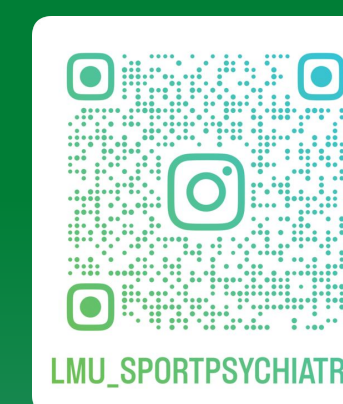


Interoceptive Alterations in Schizophrenia Spectrum Disorders: A Multimodal Approach

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Introduction

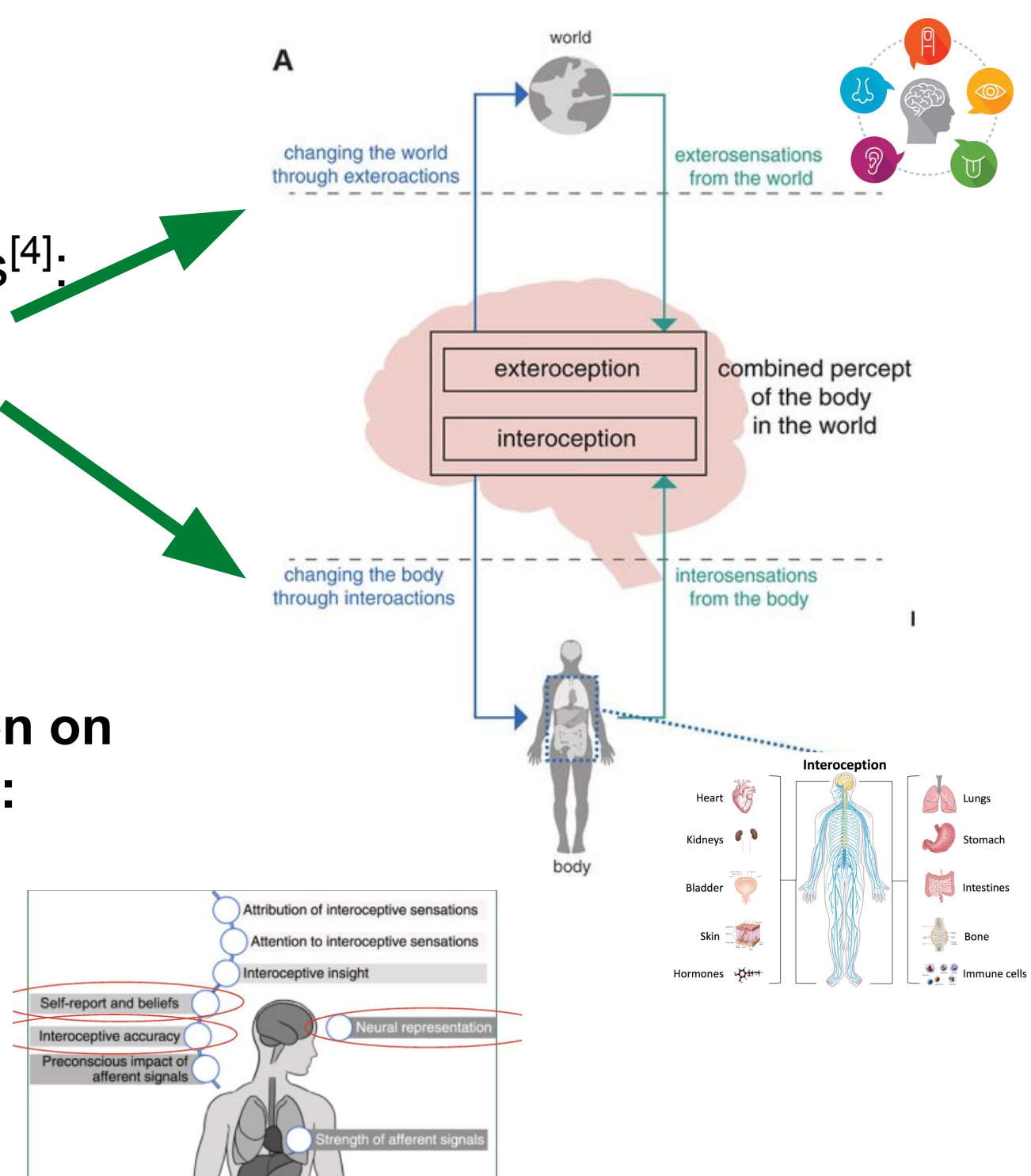
Perceiving one's body in the world combines^[4]:

- o **Exteroception** in SSD => well-researched!
- o **Interoception** in SSD => **notably limited!**

Hypotheses:

Individuals with SSD show altered interoception on three levels compared to healthy controls (HC):

- 1) Altered Interoceptive Sensibility
- 2) Reduced Interoceptive Accuracy
- 3) Altered Interoception on the Neural Level



Methods

Participants

- Age: 18 - 65
- No cardiovascular illness
 - o SSD ($n = 35$)
 - o HC ($n = 41$)

Design & Procedure

During EEG (31-channel), ECG, RESP:

- Eyes-closed resting state: 5 min
- Eyes-open resting state: 5 min
- Heartbeat Counting Task
- Interview
- Questionnaires

Materials & Measures

Interoceptive Sensibility

- Multidimensional Assessment of Interoceptive Awareness (MAIA)^[2]
- Body Perception Questionnaire (BPQ)^[3]
- Cambridge Depersonalization Scale (CDS)^[4]

Interoceptive Accuracy

- Heartbeat Counting Task (HCT)^[5]
 - o 9 pseudo-randomized trials : 25, 35, and 45 secs

$$\frac{1}{9} \sum (1 - [(recorded\ heartbeats - counted\ heartbeats) \div recorded\ heartbeats])$$

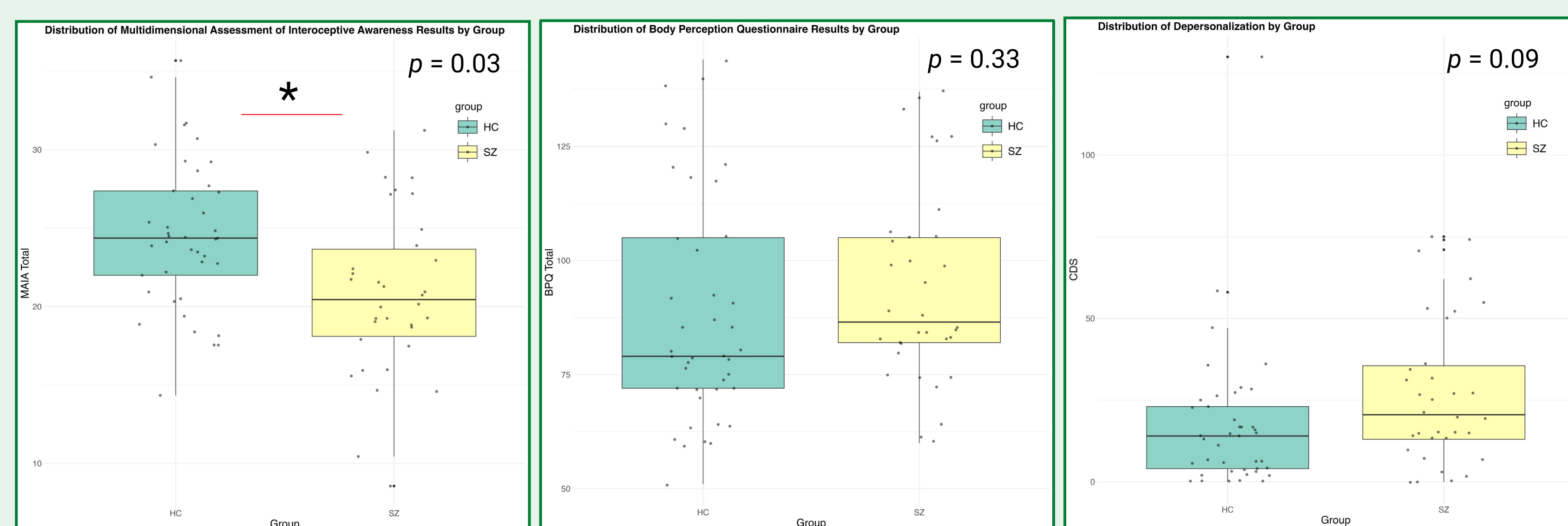
Neural Representation

- Heartbeat Evoked Potential (HEP)
 - o Average EEG amplitude
 - o 450 - 500 msec post-R-peaks
 - o CFA cleaning: ICA & ECG corr.

Misc.: Cognition, Symptoms, MRI in SSD

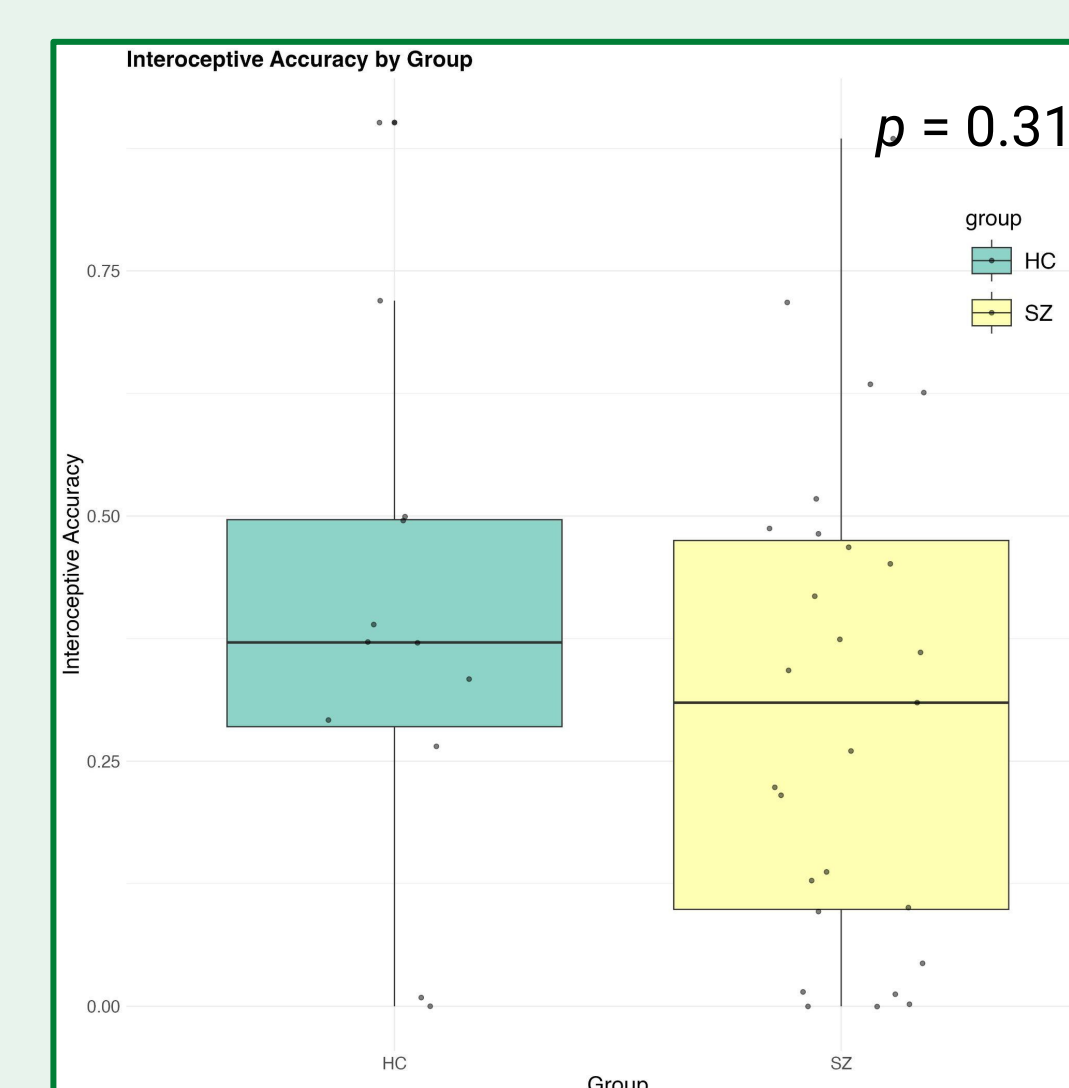
Results

Interoceptive Sensibility & Depersonalization



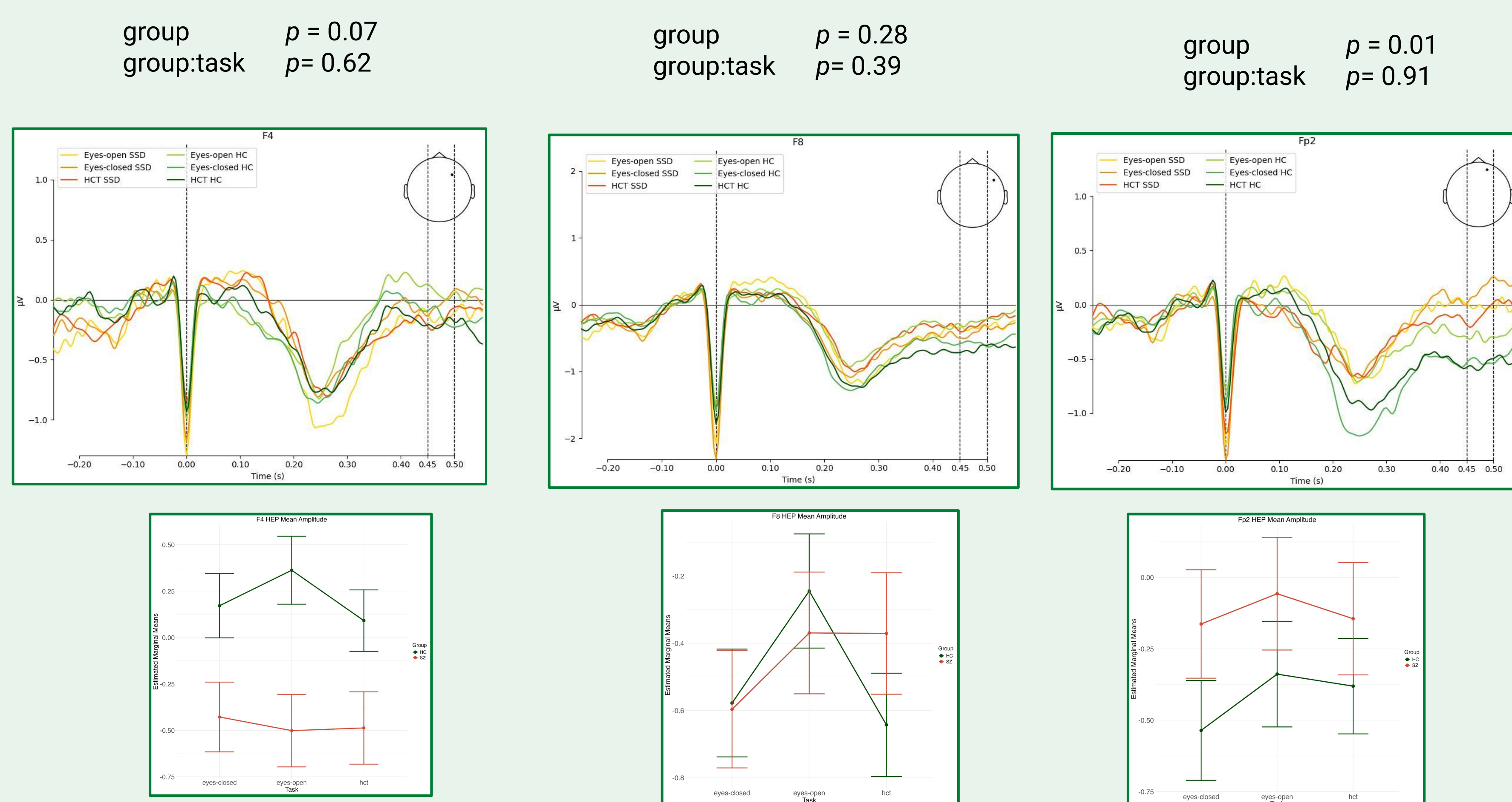
- Multiple Linear Regression Equations:
 - o $Questionnaire \sim Group + Age + Sex + Education\ Years + BMI$
 - o All ps after false discovery rate correction with Benjamini-Hochberg procedure

Interoceptive Accuracy



- Multiple Linear Regression:
 - o $Interoceptive\ Accuracy \sim Group + Age + Sex + Education\ Years + BMI + Heart\ Rate + Smoker + Caffeine\ Intake + Knows\ Heart\ Rate + MAIA\ Not\ Worrying$

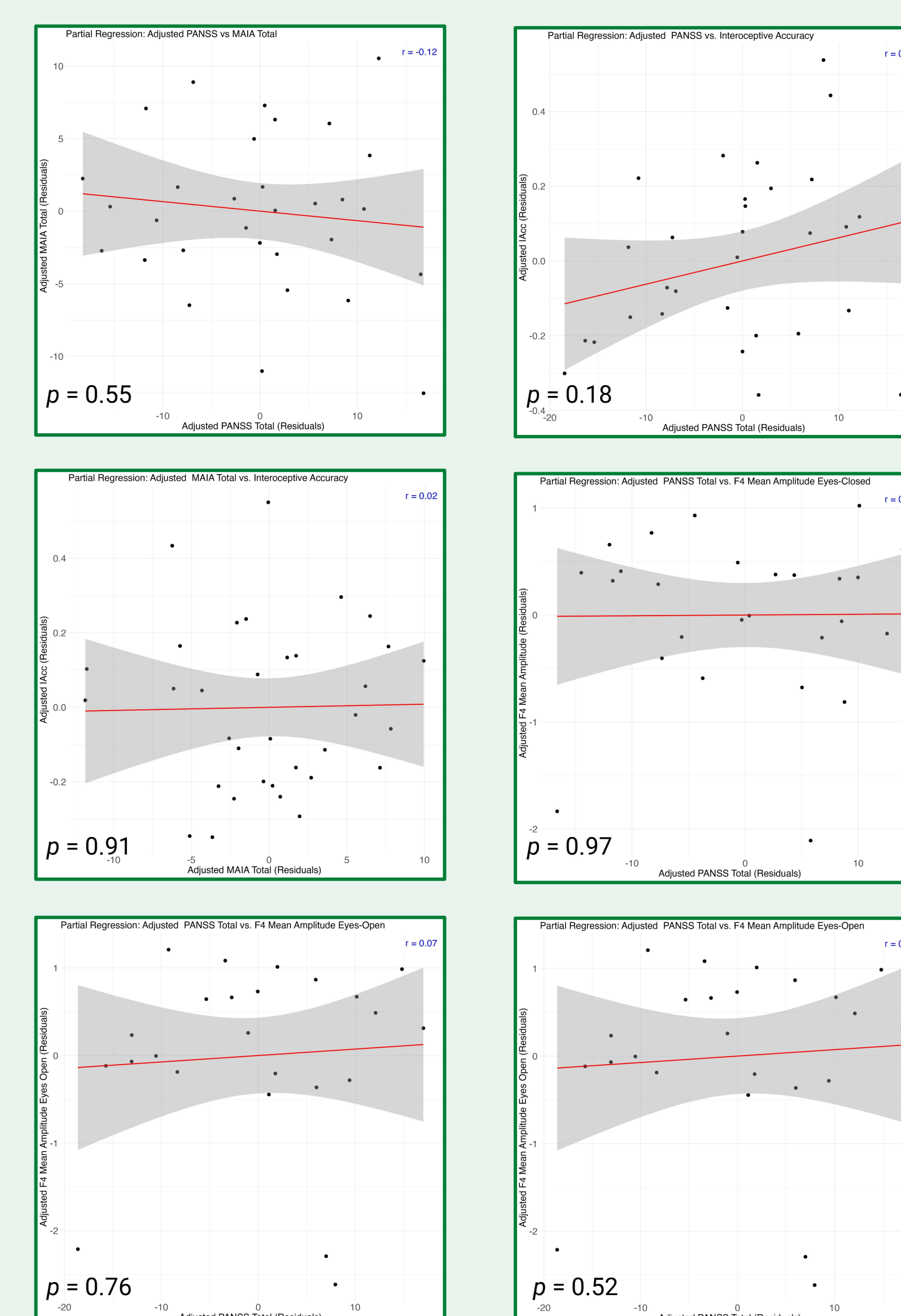
Heartbeat Evoked Potential



ANCOVAs

- o $Channel\ Mean\ HEP\ Amplitude \sim group * task + age + sex + Education\ Years + BMI + Smoker + Caffeine\ Intake + HRV\ (RMSSD) + R\text{-}peak\ Amplitude + MAIA_not_worrying + PC1 + PC2$
- o $PC1\ and\ PC2\ from: QT\ Interval + QTc\ Interval + Heart\ Rate$

Correlations



Partial correlations

- controlling for age, sex, education years, and BMI

Discussion



Our SSD patients were all in post-acute phase, which may have affected the results.



Methodological caveat in HCT => Potential confounds: attention, belief about heart rate, time estimation^[6], **Strict Instructions!**



Somatosensory processing can confound HEP => Attention around the torso?



HEP conceptualized as... Subjective "I" ^[7] vs. Interoceptive PE^[8]



Further exploratory analyses are needed : HEP in different channels and different time windows, correlations of interoception with symptom severity and cognitive impairments, other interoceptive (RESP) and neuroimaging (MRI) modalities.