**Supplemental Material**

**Vagus Nerve Stimulation Paired with Rehabilitative Training Enhances Motor Recovery after Bilateral Spinal Cord Injury to Cervical Forelimb Motor Pools**

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**Supplemental Figure 1: VNS does not influence lesion extent.** (A) Gray matter damage to the left and right hemicord is comparable across groups (Left Hemicord; Two-way repeated measures ANOVA, F[1,8] = 0.28; p = 0.61; Right Hemicord; Two-way repeated measures ANOVA, F[1,8] = 0.04; p = 0.85). (B) White matter damage to the left and right hemicord is comparable across groups (Left Hemicord; Two-way repeated measures ANOVA, F[1,8] = 0.01; p = 0.95; Right Hemicord; Two-way repeated measures ANOVA, F[1,8] = 0.22; p = 0.65). The absence of differences in lesion size indicate that VNS does not confer neuroprotective effects that could account for the differences in recovery. Data represent mean ± SEM.

**Table 1. Average Peak Pull Force at Each Week**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Animal ID** | **Group** | **Wk -1** | **Wk 8** | **Wk 9** | **Wk 10** | **Wk 11** | **Wk 12** | **Wk 13** | **Wk 14** |
| 1 | Rehab | 147.8 | 38.1 | 32.2 | 56.5 | 68.2 | 89.8 | 108.1 | 110.1 |
| 2 | Rehab | 149.2 | 37.7 | 57.8 | 73.8 | 89.0 | 104.6 | 114.8 | 114.4 |
| 3 | Rehab | 153.5 | 71.7 | 122.3 | 154.4 | 143.3 | 130.9 | 128.9 | 112.6 |
| 4 | Rehab | 151.4 | 75.9 | 92.7 | 126.3 | 109.1 | 85.5 | 73.0 | 82.0 |
| 5 | Rehab | 146.2 | 66.0 | 114.0 | 113.6 | 91.3 | 76.7 | 78.3 | 68.3 |
| 6 | Rehab | 159.0 | 47.0 | 109.6 | 123.6 | 137.0 | 141.6 | 131.6 | 111.6 |
| 7 | Rehab | 139.7 | 56.6 | 63.3 | 87.1 | 120.6 | 132.8 | 120.3 | 115.6 |
| 8 | Rehab | 139.4 | 24.3 | 25.8 | 100.0 | 105.2 | 86.2 | 94.4 | 84.6 |
| 9 | VNS+Rehab | 136.4 | 66.2 | 102.9 | 115.9 | 108.4 | 131.5 | 141.1 | 133.1 |
| 10 | VNS+Rehab | 177.3 | 48.4 | 89.9 | 114.8 | 137.5 | 137.5 | 164.4 | 155.1 |
| 11 | VNS+Rehab | 168.1 | 48.7 | 127.2 | 149.4 | 165.9 | 171.8 | 172.0 | 146.3 |
| 12 | VNS+Rehab | 138.7 | 56.1 | 84.1 | 138.0 | 147.8 | 155.1 | 137.0 | 123.5 |
| 13 | VNS+Rehab | 152.8 | 66.1 | 97.3 | 145.1 | 169.0 | 172.4 | 160.5 | 167.6 |
| 14 | VNS+Rehab | 140.5 | 68.3 | 95.6 | 135.3 | 128.8 | 130.0 | 148.0 | 146.4 |
| 15 | VNS+Rehab | 175.1 | 42.7 | 62.2 | 84.8 | 136.4 | 137.8 | 152.2 | 127.1 |
| 16 | VNS+Rehab | 146.1 | 54.6 | 110.9 | 148.7 | 149.9 | 146.7 | 156.4 | 123.5 |
| 17 | VNS+Rehab | 148.7 | 68.3 | 66.2 | 161.3 | 135.1 | 162.6 | 152.2 | 160.0 |
| 18 | VNS+Rehab | 134.3 | 69.3 | 111.5 | 139.0 | 127.1 | 100.1 | 97.2 | 105.6 |
| All forces in grams | | | | | | | | | |

**Table 2. Hit Rate at each Week**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Animal ID** | **Group** | **Wk -1** | **Wk 8** | **Wk 9** | **Wk 10** | **Wk 11** | **Wk 12** | **Wk 13** | **Wk 14** |
| 1 | Rehab | 85.3% | 0.1% | 0.0% | 0.4% | 2.1% | 9.0% | 25.2% | 40.4% |
| 2 | Rehab | 88.5% | 0.0% | 0.4% | 2.3% | 8.2% | 23.6% | 42.8% | 41.2% |
| 3 | Rehab | 79.1% | 25.2% | 75.8% | 87.4% | 79.5% | 64.4% | 63.8% | 55.2% |
| 4 | Rehab | 87.2% | 11.9% | 15.4% | 58.2% | 34.6% | 18.0% | 3.6% | 3.8% |
| 5 | Rehab | 91.7% | 20.1% | 45.7% | 40.1% | 21.6% | 10.9% | 2.3% | 13.5% |
| 6 | Rehab | 79.7% | 3.4% | 39.2% | 56.9% | 75.3% | 72.1% | 61.5% | 60.5% |
| 7 | Rehab | 83.4% | 4.1% | 8.9% | 20.3% | 50.8% | 64.3% | 52.4% | 48.5% |
| 8 | Rehab | 82.5% | 0.0% | 3.9% | 31.5% | 34.4% | 35.2% | 30.6% | 33.5% |
| 9 | VNS+Rehab | 80.2% | 15.4% | 35.1% | 46.2% | 56.1% | 64.2% | 72.5% | 68.1% |
| 10 | VNS+Rehab | 94.3% | 5.1% | 66.5% | 82.6% | 74.3% | 76.5% | 74.8% | 84.8% |
| 11 | VNS+Rehab | 92.8% | 5.6% | 46.8% | 71.1% | 88.5% | 90.3% | 91.2% | 87.6% |
| 12 | VNS+Rehab | 75.5% | 17.4% | 48.1% | 65.3% | 83.8% | 82.5% | 91.5% | 83.2% |
| 13 | VNS+Rehab | 88.8% | 24.2% | 85.7% | 85.2% | 89.5% | 86.1% | 89.9% | 93.0% |
| 14 | VNS+Rehab | 75.1% | 17.6% | 37.5% | 66.0% | 60.4% | 60.7% | 74.1% | 78.2% |
| 15 | VNS+Rehab | 92.8% | 0.0% | 1.7% | 15.7% | 77.0% | 83.3% | 72.2% | 61.4% |
| 16 | VNS+Rehab | 85.2% | 5.9% | 42.4% | 80.2% | 80.5% | 80.7% | 81.8% | 54.9% |
| 17 | VNS+Rehab | 77.0% | 17.6% | 23.8% | 71.8% | 57.4% | 70.0% | 73.2% | 67.1% |
| 18 | VNS+Rehab | 78.1% | 16.4% | 23.3% | 65.0% | 70.5% | 62.4% | 58.9% | 66.1% |

**Table 3. Cylinder Total Contacts**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Animal ID** | **Group** | **Wk -1** | **Wk 8** | **Wk 14** |
| 1 | Rehab | 113 | 42 | 67 |
| 2 | Rehab | 79 | 31 | 38 |
| 3 | Rehab | 85 | 24 | 16 |
| 4 | Rehab | 173 | 11 | 25 |
| 5 | Rehab | 95 | 18 | 31 |
| 6 | Rehab | 67 | 27 | 26 |
| 7 | Rehab | 75 | 7 | 24 |
| 8 | Rehab | 69 | 11 | 19 |
| 9 | VNS+Rehab | 126 | 23 | 98 |
| 10 | VNS+Rehab | 108 | 9 | 65 |
| 11 | VNS+Rehab | 75 | 7 | 63 |
| 12 | VNS+Rehab | 84 | 16 | 65 |
| 13 | VNS+Rehab | 81 | 19 | 57 |
| 14 | VNS+Rehab | 91 | 25 | 68 |
| 15 | VNS+Rehab | 84 | 30 | 76 |
| 16 | VNS+Rehab | 101 | 33 | 44 |
| 17 | VNS+Rehab | 50 | 16 | 97 |
| 18 | VNS+Rehab | 113 | 3 | 77 |

**Table 4. Grip Strength**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **Right Paw** | | | **Left Paw** | | |
| **Animal ID** | **Group** | **Wk -1** | **Wk 8** | **Wk 14** | **Wk -1** | **Wk 8** | **Wk 14** |
| 1 | Rehab | 638.4 | 252.1 | 308.8 | 654.2 | 259.1 | 248.8 |
| 2 | Rehab | 591.1 | 309.3 | 362.4 | 581.5 | 321.4 | 332.7 |
| 3 | Rehab | 720.4 | 289.7 | 319.6 | 701.1 | 270.4 | 291.6 |
| 4 | Rehab | 608.1 | 254.0 | 382.4 | 605.4 | 289.4 | 355.4 |
| 5 | Rehab | 627.1 | 342.7 | 454.1 | 674.5 | 354.2 | 382.7 |
| 6 | Rehab | 715.4 | 259.4 | 350.0 | 727.3 | 268.4 | 295.9 |
| 7 | Rehab | 729.0 | 321.1 | 403.9 | 700.8 | 401.3 | 425.1 |
| 8 | Rehab | 694.1 | 282.4 | 368.5 | 687.6 | 273.4 | 285. |
| 9 | VNS+Rehab | 719.4 | 276.1 | 503.5 | 704.4 | 258.5 | 355.4 |
| 10 | VNS+Rehab | 613.1 | 288.1 | 435.8 | 591.4 | 304.5 | 389.4 |
| 11 | VNS+Rehab | 664.6 | 234.3 | 402.6 | 684.3 | 197.7 | 319.2 |
| 12 | VNS+Rehab | 609.1 | 313.4 | 591.6 | 628.9 | 335.7 | 404.4 |
| 13 | VNS+Rehab | 727.8 | 349.5 | 546.6 | 724.9 | 381.1 | 487.7 |
| 14 | VNS+Rehab | 564.5 | 274.8 | 454.6 | 542.4 | 292.2 | 357.4 |
| 15 | VNS+Rehab | 571.6 | 243.8 | 468.0 | 578.4 | 221.1 | 501.1 |
| 16 | VNS+Rehab | 722.6 | 318.1 | 446.1 | 719.8 | 333.5 | 397.0 |
| 17 | VNS+Rehab | 521.8 | 291.3 | 368.3 | 502.9 | 307.4 | 424.6 |
| 18 | VNS+Rehab | 634.4 | 258.6 | 372.0 | 619.8 | 246.3 | 275.4 |

All forces in grams

**Table 5. Total Trials during Rehabilitative Training**

|  |  |  |
| --- | --- | --- |
| **Animal ID** | **Group** |  |
| 1 | Rehab | 11780 |
| 2 | Rehab | 8897 |
| 3 | Rehab | 14386 |
| 4 | Rehab | 12446 |
| 5 | Rehab | 12432 |
| 6 | Rehab | 8720 |
| 7 | Rehab | 9472 |
| 8 | Rehab | 9813 |
| 9 | VNS+Rehab | 8766 |
| 10 | VNS+Rehab | 10573 |
| 11 | VNS+Rehab | 7863 |
| 12 | VNS+Rehab | 9546 |
| 13 | VNS+Rehab | 12050 |
| 14 | VNS+Rehab | 10606 |
| 15 | VNS+Rehab | 11298 |
| 16 | VNS+Rehab | 6686 |
| 17 | VNS+Rehab | 8363 |
| 18 | VNS+Rehab | 8149 |