

Supplemental Table 1. List of data collection sessions. Related to STAR Methods section “Session Structure and Cued Movement Tasks”.

| Participant | Date (Post-Implant Day) | Description | Figure / Video |
|-------------|-------------------------|---|----------------------------|
| T5 | 10.22.2018 (796) | Cued face, head, arm & leg movements. 32 trials per movement. | Fig 1A-D SFig 1,2,3 |
| T7 | 08.23.2013 (24) | Cued face, head, arm & leg movements. 18 trials per movement. | Fig 1A, C, D SFig 1,2,3 |
| T5 | 12.05.2018 (840) | Cued ipsilateral & contralateral arm and leg movements. 30 trials per movement. | Fig 2, 3, 4A-B, SFig 5 |
| T5 | 11.19.2018 (824) | Cued ipsilateral & contralateral arm and leg movements, focusing on homologous pairs. 20 trials per movement. | Fig 4C, SFig 5 |
| T5 | 12.10.2018 (845) | Partially cued movements (laterality). 32 trials per movement condition. | Fig 4D, SFig 6 |
| T5 | 03.27.2019 (952) | Partially cued movements (arm vs. leg). 31 trials per movement condition. | Fig 4E, SFig 6 |
| T5 | 02.13.2019 (910) | Four effectors, radial 8 movements (hands and feet). 24 trials per target. | SFig 4B-D |
| T5 | 12.05.2018 (840) | Four effectors, radial 6 movements [arms and legs]. 26 trials per target. | SFig 4E |
| T5 | 03.19.2018 (579) | Simultaneous movement with the following effector pairs: (R-Arm, L-Arm), (R-Arm, Head), (R-Arm, L-Leg), (R-Leg, L-Leg). 18 trials per movement condition. | Fig 5 |
| T5 | 03.21.2018 (581) | Simultaneous movement with the following effector pair: (R-Arm, R-Leg). 18 trials per movement condition. | Fig 5 |
| T5 | 04.02.2018 (593) | Simultaneous movement with the following effector pairs: (R-Leg, Head), (L-Leg, Head), (L-Arm, Head), (R-Leg, L-Arm), (L-Arm, L-Leg). 18 trials per movement condition. | Fig 5 |
| T5 | 11.05.2018 (810) | Single-effector radial target layouts with different numbers of targets. 540 trials per layout. | Fig 6B |
| T5 | 01.07.2019 (873) | 16-target layouts with 1 effector, 2 effectors, or 4 effectors. 355 trials per layout. | Fig 6C-E |
| T5 | 09.19.2018 (763) | Closed-loop discrete decoding with a four-effector layout (900 trials per layout) | Fig 6F-G, SVid 1 |
| T5 | 09.26.2018 (770) | Closed-loop discrete decoding with a two-effector layout | Fig 6F |
| T5 | 10.01.2018 (775) | Closed-loop discrete decoding with a one-effector layout and 32-target layout | Fig 6F, SVid 2 |
| T5 | 10.03.2018 (777) | Closed-loop discrete decoding with a four-effector layout and one-effector layout | Fig 6F |
| T5 | 10.08.2018 (782) | Closed-loop discrete decoding with a two-effector layout and 32-target layout | Fig 6F |
| T5 | 10.10.2018 (784) | Closed-loop discrete decoding with a four-effector layout and one-effector layout | Fig 6F |
| T5 | 10.15.2018 (789) | Closed-loop discrete decoding with a two-effector layout and 32-target layout | Fig 6F |

Supplemental Table 2: Motor power & reflex exam results for T5 and T7. Related to STAR Methods section “Experimental Model and Subject Details”.

Motor Power Key: (0=Nothing, 1=Muscle Twitch but no Joint Movement, 2=Some Joint Movement, 3=Overcomes Gravity, 4=Overcomes Some Resistance, 5=Overcomes Full Resistance).

Reflex Testing Key: (0=Areflexive, 1=Hyporeflexive, 2=Normal, 3=Brisk, 4=Clonus).

| Muscle Group | T5 Left (Ipsi.) | T5 Right (Contra.) | T7 Left (Ipsi.) | T7 Right (Contra.) |
|----------------------------|-----------------|--------------------|-----------------|-------------------------------|
| Cervical Flexion | 5 | | 4 | |
| Cervical Extension | 5 | | 4 | |
| Cervical Sidebend | 5 | 5 | 4 | 4 |
| Cervical Rotation | 5 | 5 | 4 | 4 |
| Hip Flexion | 2 | 1 | 4 | 4 |
| Hip Extension | 2 | 1 | 4 | 4 |
| Hip Abduction | 1 | 2 | 4 | 4 |
| Hip Adduction | 1 | 1 | 4 | 4 |
| Knee Flexion | 2 | 2 | 4 | 4 |
| Knee Extension | 2 | 2 | 4 | 5 |
| Ankle Dorsiflexion | 0 | 1 | 3 | 4 |
| Ankle Plantarflexion | 1 | 2 | 4 | 4 |
| Shoulder Flexion | 3 | 1 | 2 | 2 |
| Shoulder Extension | 3 | 2 | 2 | Not tested due to positioning |
| Shoulder Internal Rotation | 2 | 0 | 2 | 3 |
| Shoulder External Rotation | 2 | 2 | 1 | 1 |
| Elbow Flexion | 5 | 0 | 2 | 2 |
| Elbow Extension | 1 | 1 | 2 | 3 |
| Wrist Flexion | 0 | 0 | 2 | 3 |
| Wrist Extension | 1 | 2 | 1 | 3 |
| Finger Flexion | 0 | 0 | 2 | 4 |
| Finger Extension | 3 | 2 | 1-3 | 2-3 |
| | | | | |
| Reflex | T5 Left (Ipsi.) | T5 Right (Contra.) | T7 Left (Ipsi.) | T7 Right (Contra.) |
| Biceps | 3 | 3 | 2 | 2 |
| Brachioradialis | 3 | 3 | 2 | 2 |
| Triceps | 3 | 3 | 1 | 0 |
| Patella | 3 | 3 | 3 | 3 |
| Achilles | 0 | 0 | 4 | 4 |