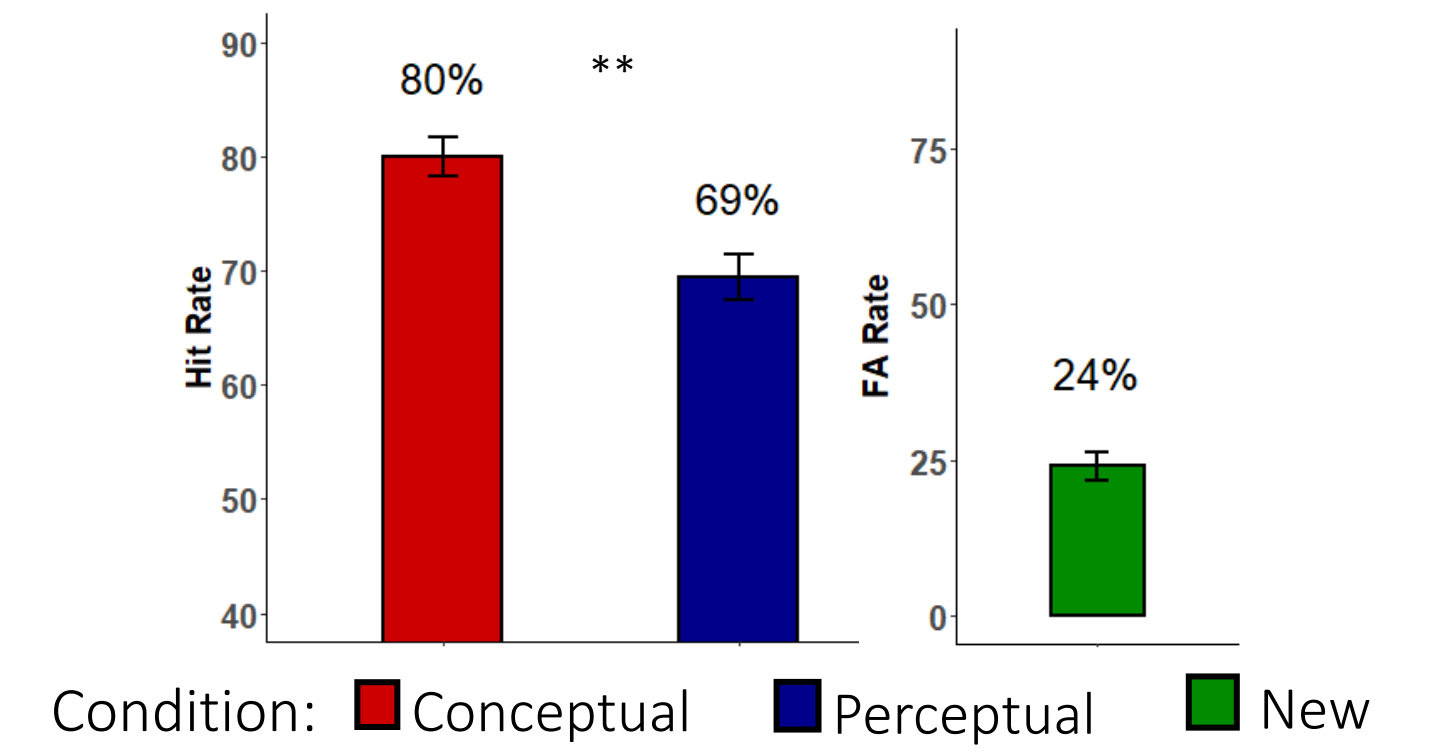
Paired sample T-test with condition as factor: p <0.01. Results across different runs showed the same pattern

fMRI Results

We used functional localizers to define perceptual and social brain areas in each individual participant.
We compared the fMRI response <u>during the recognition task</u> between faces that were evaluated conceptually or perceptually <u>during the learning phase</u>.
Functional localizers included:
1) A face-object localizer to define face-selective areas.
2) A Social-Perceptual Evaluation (SPE) localizer in which participants evaluated faces socially or perceptually : Social > Perceptual brain areas and Perceptual > Social brain areas.
3) Social brain areas based on Neurosynth

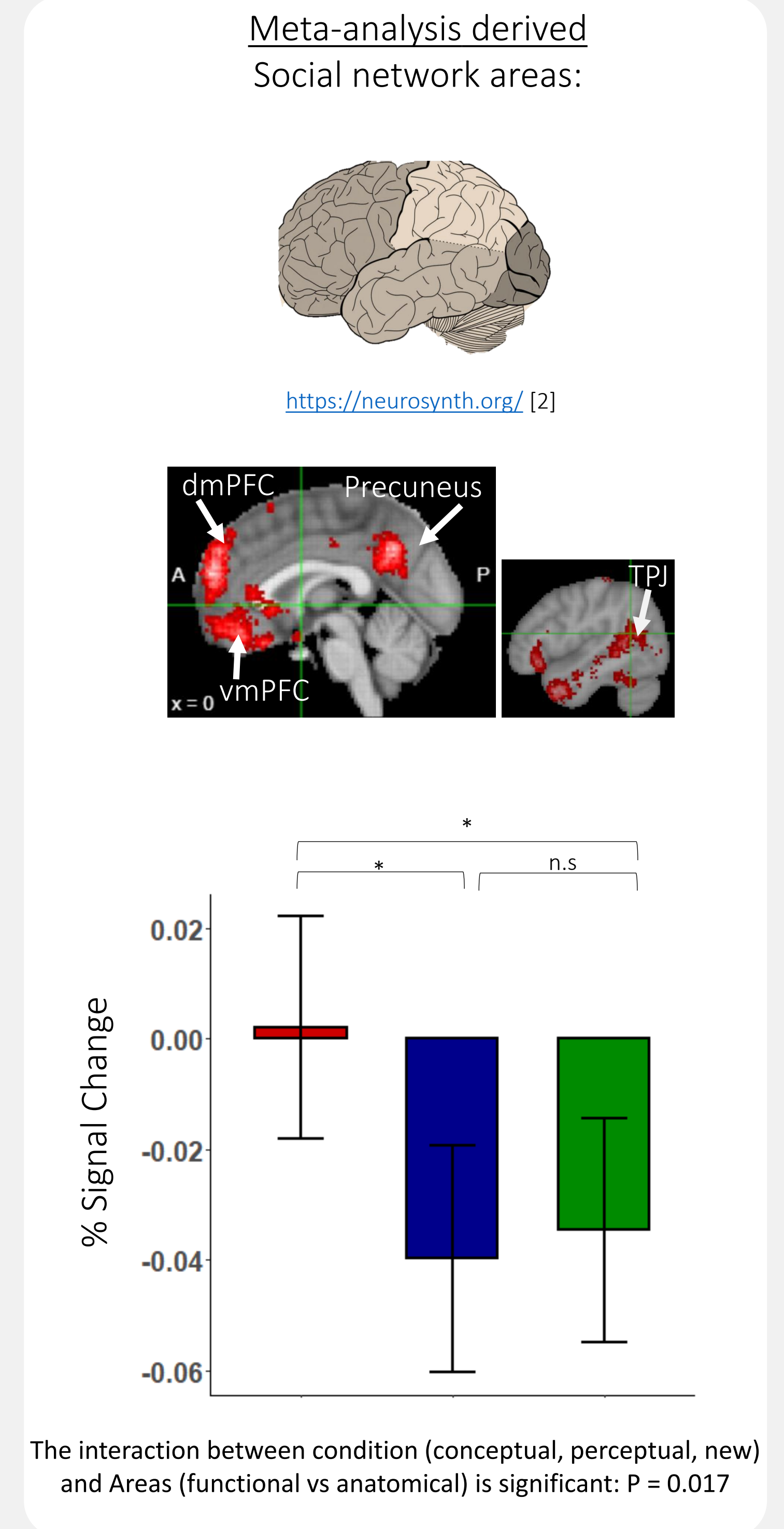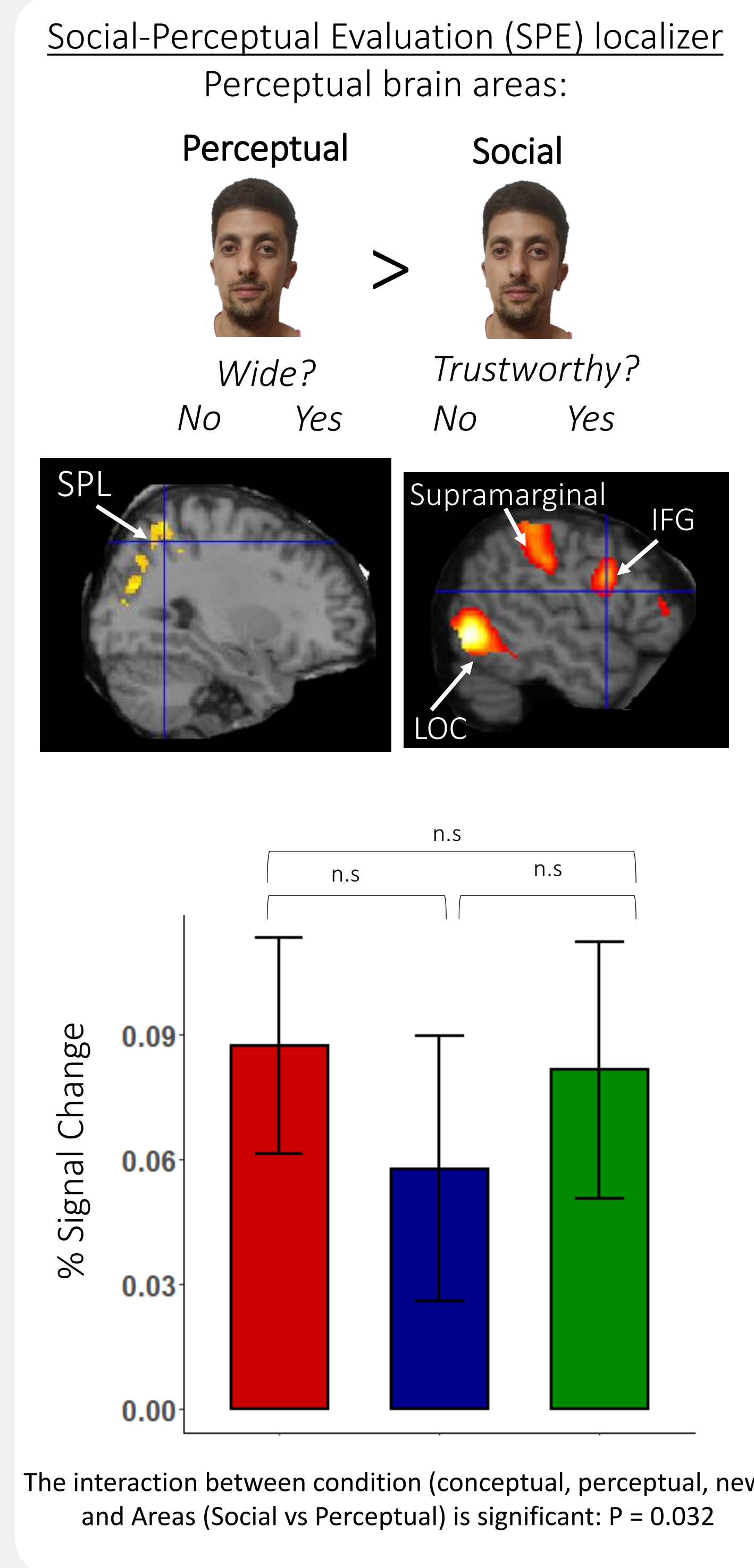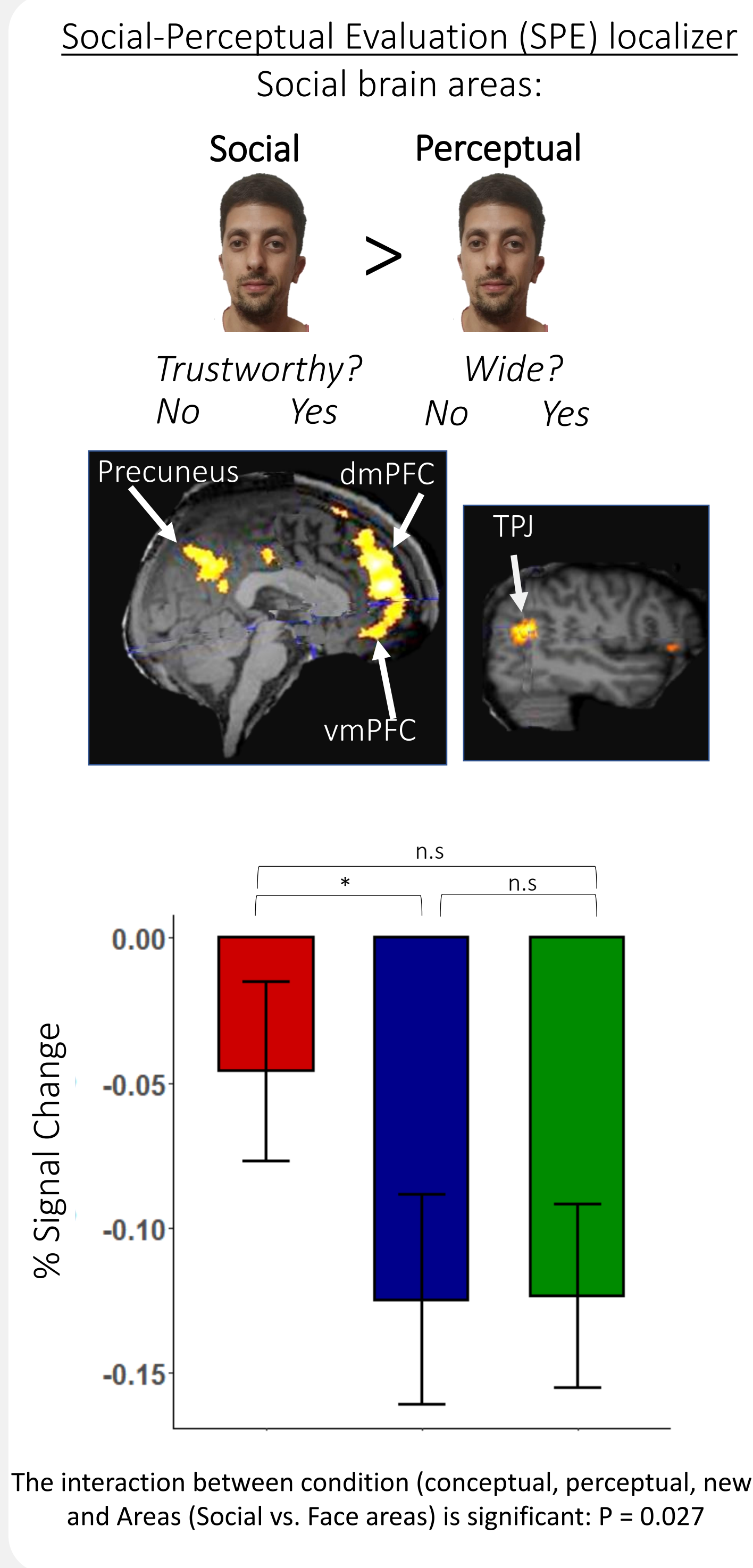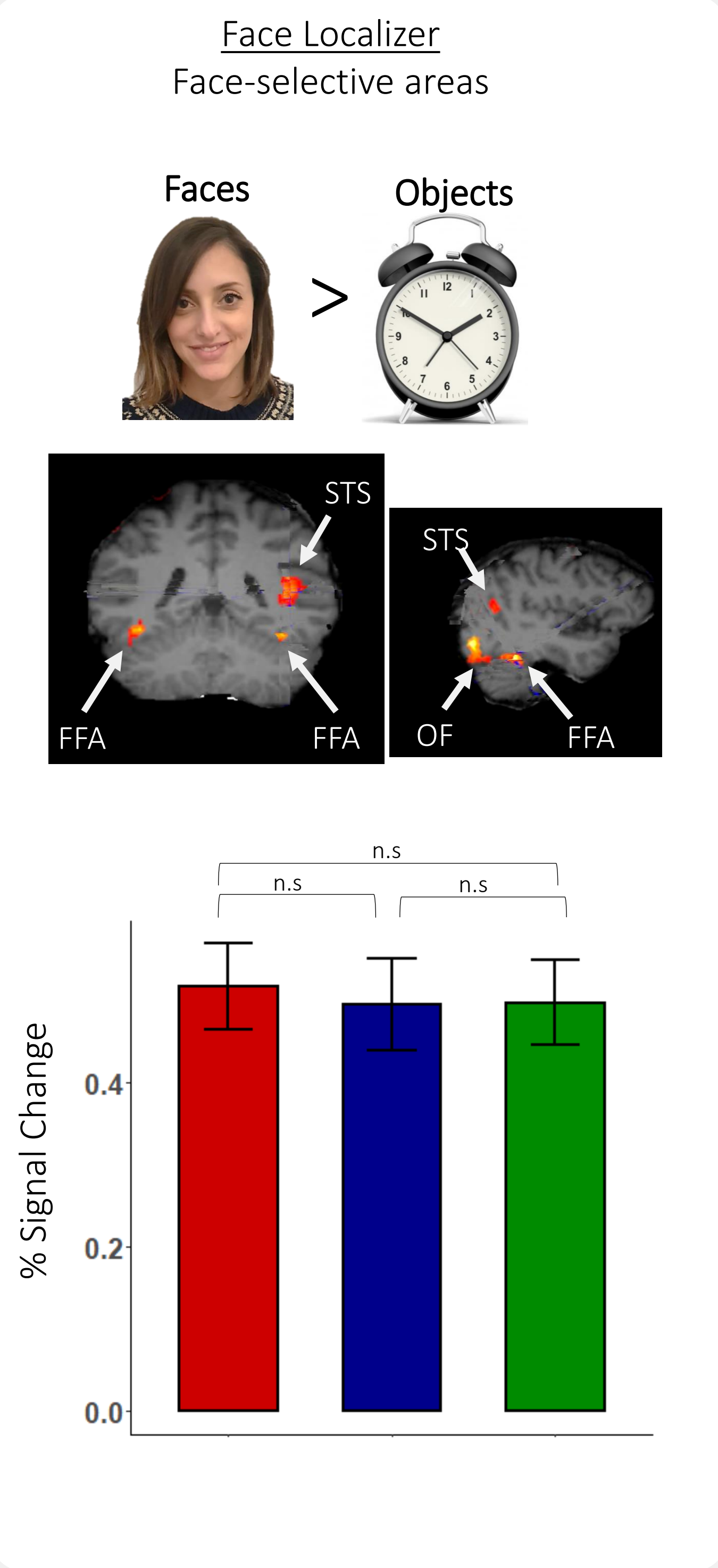| Is the social evaluation benefit mediated by the face-selective areas?	Is the social evaluation benefit mediated by the social-network areas?	Does the similarity between the localizer task and the recognition task account for the social effect?	Is the social evaluation effect specific to the areas extracted from our social localizer task?
No	**Yes**	**No**	**No**

Face Localizer
Face-selective areas

Faces > Objects

Social-Perceptual Evaluation (SPE) localizer
Social brain areas:

Social > Perceptual

Trustworthy? No Yes — *Wide?* No Yes

The interaction between condition (conceptual, perceptual, new) and Areas (Social vs. Face areas) is significant: P = 0.027

Social-Perceptual Evaluation (SPE) localizer
Perceptual brain areas:

Perceptual > Social

Wide? No Yes — *Trustworthy?* No Yes

The interaction between condition (conceptual, perceptual, new) and Areas (Social vs Perceptual) is significant: P = 0.032

Meta-analysis derived
Social network areas:

https://neurosynth.org/ [2]

The interaction between condition (conceptual, perceptual, new) and Areas (functional vs anatomical) is significant: P = 0.017
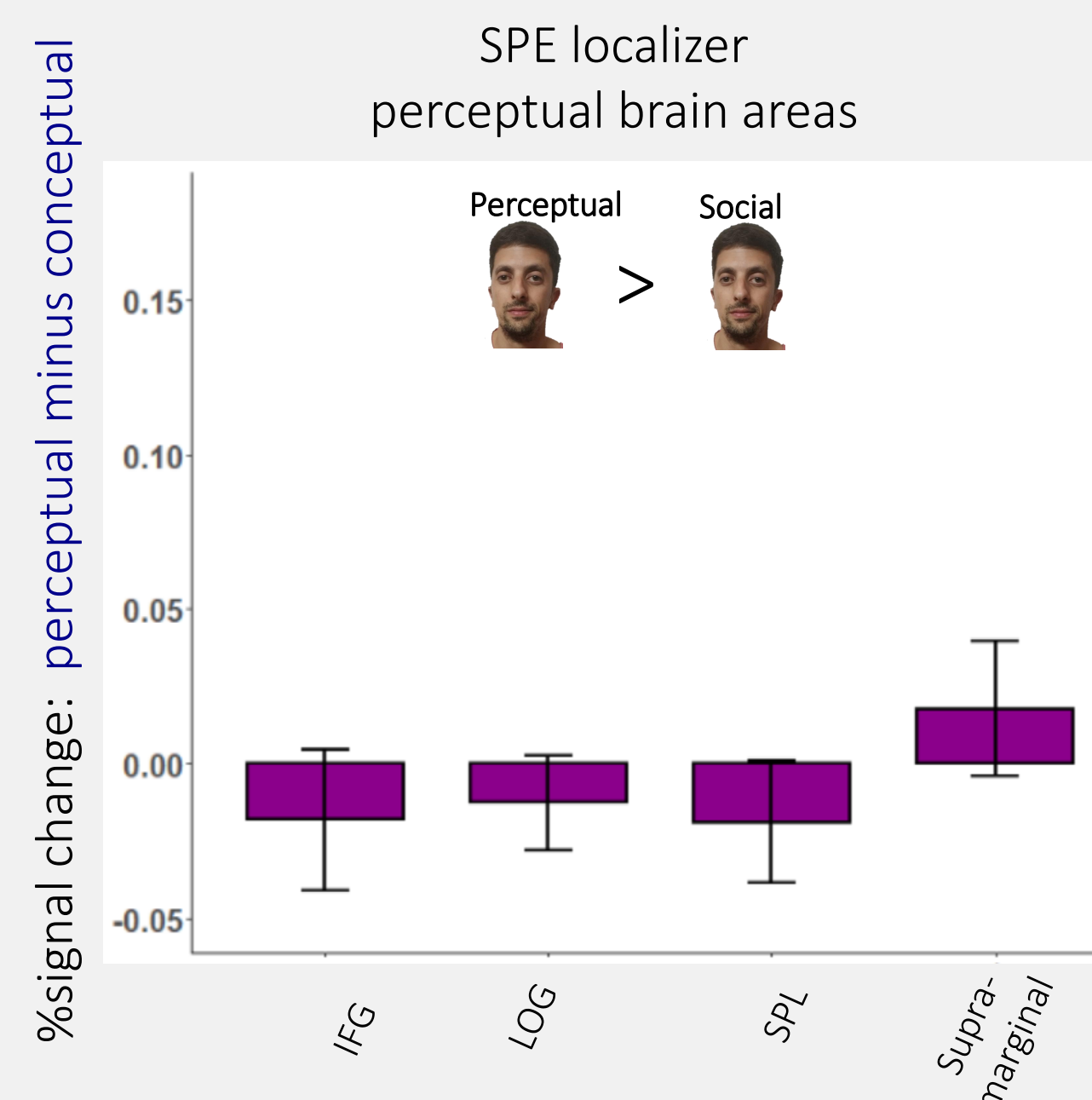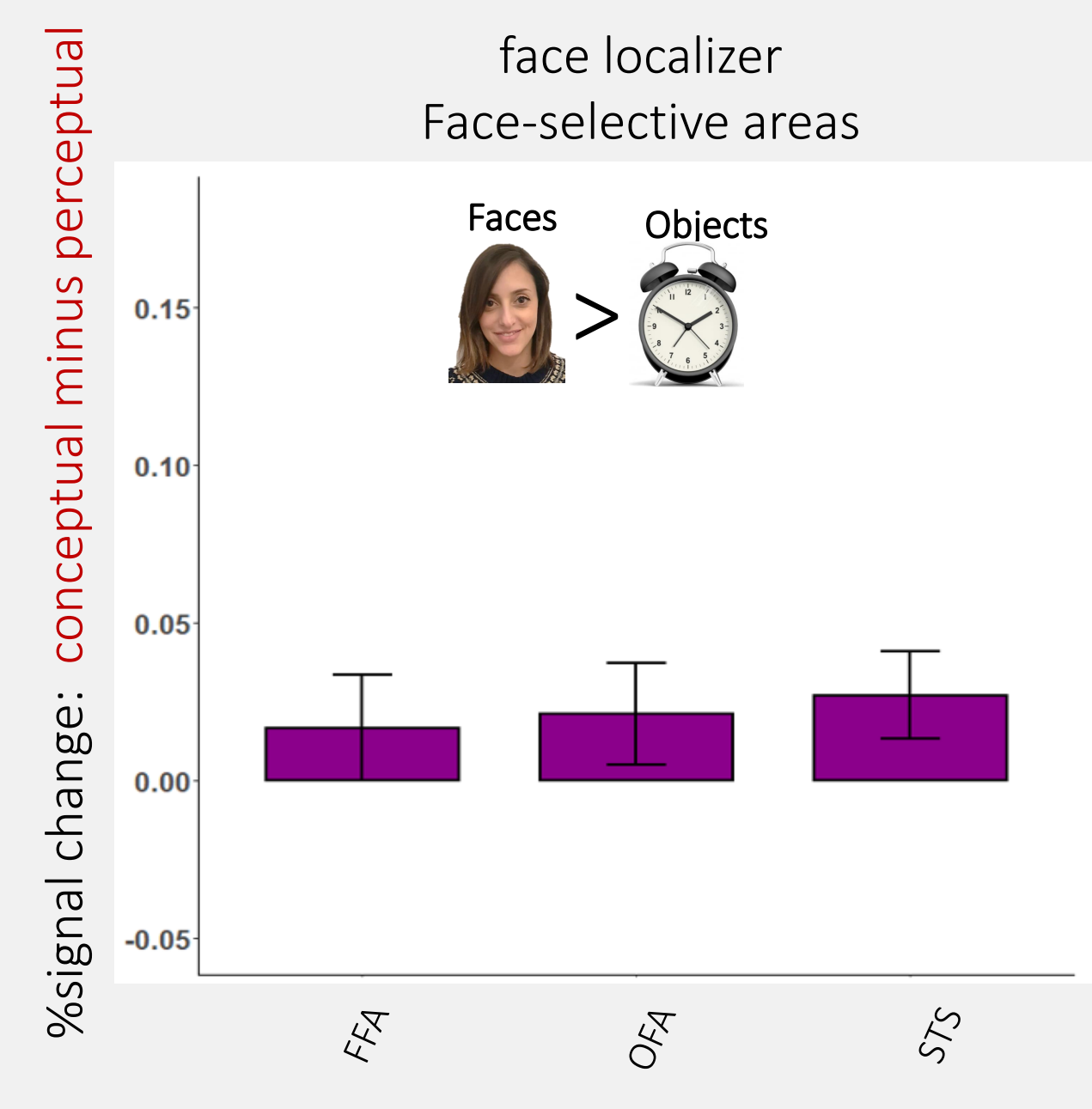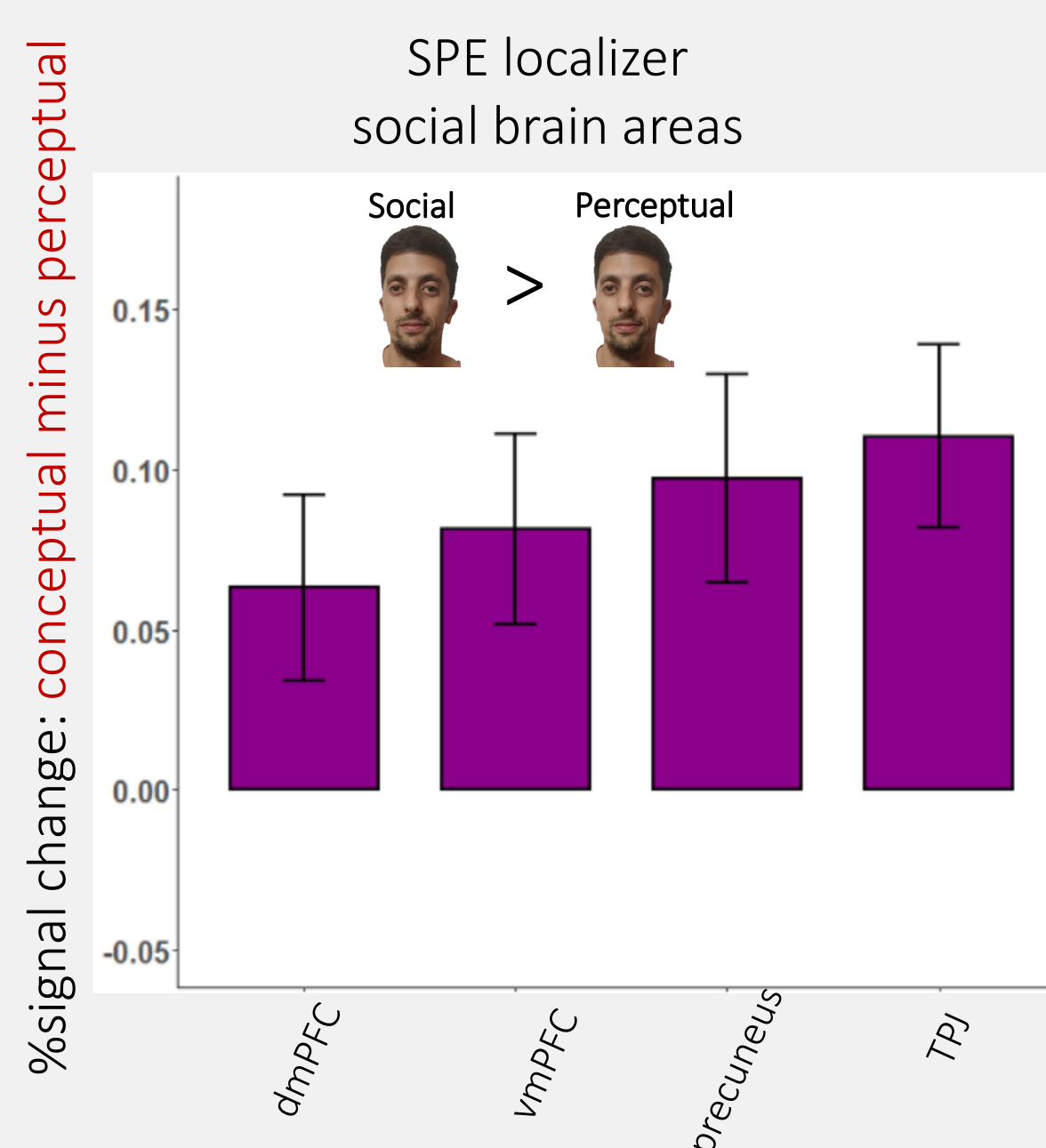
Condition: ■ Conceptual ■ Perceptual ■ New

Repeated measure ANOVA with Condition (conceptual, perceptual, new) as factor for each localizer contrast separately: *p< 0.05

Results across the different ROIs:

SPE localizer social brain areas
Social > Perceptual

face localizer Face-selective areas
Faces > Objects

SPE localizer perceptual brain areas
Perceptual > Social

Conclusions

These results support *The conceptual-social Hypothesis* indicating that the conceptual benefit of face recognition is mediated by social rather than perceptual mechanisms.
We propose that social evaluations during learning convert faces from a perceptual image-based representation to a socially meaningful representation that enhances person recognition

[1] Schwartz & Yovel (2018). Learning Faces as Concepts Rather Than Percepts Improves Face Recognition. [2] Yarkoni, Poldrack, Nichols, Van Essen & Wager (2011). Large-scale automated synthesis of human functional neuroimaging data.