The Heritability of Frontal EEG Asymmetry: Reference & Sex Differences
Andrew W. Bismark1, William G. Iacono2, Stephen M. Malone2, John B. Allen1
1. The University of Arizona; 2. University of Minnesota

Methods

Participants:
- From the Minnesota Center for Twin and Family Research (MCTFR), 799 pairs of twins were analyzed.
- Cohorts collapsed across age for initial analysis (66% MZ, 50% male [overall sample]).

Data Collection, Reduction & Analysis:
- 5 minutes of resting EEG recorded, counter balancing eyes open and closed using 64-channel EEG cap with 256Hz sampling rate.
- All data analysis performed with custom Matlab scripts using function from EEGLAB version 9.0.0b. (7)
- All Artifact-free epochs transformed to 3 different reference montages: including Average (AVG), Cz, Linked Mastoids (LM) and the reference-free montage Current Source Density (CSD) that attenuates contribution of distal sources.
- A Fast Fourier Transform (FFT) (Hamming-window) was used to extract alpha power and Alpha asymmetry scores computed using ln-transformed alpha power (ln[Right]-ln[Left]) between homologous sites.
- Heritability estimated for only frontal site pairs of F1/2, F3/4, F5/6 & F7/8.

Modeling & Statistics:
- The Intra-class correlations were calculated in SPSS then used to estimate Falconer’s heritability estimates. (9).
- Formula: $h^2 = 2(r_{MZ} - r_{DZ})$.
- On occasion, intra-class correlations are estimated to be less than zero. In such instances, the correlation is generally assumed to be zero, and this assumption was made in for the presented analyses.

Results

Heritability of EEG Asymmetry Modeled using Falconer’s Broad Sense Heritability Estimate: $h^2 = 2(r_{MZ} - r_{DZ})$

<table>
<thead>
<tr>
<th>Channel</th>
<th>MZ</th>
<th>DZ</th>
<th>$h^2$</th>
<th>MZ</th>
<th>DZ</th>
<th>$h^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>F7/8</td>
<td>0.14</td>
<td>0.09</td>
<td>0.09</td>
<td>0.11</td>
<td>0.09</td>
<td>0.05</td>
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<tr>
<td>F5/6</td>
<td>0.12</td>
<td>0.05</td>
<td>0.15</td>
<td>0.01</td>
<td>0.00</td>
<td>0.02</td>
</tr>
<tr>
<td>F3/4</td>
<td>0.10</td>
<td>0.06</td>
<td>0.08</td>
<td>0.00</td>
<td>0.07</td>
<td>0.00</td>
</tr>
<tr>
<td>F1/2</td>
<td>0.11</td>
<td>0.02</td>
<td>0.17</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
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<th>$h^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>F7/8</td>
<td>0.10</td>
<td>0.00</td>
<td>0.21</td>
<td>0.19</td>
<td>0.03</td>
<td>0.32</td>
</tr>
<tr>
<td>F5/6</td>
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<td>0.21</td>
<td>0.00</td>
<td>0.05</td>
<td>0.01</td>
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</tbody>
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Heritability estimated for only frontal site pairs of F1/2, F3/4, F5/6 & F7/8.

Discussion

- Modest genetic contributions to frontal asymmetry are seen for all EEG transformations.

References

9. Norman, K. S., & Nurmi, M. (1998). The Intra-class correlations were calculated in SPSS then used to estimate Falconer’s heritability estimates. (9).