Transcranial direct current stimulation (tDCS) may be used to improve the function and activities of daily living (ADL) after stroke.

**Objectives**
To assess the effects of tDCS on ADL and motor function in people with stroke.

**Methods**
We searched the Cochrane Stroke Group Trials Register (March 2013), the Cochrane Central Register of Controlled Trials (CENTRAL; The Cochrane Library, May 2013), MEDLINE (1948 to May 2013), EMBASE (1980 to May 2013), CINAHL (1982 to May 2013), AMED (1985 to May 2013), Science Citation Index (1899 to May 2013), and 4 additional databases. Two review authors independently assessed risk of bias of included trials and extracted data. We included only randomized controlled trials that compared tDCS versus control in adults with stroke. The primary outcome was ADL performance at study end and at follow-up; secondary outcomes were function, muscle strength, dropouts, and adverse events.

**Main Results**
We included 15 studies involving a total of 455 participants. At the end of the intervention phase, tDCS did not improve ADL (mean difference=5.31 Barthel index points; 95% confidence interval, −0.52 to 11.14; P=0.07), but at follow-up, ADL was improved (mean difference=11.13 Barthel index points; 95% confidence interval, 2.89–19.37; P=0.008). TDCS improved arm function (mean difference=3.45 upper extremity Fugl–Meyer score points; 95% confidence interval, 1.23–5.67; P=0.002; Figure). Dropouts and adverse events were rare and comparable between groups.

**Implications for Clinical Practice and Future Research**
This review of 15 trials involving 455 participants found evidence of very low to low quality on the effectiveness of tDCS in enhancing rehabilitation outcomes regarding ADL and function. Future research should investigate the effects of anodal and cathodal tDCS on lower limb function.

**Disclosures**
Two review authors (Dr Mehrholz and Pohl) were involved in one of the included trials. The other authors report no conflicts.

**Reference**
### Figure

Active transcranial direct current stimulation (tDCS) vs sham for improving upper extremity function measured by upper extremity Fugl-Meyer assessment (UE-FM) at the end of intervention phase. CI indicates confidence interval.

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Mean [UE-FM unit]</th>
<th>SD [UE-FM unit]</th>
<th>Total</th>
<th>Mean [UE-FM unit]</th>
<th>SD [UE-FM unit]</th>
<th>Total</th>
<th>Weight</th>
<th>IV Random, 95% CI [UE-FM unit]</th>
<th>Random, 95% CI [UE-FM unit]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urogeri 2011</td>
<td>6.3</td>
<td>6.4</td>
<td>7</td>
<td>1.5</td>
<td>4.8</td>
<td>7</td>
<td>9.4%</td>
<td>4.60 [-1.13, 10.23]</td>
<td></td>
</tr>
<tr>
<td>Hesse 2011</td>
<td>11.2</td>
<td>9.8</td>
<td>64</td>
<td>11</td>
<td>11.8</td>
<td>32</td>
<td>12.4%</td>
<td>11.20 [4.34, 18.06]</td>
<td></td>
</tr>
<tr>
<td>Lindenberg 2010</td>
<td>5.6</td>
<td>1.9</td>
<td>10</td>
<td>0.5</td>
<td>0.8</td>
<td>10</td>
<td>26.3%</td>
<td>5.10 [3.82, 6.38]</td>
<td></td>
</tr>
<tr>
<td>Nak 2011</td>
<td>4</td>
<td>2.7</td>
<td>7</td>
<td>1.6</td>
<td>1.5</td>
<td>7</td>
<td>22.0%</td>
<td>2.50 [0.21, 4.78]</td>
<td></td>
</tr>
<tr>
<td><strong>Subtotal (95% CI)</strong></td>
<td><strong>56</strong></td>
<td><strong>70.2%</strong></td>
<td><strong>88</strong></td>
<td><strong>56</strong></td>
<td><strong>70.2%</strong></td>
<td><strong>88</strong></td>
<td><strong>3.91 [1.35, 6.58]</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Heterogeneity: Tau^2 = 2.44; CH^2 = 6.78, df = 3 (P = 0.09); P = 56%
Test for overall effect: Z = 3.18 (P < 0.001)

### 2.1.2 Absolute values

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Mean [UE-FM unit]</th>
<th>SD [UE-FM unit]</th>
<th>Total</th>
<th>Mean [UE-FM unit]</th>
<th>SD [UE-FM unit]</th>
<th>Total</th>
<th>Weight</th>
<th>IV Random, 95% CI [UE-FM unit]</th>
<th>Random, 95% CI [UE-FM unit]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kim 2013</td>
<td>49.2</td>
<td>15</td>
<td>11</td>
<td>49</td>
<td>10.6</td>
<td>7</td>
<td>3.1%</td>
<td>0.20 [-1.64, 12.04]</td>
<td></td>
</tr>
<tr>
<td>Rossi 2013</td>
<td>7.5</td>
<td>10.1</td>
<td>25</td>
<td>9.6</td>
<td>10.3</td>
<td>25</td>
<td>10.0%</td>
<td>-2.10 [-7.75, 3.55]</td>
<td></td>
</tr>
<tr>
<td>Wu 2013</td>
<td>22.3</td>
<td>7.9</td>
<td>45</td>
<td>14.6</td>
<td>9.1</td>
<td>45</td>
<td>16.1%</td>
<td>7.70 [4.18, 11.22]</td>
<td></td>
</tr>
<tr>
<td><strong>Subtotal (95% CI)</strong></td>
<td><strong>81</strong></td>
<td><strong>29.8%</strong></td>
<td><strong>169</strong></td>
<td><strong>77</strong></td>
<td><strong>29.8%</strong></td>
<td><strong>169</strong></td>
<td><strong>2.50 [-5.05, 10.04]</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Heterogeneity: Tau^2 = 32.19; CH^2 = 8.90, df = 2 (P = 0.01); P = 78%
Test for overall effect: Z = 0.05 (P = 0.95)

**Total (95% CI)**: 169

Heterogeneity: Tau^2 = 4.44; CH^2 = 15.74, df = 6 (P = 0.02); P = 62%
Test for overall effect: Z = 3.05 (P = 0.002)

Test for subgroup differences: CH^2 = 0.06, df = 1 (P = 0.80), P = 0%
Transcranial Direct Current Stimulation for Activities After Stroke: What Is the Evidence?

Bernhard Elsner, Joachim Kugler, Marcus Pohl and Jan Mehrholz

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