

QUANTIFICATION OF METACOGNITION OF EMOTION: AN EEG AND PUPILLOMETRY STUDY

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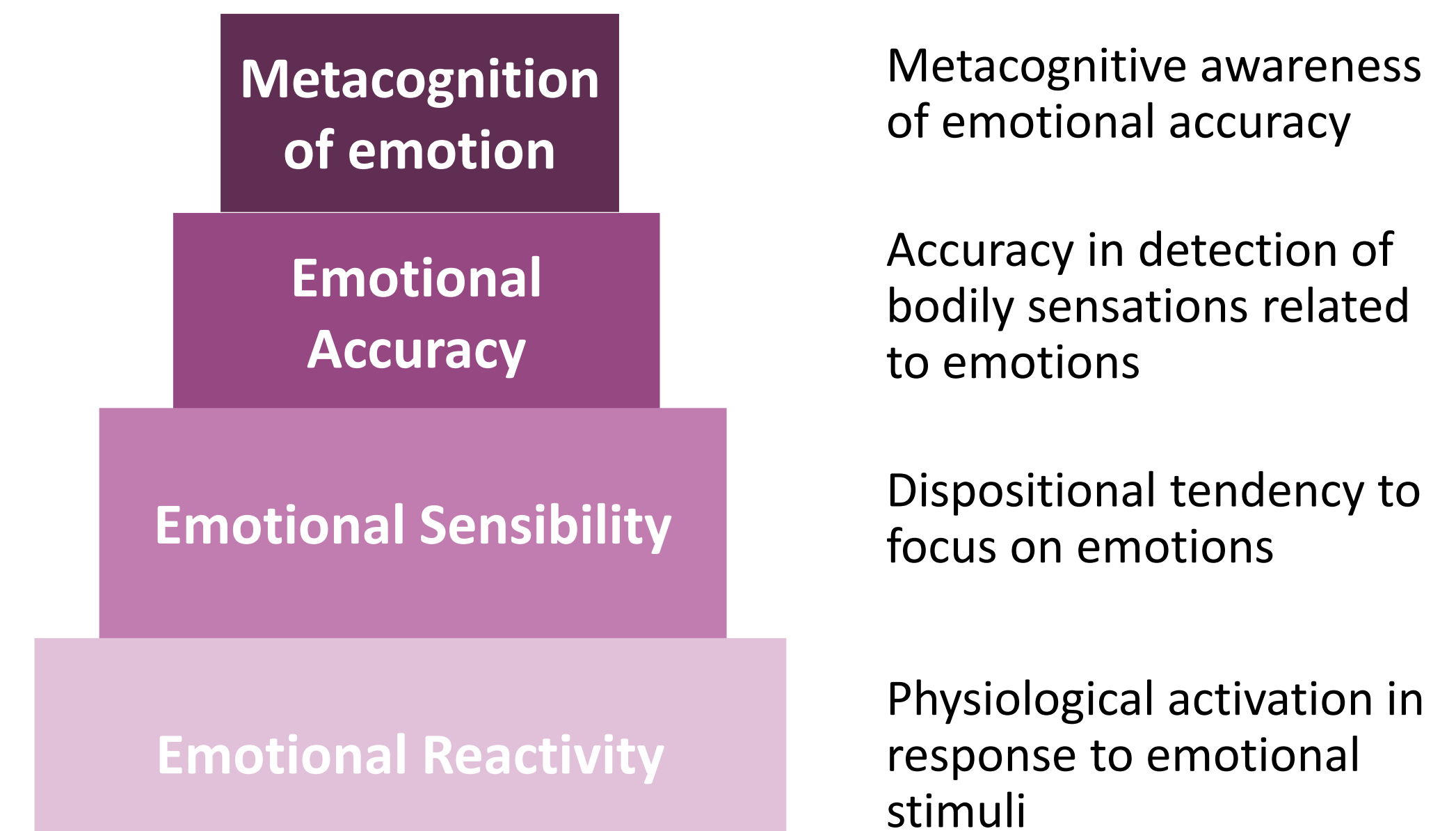
INTRODUCTION

To what extent are we able to **accurately recognize the affective states** we experience at a given moment? Research in metacognition has investigated both exteroceptive and interoceptive processes, yet the metacognitive aspect of emotional processes remains almost unexplored^{1,2}. This project aims to establish a quantification method for the construct **metacognition of emotion**, by using neural- and physiological measures.

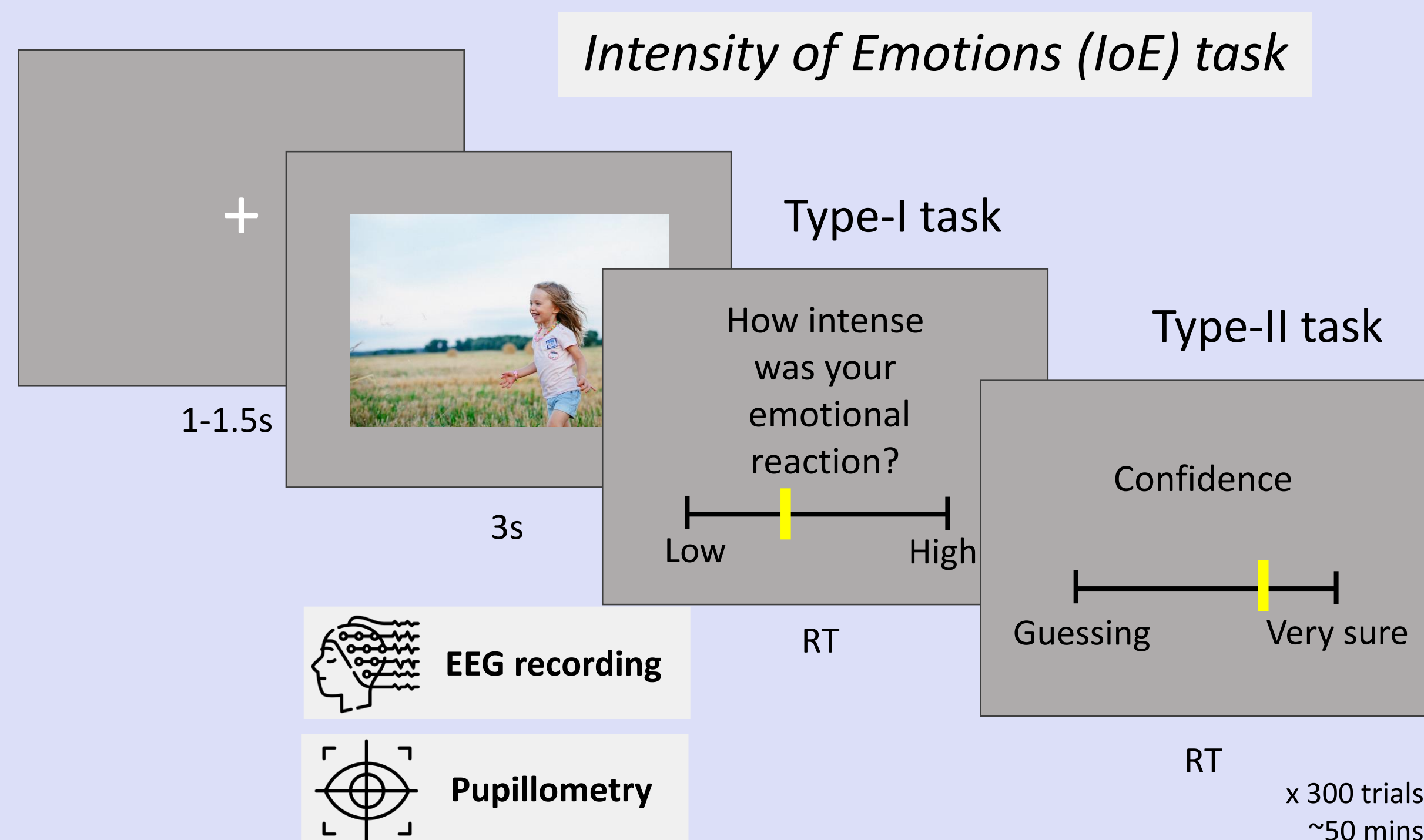
Being inspired by Garfinkel & Critchley's model of interoceptive processes³, we propose a model with several levels of emotional awareness. First '**emotional accuracy**', as the correspondence between physiological and self-reported measures of emotion; and a higher level of **metacognitive awareness**: the correspondence between accuracy and **confidence** judgements.

This study has implications for the understanding of **mental health** conditions in which emotional processes are impaired, and potential mechanisms mediating therapeutic interventions. It may also provide evidence supporting the **higher-order theory of emotional consciousness**⁴.

Proposed four-dimensional model of emotional processes



METHODS



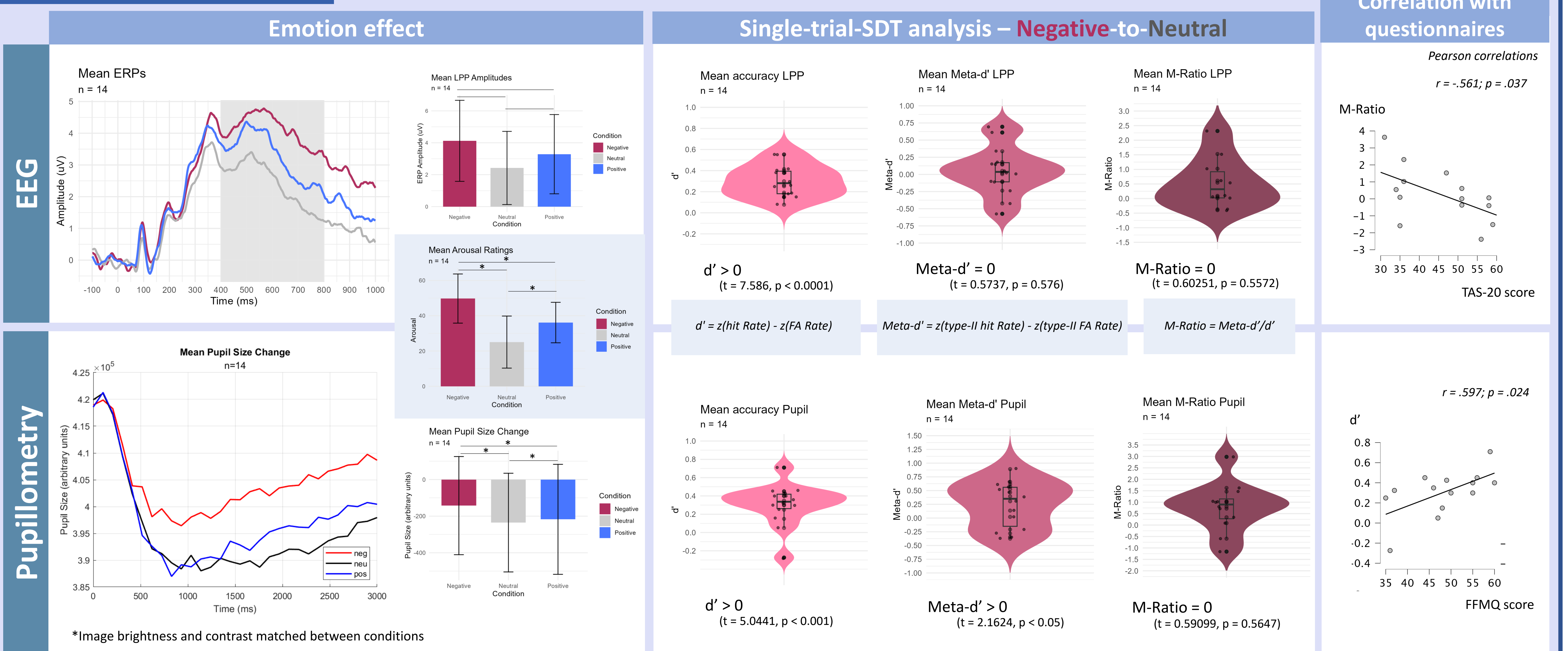
- Sample: Aim n = 67 (age range 18-60)
- Stimuli: Affective images of conditions: negative (100), neutral (100), positive (100) taken from EmoMadrid database
- Indexes of emotional arousal: the EEG **late positive potential (LPP)**⁵ and **pupil size change**⁶
- Participants also complete the Alexithymia scale (TAS-20), Affective Style Questionnaire (ASQ), Five-facet Mindfulness Questionnaire (FFMQ), and Autistic Quotient (AQ-10).

ANALYSIS

Metacognitive analysis:
Signal detection theory (SDT) analysis⁷

Type-I SDT		LPP amplitude/Pupil	
		High	Low
Arousal rating	High	hit	FA
	Low	miss	CR
Type-II SDT		Confidence	
		High	Low
Type-I decision	Correct	hit	FA
	Incorrect	miss	CR

PRELIMINARY RESULTS



DISCUSSION

- Preliminary data shows a significant effect of emotion condition, with higher arousal for negative than positive, consistent with the literature.
- SDT analyses of the negative condition show similar performance values (d') for both EEG and pupillometry measures, but metacognitive values (meta- d' , M-Ratio) differ.
- Future analysis may use a subset of participants above a certain threshold of d' to have more sensible estimations of M-Ratio.
- M-Ratio correlating with Alexithymia score suggests face validity of the construct metacognition of emotion.

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