Frontal EEG alpha asymmetry: Reference and site matter for convergent validity.
Substantial method variance exists.

Concordance of Frontal EEG Alpha Asymmetry Between Reference Montages

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Topography of Frontal Alpha Power: Reference Montage Effects

Natural-log transformed alpha power values at each site. The current source density transformation restricts occipital alpha to occipital leads while other montages show contamination of non-frontal alpha to frontal leads. (from Smith, Reznik, Stewart, and Allen, 2017).

Correlations Between Total Alpha (8-13 Hz) Asymmetry Scores by Reference Montage

<table>
<thead>
<tr>
<th>Montage</th>
<th>F2F1</th>
<th>F4F3</th>
<th>F6F5</th>
<th>F8F7</th>
</tr>
</thead>
<tbody>
<tr>
<td>LM</td>
<td>0.86</td>
<td>0.77</td>
<td>0.68</td>
<td>0.55</td>
</tr>
<tr>
<td>AVG</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CZ</td>
<td>-0.01</td>
<td>-0.26</td>
<td>-0.28</td>
<td>-0.22</td>
</tr>
<tr>
<td>CSD</td>
<td>0.38</td>
<td>0.07</td>
<td>0.11</td>
<td>0.04</td>
</tr>
<tr>
<td></td>
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</tbody>
</table>

Average Correlation

<table>
<thead>
<tr>
<th>Montage</th>
<th>LM</th>
<th>AVG</th>
<th>CZ</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVG</td>
<td>0.74</td>
<td>0.4</td>
<td>0.19</td>
</tr>
<tr>
<td>CZ</td>
<td>-0.19</td>
<td>0.4</td>
<td>0.12</td>
</tr>
<tr>
<td>CSD</td>
<td>0.15</td>
<td>0.12</td>
<td>0.09</td>
</tr>
</tbody>
</table>

INTRO

Frontal EEG asymmetry has been measured at a variety of sites using a variety of reference montages.

RESULTS

We examined the degree of concordance across four homologous electrode pairs: F2F1, F4F3, F6F5, and F8F7 using four reference montages, average of all EEG leads (AVG), current source density (CSD), CZ, and averaged (“linked”) mastoids (LM).

METHODS

This study’s sample is reported in full in Stewart et al. (2010).

N= 306 right-handed individuals, aged 17-34
143 with a lifetime history of major depressive disorder

RESULTS CONT.

The AVG reference showed the greatest levels of correlation with other references, regardless of alpha band or channel pair.

CZ was an outlier, as might be expected, frequently demonstrating significant negative correlation with other reference montages, particularly LM.

Current source density transformed data showed intermediate levels of overlap with other references.

DISCUSSION

These results suggest the presence of a high rate of unaddressed method variance in the frontal alpha asymmetry literature.

Effects on meta-analyses must be considered carefully, as results obtained utilizing different reference montages may not be comparable. This was insufficiently accounted for in a recent meta-analysis (van der Vinne et al., 2017).

When inferences about source generators are made, use of the CSD transformation is highly recommended, (see Smith et al 2017). Further, F2F1 seems the most impervious to reference montage effects.

REFERENCES


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