Exploring the efficacy of non-invasive brain stimulation in older adults: the role of cardiovascular risk factors and baseline depression scores.

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Background
- Brain stimulation can elevate mood in healthy young adults and adults with depression when applied to the dorsolateral prefrontal cortex (DLPFC).
- Changes in brain microstructure associated with aging and cardiovascular risk factors (CVRF) may reduce the efficacy of brain stimulation.
- Transcranial random noise stimulation (tRNS) was used to increase the excitability of the DLPFC.
- Change in mood was assessed among older adults with and without CVRF.

Hypotheses
- tRNS over the DLPFC will elevate mood.
- The efficacy of tRNS may differ depending on age and presence of CVRF.

Method
- Participants: YA - Young adults (aged 20-40); HOA - older adults (>60) without CVRF; OVR - older adults with CVRF.
- OVR group assignment based on presence of high blood pressure or cholesterol, or a diagnosis of diabetes.
- Framingham stroke risk profile (FSRP) score quantified risk.
- Test batteries/self-report measures: Wechsler Test of Adult Reading (WTAR); Geriatric Depression Scale (GDS); Positive and Negative Affective Scale (PANAS).

Results
- **Group comparisons (Mann-Whitney U):** Differences between stimulation conditions for change in PA scores do not reach significance.
- Figure 2 suggests a greater mood increase after Real tRNS.
- Effect of Real tRNS similar between YA and HOA; OVR smaller effect of tRNS

GDS & Mood Change Correlations (Spearman’s rho): in YA, higher depression scores correlated with less change in mood after Real tRNS. NB: similar trend after Sham tRNS in YA.

Table 1: Demographics, mean (standard deviation)

<table>
<thead>
<tr>
<th></th>
<th>YA (n=29)</th>
<th>HOA (n=34)</th>
<th>OVR (n=26)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (m,f)</td>
<td>26.55 (5.30)</td>
<td>67.68 (6.80)</td>
<td>66.88 (6.72)</td>
</tr>
<tr>
<td>Sex (m,f)</td>
<td>15,14</td>
<td>13, 21</td>
<td>12,14</td>
</tr>
<tr>
<td>FSRP(%)</td>
<td>1.85 (1.30)</td>
<td>1.94 (1.02)</td>
<td>4.48 (2.32)</td>
</tr>
<tr>
<td>GDS</td>
<td>5.28 (3.49)</td>
<td>3.38 (4.07)</td>
<td>4.50 (4.55)</td>
</tr>
<tr>
<td>WTAR FSIQ</td>
<td>109.79 (6.49)</td>
<td>111.91 (5.36)</td>
<td>109.04 (7.32)</td>
</tr>
</tbody>
</table>

Table 2: GDS & Mood Change Correlations by Group

<table>
<thead>
<tr>
<th>Mood Change</th>
<th>YA (n=29)</th>
<th>Old (n=60)</th>
<th>HOA (n=34)</th>
<th>OVR (n=26)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDS*Sham tRNS</td>
<td>r_s=-.347, p=.065</td>
<td>r_s=.138, p=.294</td>
<td>r_s=-.130, p=.462</td>
<td>r_s=.186, p=.362</td>
</tr>
<tr>
<td>GDS*Real tRNS</td>
<td>r_s=-.608, p&lt;.001*</td>
<td>r_s=-.188, p=.150</td>
<td>r_s=-.106, p=.550</td>
<td>r_s=.283, p=.161</td>
</tr>
</tbody>
</table>

Conclusion
- GDS scores are higher in younger than older adults.
- Change in mood in response to tRNS does not appear to differ with age.
- In the mild CVRF group (OVR), there is less response to Real tRNS than in HOA; CVRF may reduce effects of tRNS on mood.
- Endorsement of depressive symptoms seems to influence response to tRNS.
- Future studies should examine the impact of more severe CVRF on mood in aging.

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Glossary:
- GDS = Geriatric Depression Scale
- PANAS = Positive and Negative Affect Schedule
- MMSE = Mini Mental State Exam
- WTAR FSIQ = Wechsler Test of Adult Reading predicted FSIQ

Brain Stimulation
- Participants received 10 mins of real tRNS or sham tRNS over 2 sessions.
  - 1st 5 mins: sat quietly.
  - 2nd 5 mins: talked about positive memory.
- 1mA of tRNS applied bilaterally over the DLPFC using 5x5cm electrodes.