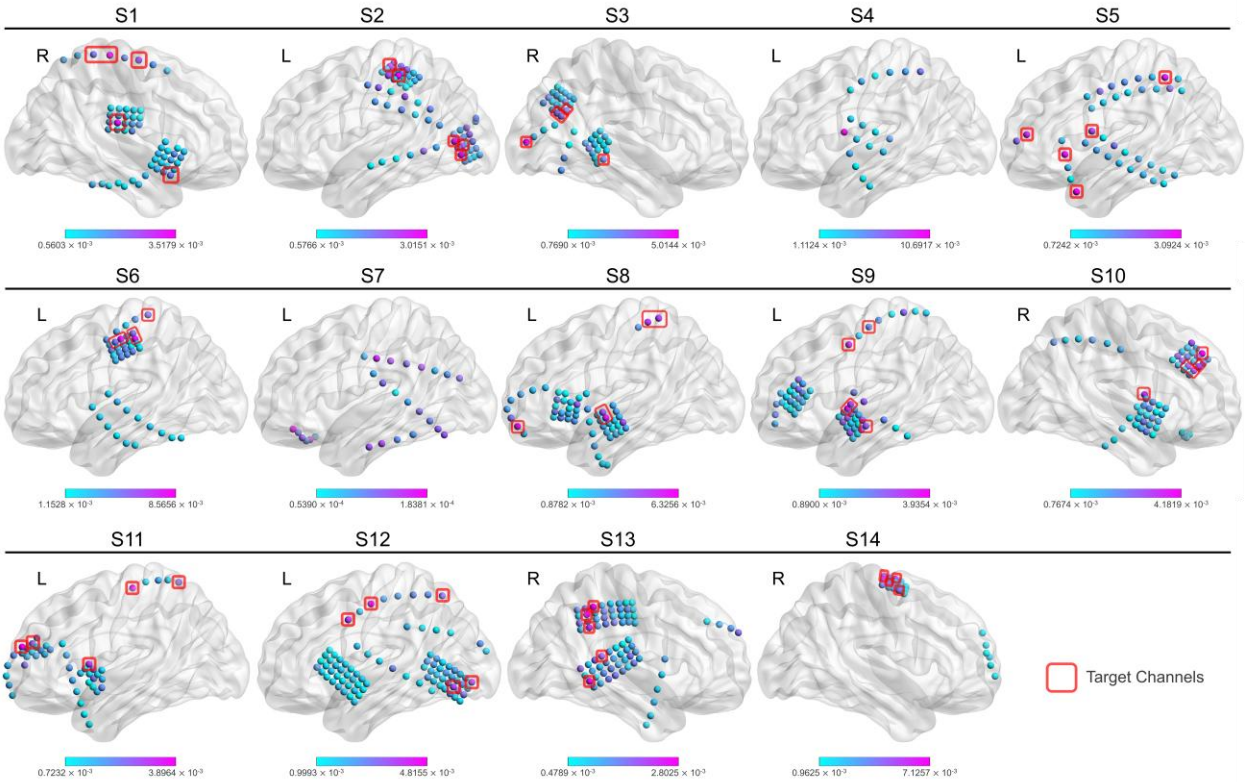
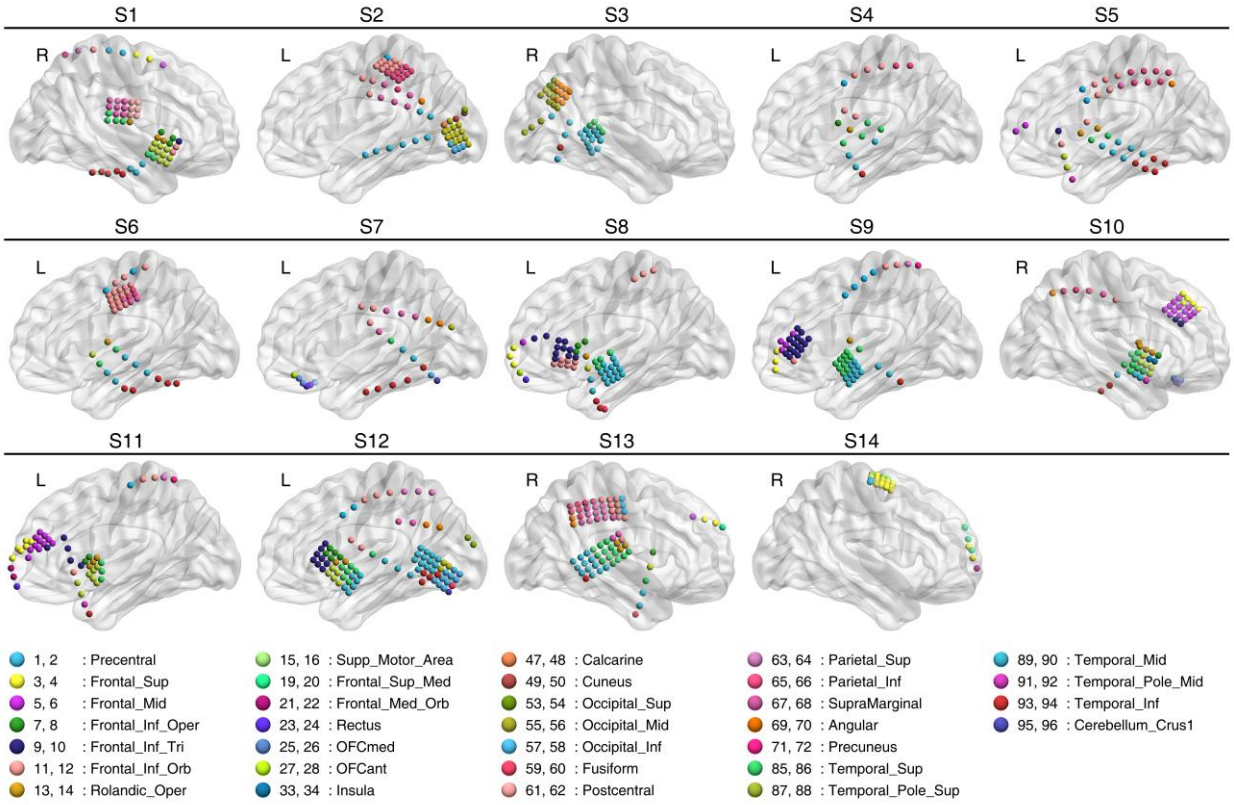
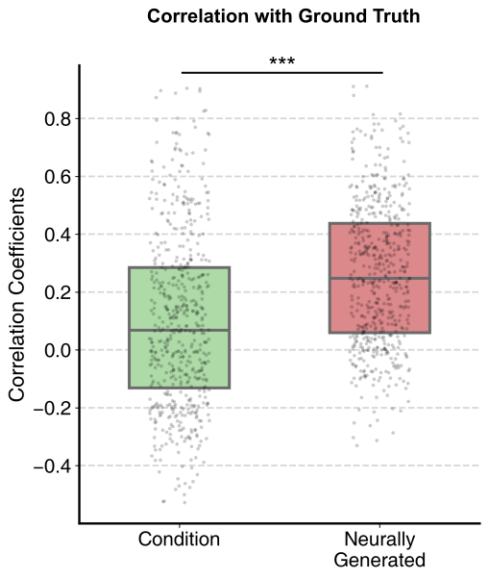
List of Supplementary Materials



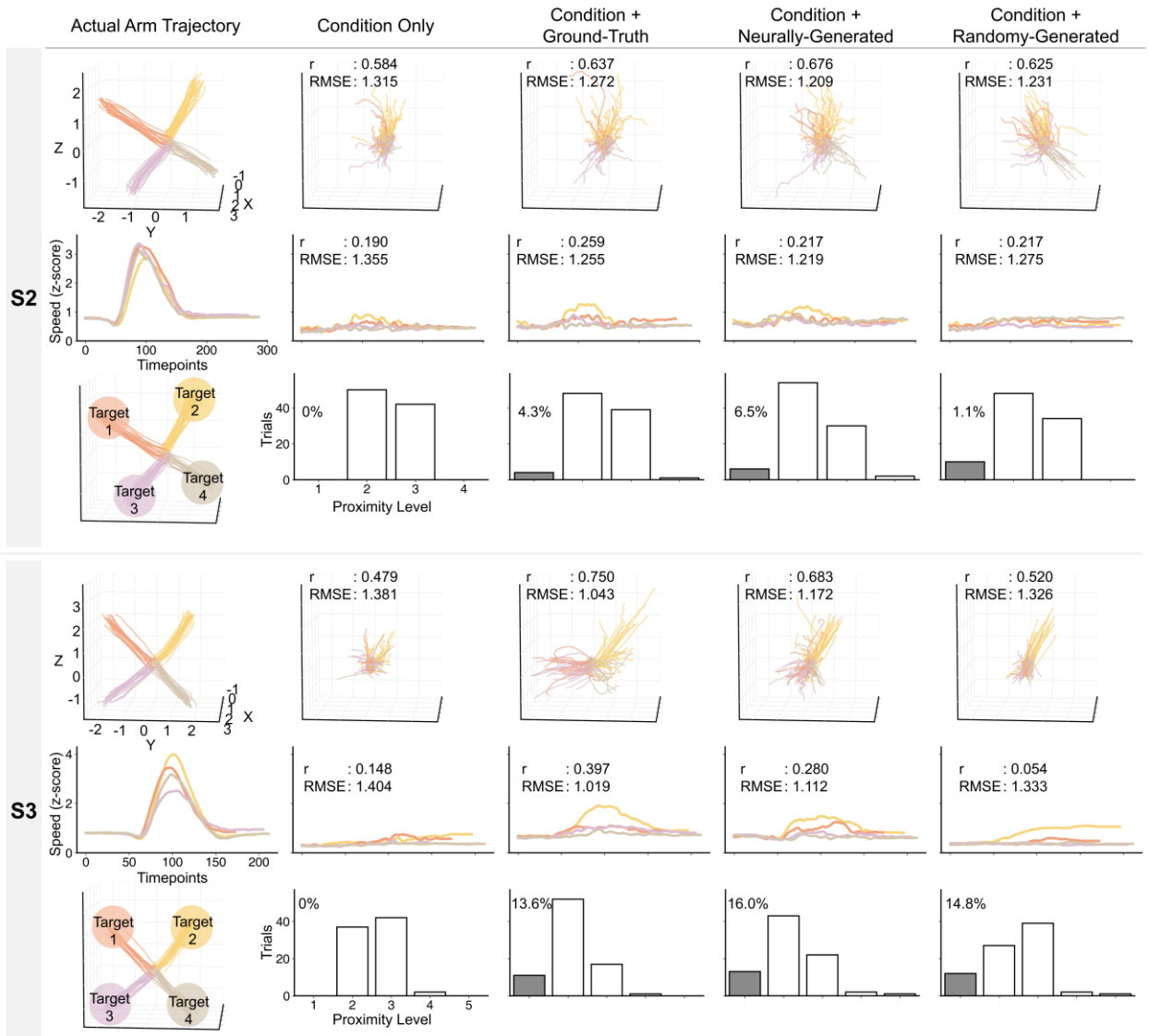
Supplementary Figure 1. Intra-subject XAI contribution maps. Integrated gradients were computed from subject-specific Bi-LSTM decoders trained on Session 1 data. Electrodes are color-coded by IG values, with higher values indicating greater contribution. The top five target channels used for intra-subject analysis are indicated, except for excluded subjects (S4 and S7). R, right lateral view; L, left lateral view.

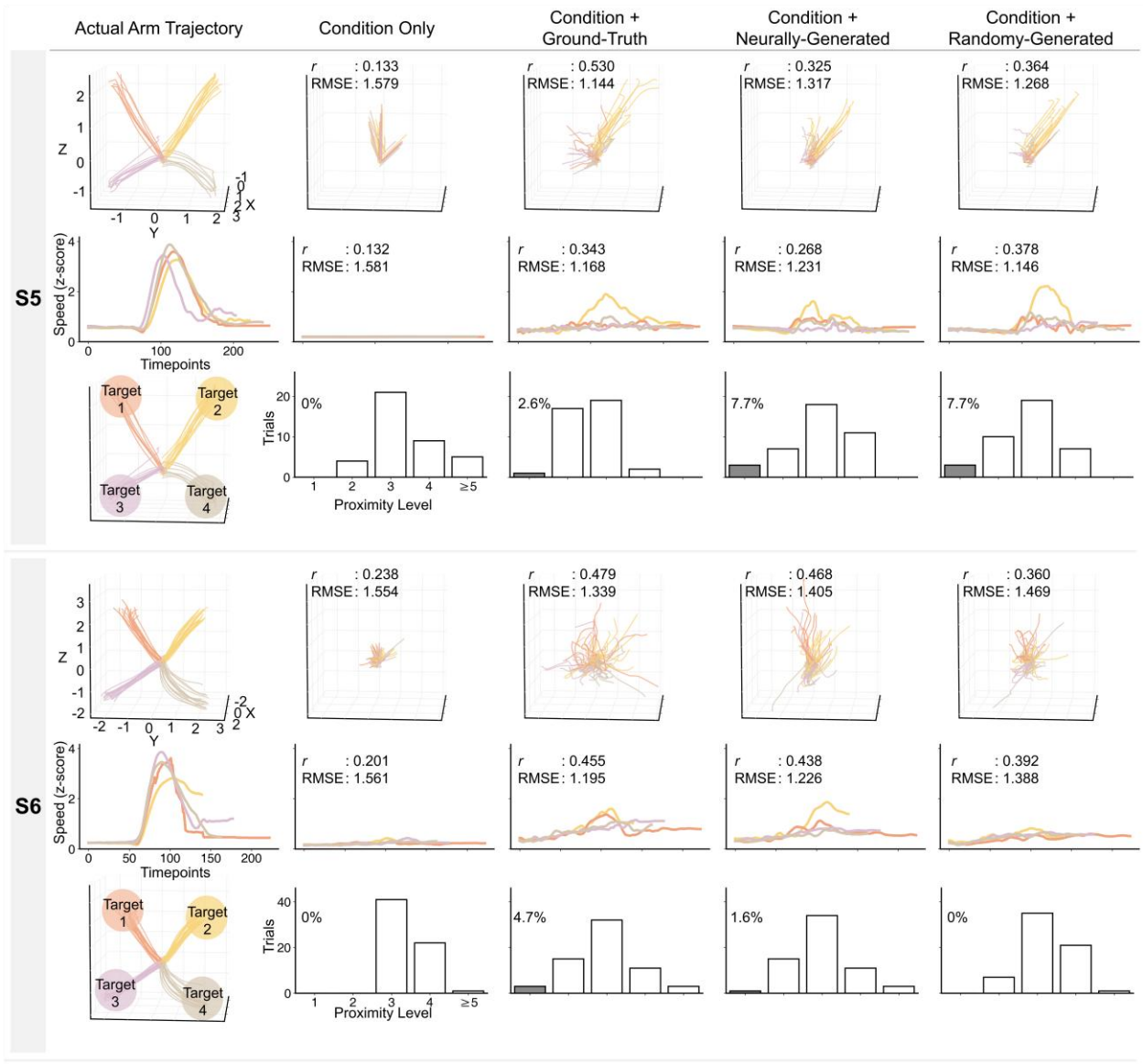


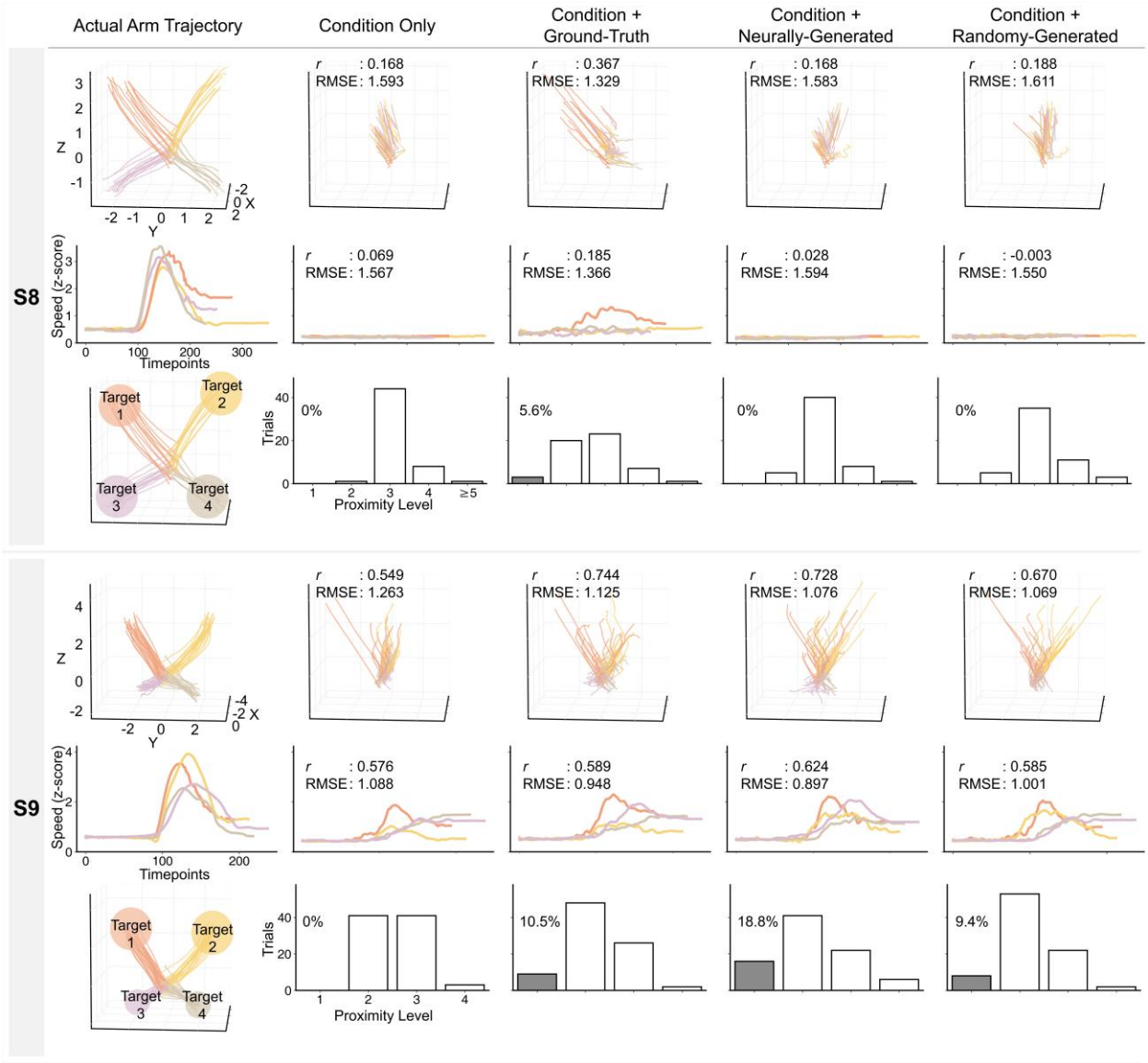
Supplementary Figure 2. Electrode location across all subjects. ECoG electrode locations projected onto an MNI template. Electrode placement was determined based on clinical requirements for seizure monitoring. Colors denote AAL3-defined region. Bad channels were excluded. R, right lateral view; L, left lateral view.

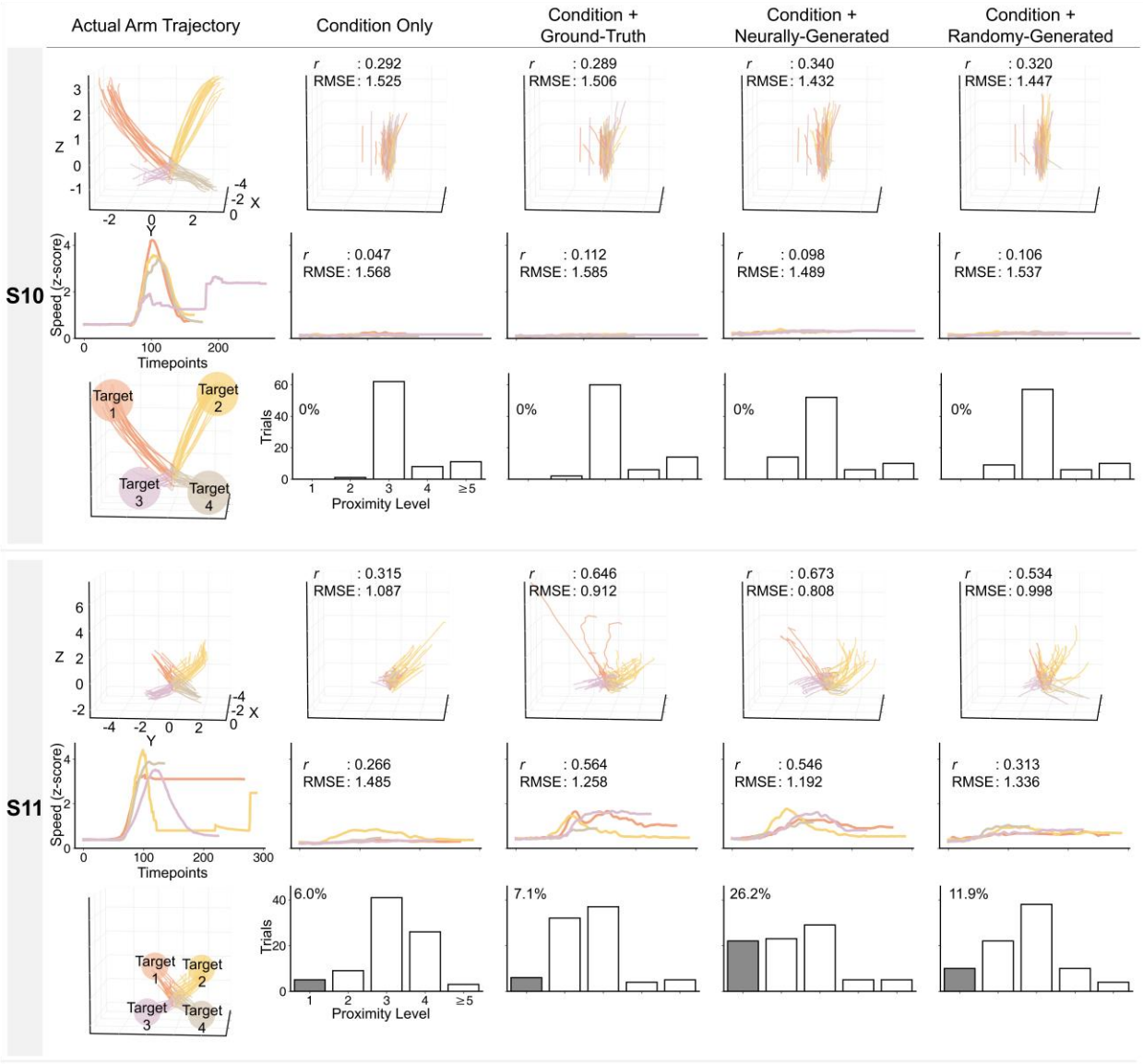


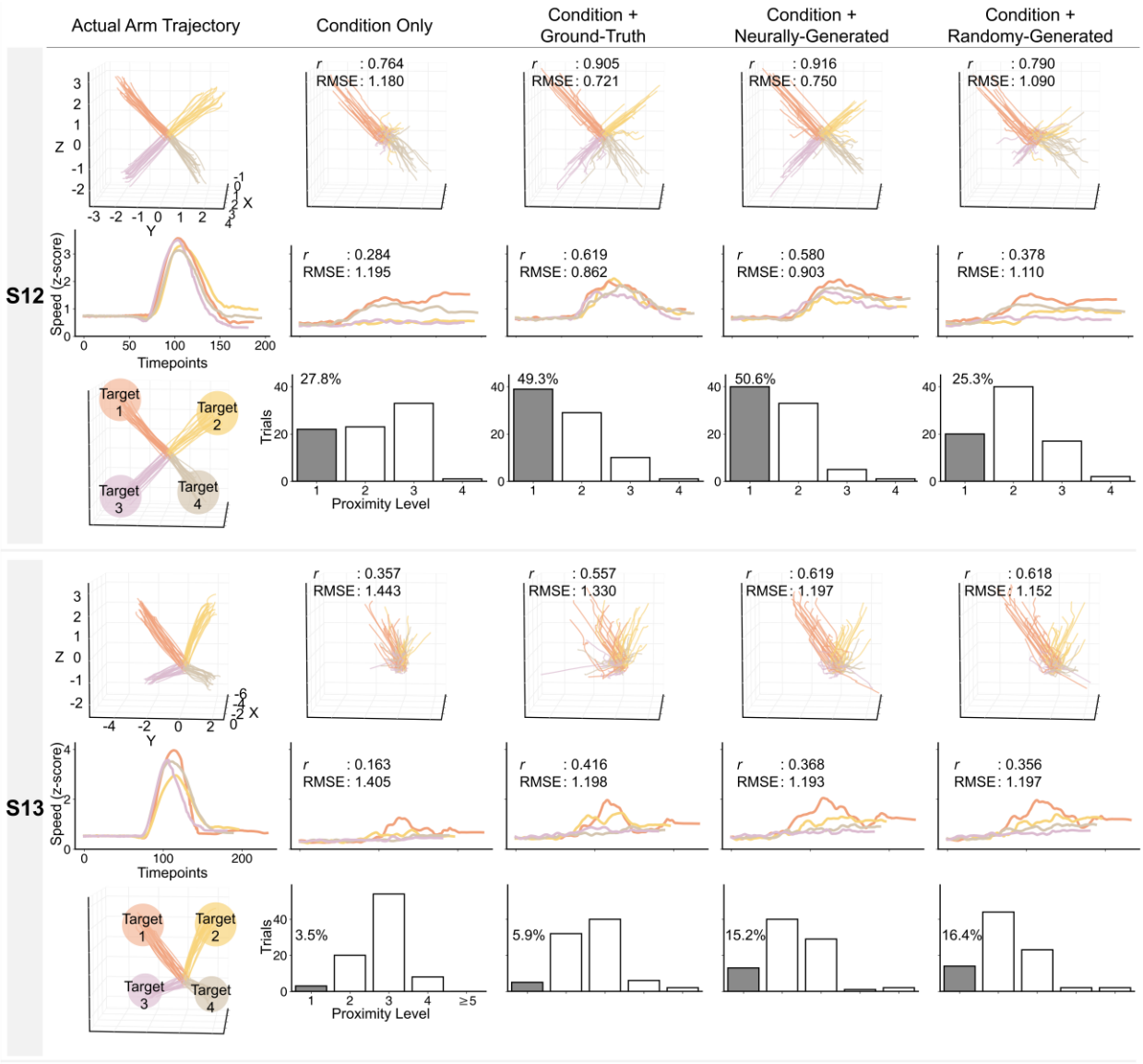
Supplementary Figure 3. Correlation coefficients of ground-truth signals with neurally-generated and condition-channel signals. Correlation Coefficients between the ground truth and each signal type (condition channel signals, and neurally-generated signals) across all cases (n= 5 target channels × 110 cases = 550). For condition channel signals, the maximum correlation coefficient across all target-condition pairs was used for each case**.** Boxes represent the interquartile range (IQR; 25th-75th percentile) with the median indicated by the horizontal line, and individual data points are shown as scatter dots. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$; statistical significance was assessed using two-sided pairwise Wilcoxon signed-rank test**s**.

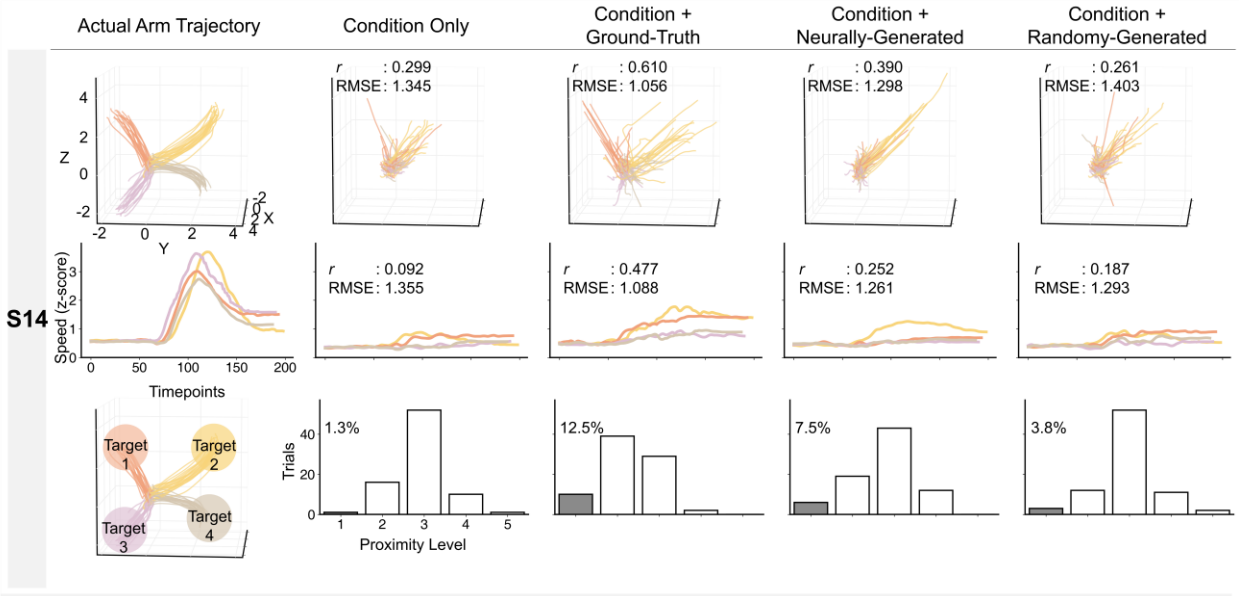

Actual Arm Trajectory
Condition Only
Condition + Ground-Truth
Condition + Neurally-Generated
Condition + Randomy-Generated
S2
S3
r : 0.584
RMSE: 1.315
r : 0.637
RMSE: 1.272
r : 0.676
RMSE: 1.209
r : 0.625
RMSE: 1.231
r : 0.190
RMSE: 1.355
r : 0.259
RMSE: 1.255
r : 0.217
RMSE: 1.219
r : 0.217
RMSE: 1.275
Speed (z-score)
Timepoints
Target 1
Target 2
Target 3
Target 4
Trials
Proximity Level
0%
4.3%
6.5%
1.1%
r : 0.479
RMSE: 1.381
r : 0.750
RMSE: 1.043
r : 0.683
RMSE: 1.172
r : 0.520
RMSE: 1.326
r : 0.148
RMSE: 1.404
r : 0.397
RMSE: 1.019
r : 0.280
RMSE: 1.112
r : 0.054
RMSE: 1.333
0%
13.6%
16.0%
14.8%


Actual Arm Trajectory
Condition Only
Condition + Ground-Truth
Condition + Neurally-Generated
Condition + Randomy-Generated
S5
S6
r : 0.133
RMSE: 1.579
r : 0.530
RMSE: 1.144
r : 0.325
RMSE: 1.317
r : 0.364
RMSE: 1.268
r : 0.132
RMSE: 1.581
r : 0.343
RMSE: 1.168
r : 0.268
RMSE: 1.231
r : 0.378
RMSE: 1.146
r : 0.238
RMSE: 1.554
r : 0.479
RMSE: 1.339
r : 0.468
RMSE: 1.405
r : 0.360
RMSE: 1.469
r : 0.201
RMSE: 1.561
r : 0.455
RMSE: 1.195
r : 0.438
RMSE: 1.226
r : 0.392
RMSE: 1.388
Speed (z-score)
Timepoints
Trials
Proximity Level
0%
2.6%
7.7%
7.7%
0%
4.7%
1.6%
0%
Target 1
Target 2
Target 3
Target 4

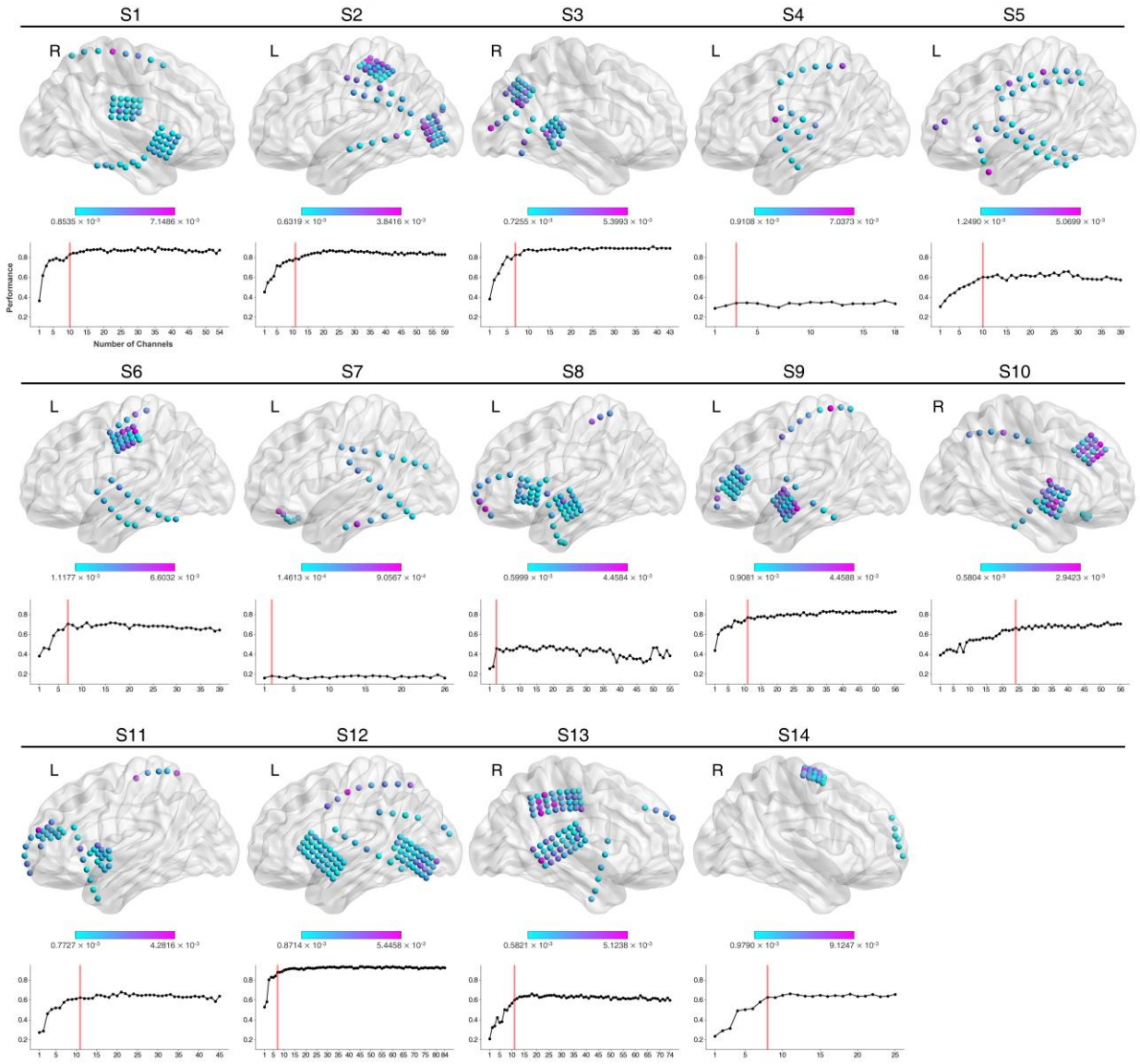

Actual Arm Trajectory
Condition Only
Condition + Ground-Truth
Condition + Neurally-Generated
Condition + Randomy-Generated
S8
S9
r : 0.168
RMSE: 1.593
r : 0.367
RMSE: 1.329
r : 0.168
RMSE: 1.583
r : 0.188
RMSE: 1.611
r : 0.069
RMSE: 1.567
r : 0.185
RMSE: 1.366
r : 0.028
RMSE: 1.594
r : -0.003
RMSE: 1.550
Speed (z-score)
Timepoints
Target 1
Target 2
Target 3
Target 4
Trials
Proximity Level
0%
5.6%
0%
0%
r : 0.549
RMSE: 1.263
r : 0.744
RMSE: 1.125
r : 0.728
RMSE: 1.076
r : 0.670
RMSE: 1.069
r : 0.576
RMSE: 1.088
r : 0.589
RMSE: 0.948
r : 0.624
RMSE: 0.897
r : 0.585
RMSE: 1.001
10.5%
18.8%
9.4%


Actual Arm Trajectory
Condition Only
Condition + Ground-Truth
Condition + Neurally-Generated
Condition + Randomy-Generated
S10
S11
r : 0.292
RMSE: 1.525
r : 0.289
RMSE: 1.506
r : 0.340
RMSE: 1.432
r : 0.320
RMSE: 1.447
r : 0.047
RMSE: 1.568
r : 0.112
RMSE: 1.585
r : 0.098
RMSE: 1.489
r : 0.106
RMSE: 1.537
Speed (z-score)
Timepoints
Target 1
Target 2
Target 3
Target 4
Trials
Proximity Level
0%
r : 0.315
RMSE: 1.087
r : 0.646
RMSE: 0.912
r : 0.673
RMSE: 0.808
r : 0.534
RMSE: 0.998
r : 0.266
RMSE: 1.485
r : 0.564
RMSE: 1.258
r : 0.546
RMSE: 1.192
r : 0.313
RMSE: 1.336
6.0%
7.1%
26.2%
11.9%

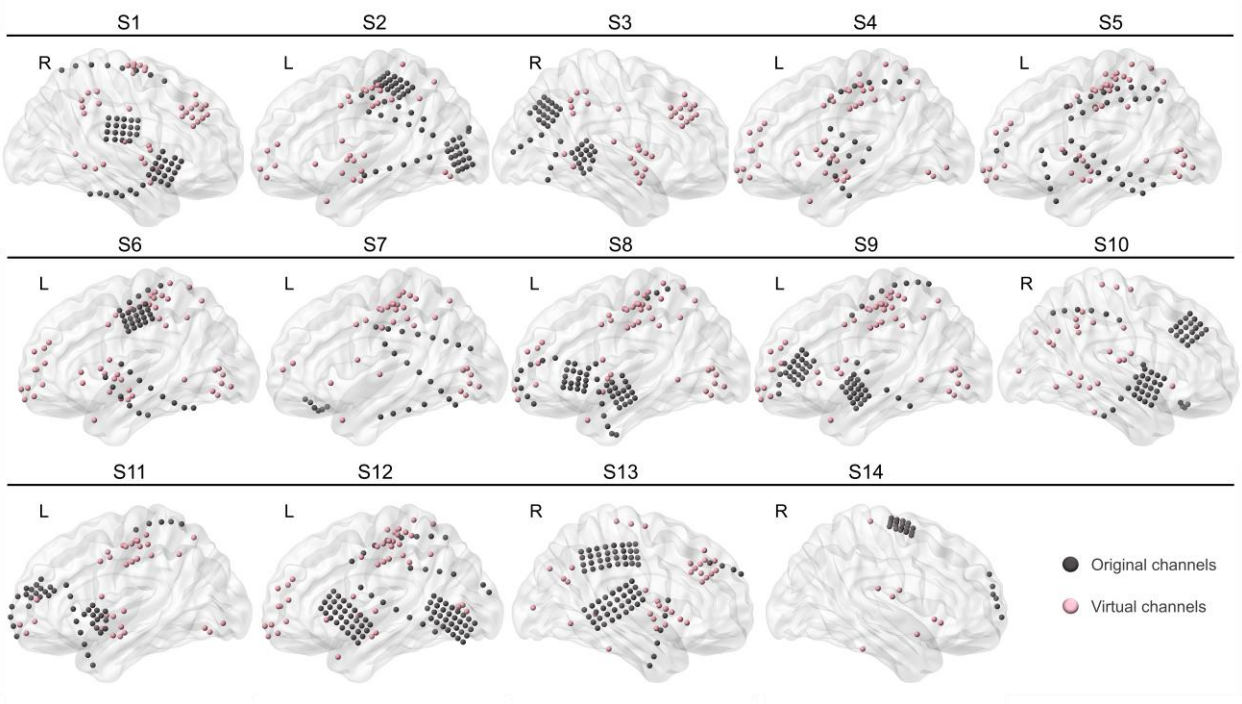

Actual Arm Trajectory
Condition Only
Condition + Ground-Truth
Condition + Neurally-Generated
Condition + Randomy-Generated
S12
S13
r : 0.764
RMSE: 1.180
r : 0.905
RMSE: 0.721
r : 0.916
RMSE: 0.750
r : 0.790
RMSE: 1.090
r : 0.284
RMSE: 1.195
r : 0.619
RMSE: 0.862
r : 0.580
RMSE: 0.903
r : 0.378
RMSE: 1.110
r : 0.357
RMSE: 1.443
r : 0.557
RMSE: 1.330
r : 0.619
RMSE: 1.197
r : 0.618
RMSE: 1.152
r : 0.163
RMSE: 1.405
r : 0.416
RMSE: 1.198
r : 0.368
RMSE: 1.193
r : 0.356
RMSE: 1.197
Speed (z-score)
Timepoints
Trials
Proximity Level
27.8%
49.3%
50.6%
25.3%
3.5%
5.9%
15.2%
16.4%
Target 1
Target 2
Target 3
Target 4



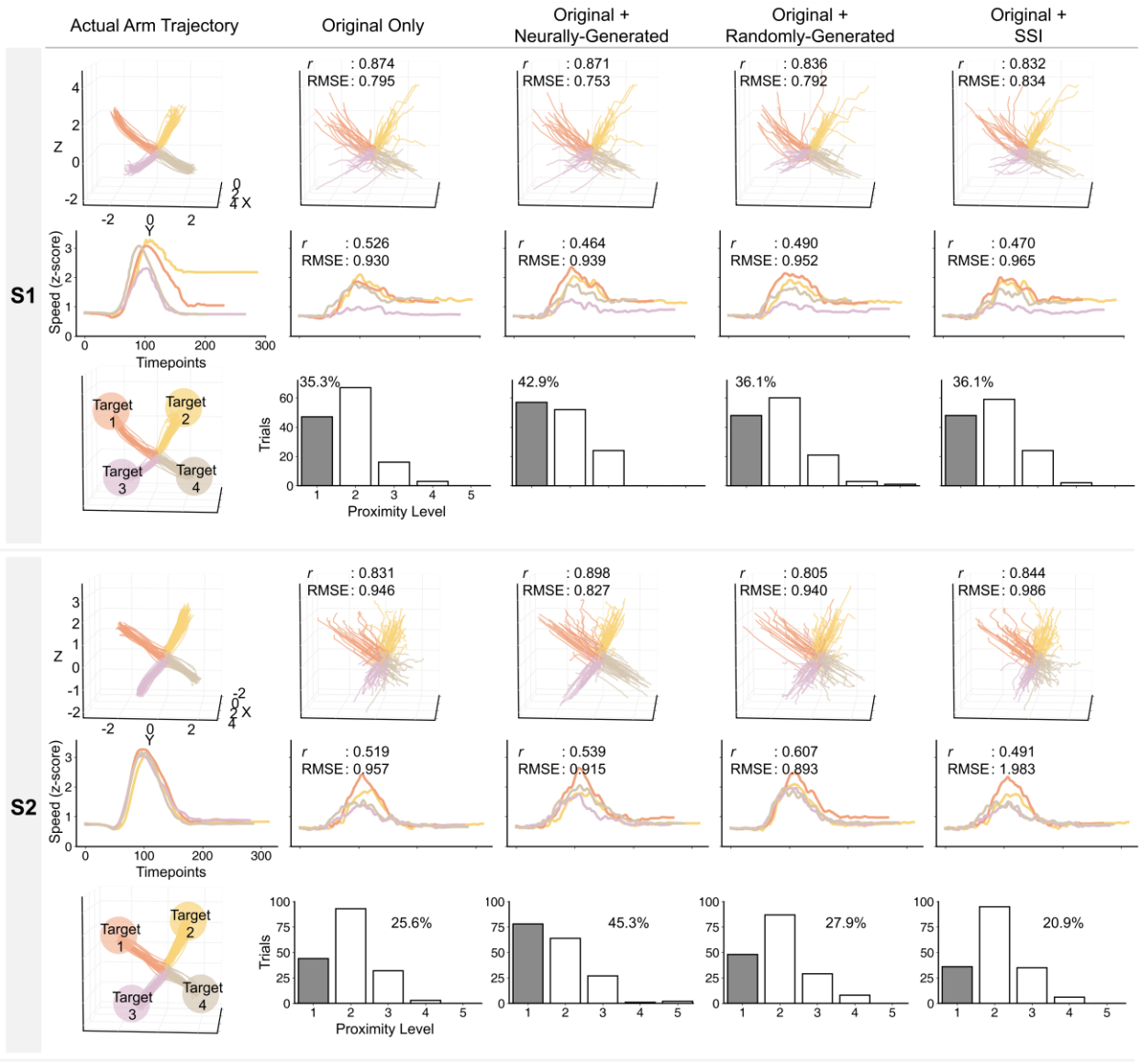
Supplementary Figure 4. Intra-subject decoding results. Representative intra-subject analysis results for individual subjects. Decoded trajectories, speed profiles, and endpoint reaching rate histograms are displayed, following the visualization format described in Figure 2.

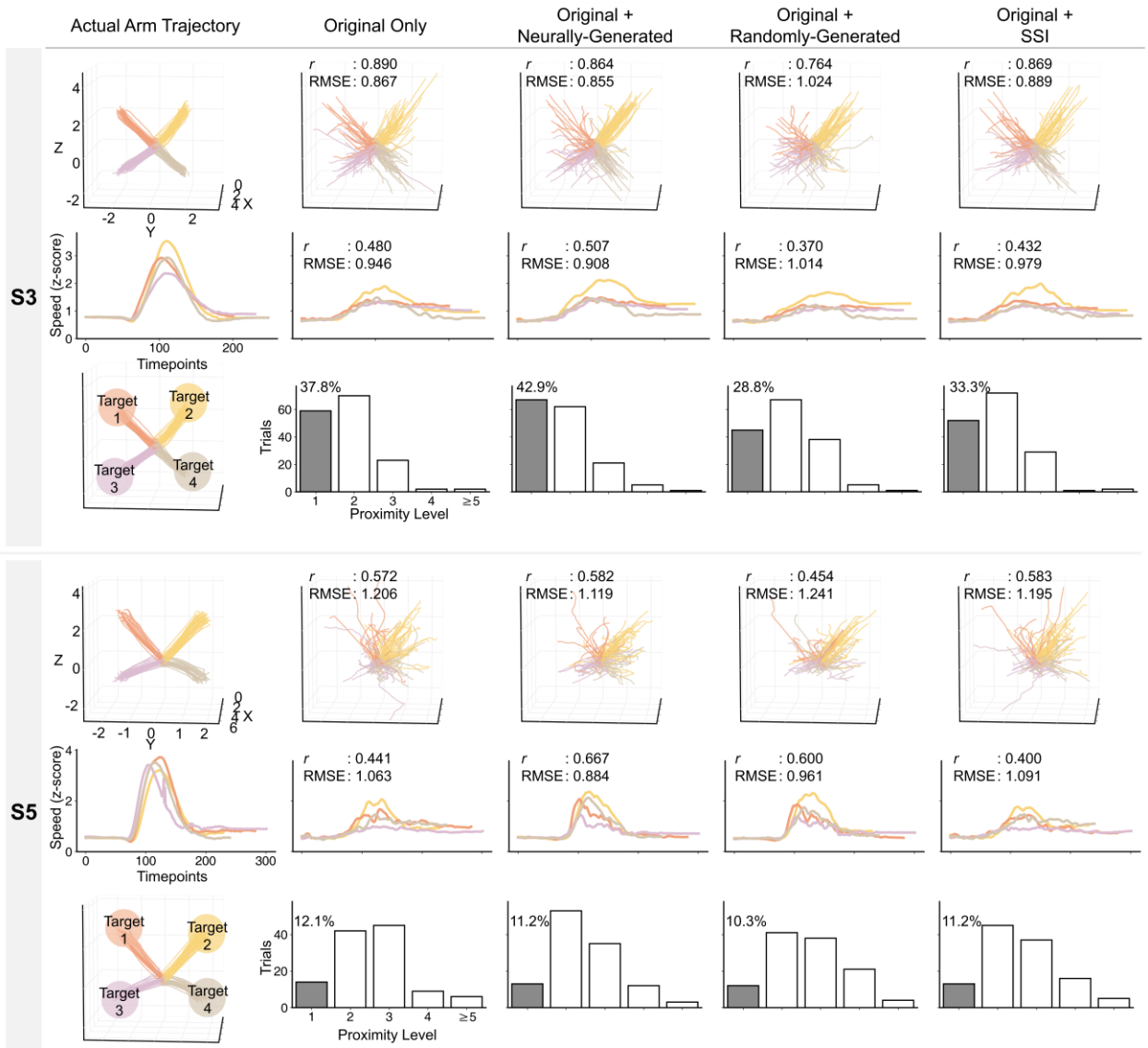


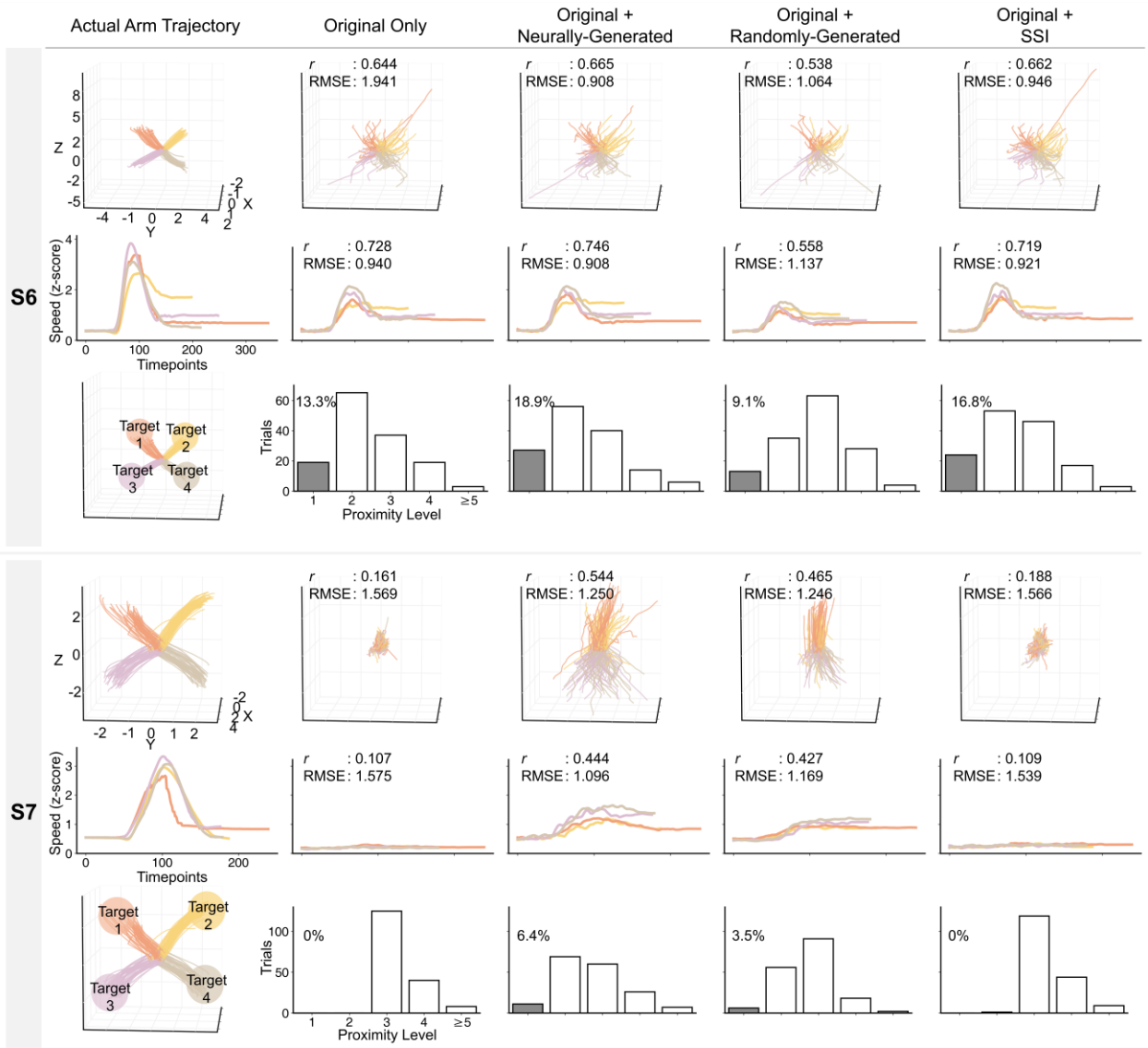
Supplementary Figure 5. Inter-subject XAI maps and elbow point-based channel selection. Inter-subject XAI contribution maps and the corresponding elbow point analysis for target channel selection, utilizing data from all sessions. For each subject, the contribution of all channels is mapped onto the cortical surface, followed by an evaluation of the elbow point using the trajectory correlation coefficient as the performance metric. This elbow point serves as the threshold for identifying the target channels used in the inter-subject analysis. R, right lateral view; L, left lateral view.

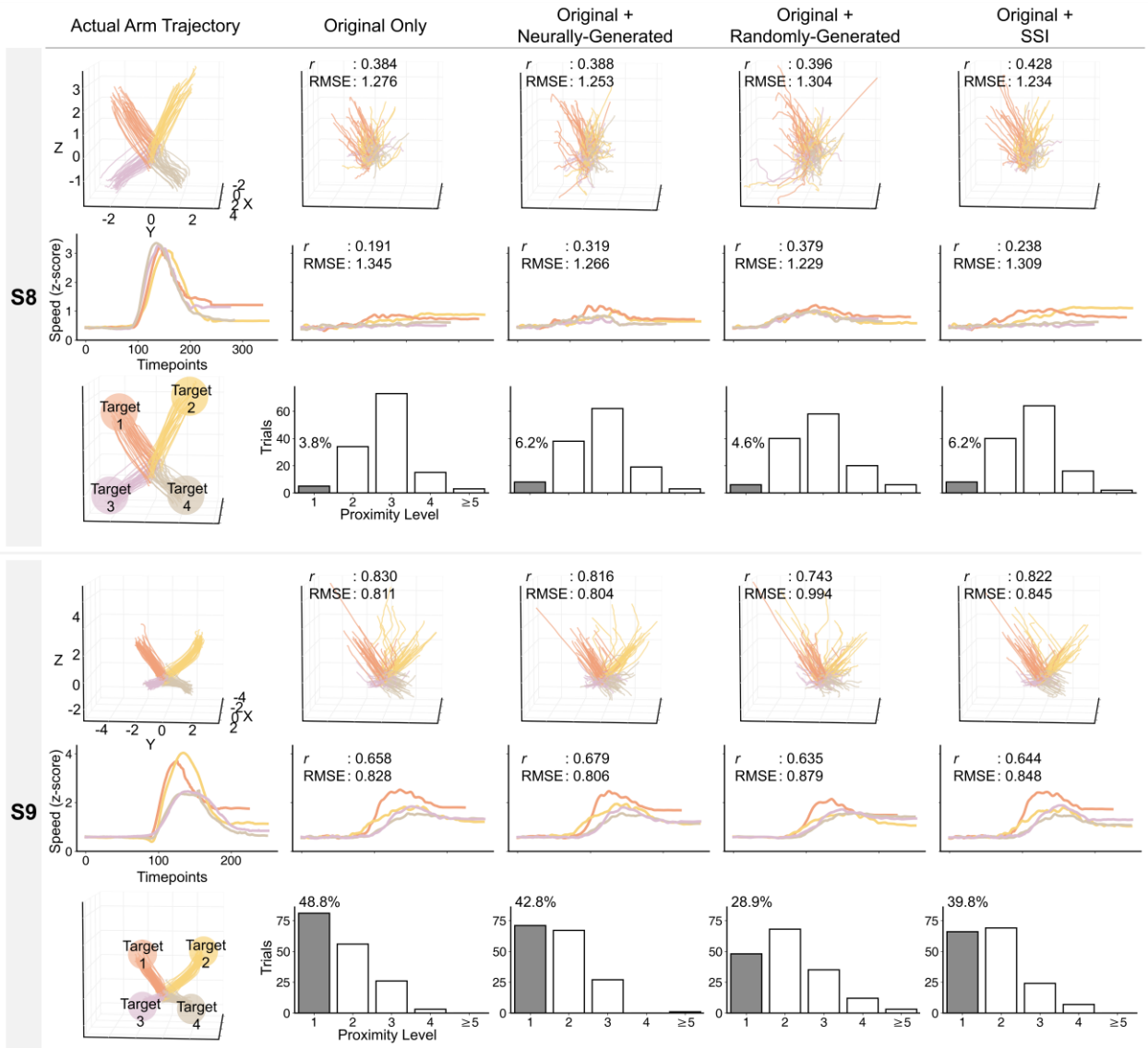


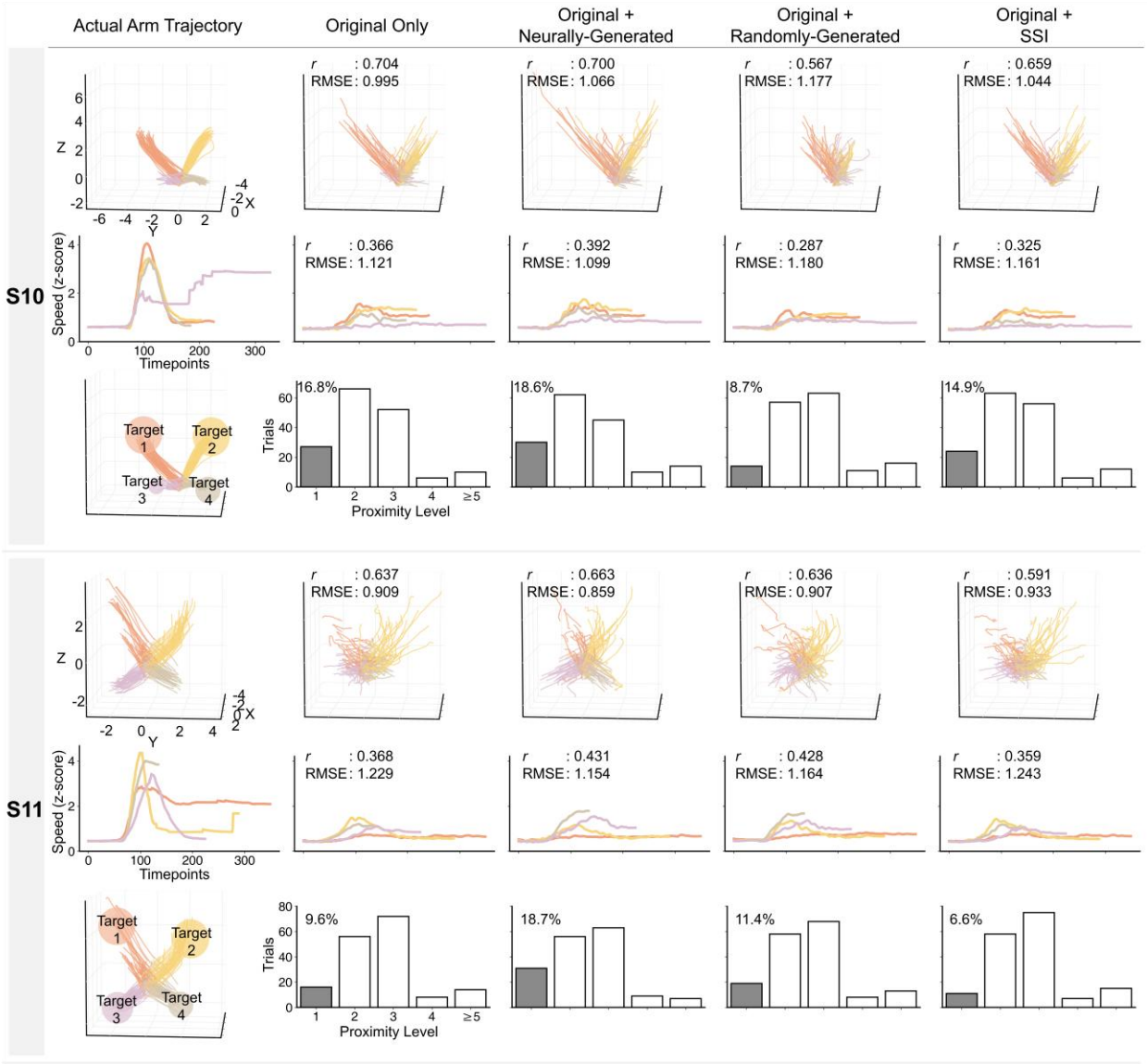
Supplementary Figure 6. Spatial distribution of original and virtual electrodes. Original channels are shown in black, and virtual channels are shown in pink (n = 14). R, right lateral view; L, left lateral view.

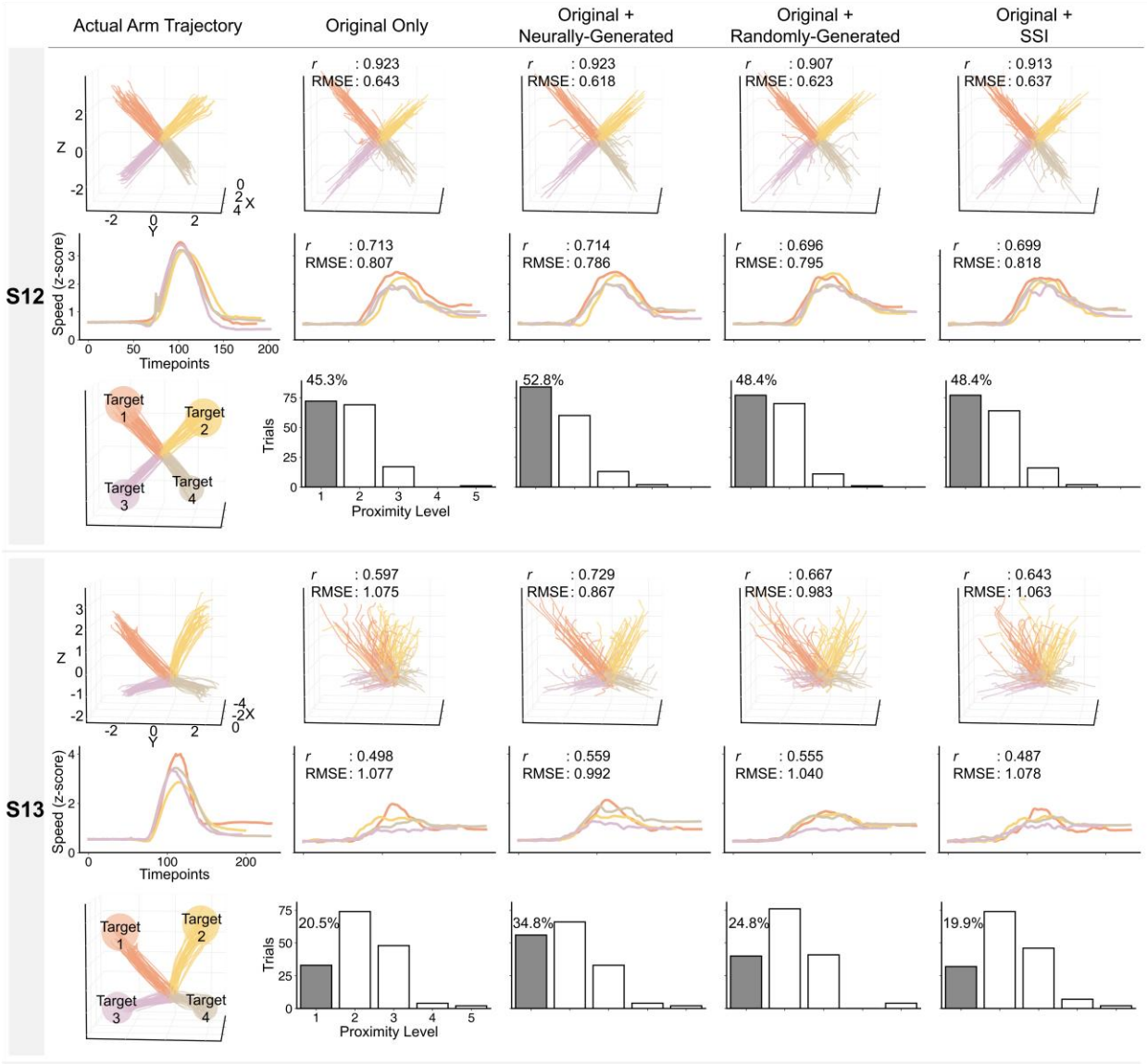

Actual Arm Trajectory
Original Only
Original + Neurally-Generated
Original + Randomly-Generated
Original + SSI
S1
S2
r : 0.874
RMSE: 0.795
r : 0.871
RMSE: 0.753
r : 0.836
RMSE: 0.792
r : 0.832
RMSE: 0.834
r : 0.526
RMSE: 0.930
r : 0.464
RMSE: 0.939
r : 0.490
RMSE: 0.952
r : 0.470
RMSE: 0.965
Speed (z-score)
Timepoints
Target 1
Target 2
Target 3
Target 4
35.3%
42.9%
36.1%
36.1%
Trials
Proximity Level
r : 0.831
RMSE: 0.946
r : 0.898
RMSE: 0.827
r : 0.805
RMSE: 0.940
r : 0.844
RMSE: 0.986
r : 0.519
RMSE: 0.957
r : 0.539
RMSE: 0.915
r : 0.607
RMSE: 0.893
r : 0.491
RMSE: 1.983
25.6%
45.3%
27.9%
20.9%

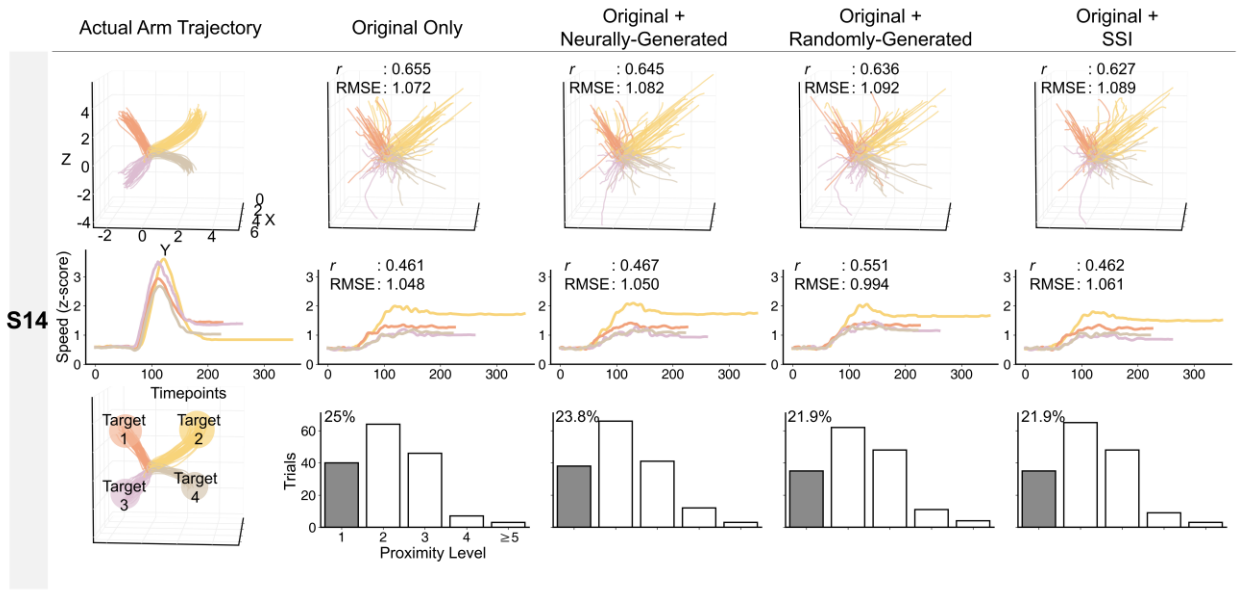

Actual Arm Trajectory
Original Only
Original + Neurally-Generated
Original + Randomly-Generated
Original + SSI
S3
S5
r : 0.890
RMSE: 0.867
r : 0.864
RMSE: 0.855
r : 0.764
RMSE: 1.024
r : 0.869
RMSE: 0.889
r : 0.480
RMSE: 0.946
r : 0.507
RMSE: 0.908
r : 0.370
RMSE: 1.014
r : 0.432
RMSE: 0.979
Speed (z-score)
Timepoints
Target 1
Target 2
Target 3
Target 4
37.8%
42.9%
28.8%
33.3%
Trials
Proximity Level
r : 0.572
RMSE: 1.206
r : 0.582
RMSE: 1.119
r : 0.454
RMSE: 1.241
r : 0.583
RMSE: 1.195
r : 0.441
RMSE: 1.063
r : 0.667
RMSE: 0.884
r : 0.600
RMSE: 0.961
r : 0.400
RMSE: 1.091
12.1%
11.2%
10.3%
11.2%


Actual Arm Trajectory
Original Only
Original + Neurally-Generated
Original + Randomly-Generated
Original + SSI
S6
S7
r : 0.644
RMSE: 1.941
r : 0.665
RMSE: 0.908
r : 0.538
RMSE: 1.064
r : 0.662
RMSE: 0.946
r : 0.728
RMSE: 0.940
r : 0.746
RMSE: 0.908
r : 0.558
RMSE: 1.137
r : 0.719
RMSE: 0.921
r : 0.161
RMSE: 1.569
r : 0.544
RMSE: 1.250
r : 0.465
RMSE: 1.246
r : 0.188
RMSE: 1.566
r : 0.107
RMSE: 1.575
r : 0.444
RMSE: 1.096
r : 0.427
RMSE: 1.169
r : 0.109
RMSE: 1.539
Speed (z-score)
Timepoints
Target 1
Target 2
Target 3
Target 4
Trials
Proximity Level
13.3%
18.9%
9.1%
16.8%
0%
6.4%
3.5%
0%

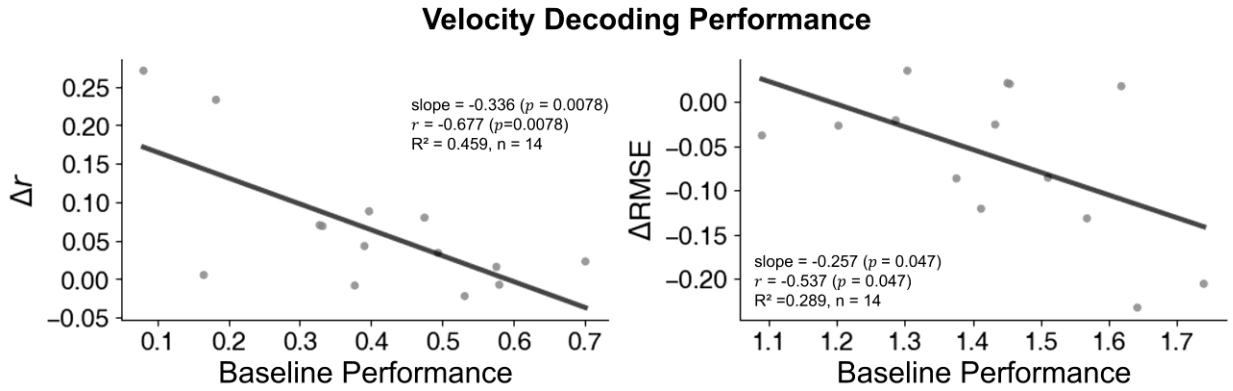

Actual Arm Trajectory
Original Only
Original + Neurally-Generated
Original + Randomly-Generated
Original + SSI
S8
S9
r : 0.384
RMSE: 1.276
r : 0.388
RMSE: 1.253
r : 0.396
RMSE: 1.304
r : 0.428
RMSE: 1.234
r : 0.191
RMSE: 1.345
r : 0.319
RMSE: 1.266
r : 0.379
RMSE: 1.229
r : 0.238
RMSE: 1.309
Speed (z-score)
Timepoints
Target 1
Target 2
Target 3
Target 4
Trials
Proximity Level
3.8%
6.2%
4.6%
6.2%
r : 0.830
RMSE: 0.811
r : 0.816
RMSE: 0.804
r : 0.743
RMSE: 0.994
r : 0.822
RMSE: 0.845
r : 0.658
RMSE: 0.828
r : 0.679
RMSE: 0.806
r : 0.635
RMSE: 0.879
r : 0.644
RMSE: 0.848
48.8%
42.8%
28.9%
39.8%


Actual Arm Trajectory
Original Only
Original + Neurally-Generated
Original + Randomly-Generated
Original + SSI
S10
S11
r : 0.704
RMSE: 0.995
r : 0.700
RMSE: 1.066
r : 0.567
RMSE: 1.177
r : 0.659
RMSE: 1.044
r : 0.366
RMSE: 1.121
r : 0.392
RMSE: 1.099
r : 0.287
RMSE: 1.180
r : 0.325
RMSE: 1.161
r : 0.637
RMSE: 0.909
r : 0.663
RMSE: 0.859
r : 0.636
RMSE: 0.907
r : 0.591
RMSE: 0.933
r : 0.368
RMSE: 1.229
r : 0.431
RMSE: 1.154
r : 0.428
RMSE: 1.164
r : 0.359
RMSE: 1.243
Speed (z-score)
Timepoints
Target 1
Target 2
Target 3
Target 4
Trials
Proximity Level
16.8%
18.6%
8.7%
14.9%
9.6%
18.7%
11.4%
6.6%

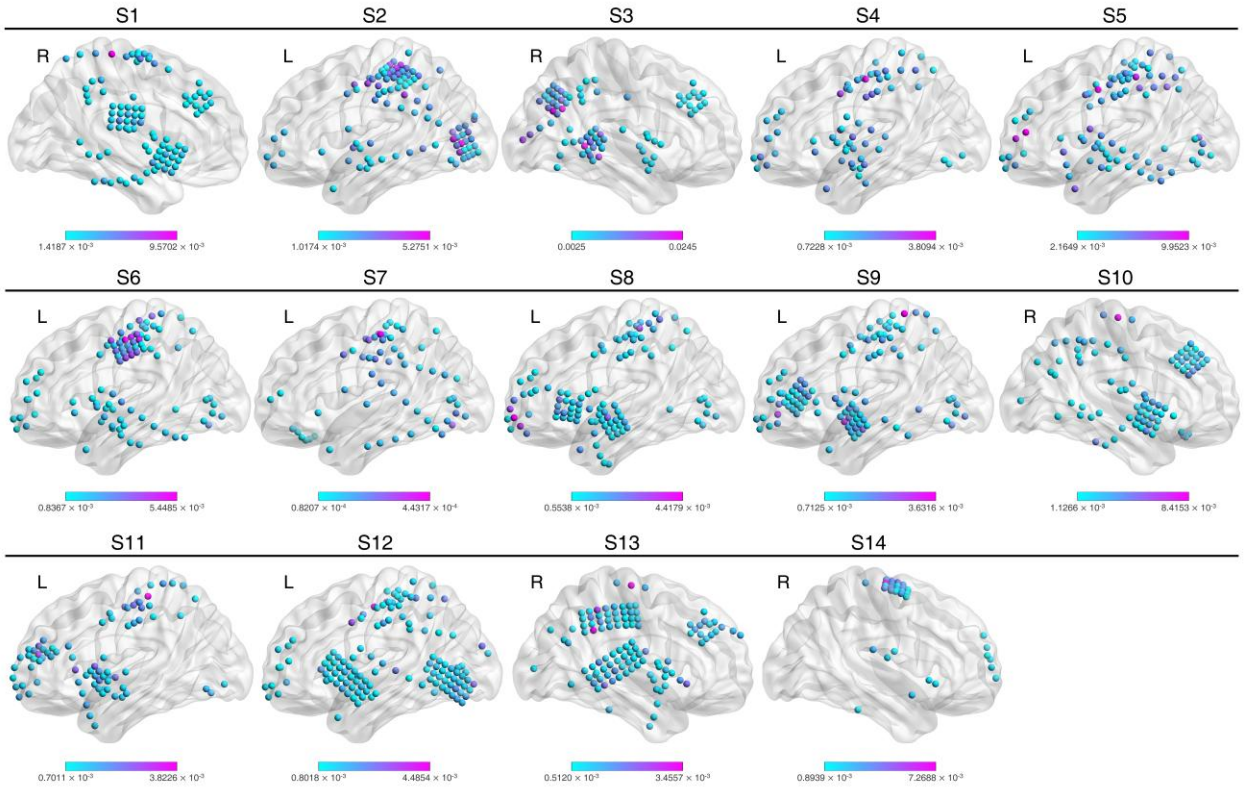

Actual Arm Trajectory
Original Only
Original + Neurally-Generated
Original + Randomly-Generated
Original + SSI
S12
r : 0.923
RMSE: 0.643
r : 0.923
RMSE: 0.618
r : 0.907
RMSE: 0.623
r : 0.913
RMSE: 0.637
Z
Y
X
Speed (z-score)
Timepoints
r : 0.713
RMSE: 0.807
r : 0.714
RMSE: 0.786
r : 0.696
RMSE: 0.795
r : 0.699
RMSE: 0.818
Target 1
Target 2
Target 3
Target 4
45.3%
52.8%
48.4%
48.4%
Trials
Proximity Level
S13
r : 0.597
RMSE: 1.075
r : 0.729
RMSE: 0.867
r : 0.667
RMSE: 0.983
r : 0.643
RMSE: 1.063
r : 0.498
RMSE: 1.077
r : 0.559
RMSE: 0.992
r : 0.555
RMSE: 1.040
r : 0.487
RMSE: 1.078
20.5%
34.8%
24.8%
19.9%



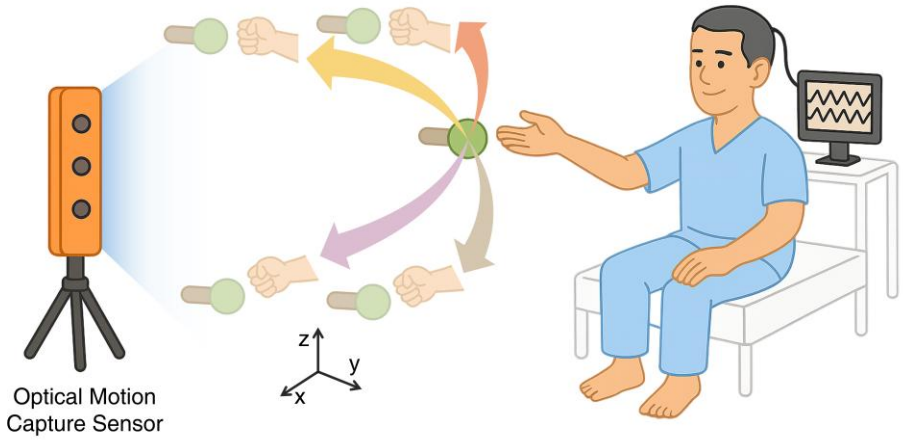
Supplementary Figure 7. Inter-subject decoding results. Inter-subject analysis results for individual subjects. Decoded trajectories, speed profiles, and endpoint reaching rate histograms are displayed, following the visualization format described in Figure 5.



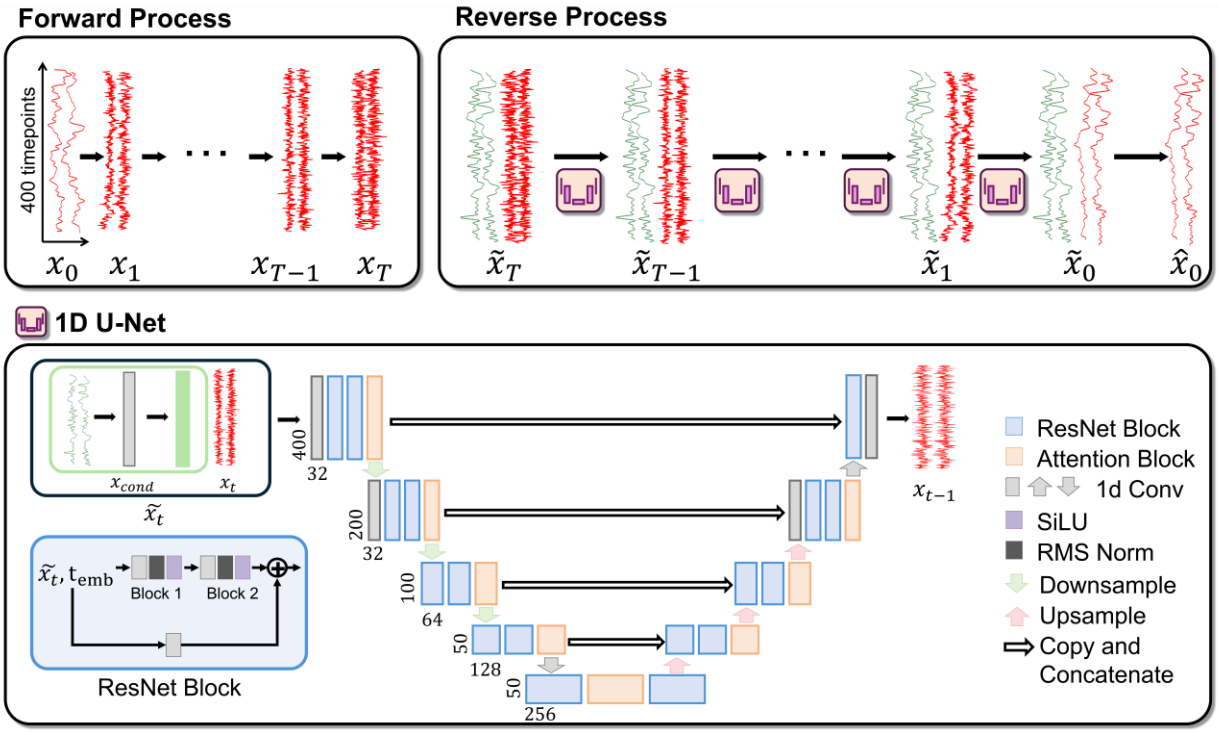
Supplementary Figure 8. Greater decoding performance improvement in subjects with lower baseline performance. Scatter plots show the relationship between original decoding performance and the improvement in velocity decoding performance, measured by Δr (left) and ΔRMSE (right). Δr and ΔRMSE were computed as the difference between decoding performance obtained with generated virtual channels and that obtained using implanted electrodes only. Linear regression analysis revealed a significant negative correlation in both metrics, indicating that subjects with lower baseline decoding performance exhibited greater performance improvements after incorporating virtual channels (n = 14).



Supplementary Figure 9. Inter-subject XAI contribution maps with generated virtual channels. Explainable AI was applied to the decoder trained with generated virtual signals. Contribution maps include both implanted and generated virtual channels, color-coded by IG values, with higher values indicating greater contributions. R, right lateral view; L, left lateral view.



Supplementary Figure 10. Experimental setup for center-out reach-and-grasp task. Subjects performed the task using the arm contralateral to the implanted hemisphere. Arm and hand movements were tracked at 100 Hz using an optical motion capture sensor. The experimenter guided the target trajectories by manually moving a ball attached to a rod toward one of four directions.



Supplementary Figure 11. Overview of the DDPM Framework. The top panel illustrates the mechanism of the diffusion process, consisting of forward and reverse processes. In the forward process, incremental noise is added to the original data ($\boldsymbol{x_0}$) until it reaches a state of pure gaussian noise ($\boldsymbol{x_T}$). In the Reverse Step, the U-Net architecture predicts the noise at each step to reconstruct the signal ($\hat{\boldsymbol{x}}_\mathbf{0}$) over 100 iterations (T=100). The bottom panel shows the detailed architecture of the 1D U-Net that executes reverse process. The U-Net is composed of 1-dimensional convolution (1d Conv), Residual Networks (ResNet), Sigmoid Linear Units (SiLU), Root Mean Square Normalization (RMS Norm) and Attention Block. To recognize the current diffusion stage, the model transforms the timestep t into a 32-dimensional embedding vector via sinusoidal embedding ($\boldsymbol{t_{emb}}$), which is then expanded into 128-dimensional temporal context through an multilayer perception (MLP). Within each ResNet block, this time embedding vector is further processed by an MLP and split into two values, scale and shift. These scale and shift values are directly applied to the $\hat{\boldsymbol{x}}_\boldsymbol{t}$ within the block to perform step-specific modulations.

Supplementary Table 1. Intra-subject analysis cases. This table summarizes the 110 generation cases used for the intra-subject analysis. For each subject, every cortical region not containing a target channel was individually used as a condition input. The table lists the corresponding AAL3 region numbers, with region names provided in Supplementary Fig. 1. The number in parenthesis next to each region number indicates the number of implanted electrodes within that region. The number of cases corresponds to the number of conditioning regions. Since five target channels were selected per case, a total of 550 target-channel generations were produced across all subjects.

Subject	Target area AAL3 region No. (number of electrodes)	Condition area AAL3 region No. (number of electrodes)	Number of cases
S1	2 (2), 4 (2), 62 (7), 68 (8), 88 (9)	6 (1), 8 (3), 10 (1), 14 (3), 12 (2), 64 (1), 72 (1), 86 (6), 90 (3), 94 (5)	10
S2	55 (13), 57 (4), 61 (13)	1 (1), 47 (1), 49 (2), 53 (1), 65 (10), 67 (5), 69 (1), 89 (8)	8
S3	56 (11), 70 (9), 90 (15)	54 (2), 58 (1), 86 (4), 94 (1)	4
S5	5 (2), 11 (1), 61 (6), 65 (7), 91 (1)	1 (2), 9 (1), 13 (2), 67 (1), 69 (1), 85 (2), 87 (2), 89 (6), 93 (5)	9
S6	61 (17), 65 (3)	1 (2), 13 (1), 67 (3), 85 (2), 87 (1), 89(5), 93 (5)	7
S8	27 (1), 61 (3), 89 (16), 85 (4)	3 (3), 5 (1), 7 (3), 9 (11), 11 (7), 13 (1), 23 (1), 59 (1), 87 (1), 93 (2)	10
S9	1 (4), 85 (11), 89 (12)	3 (3), 5 (4), 9 (15), 11 (1), 13 (1), 61 (2), 63 (1), 71 (1), 93 (1)	9
S10	4 (5), 6 (13), 14 (4)	8 (1), 10 (2), 23 (1), 24 (1), 25 (1), 26 (1), 34 (2), 62 (1), 66 (3), 68 (1), 70 (1), 86 (8), 88 (5), 90 (3), 92 (1), 94 (2)	16
S11	1 (1), 3 (5), 5 (10), 7 (2), 71 (1)	9 (5), 11 (1), 13 (2), 21 (2), 23 (1), 61 (2), 63 (1), 85 (3), 87 (7), 91 (1), 93 (1)	11

S12	1 (2), 57 (10), 61 (5), 63 (3)	7 (5), 9 (8), 13 (2), 53 (2), 55 (3), 59 (1), 67 (2), 69 (2), 85 (7), 87 (5), 89 (22), 93 (4), 95 (1)	13
S13	66 (7), 68 (13), 86 (14), 90 (14)	2 (3), 4 (2), 6 (1), 8 (1), 14 (3), 20 (1), 62 (10), 70 (2), 88 (1), 94 (2)	10
S14	4 (16), 16 (3)	2 (2), 20 (3), 22 (1)	3
Total			**110**

Supplementary Table 2. Inter-subject analysis channel configuration. This table summarizes the train subjects used and the number of channels before and after signal generation, including original channels, generated channels, and the total number of channels used for decoding.

Subject	**Number of original channels**	**Train Subjects**	**Number of generated virtual channels**	**Number of total channels**
S1	54	S10, S13, S14	38	92
S2	59	S5, S6, S8, S9, S12	33	92
S3	43	S10, S13	33	76
S4	18	S5, S6, S8, S9, S11, S12	46	64
S5	39	S2, S6, S8, S9, S11, S12	45	84
S6	39	S2, S6, S8, S9, S11, S12	50	89
S7	26	S2, S5, S6, S12	33	59
S8	55	S2, S5, S6, S9, S11, S12	44	99
S9	56	S2, S5, S6, S8, S11, S12	46	102
S10	56	S1, S3, S13	26	82
S11	45	S5, S6, S8, S9, S12	33	78
S12	84	S2, S5, S6, S8, S9, S11	42	126
S13	74	S1, S3, S10	34	108

S14	25	S1	8	33
Total	**673**		**511**	**1184**

Supplementary Table 3. Demographic and clinical characteristics of the subjects. This table includes age, sex, electrode hemisphere, total number of implanted electrodes, AAL3 region numbers and diagnosis of each subject. The number in parentheses next to each AAL3 region number indicates the number of electrodes belonging to that region.

Subject	Age	Sex	Electrode hemisphere	Number of electrodes	AAL3 region No. (number of electrodes)	Diagnosis
S1	22	F	Right	54	2 (2), 4 (2), 6 (1), 8 (3), 10 (1), 14 (3), 12 (2), 62 (7), 64 (1), 68 (8), 88 (9), 72 (1), 86 (6), 90 (3), 94 (5)	FLE
S2	24	M	Left	59	1 (1), 47 (1), 49 (2), 53 (1), 55 (13), 57 (4), 61 (13), 65 (10), 67 (5), 69 (1), 89 (8)	FLE
S3	28	M	Right	43	54 (2), 56 (11), 58 (1), 70 (9), 86 (4), 90 (15), 94 (1)	TLE
S4	27	F	Left	18	1 (1), 7 (1), 13 (1), 61 (5), 65 (2), 85 (4), 89 (3), 93 (1)	TLE
S5	36	F	Left	39	1 (2), 5 (2), 9 (1), 11 (1), 13 (2), 61 (6), 65 (7), 67 (1), 69 (1), 85 (2), 87 (2), 89 (6), 91 (1), 93 (5)	TLE
S6	58	M	Left	39	1 (2), 13 (1), 61 (17), 65 (3), 67 (3), 85 (2), 87 (1), 89(5), 93 (5)	TLE

S7	31	F	Left	26	23 (1), 24 (1), 25 (2), 26 (1), 27 (1), 55 (1), 57 (1), 61 (3), 67 (4), 69 (2), 85 (1), 89 (2), 93 (5), 95 (1)	TLE
S8	20	M	Left	55	3 (3), 5 (1), 7 (3), 9 (11), 11 (7), 13 (1), 23 (1), 27 (1), 59 (1), 61 (3), 85 (4) 87 (1), 89 (16),93 (2)	FLE
S9	48	M	Left	56	1 (4), 3 (3), 5 (4), 9 (15), 11 (1), 13 (1), 61 (2), 63 (1), 71 (1), 85 (11), 89 (12), 93 (1)	TLE
S10	25	F	Right	56	4 (5), 6 (13), 8 (1), 10 (2), 14 (4), 23 (1), 24 (1), 25 (1), 26 (1), 34 (2), 62 (1), 66 (3), 68 (1), 70 (1), 86 (8), 88 (5), 90 (3), 92 (1), 94 (2)	TLE
S11	50	M	Left	45	1 (1), 3 (5), 5 (10), 7 (2), 9 (5), 11 (1), 13 (2), 21 (2), 23 (1), 61 (2), 63 (1), 71 (1), 85 (3), 87 (7), 91 (1), 93 (1)	FTLE
S12	18	F	Left	84	1 (2), 7 (5), 9 (8), 13 (2), 53 (2), 55 (3), 57 (10), 59 (1), 61 (5), 63 (3), 67 (2), 69 (2), 85 (7), 87 (5), 89 (22), 93 (4), 95 (1)	TLE
S13	23	M	Right	74	2 (3), 4 (2), 6 (1), 8 (1), 14 (3), 20 (1), 62 (10), 66 (7), 68 (13), 70 (2), 86 (14), 88 (1), 90 (14), 94 (2)	TLE
S14	21	M	Right	25	2 (2), 4 (16), 16 (3), 20 (3), 22 (1)	FLE

112 FLE, frontal lobe epilepsy; TLE, temporal lobe epilepsy; FTLE; frontal and temporal lobe epilepsy.

Supplementary Table 4. Number of trials per session for each participant. Values separated by commas indicate the number of trials in session 1 and session 2, respectively. Bad trials were excluded. Columns labeled Direction 1-4 correspond to the number of trials performed toward each of the four target directions in the center-out reach-and-grasp task.

Subject	Number of trials (Session 1, 2)	Direction 1	Direction 2	Direction 3	Direction 4
S1	60, 73	18, 23	11, 13	16, 19	15, 18
S2	80, 92	24, 27	16, 19	21, 23	19, 23
S3	75, 81	24, 24	13, 16	18, 20	20, 21
S4	53, 23	16, 7	10, 5	15, 5	12, 6
S5	77, 39	25, 13	12, 7	19, 11	21, 8
S6	79, 64	24, 20	16, 13	20, 16	19, 15
S7	81, 92	20, 23	20, 23	21, 22	20, 24
S8	76, 54	20, 14	17, 14	20, 13	19, 13
S9	81, 85	20, 21	20, 21	24, 21	17, 22
S10	79, 82	20, 21	20, 20	20, 20	19, 21
S11	82, 84	20, 21	20, 21	23, 22	19, 20
S12	80, 79	20, 19	20, 20	20, 20	20, 20
S13	76, 85	19, 21	20, 21	18, 22	19, 21
S14	80, 80	20, 20	20, 20	20, 20	20, 20

Supplementary Table 5. Model architecture of the Bi-LSTM decoder. The decoder consisted of two Bi-LSTM layers followed by dropout and two linear layers. The table provides a representative example from Subject S1 with 54 input electrodes; the same architecture was applied across all subjects**.**

Layer name (activation)	**Number of trainable parameters**	**Output shape**	**Note**
Input Sequence	-	[Batch, 10, 54]	Batch size, sequence length = 10, number of electrodes = 54
bLSTM (tanh)	22,528	[Batch, 10, 64]	First Bi-LSTM layer
Dropout	-	[Batch, 10, 64]	Dropout rate = 0.1
bLSTM (tanh)	10,496	[Batch, 10, 32]	Second Bi-LSTM layer
Dropout	-	[Batch, 10, 32]	Dropout rate = 0.1
Linear (ReLU)	2,112	[Batch, 64]	Fully connected layer
Dropout	-	[Batch, 64]	Dropout rate = 0.1
Linear (linear)	195	[Batch, 3]	Output layer predicting 3-axis hand velocity
Total number of trainable parameters	35,331	-	-