

Threat Learning After Social Isolation In Adolescents

Emily Towner, Livia Tomova, Kirsten Thomas & Sarah-Jayne Blakemore

Department of Psychology, University of Cambridge, UK

Background

Loneliness and isolation are increasing in societies all around the world¹⁻².

Adolescents may be particularly sensitive to the effects of isolation³⁻⁵.

Social isolation during adolescence has been found to increase anxiety behaviours in animal models⁶.

In rodents, social isolation in adolescence has been associated with a significant deficit in the extinction of the conditioned threat response⁷.

Research Question

How does social isolation affect threat learning in human adolescents?

Methods

Participants

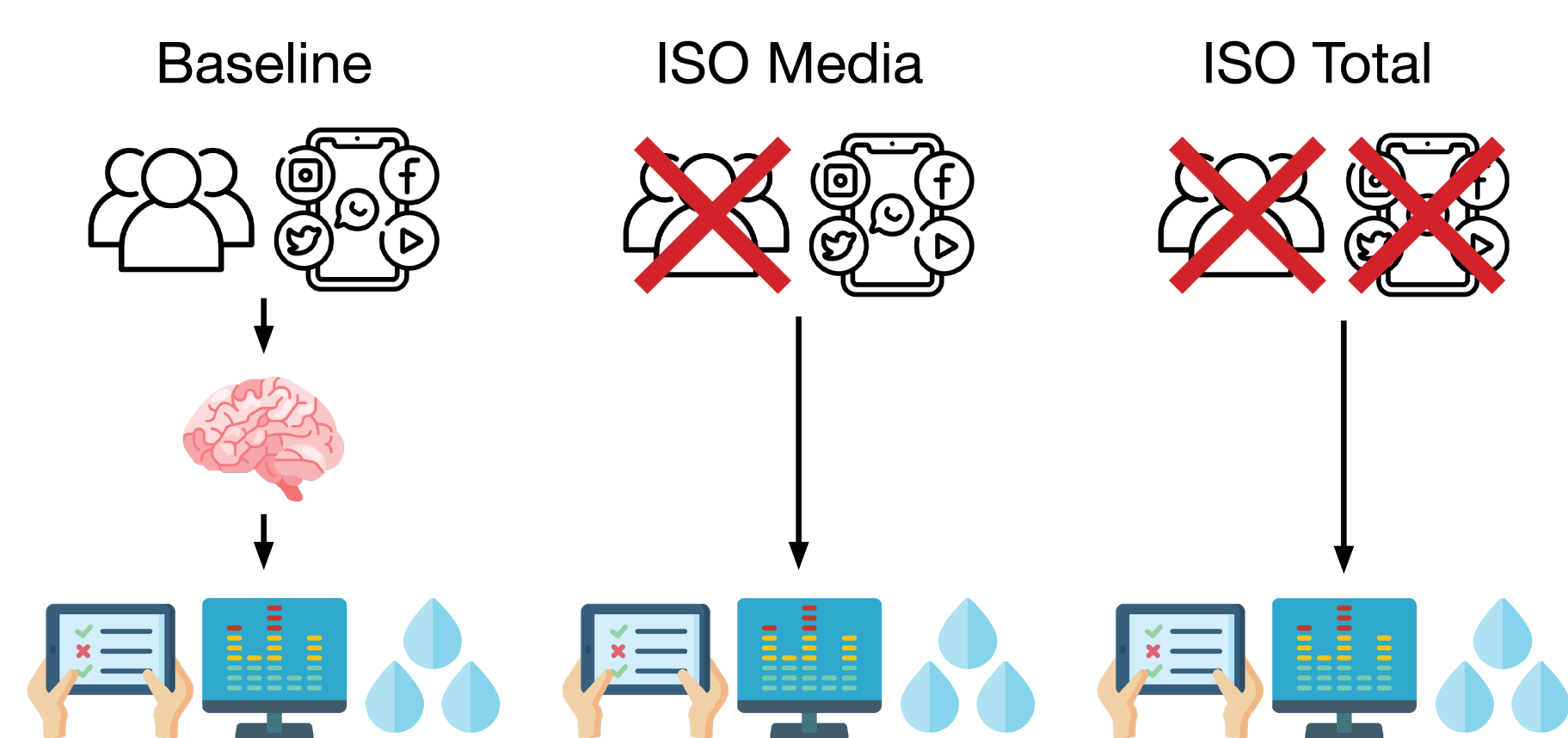
40 participants
(Age 16-19 years; 18 male)

Study Design

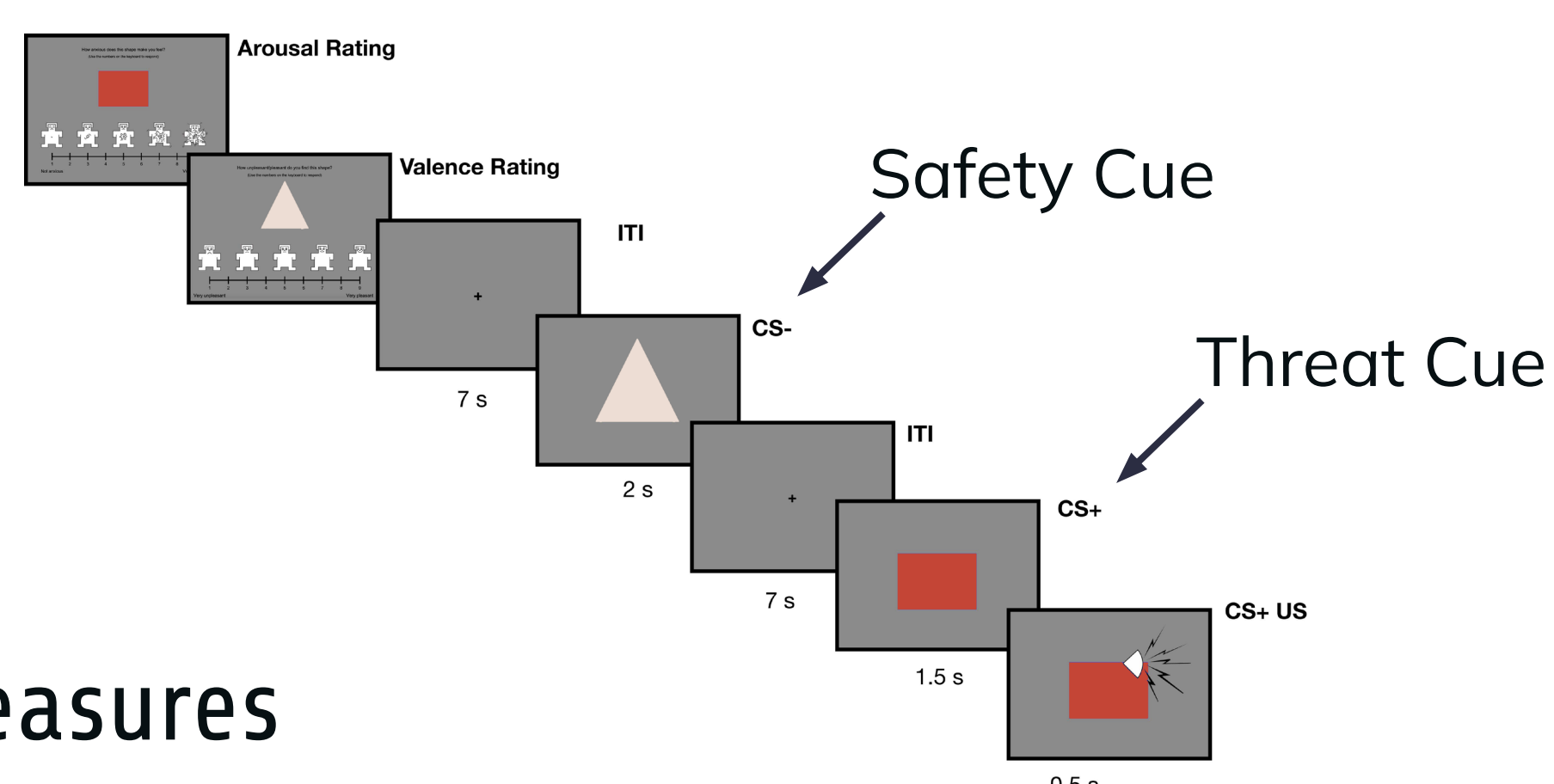
3 experimental sessions

Manipulation

3-4 hours in isolation



Threat Learning Task



Measures

Arousal rating - "How anxious does this shape make you feel?"
[1] not at all anxious - [9] very anxious

Valence rating - "How unpleasant/pleasant do you find this shape?"
[1] very pleasant - [9] very unpleasant

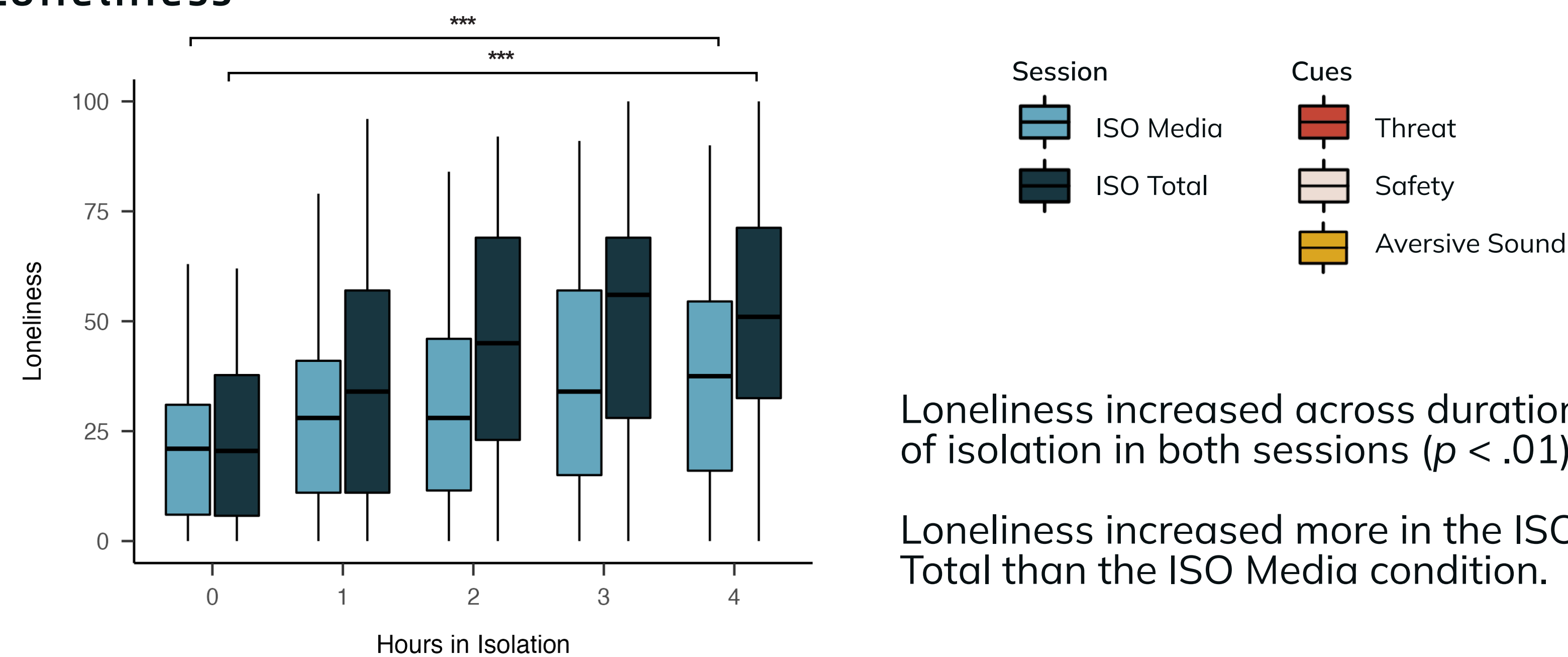
Skin conductance response - average reconstructed response amplitude per condition
PsPM⁸

Loneliness - "How lonely do you feel right now?"
[0] not at all - [100] extremely

IQ - (abstract reasoning) MaRs-IB⁹

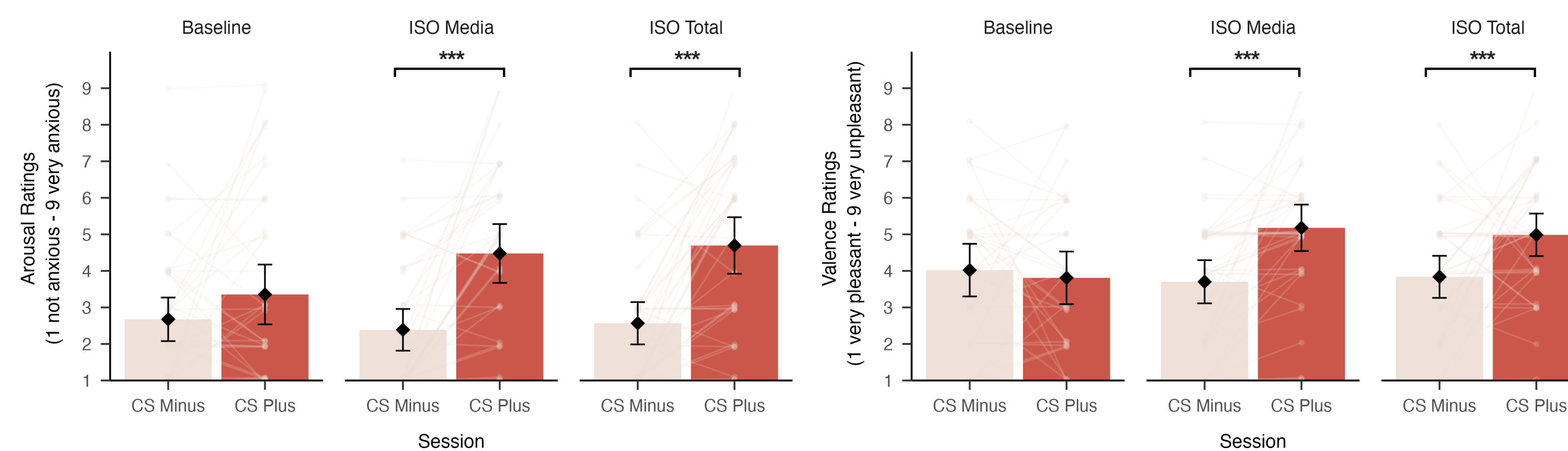
Results

Loneliness

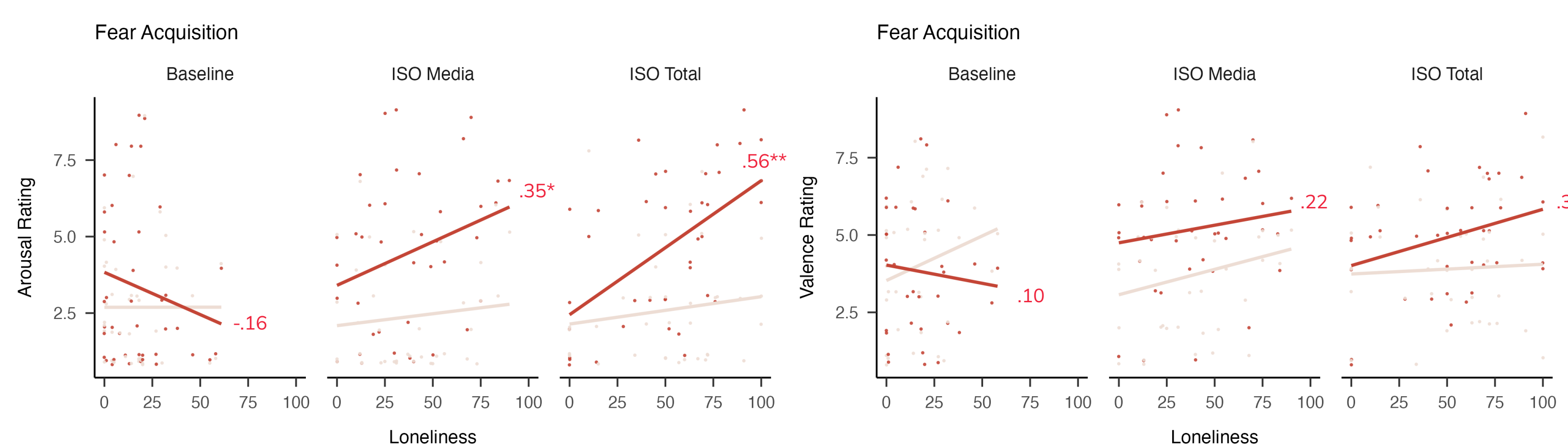


Threat - Behavioural

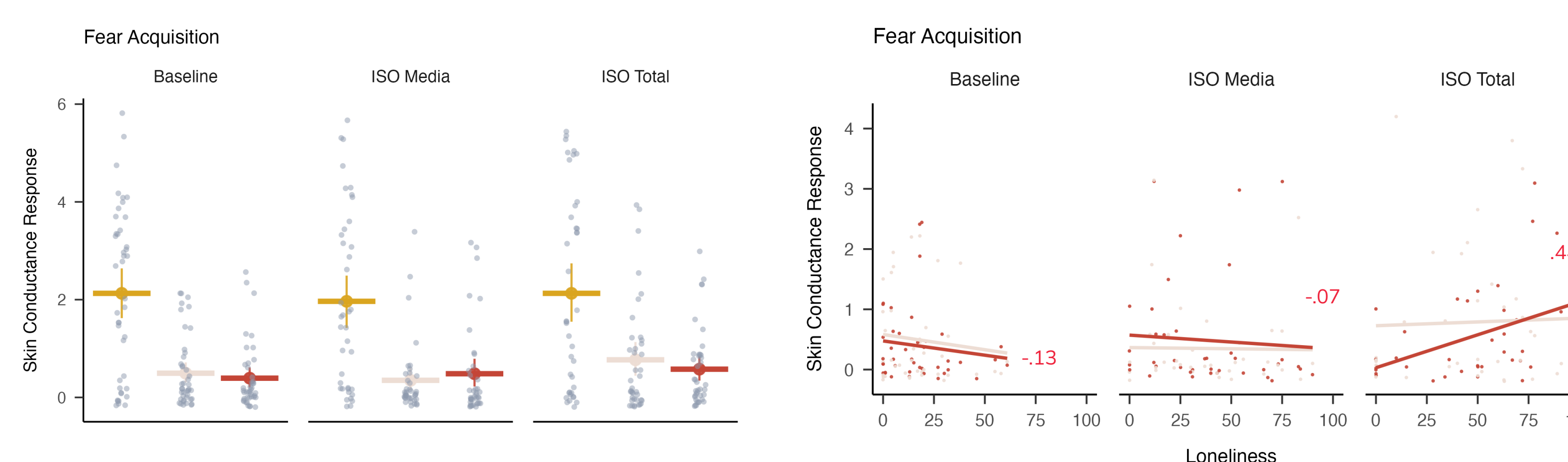
Threat Rating ~ Sex + Age + IQ + **Session*Cue** + (Session*Cue | Participant)



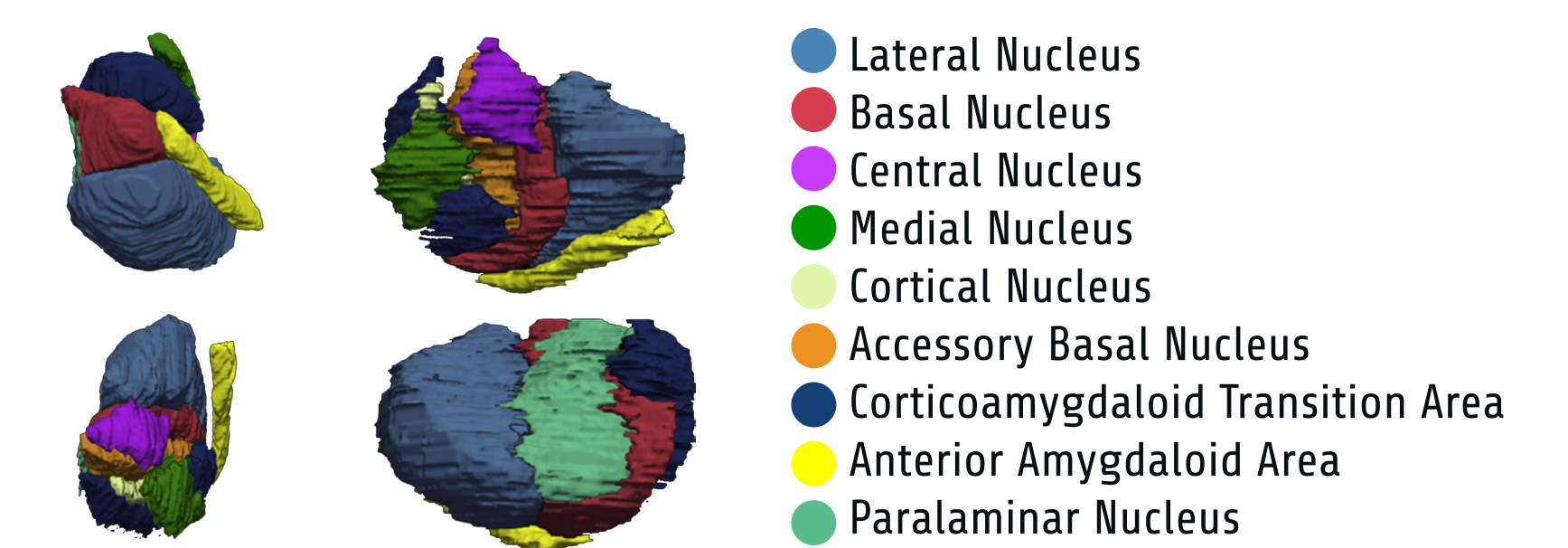
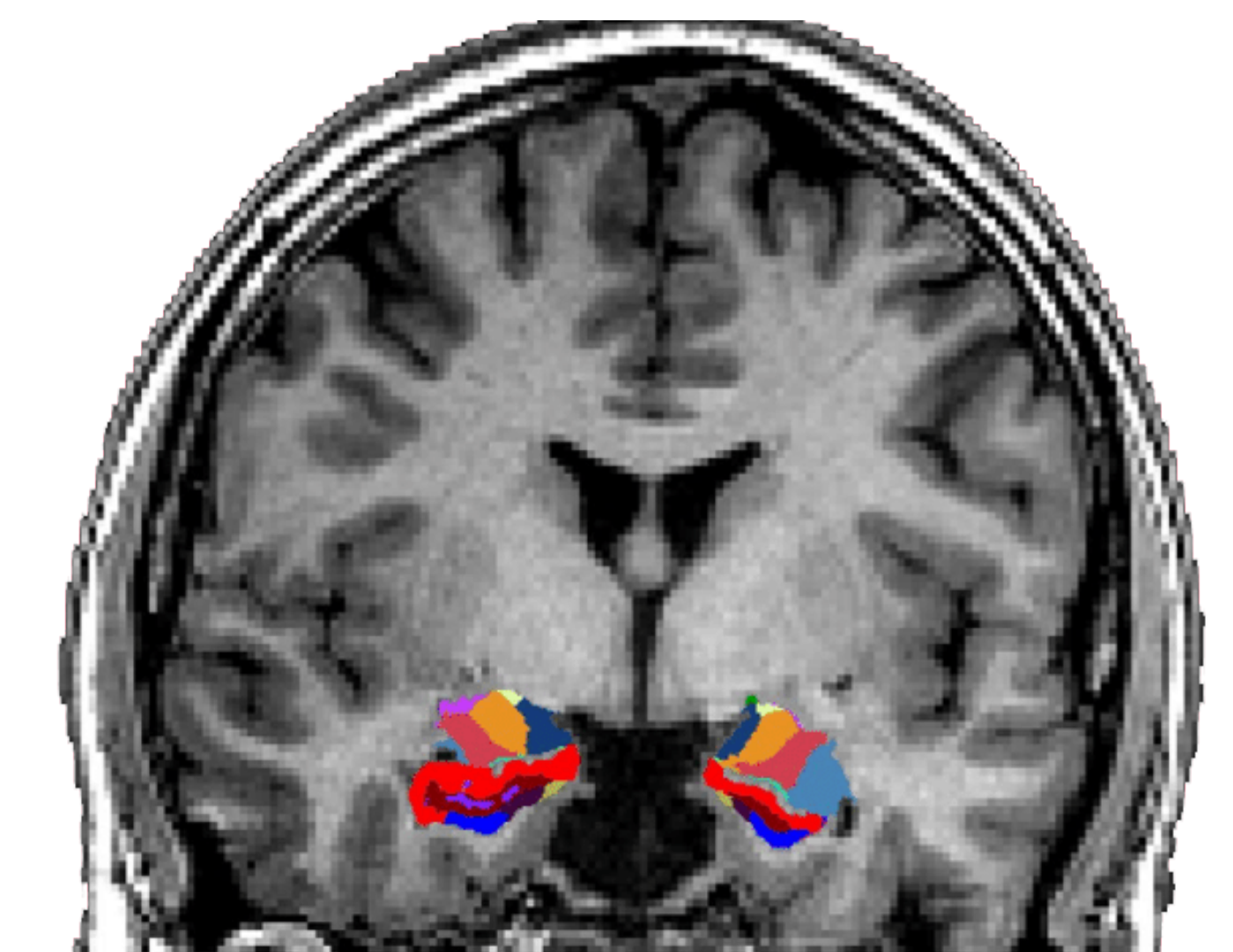
Threat Rating ~ Sex + Age + IQ + **Session*Cue*Loneliness** + (Session*Cue*Loneliness | Participant)



Threat - Physiological



Amygdala Volume - Subnuclei



Recent advances in neuroimaging have allowed the automatic segmentation of the human amygdala into distinct subnuclei¹⁰.

We used Freesurfer to segment the amygdala into 9 subnuclei (quantified as volume in mm³).

Functional imaging studies have shown the centromedial amygdala (CMA) as responsive to aversive outcomes, while implicating the basolateral amygdala (BLA) in the encoding of predictive aversive cues¹¹⁻¹².

Analysis Plan

Threat Rating ~ Sex + Age + IQ + **Session*Cue*Amygdala Volume** + (Session*Cue | Participant)

Discussion

Even brief periods of social isolation can increase behavioural markers of threat learning in human adolescents, and **virtual social interactions** do not fully remediate these effects.

Heightened threat learning could be one **mechanism** by which social isolation and loneliness increase anxiety⁶.

Loneliness has been linked to mental health problems in adulthood¹³, and this experimental evidence suggests that heightened threat learning might be a **pathway** by which social isolation exerts long term negative effects on well-being during development.

Outstanding Questions/Issues

SCR data - outlier exclusion, physiological non-responders, peak scoring method, SCR frequency, SCL (skin conductance level - tonic)

sMRI data - multicollinearity of subnuclei, lateralization, multiple comparison correction, sample size