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Supplemental Information

Intrinsic Variable Learning for Brain-Machine Interface Control by Human Anterior Intraparietal Cortex

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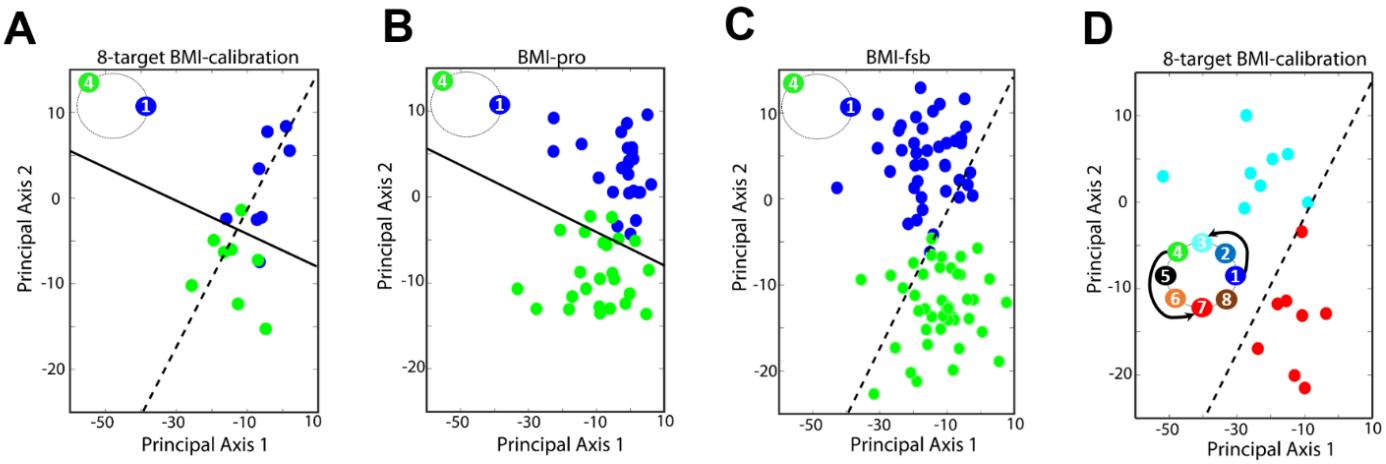

Figure S1 (related to 6B). Activity distribution of untrained neurons in 2-dimensional space in BMI-pro and BMI-fsb tasks. (**A**) We project the population activity of 20 untrained neurons from the BMI-calibration trials during intended movements to stimulus 1 (green) and 4 (blue) into 2-dimensional space using PCA. A linear discriminant analysis (LDA) is applied to identify a boundary that best separates the two-firing rate clusters of the untrained neurons (black continuous line). We also identify a boundary that provides the worst classification between the two-firing rate clusters (black discontinuous line). (**B**) Using the projection matrix from the PCA analysis in BMI-calibration, we project the population activity of the untrained neurons from the BMI-pro task in the 2D space. The linear boundary that best separates the two firing rate clusters does not change, indicating that the untrained neurons maintained the same coding between the BMI-calibration and BMI-pro task. (**C**) Projecting the population activity during the BMI-fsb task into the 2D space, the two-firing rate clusters are best separated by the discontinuous linear boundary – i.e., the one that poorly performed in the BMI-pro trials. This suggests that the distribution of the neuronal activity of the untrained neurons between the BMI-pro and the BMI-fsb tasks are different. (**D**) Activity distribution of the untrained neurons in a 2-dimensional space during BMI-

calibration trials for intended wrist movements to stimuli 3 (cyan) and 7 (red). Consistent with the findings from trained neuron analysis, the matching targets for the stimulus 1 is stimulus 3 and for the stimulus 4 is stimulus 7. The arrows indicate the relationship between the stimulus and matched target locations in the BMI-calibration. Therefore, we conclude that both trained and untrained neurons encode the same matching targets providing evidence in favor of the re-aiming strategy to compensate for the perturbation in the BMI-fsb task.