Supplementary Materials

Supplementary Movie 1. Radial8 Calibration Task. Participant T15 performing the Radial8 Calibration Task. Cursor movement and click were in full closed-loop neural control. This was the third of three consecutive calibration blocks, so the cursor decoder and click decoder being used were trained on the previous two calibration blocks and continually updated throughout the video. There was no specific instructed imagery (i.e., T15 described his method of control as “intuition” for both cursor and click).
Link to view online: https://ucdavis.box.com/s/aywxbzq4l73f23e58kzwvtpa0hd698iw

Supplementary Movie 2. Grid Evaluation Task. Participant T15 performing the Grid Evaluation Task. Cursor movement and click were in full closed-loop neural control. There was no specific instructed imagery (i.e., T15 described his method of control as “intuition” for both cursor and click).
Link to view online: https://ucdavis.box.com/s/i5z9oznksdea6s46afxgw5fxjuikl1hd

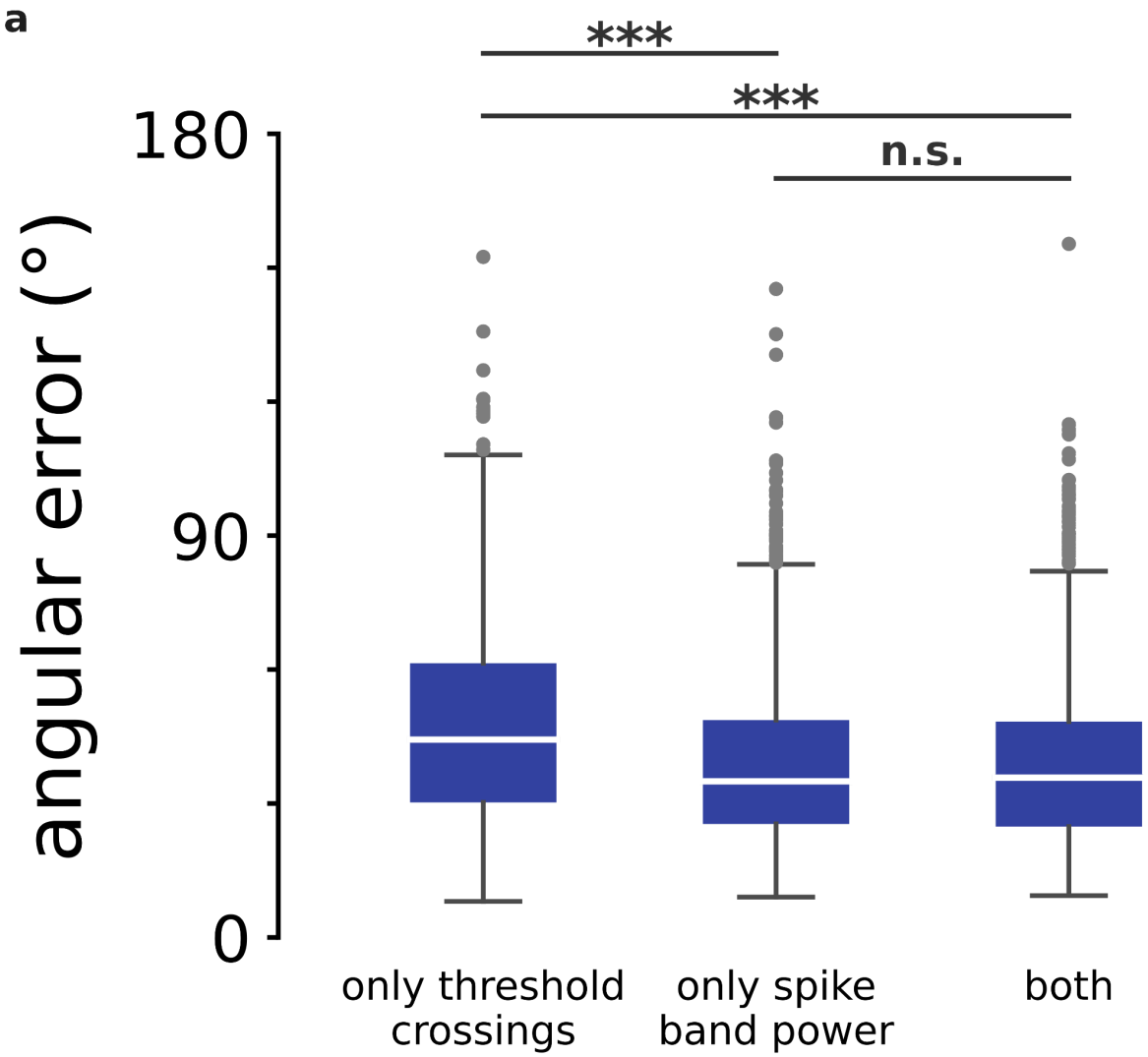
Supplementary Movie 3. Simultaneous Speech and Cursor Task. Participant T15 performing the Simultaneous Speech and Cursor Task. Cursor movement was in full closed-loop neural control. The block type was ‘speak if beep’, so T15 attempted to speak the words (inaudible in this video) when he heard the beep (the ‘speech go cue’). The instructed cursor imagery was ‘Right Hand Mouse’. Targets were selected by dwelling the cursor on them (i.e., there was no clicking).
Link to view online: https://ucdavis.box.com/s/jksikp6t3rhi70r87678dun70zw29q2v

Supplementary Movie 4. Rapid calibration during first-ever cursor BCI usage. Participant T15’s first 3 minutes of ever using a cursor BCI. As described in Section 2.3.1, the task began in open-loop and gradually transitioned to closed-loop as a decoder being trained in the background improved. From the 35 second mark on, T15 had full closed-loop neural control of the cursor. The instructed cursor imagery was ‘Right Hand Mouse’, but T15 also moved his head along with the cursor during this block. T15 had familiarity with using a head mouse from past experience.
Link to view online: https://ucdavis.box.com/s/uka4ddljzqmhhphihsim0qr9gezudmqi

Supplementary Movie 5. Personal use (opening and browsing Netflix). Over-the-shoulder view of participant T15 using the cursor BCI to control his personal computer’s mouse cursor, with screen

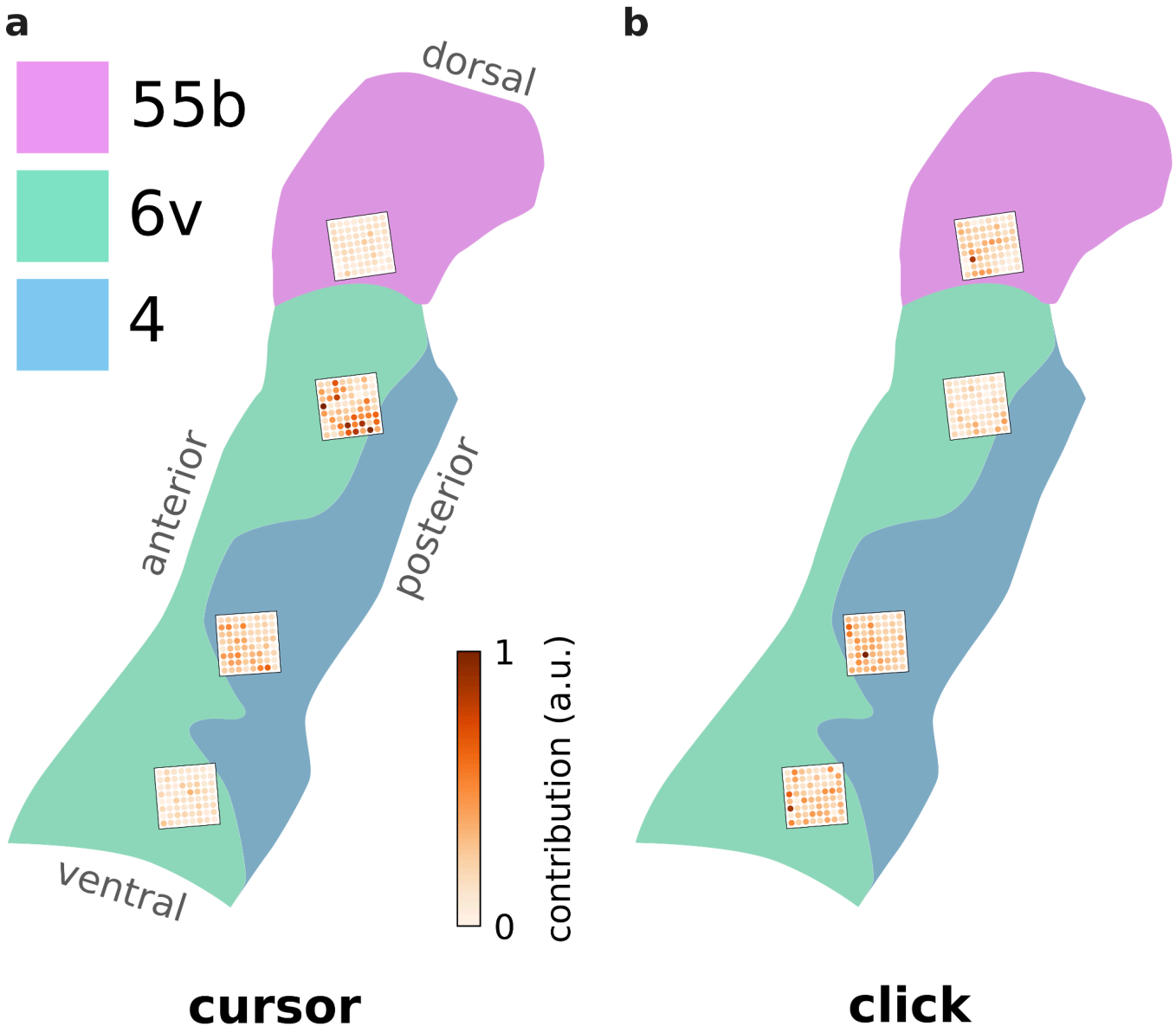
capture of his monitor overlaid. In this clip, T15 opened Netflix in a new browser tab, selected his own user account, scrolled down the page by clicking the scroll bar, and started watching a TV show.
Link to view online: https://ucdavis.box.com/s/x39nfzujcfdf0czhj3h43r720rgk4lts

Supplementary Movie 6. Personal use (playing the New York Times Spelling Bee).
Over-the-shoulder view of participant T15 using the cursor BCI to control his personal computer's mouse cursor, with screen capture of his monitor overlaid. In this clip, T15 typed and submitted words in the New York Times Spelling Bee web game by clicking each letter and clicking the word submission button.
Link to view online: https://ucdavis.box.com/s/ac6pymrvvenydg5smhbn6ipfguojkuzu



Supplementary Figure 1. Comparison of neural feature types for cursor decoding. a. Angular error per trial computed offline under three different choices of neural features used for decoding: threshold crossings, spike band power, and both combined. Input vectors to the training and decoding algorithms were 512-D when using both types of neural features (as was done online in this study) and 256-D when using each feature type alone. There was no significant difference between using spike

band power alone vs. using spike band power and threshold crossings together (* p<0.05, ** p<0.01, *** p<0.001, rank-sum test, Bonferroni correction).



Supplementary Figure 2. Microelectrode contributions to cursor and click. a. Individual microelectrodes, colored by their relative contribution to the cursor decoder's output vectors during the Grid Evaluation Task. The arrays are overlaid on the HCP parcellation results for T15's vPCG. **b.** Same as panel a, but for click decoding. Electrodes are colored by the portion they contributed to the click decoder's class probability estimates. See Sections 2.4.2 and 2.5.1 for how each electrode's decoder contributions were calculated.