The Relationship Between Neural Sensitivity to Social and Non-Social Positive and Negative Feedback and Autistic Traits

Virginia Carter Leno, Anthony Cox, Adam Naples, Rachael Tillman, Hannah Reuman, Emily Levy, Helena Rutherford & James McPartland

McPartland Lab, Yale Child Study Center, New Haven, CT, USA; University College London, London, UK

BACKGROUND

Both positive and negative feedback can modulate human behaviour.
- Social and non-social feedback can be positive or negative in valence.
- Our sensitivity to different types of feedback may developmentally shape how we interact with our environment.

Autism spectrum disorder (ASD) is characterised by difficulties in social functioning.
- Decreased sensitivity to positive social feedback (social reward) has been implicated in the aetiology of ASD.
- Individuals with ASD display attenuated behavioural responsiveness to a range of social rewards.

ERP studies reveal decreased neural response (lower P3 amplitude) to social (smiling faces) and non-social (monetary) rewards in individuals with ASD. P3 amplitudes correlate negatively with social symptom severity (Kohls et al., 2011).
- P3 is thought to reflect allocation of attentional resources to reward stimuli.

Sensitivity to social feedback in individuals with ASD is less well studied than social reward.
- Atypical neural response is found in response to negative social feedback (social exclusion) in individuals with ASD (McPartland et al., 2011).
- However, typical neural response (FRN amplitude) is found in individuals with ASD to non-social negative feedback (sub-optimal monetary outcomes) (McPartland et al., 2012).
- FRNs is thought to reflect motivational salience (Yeung, Holroyd & Cohen, 2005).

The behavioural phenotype of ASD may be in part due to decreased neural sensitivity to social but not non-social feedback.

Aims of the current study
- Experiment 1: To investigate the association between autistic traits and neural sensitivity to social, non-social, and non-feedback.
- Experiment 2: To investigate the association between autistic traits and neural sensitivity to negative social, non-social, and non-feedback.

Hypothesis
- Those with high levels of autistic traits will demonstrate a selective decreased neural response to both positive and negative social feedback but not non-social or non-feedback.

METHOD

Participants (Table 1)
- 69 typical adults (Assigned to “high” and “low” autistic trait groups based upon a median split on the SRS-A)

Behavioural measures
- SRS-A - 65 item questionnaire measure of social functioning

Table 1. Participant Demographics

<table>
<thead>
<tr>
<th></th>
<th>Experiment 1 (N=36)</th>
<th>Experiment 2 (N=33)</th>
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</thead>
<tbody>
<tr>
<td>Low SRS-A</td>
<td>(n=18)</td>
<td>(n=18)</td>
</tr>
<tr>
<td>High SRS-A</td>
<td>(n=18)</td>
<td>(n=15)</td>
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<tr>
<td>SRS-A Total</td>
<td>(8.02)</td>
<td>(8.02)</td>
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<tr>
<td>(SD)</td>
<td>(20.56)</td>
<td>(20.56)</td>
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<tr>
<td>Age</td>
<td>23.94</td>
<td>25.57</td>
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<tr>
<td>Sex (M:F)</td>
<td>7:11</td>
<td>10:11</td>
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| ERP Components of Interest

Figure 1. P3, electrode P2

Figure 2. FRN Montage, electrodes 5, 6, 11, 12

RESULTS

Figure 3. Illustration of task with three feedback conditions: social, non-social and non-feedback

Experiment 1 (Positive Feedback):
- Controls produced the highest P3 amplitudes at Pz (M=4.35), followed by SR (M=4.21) for both experiments.
- Reward x group interaction: Significant reward x group interaction (F[2,60]=4.24, p<0.05).
- Follow up t-tests revealed that high SRS-A displayed a significantly lower P3 amplitude to SR (M=2.98, SD=2.18) than low SRS-A (M=5.43, SD=3.16), [t(34)=2.70, p<0.05].
- In contrast, there were no significant between group differences for CR; [t(34)=38, p>0.05] or NR; [t(34)=49, p>0.05].

Correlations:
- A significant negative correlation was found between SRS-A scores and P3 amplitude for SR: [r=(36)=−36, p<0.05], but not CR or NF

P3 latency effects
- No significant differences were found for either reward or group

Experiment 2 (Negative Feedback)
- Effect of feedback and response on FRN amplitude
  - Main effect of response, greater decrease in FRN amplitudes following incorrect (M=1.78, SD = 2.53) compared to correct responses (M=1.10, SD = 2.53); [t(32)=3.02, p<0.01]
  - SF elicited the most negative FRN amplitudes (M=1.89, SD=2.96), followed by CF (M=1.78, SD=2.86) following NF (M=1.58, SD=2.60); [F(2,64)=5.9, p<0.05]

FRN latency effects
- No significant differences were found for either reward or group

CONCLUSIONS

- Our study found decreased neural response to both positive and negative social feedback in individuals with high levels of autistic traits.
- This supports, and extends, the social motivation hypothesis (Dawson, Webb & McPartland, 2005), which posits that decreased neural reward to social reward may underlie the development of difficulties in social functioning seen in individuals with ASD.

- Future studies should aim to investigate whether if any comparable findings are present in clinical populations and if attenuation of the P3 or FRN response is related to dissociable aspects of the ASD phenotype or to overall symptom severity.

REFERENCES