Gamma Synchronization During Face Processing is Associated with Social Motivation

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BACKGROUND

Electrophysiological markers of face perception reveal atypical brain activity in ASD. Individuals with ASD display a delayed and diminished event-related potential (ERP) response at the face-sensitive N170.

This hypothesis is consistent with observed relationships between social motivation and face-related brain activity in typical development.

We predicted:

- Gamma coherence, measured between electrodes over the left prefrontal and right occipitotemporal regions, is increased in extraverted individuals compared to introverted individuals.

METHODS

Participants
- 96 typically-developing adults (34 male) were pre-screened with the Eysenck Personality Questionnaire Revised Short Scale (EPQ-R) for high or low (+/- 1 SD) scores on the extraversion subscale.
- 34 extreme scorers (19 extraverts, 15 introverts) were invited to participate in the EEG portion of the study.

Stimuli and data acquisition
- Participants viewed 60 trials each of upright faces and inverted faces.
- Each trial was preceded by a central fixation cross for a random period between 500 and 1000 ms.
- EEG was recorded continuously at 250 Hz using 128-channel Geodesic sensor net.

Data analysis
- Coherence was calculated between 150 and 250 Hz.
- Coherence was calculated between 250 and 350 Hz.

RESULTS

Statistical analysis
- For each participant, a difference matrix based on stimulus category was calculated by subtracting coherence associated with inverted faces from coherence associated with upright faces.
- Two-tailed t-tests compared extraverted and introverted groups on this difference matrix to retain only the statistically significant (p < 0.05) coherence values between the two groups.

150-250 ms Time Window
- Extraverted individuals exhibited significantly (p < 0.05) decreased frontal/occipital coherence in response to upright faces.
- Extraverted individuals showed greater coherence compared to introverted individuals.
- Extraverted individuals exhibited significantly more pronounced in extraverted individuals than in introverted individuals.

250-350 ms Time Window
- Extraverted individuals showed greater coherence in response to upright faces compared to inverted faces.
- Introverted individuals showed no significant difference.

CONCLUSIONS

- Consistent with our hypotheses, increased gamma coherence was positively associated with social motivation.
- Extraverted individuals exhibited higher overall levels of coherence.
- Upright faces elicited enhanced coherence within prefrontal and occipitotemporal regions in extraverted individuals but not in introverted individuals.
- These findings are consistent with prior work demonstrating attenuated ERP face inversion effects in introverted individuals.
- Extraverted individuals showed greater coherence compared to introverted individuals.
- Both groups showed more coherence in response to upright faces compared to inverted faces during this time window.
- However, this difference was more pronounced in extraverted individuals than in introverted individuals.

FUTURE DIRECTIONS

- We are developing methods to statistically correct for multiple comparisons in a coherence difference matrix, such as false discovery rate control, and to select confidence intervals, such as simulation methods.
- Extraverted individuals exhibited higher total levels of coherence.
- Upright faces elicited enhanced coherence within prefrontal and occipitotemporal regions in extraverted individuals but not in introverted individuals.
- Extraverted individuals showed greater coherence compared to introverted individuals.
- Both groups showed more coherence in response to upright faces compared to inverted faces during this time window.
- However, this difference was more pronounced in extraverted individuals than in introverted individuals.

REFERENCES

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