Supplementary Material of Decoding Brain States in Task-Based Whole-Brain fMRI Data using 3D ConvNeXt

Ji-Hye Lim, Hyun-Chul Kim

A. Specifications of attention-based 3D CNN and 3D EfficientNet

1) Attention-based 3D CNN: This model is adapted from prior work that achieved state-of-the-art performance using MRI data [1]. It integrates channel attention mechanisms into a 3D version of the ResNet-34 architecture. The input layer applies a 7 × 7 × 7 convolution with a stride of 2 to convert single-channel input into 64-channel feature maps, followed by batch normalization, ReLU activation, and a 3 × 3 × 3 max-pooling layer with a stride of 2. The model follows a four-stage design comprising 3, 4, 6, and 3 residual blocks, respectively, with corresponding channel dimensions of 64, 128, 256, and 512. Each block consists of two 3 × 3 × 3 convolutional layers, each followed by batch normalization and ReLU activation. Residual connections are used throughout to mitigate the vanishing gradient problem and facilitate efficient training of deeper networks. A key component of this architecture is the integration of channel attention modules. These modules are applied to the output of each layer and extract global contextual information through both average pooling and max pooling operations. The pooled features are passed through a 1 × 1 × 1 convolution-based multilayer perceptron (MLP), followed by a sigmoid activation function, to generate channel-wise weights in the range [0, 1]. These weights modulate the importance of each feature channel. In the final stage, adaptive average pooling is applied to the attention-enhanced feature maps from each layer to obtain fixed-size feature vectors. These vectors, corresponding to the four resolution levels (64 + 128 + 256 + 512 = 960 dimensions), are concatenated to form a multi-scale feature representation. This representation is then passed through a fully connected layer to perform the final classification.

2) 3D EfficientNet: This model is a 3D adaptation of EfficientNet, originally proposed for 2D vision tasks, and has demonstrated state-of-the-art performance in MRI-based applications [2]. The architecture achieves lightweight and efficient computation by extending Mobile Inverted Bottleneck (MBConv) blocks and Squeeze-and-Excitation (SE) attention mechanisms into three dimensions. The input layer applies a 7 × 7 × 7 convolution with a stride of 2 to generate 64-channel feature maps from a single-channel input, followed by ReLU activation and batch normalization. A subsequent max-pooling layer with a 1 × 1 × 1 kernel and a stride of 2 further reduces spatial resolution.
The core of the model consists of five MBConv stages:

1. Stage 3: Maintains 64 channels with one block using 3 × 3 × 3 kernels.
2. Stage 4: Expands to 96 channels with one block using 5 × 5 × 5 kernels and a stride of 2.
3. Stage 5: Contains two blocks with 128 channels.
4. Stage 6: Contains three blocks with 192 channels.
5. Stage 7: Includes one block with 256 channels.

Kernels of 5 × 5 × 5 or 3 × 3 × 3 are used throughout these stages based on the resolution and channel configuration. Each MBConv block comprises three main phases:

1. Channel Expansion using a 1 × 1 × 1 pointwise convolution with an expansion ratio of 6.
2. Depthwise Separable Convolution for spatial feature extraction.
3. Channel Attention via the SE module, which applies adaptive average pooling followed by two 1 × 1 × 1 convolutions. The SE module uses Sigmoid Linear Unit activations to compute channel-wise attention weights.

Residual connections are applied only when the input and output dimensions match and the stride is equal to 1, preserving information without unnecessary transformations. In the final stage, features are expanded to 512 channels via a 1 × 1 × 1 convolution. The resulting feature maps are flattened and passed through a three-stage fully connected classifier, consisting of two hidden layers with 400 and 64 neurons, respectively, and a final output layer. Dropout regularization is employed to mitigate overfitting and enhance generalization.

[1] B. Zheng, A. Gao, X. Huang, Y. Li, D. Liang, and X. Long, “A modified 3D EfficientNet for the classification of Alzheimer’s disease using structural magnetic resonance images,” *IET Image Processing*, vol. 17, no. 1, pp. 77–87, 2023.

[2] Y. Zhang *et al.*, “Attention-based 3D CNN with Multi-layer Features for Alzheimer’s Disease Diagnosis using Brain Images,” in *2023 45th Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC)*, IEEE, 2023, pp. 1–4.

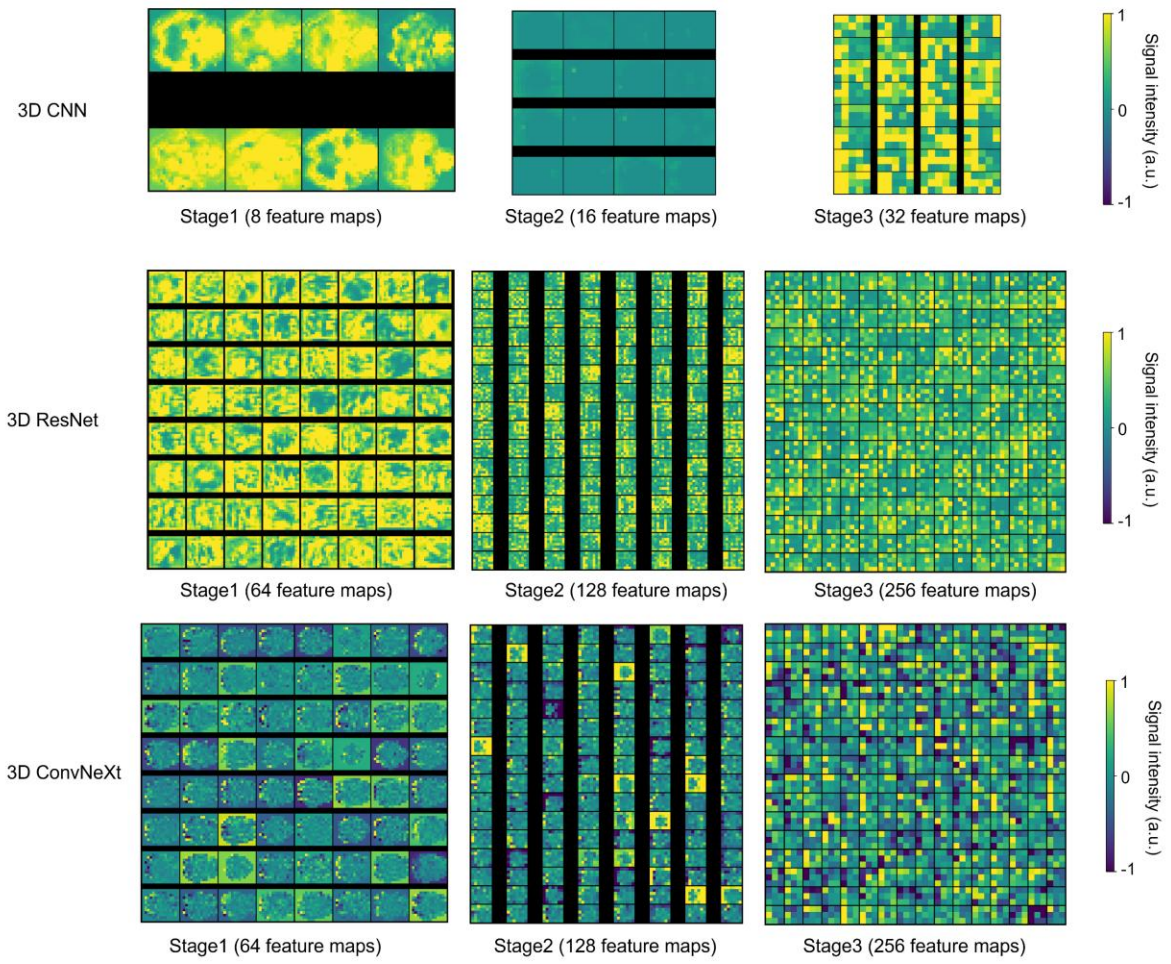

Fig. SI. Feature activation patterns across higher network layers for working memory task.

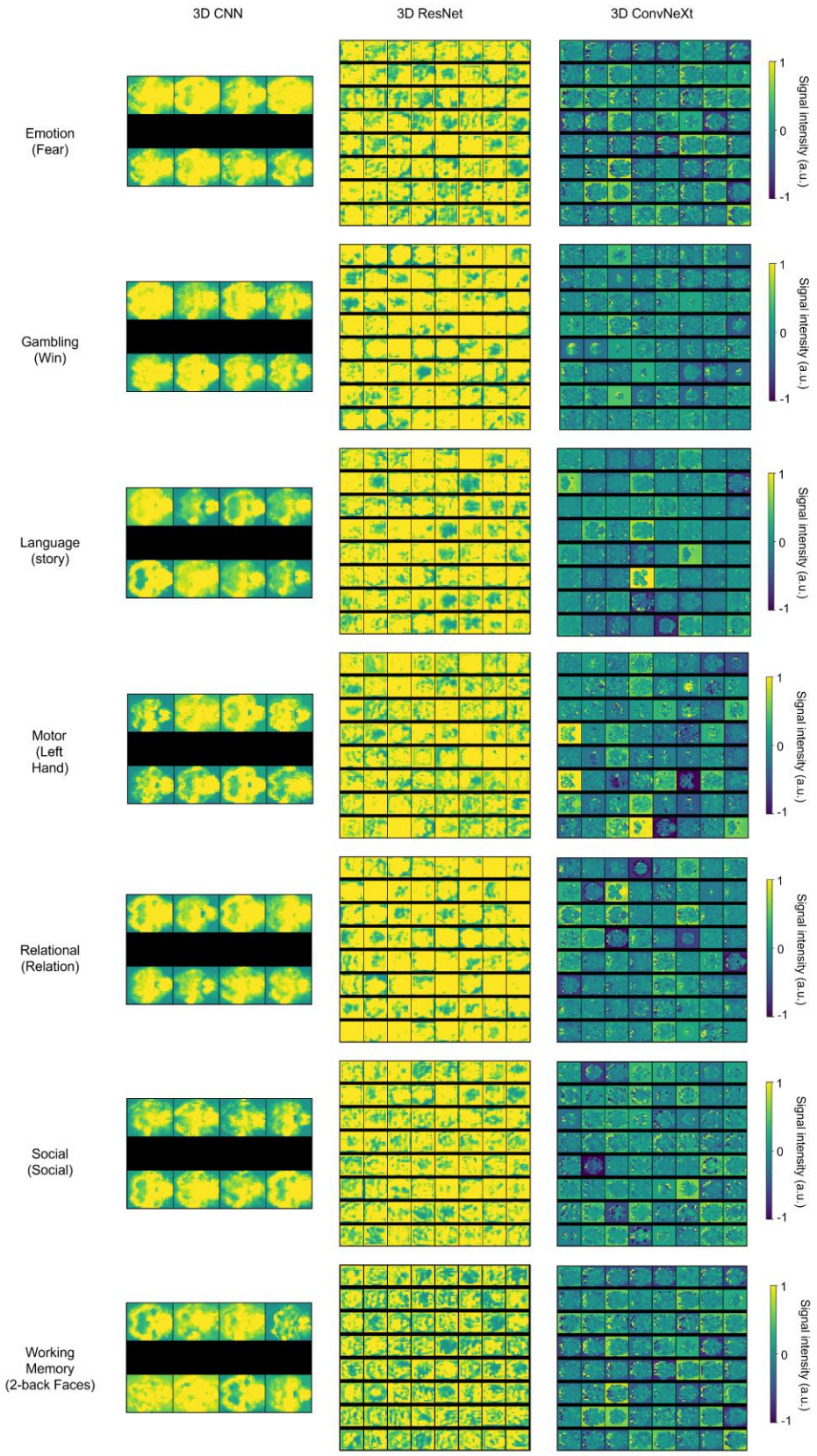

Fig. SII. Feature activation patterns for all tasks at the first stage.

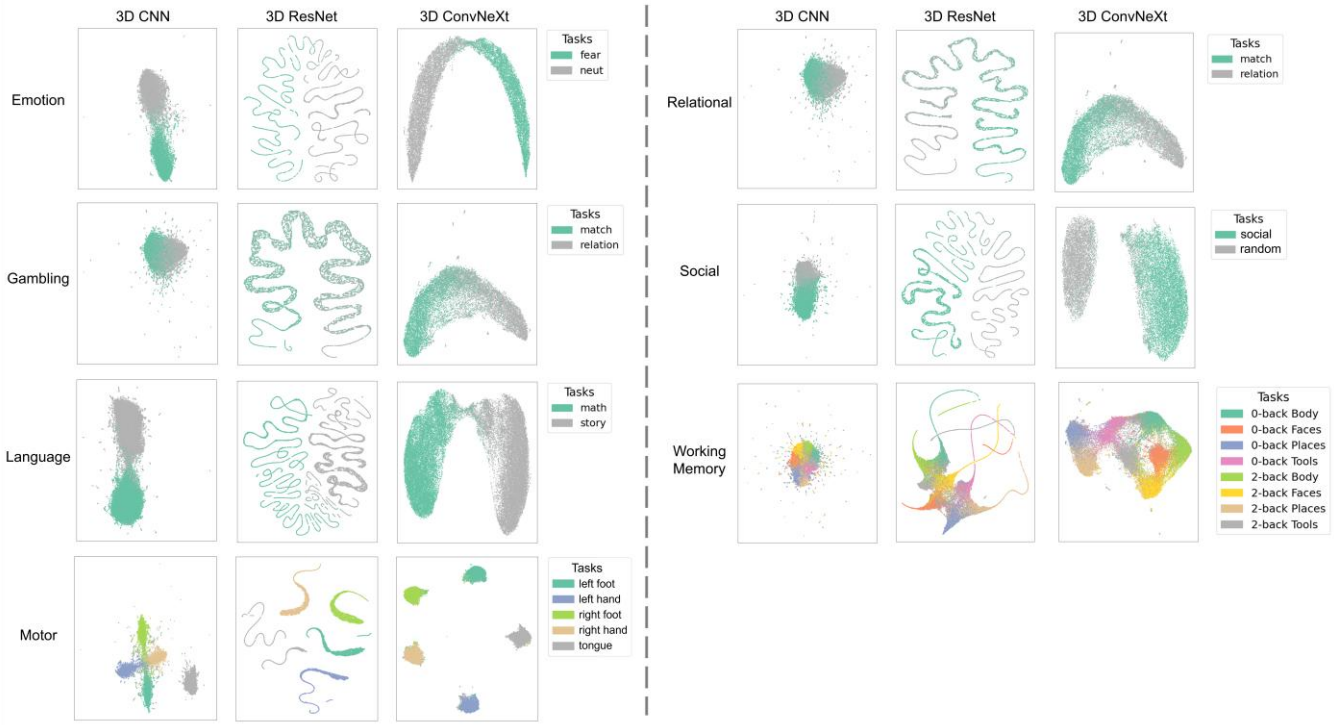

Fig. SIII. UMAP visualization of latent representations for all tasks.

TABLE I

COMPARISON OF DEEP LEARNING APPROACHES ON THEIR FEATURES AND LIMITATIONS

Study	Method	Task Coverage	Features	Limitations
Wang et al. (2020)	3D Convolutional Neural Network (CNN) (Volumetric)	7 tasks (selected subset)	Basic spatial feature extraction from volumetric fMRI using 3D CNN	Limited task coverage; spatial-only features without temporal modeling
Hung et al. (2021)	3D CNN + Bidirectional Long-Short Term Memory (BiLSTM) + Attention	7 tasks (selected subset)	Joint spatial–temporal modeling with an attention mechanism	Limited task coverage; high computational cost from spatio-temporal integration
Zhang et al. (2022)	GraphNet Graph Convolutional Network (GCN)	21 tasks (excluding gambling subtasks)	Connectivity-based modeling for multi-task classification	Requires predefined parcellations; loss of voxel-level spatial detail
Hwang et al. (2023)	DNN pre-trained Autoencoder (AE) & Restricted Boltzmann machine (RBM)	All HCP subtasks	Unsupervised pre-training with DBM + AE for full HCP coverage	Loss of spatial fidelity due to 1D vectorization; no explicit temporal modeling
Zhang et al. (2023)	3D CNN + Domain Adaptation	Working memory + Resting-state	Cross-condition decoding via unsupervised joint domain adaptation	Limited to specific tasks; lacks generalization to all HCP conditions
Rastegarnia et al. (2023)	GCN + Multilayer Perceptron (MLP)	21 tasks (excluding gambling subtasks)	k-nearest neighbor GCN + MLP for large-scale multi-task classification	Same parcellation dependency; no temporal feature integration
Proposed	3D ConvNeXt	All HCP subtasks	Layer normalization + Global response Normalization-enhanced multi-scale 3D feature extraction; preserves complete spatial structure	Spatial-only features (address task coverage, spatial fidelity, and computational efficiency)

TABLE II

COMPARISON OF DEEP LEARNING APPROACHES FOR HCP TASK-BASED FMRI CLASSIFICATION

Study	Method	Task Coverage	Classification Accuracy (%)							
			Emo	Gam	Lan	Mot	Rel	Soc	WM	Total
Wang et al. (2020)	3D CNN (Volumetric)	7 tasks (subset)	-	-	-	-	-	-	-	93.7
Hung et al. (2021)	3D CNN + BiLSTM + Attention	7 tasks (subset)	-	-	-	-	-	-	-	94.3
Zhang et al. (2022)	GraphNet GCN	21 tasks (excluding gambling subtasks)	-	-	-	-	-	-	-	93.4
Hwang et al. (2023)	DBM + AE (Unsupervised)	All HCP subtasks	*95.5	*67.4	*96.1	*94.1	*78.1	*91.3	*75.0	-
Zhang et al. (2023)	JDAD (Domain Adaptation)	Working memory + Resting-state	-	-	-	-	-	-	-	81.6
Rastegarnia et al. (2023)	GCN + MLP	21 tasks (excluding gambling subtasks)	-	-	-	-	-	-	-	58-67% (individual)
Proposed	3D ConvNeXt	All HCP subtasks	**95.6	**66.2	**97.3	**95.0	**79.8	**91.1	**74.4	-

Emo = Emotion, Gam = Gambling, Lan = Language, Mot = Motor, Rel = Relational, Soc = Social, WM = Working Memory.
*Hwang et al. (2023): Transfer learning evaluation on ~45 test subjects and selected best accuracy from either AE or RBM.
**Our study employed a 5-fold cross-validation evaluation on approximately 170 test subjects per fold, presenting a more challenging evaluation setting compared to Hwang et al. (2023).

TABLE SIII

A SUMMARY OF SAMPLE DISTRIBUTION ACROSS TASKS AND SUBTASKS.

Task	Subtask	Sample Ratio (%), Average Sample per Subject			
		100	50	25	10
Emotion	Fear	49.0	24.5	12.2	4.9
	Shape	63.0	31.5	15.8	6.3
Gambling	Loss	68.0	34.0	17.0	6.8
	Win	68.0	34.0	17.0	6.8
Language	Math	121.7	60.8	30.4	12.2
	Story	135.7	67.9	33.9	13.6
Motor	Left Foot	26.0	13.0	6.5	2.6
	Right Foot	26.0	13.0	6.5	2.6
	Left Hand	26.0	13.0	6.5	2.6
	Right Hand	26.0	13.0	6.5	2.6
	Tongue	26.0	13.0	6.5	2.6
Relational	Match	54.0	27.0	13.5	5.4
	Relation	54.0	27.0	13.5	5.4
Social	Social	80.0	40.0	20.0	8.0
	Random	54.0	27.0	13.5	5.4
Working Memory	0-back Body	34.0	17.0	8.5	3.4
	0-back Faces	34.0	17.0	8.5	3.4
	0-back Places	34.0	17.0	8.5	3.4
	0-back Tools	34.0	17.0	8.5	3.4
	2-back Body	34.0	17.0	8.5	3.4
	2-back Faces	34.0	17.0	8.5	3.4
	2-back Places	34.0	17.0	8.5	3.4
	2-back Tools	34.0	17.0	8.5	3.4

TABLE SIV

CLASSIFICATION ACCURACY FOR EACH TASK ACROSS DIFFERENT MODELS.

Task	Sample Ratio (%)	Classification Accuracy (%, Mean ± Standard error)			Kruskal-Wallis H-test ($p < 0.05$) followed by Wilcoxon-signed test		
		CNN	ResNet	ConvNeXt	CNN vs. ResNet	ResNet vs. ConvNeXt	ConvNeXt vs. CNN
Emotion	10	92.7 ± 0.5	93.6 ± 0.6	**94.1 ± 0.6**	***	-	***
	25	93.2 ± 0.3	94.4 ± 0.2	**94.9 ± 0.3**	***	**	***
	50	94.2 ± 0.3	94.8 ± 0.3	**95.2 ± 0.3**	***	**	***
	100	94.8 ± 0.3	94.9 ± 0.3	**95.5 ± 0.3**	-	***	***
Gambling	10	61.0 ± 0.4	62.3 ± 0.2	**62.5 ± 0.5**	*	-	*
	25	62.7 ± 0.4	64.2 ± 0.3	**65.3 ± 0.3**	***	*	***
	50	63.9 ± 0.4	64.5 ± 0.4	**65.7 ± 0.2**	**	**	***
	100	65.2 ± 0.3	65.4 ± 0.2	**66.1 ± 0.2**	-	a)**	a)***
Language	10	94.8 ±0.2	**96.1 ± 0.3**	95.6 ± 0.2	***	**	***
	25	95.5 ± 0.2	96.5 ± 0.2	**96.6 ± 0.1**	***	-	***
	50	95.9 ± 0.2	96.9 ± 0.2	**97.0 ± 0.1**	***	**	***
	100	96.2 ± 0.2	97.1 ± 0.2	**97.3 ± 0.1**	***	***	***
Motor	10	88.8 ± 0.4	**92.7 ± 0.3**	84.9 ± 0.6	***	***	***
	25	93.1 ± 0.3	**93.9 ± 0.2**	93.3 ± 0.2	***	***	-
	50	93.5 ± 0.4	93.9 ± 0.2	**94.4 ± 0.2**	**	***	***
	100	94.0 ± 0.3	94.4 ± 0.2	**94.9 ± 0.2**	***	***	***
Relational	10	72.4 ± 0.3	**76.4 ± 0.5**	75.5 ± 0.3	***	-	***
	25	76.3 ± 0.3	**77.4 ± 0.1**	77.1 ± 0.2	b)***	-	b)*
	50	77.2 ± 0.3	**78.2 ± 0.2**	**78.2 ± 0.2**	c)***	-	c)**
	100	77.9 ± 0.3	79.1 ± 0.2	**79.5 ± 0.2**	***	*	***
Social	10	85.7 ± 0.1	**89.2 ± 0.4**	87.9 ± 0.3	***	**	***
	25	87.5 ± 0.2	**89.5 ± 0.2**	89.4 ± 0.3	***	-	***
	50	88.5 ± 0.3	90.3 ± 0.2	**90.4 ± 0.3**	***	-	***
	100	89.7 ± 0.5	90.8 ± 0.2	**90.9 ± 0.2**	***	-	***
Working Memory	10	51.4 ± 0.7	**66.7 ± 0.6**	65.8 ± 0.6	***	*	***
	25	59.3 ± 0.4	69.9 ± 0.5	**70.3 ± 0.6**	***	-	***
	50	62.5 ± 0.5	71.3 ± 0.5	**72.4 ± 0.5**	***	***	***
	100	64.2 ± 0.5	72.5 ± 0.5	**74.3 ± 0.5**	***	***	***

a) Kruskal-Wallis H-test: $p = 0.070$; Wilcoxon signed-rank test: significant. b) Kruskal-Wallis H-test: $p = 0.175$; Wilcoxon signed-rank test: significant. c) Kruskal-Wallis H-test: $p = 0.104$; Wilcoxon signed-rank test: significant. -: Not significant, *: $P < 0.05$, **: $P < 0.01$, AND ***: $P < 0.001$.

TABLE SV

ROI TABLE FOR TOP 5% BRAIN ACTIVATION PATTERNS

1. Emotion Task: Fear and Shape Conditions

Subtask	Hemisphere	Destrieux atlas	Vertices	Max value	Mean value	Std
Fear	Left	Occipital pole	22	0.0246	0.0165	0.0043
		Inferior temporal gyrus (T3)	24	0.0242	0.0153	0.0046
		Superior occipital gyrus (O1)	37	0.0254	0.0142	0.0031
		Middle temporal gyrus (T2)	10	0.0201	0.0138	0.0028
		Calcarine sulcus	14	0.0182	0.0137	0.0022
		Inferior occipital gyrus (O3) and sulcus	24	0.0169	0.0134	0.0017
		Middle occipital sulcus and lunatus sulcus	58	0.0171	0.0127	0.0019
		Middle occipital gyrus (O2, lateral occipital gyrus)	73	0.0182	0.0127	0.0017
		Superior parietal lobule (lateral part of P1)	5	0.0148	0.0125	0.0013
		Angular gyrus	13	0.0173	0.0123	0.0019
		Anterior occipital sulcus and preoccipital notch (temporo-occipital incisure)	39	0.0181	0.0121	0.0018
		Superior occipital sulcus and transverse occipital sulcus	40	0.0157	0.0120	0.0017
	Right	Middle occipital sulcus and lunatus sulcus	58	0.0285	0.0190	0.0032
		Occipital pole	62	0.0360	0.0168	0.0060
		Middle occipital gyrus (O2, lateral occipital gyrus)	64	0.0307	0.0163	0.0042
		Middle temporal gyrus (T2)	25	0.0261	0.0156	0.0046
		Inferior occipital gyrus (O3) and sulcus	27	0.0258	0.0156	0.0045
		Lateral aspect of the superior temporal gyrus	25	0.0210	0.0148	0.0031
		Superior occipital sulcus and transverse occipital sulcus	70	0.0228	0.0139	0.0028
		Supramarginal gyrus	19	0.0175	0.0132	0.0023
		Superior occipital gyrus (O1)	42	0.0165	0.0123	0.0014
		Lateral occipito-temporal sulcus	38	0.0150	0.0123	0.0015
		Angular gyrus	22	0.0165	0.0122	0.0018
		Inferior temporal gyrus (T3)	25	0.0181	0.0120	0.0018
		Cuneus (O6)	10	0.0146	0.0119	0.0013
		Lateral occipito-temporal gyrus (fusiform gyrus, O4-T4)	36	0.0163	0.0118	0.0012
		Anterior occipital sulcus and preoccipital notch (temporo-occipital incisure)	18	0.0160	0.0113	0.0014
		Superior temporal sulcus (parallel sulcus)	24	0.0124	0.0111	0.0005
		Parieto-occipital sulcus (or fissure)	13	0.0123	0.0110	0.0007
Shape	Left	Occipital pole	21	0.0295	0.0171	0.0051
		Inferior temporal gyrus (T3)	15	0.0223	0.0163	0.0040
		Superior occipital gyrus (O1)	38	0.0329	0.0148	0.0044
		Middle temporal gyrus (T2)	10	0.0188	0.0137	0.0029
		Inferior occipital gyrus (O3) and sulcus	20	0.0156	0.0130	0.0010
		Middle occipital gyrus (O2, lateral occipital gyrus)	78	0.0187	0.0130	0.0018
		Angular gyrus	12	0.0180	0.0127	0.0023
		Calcarine sulcus	11	0.0188	0.0127	0.0024
		Middle occipital sulcus and lunatus sulcus	60	0.0170	0.0125	0.0015
		Superior occipital sulcus and transverse occipital sulcus	49	0.0174	0.0123	0.0018
		Anterior occipital sulcus and preoccipital notch (temporo-occipital incisure)	41	0.0169	0.0121	0.0015
		Cuneus (O6)	12	0.0154	0.0120	0.0015
		Superior temporal sulcus (parallel sulcus)	12	0.0147	0.0112	0.0012
	Right	Planum temporale or temporal plane of the superior temporal gyrus	11	0.0282	0.0175	0.0053
		Middle occipital sulcus and lunatus sulcus	58	0.0249	0.0169	0.0030
		Middle temporal gyrus (T2)	37	0.0312	0.0166	0.0055
		Occipital pole	61	0.0357	0.0161	0.0057
		Middle occipital gyrus (O2, lateral occipital gyrus)	60	0.0211	0.0150	0.0026
		Lateral aspect of the superior temporal gyrus	28	0.0256	0.0150	0.0037
		Supramarginal gyrus	19	0.0203	0.0142	0.0027
		Inferior occipital gyrus (O3) and sulcus	21	0.0199	0.0138	0.0031
		Superior occipital sulcus and transverse occipital sulcus	70	0.0203	0.0127	0.0024
		Cuneus (O6)	12	0.0153	0.0121	0.0018
		Superior occipital gyrus (O1)	45	0.0156	0.0121	0.0014
		Inferior temporal gyrus (T3)	23	0.0178	0.0121	0.0017
		Lateral occipito-temporal sulcus	33	0.0189	0.0119	0.0015
		Angular gyrus	24	0.0173	0.0118	0.0016
		Superior temporal sulcus (parallel sulcus)	21	0.0155	0.0115	0.0014
		Parieto-occipital sulcus (or fissure)	12	0.0127	0.0114	0.0008
		Lateral occipito-temporal gyrus (fusiform gyrus, O4-T4)	37	0.0133	0.0113	0.0009
		Anterior occipital sulcus and preoccipital notch (temporo-occipital incisure)	11	0.0131	0.0110	0.0008

2. Gambling Task: Loss and Win Conditions

Subtask	Hemisphere	Destrieux atlas	Vertices	Max value	Mean value	Std
Loss	Left	Superior occipital gyrus (O1)	52	0.0241	0.0115	0.0043
		Occipital pole	26	0.0175	0.0106	0.0039
		Calcarine sulcus	45	0.0185	0.0102	0.0043
		Anterior transverse collateral sulcus	11	0.0111	0.0081	0.0018
		Cuneus (O6)	29	0.0143	0.0081	0.0026
		Superior occipital sulcus and transverse occipital sulcus	18	0.0109	0.0075	0.0013
		Angular gyrus	12	0.0096	0.0070	0.0013
		Precentral gyrus	13	0.0097	0.0070	0.0013
		Middle occipital gyrus (O2, lateral occipital gyrus)	38	0.0130	0.0069	0.0018
		Inferior temporal gyrus (T3)	11	0.0085	0.0067	0.0009
	Right	Planum temporale or temporal plane of the superior temporal gyrus	28	0.0236	0.0101	0.0053
		Lateral aspect of the superior temporal gyrus	61	0.0227	0.0101	0.0043
		Occipital pole	62	0.0223	0.0099	0.0034
		Supramarginal gyrus	33	0.0171	0.0098	0.0032
		Superior occipital gyrus (O1)	55	0.0187	0.0092	0.0026
		Middle temporal gyrus (T2)	57	0.0183	0.0090	0.0035
		Cuneus (O6)	33	0.0166	0.0084	0.0032
		Calcarine sulcus	30	0.0127	0.0083	0.0022
		Triangular part of the inferior frontal gyrus	19	0.0115	0.0077	0.0017
		Inferior temporal gyrus (T3)	11	0.0103	0.0077	0.0014
		Precentral gyrus	14	0.0103	0.0077	0.0015
		Superior occipital sulcus and transverse occipital sulcus	75	0.0170	0.0076	0.0022
		Middle occipital sulcus and lunatus sulcus	31	0.0100	0.0076	0.0013
		Middle occipital gyrus (O2, lateral occipital gyrus)	36	0.0101	0.0069	0.0010
		Angular gyrus	69	0.0144	0.0068	0.0015
		Lingual gyrus, lingual part of the medial occipito-temporal gyrus (O5)	11	0.0113	0.0068	0.0017
		Parieto-occipital sulcus (or fissure)	12	0.0081	0.0061	0.0008
		Superior temporal sulcus (parallel sulcus)	29	0.0075	0.0061	0.0005
Win	Left	Superior occipital gyrus (O1)	53	0.0214	0.0103	0.0041
		Calcarine sulcus	46	0.0165	0.0086	0.0038
		Occipital pole	24	0.0149	0.0085	0.0032
		Cuneus (O6)	33	0.0116	0.0067	0.0019
		Superior occipital sulcus and transverse occipital sulcus	17	0.0092	0.0061	0.0011
		Anterior transverse collateral sulcus	10	0.0079	0.0059	0.0013
		Lingual gyrus, lingual part of the medial occipito-temporal gyrus (O5)	11	0.0087	0.0057	0.0014
		Angular gyrus	10	0.0071	0.0055	0.0009
		Middle occipital gyrus (O2, lateral occipital gyrus)	33	0.0097	0.0054	0.0014
		Precentral gyrus	11	0.0070	0.0053	0.0008
		Inferior temporal gyrus (T3)	10	0.0061	0.0051	0.0006
	Right	Occipital pole	59	0.0183	0.0081	0.0031
		Superior occipital gyrus (O1)	57	0.0146	0.0079	0.0023
		Planum temporale or temporal plane of the superior temporal gyrus	24	0.0147	0.0077	0.0032
		Lateral aspect of the superior temporal gyrus	56	0.0148	0.0076	0.0030
		Calcarine sulcus	31	0.0108	0.0069	0.0019
		Middle temporal gyrus (T2)	59	0.0140	0.0067	0.0025
		Supramarginal gyrus	41	0.0127	0.0067	0.0022
		Cuneus (O6)	38	0.0120	0.0064	0.0021
		Precentral gyrus	14	0.0089	0.0064	0.0015
		Superior occipital sulcus and transverse occipital sulcus	80	0.0162	0.0064	0.0022
		Triangular part of the inferior frontal gyrus	19	0.0095	0.0062	0.0014
		Middle occipital sulcus and lunatus sulcus	32	0.0079	0.0061	0.0010
		Lingual gyrus, lingual part of the medial occipito-temporal gyrus (O5)	11	0.0086	0.0057	0.0012
		Middle occipital gyrus (O2, lateral occipital gyrus)	36	0.0080	0.0056	0.0009
		Angular gyrus	74	0.0101	0.0054	0.0009
		Parieto-occipital sulcus (or fissure)	23	0.0066	0.0048	0.0005
		Superior temporal sulcus (parallel sulcus)	16	0.0055	0.0047	0.0003

3. Language Task: Math and Story Conditions

Subtask	Hemisphere	Destrieux atlas (long name)	Vertices	Max value	Mean value	Std
Math	Left	Lateral aspect of the superior temporal gyrus	46	0.0058	0.0039	0.0007
		Subcentral gyrus (central operculum) and sulci	59	0.0057	0.0038	0.0007
		Anterior transverse temporal gyrus (of Heschl)	20	0.0053	0.0037	0.0007
		Opercular part of the inferior frontal gyrus	36	0.0047	0.0036	0.0006
		Postcentral sulcus	67	0.0049	0.0035	0.0006
		Precentral gyrus	44	0.0045	0.0035	0.0005
		Supramarginal gyrus	81	0.0046	0.0035	0.0005
		Inferior segment of the circular sulcus of the insula	10	0.0040	0.0034	0.0003
		Angular gyrus	46	0.0042	0.0034	0.0003
		Inferior part of the precentral sulcus	38	0.0043	0.0033	0.0004
		Central sulcus (Rolando's fissure)	17	0.0041	0.0033	0.0004
		Intraparietal sulcus (interparietal sulcus) and transverse parietal sulci	19	0.0038	0.0033	0.0002

		Postcentral gyrus	21	0.0040	0.0032	0.0004
		Sulcus intermedius primus (of Jensen)	30	0.0035	0.0032	0.0002
		Middle frontal gyrus (F2)	21	0.0036	0.0032	0.0002
		Superior temporal sulcus (parallel sulcus)	72	0.0039	0.0031	0.0003
		Planum temporale or temporal plane of the superior temporal gyrus	40	0.0036	0.0031	0.0002
	Right	Subcentral gyrus (central operculum) and sulci	37	0.0059	0.0038	0.0008
		Lateral aspect of the superior temporal gyrus	57	0.0056	0.0037	0.0006
		Opercular part of the inferior frontal gyrus	21	0.0054	0.0037	0.0007
		Planum temporale or temporal plane of the superior temporal gyrus	37	0.0041	0.0034	0.0003
		Angular gyrus	52	0.0044	0.0033	0.0005
		Superior temporal sulcus (parallel sulcus)	16	0.0037	0.0033	0.0003
		Supramarginal gyrus	58	0.0040	0.0032	0.0002
Story	Left	Lateral aspect of the superior temporal gyrus	49	0.0062	0.0039	0.0008
		Subcentral gyrus (central operculum) and sulci	73	0.0060	0.0038	0.0008
		Anterior transverse temporal gyrus (of Heschl)	27	0.0056	0.0037	0.0007
		Opercular part of the inferior frontal gyrus	30	0.0046	0.0036	0.0006
		Postcentral sulcus	61	0.0048	0.0034	0.0006
		Precentral gyrus	39	0.0043	0.0034	0.0004
		Inferior segment of the circular sulcus of the insula	11	0.0040	0.0033	0.0003
		Supramarginal gyrus	90	0.0044	0.0033	0.0005
		Inferior part of the precentral sulcus	33	0.0043	0.0032	0.0005
		Angular gyrus	44	0.0038	0.0032	0.0003
		Middle frontal gyrus (F2)	16	0.0036	0.0032	0.0002
		Sulcus intermedius primus (of Jensen)	31	0.0035	0.0031	0.0002
		Postcentral gyrus	18	0.0037	0.0031	0.0003
		Central sulcus (Rolando's fissure)	16	0.0038	0.0031	0.0003
		Intraparietal sulcus (interparietal sulcus) and transverse parietal sulci	17	0.0035	0.0031	0.0002
		Planum temporale or temporal plane of the superior temporal gyrus	47	0.0035	0.0031	0.0002
		Superior temporal sulcus (parallel sulcus)	89	0.0037	0.0031	0.0002
	Right	Subcentral gyrus (central operculum) and sulci	39	0.0064	0.0039	0.0009
		Opercular part of the inferior frontal gyrus	20	0.0057	0.0038	0.0008
		Lateral aspect of the superior temporal gyrus	70	0.0060	0.0036	0.0007
		Angular gyrus	24	0.0040	0.0033	0.0005
		Planum temporale or temporal plane of the superior temporal gyrus	37	0.0041	0.0033	0.0003
		Superior temporal sulcus (parallel sulcus)	16	0.0036	0.0032	0.0003
		Supramarginal gyrus	54	0.0034	0.0030	0.0002

4. Motor Task: Left/Right Foot, Left/Right Hand, and Tongue Conditions

Subtask	Hemisphere	Destrieux atlas	Vertices	Max value	Mean value	Std
Left foot	Left	Paracentral lobule and sulcus	78	0.0434	0.0190	0.0088
		Precuneus (medial part of P1)	13	0.0267	0.0152	0.0050
		Central sulcus (Rolando's fissure)	99	0.0347	0.0147	0.0059
		Precentral gyrus	56	0.0331	0.0144	0.0047
		Superior frontal gyrus (F1)	15	0.0252	0.0140	0.0040
		Marginal branch (or part) of the cingulate sulcus	15	0.0211	0.0138	0.0032
		Postcentral gyrus	26	0.0223	0.0132	0.0030
		Superior part of the precentral sulcus	15	0.0213	0.0129	0.0029
		Superior parietal lobule (lateral part of P1)	48	0.0165	0.0125	0.0015
		Postcentral sulcus	13	0.0144	0.0118	0.0014
	Right	Paracentral lobule and sulcus	90	0.0514	0.0228	0.0102
		Precentral gyrus	97	0.0490	0.0200	0.0097
		Superior frontal gyrus (F1)	64	0.0397	0.0179	0.0074
		Postcentral gyrus	52	0.0488	0.0172	0.0076
		Superior parietal lobule (lateral part of P1)	44	0.0306	0.0158	0.0044
		Central sulcus (Rolando's fissure)	116	0.0422	0.0157	0.0070
		Marginal branch (or part) of the cingulate sulcus	22	0.0249	0.0152	0.0042
		Postcentral sulcus	62	0.0269	0.0151	0.0043
		Precuneus (medial part of P1)	38	0.0318	0.0149	0.0058
		Intraparietal sulcus (interparietal sulcus) and transverse parietal sulci	14	0.0168	0.0139	0.0018
		Superior part of the precentral sulcus	36	0.0213	0.0136	0.0021
Left hand	Left	Paracentral lobule and sulcus	34	0.0203	0.0131	0.0036
		Postcentral gyrus	32	0.0158	0.0114	0.0021
		Precentral gyrus	44	0.0174	0.0114	0.0021
		Central sulcus (Rolando's fissure)	72	0.0149	0.0105	0.0017
		Superior parietal lobule (lateral part of P1)	15	0.0115	0.0096	0.0010
	Right	Precentral gyrus	145	0.0366	0.0166	0.0063
		Postcentral gyrus	101	0.0346	0.0164	0.0069
		Central sulcus (Rolando's fissure)	182	0.0306	0.0152	0.0052
		Paracentral lobule and sulcus	45	0.0209	0.0122	0.0035
		Supramarginal gyrus	27	0.0198	0.0121	0.0027

		Superior frontal gyrus (F1)	38	0.0192	0.0115	0.0028
		Postcentral sulcus	163	0.0231	0.0111	0.0026
		Superior part of the precentral sulcus	57	0.0167	0.0107	0.0018
		Middle frontal gyrus (F2)	11	0.0123	0.0104	0.0011
		Superior parietal lobule (lateral part of P1)	26	0.0143	0.0103	0.0014
Right foot	Left	Paracentral lobule and sulcus	90	0.0555	0.0227	0.0119
		Precentral gyrus	80	0.0498	0.0171	0.0078
		Precuneus (medial part of P1)	27	0.0373	0.0154	0.0071
		Central sulcus (Rolando's fissure)	144	0.0398	0.0151	0.0060
		Superior parietal lobule (lateral part of P1)	63	0.0240	0.0150	0.0032
		Superior part of the precentral sulcus	24	0.0330	0.0144	0.0054
		Superior frontal gyrus (F1)	50	0.0399	0.0144	0.0058
		Postcentral gyrus	54	0.0338	0.0141	0.0048
		Marginal branch (or part) of the cingulate sulcus	32	0.0283	0.0139	0.0045
		Postcentral sulcus	38	0.0199	0.0124	0.0026
	Right	Paracentral lobule and sulcus	82	0.0377	0.0174	0.0065
		Precentral gyrus	77	0.0289	0.0148	0.0043
		Superior frontal gyrus (F1)	47	0.0225	0.0142	0.0032
		Postcentral gyrus	41	0.0274	0.0138	0.0036
		Central sulcus (Rolando's fissure)	85	0.0307	0.0136	0.0047
		Marginal branch (or part) of the cingulate sulcus	10	0.0153	0.0123	0.0016
		Precuneus (medial part of P1)	20	0.0182	0.0122	0.0026
		Superior parietal lobule (lateral part of P1)	20	0.0176	0.0119	0.0021
		Postcentral sulcus	26	0.0159	0.0116	0.0017
Right hand	Left	Precentral gyrus	115	0.0417	0.0191	0.0083
		Postcentral gyrus	109	0.0474	0.0188	0.0090
		Central sulcus (Rolando's fissure)	212	0.0431	0.0176	0.0068
		Paracentral lobule and sulcus	45	0.0304	0.0175	0.0061
		Superior frontal gyrus (F1)	21	0.0272	0.0134	0.0046
		Superior part of the precentral sulcus	45	0.0235	0.0130	0.0037
		Marginal branch (or part) of the cingulate sulcus	10	0.0168	0.0120	0.0022
		Superior parietal lobule (lateral part of P1)	39	0.0152	0.0115	0.0014
		Postcentral sulcus	124	0.0196	0.0114	0.0021
		Supramarginal gyrus	24	0.0144	0.0108	0.0013
	Right	Postcentral gyrus	36	0.0180	0.0127	0.0022
		Paracentral lobule and sulcus	25	0.0174	0.0126	0.0027
		Precentral gyrus	58	0.0196	0.0125	0.0025
		Central sulcus (Rolando's fissure)	73	0.0165	0.0114	0.0016
		Superior parietal lobule (lateral part of P1)	18	0.0140	0.0109	0.0012
		Superior frontal gyrus (F1)	11	0.0126	0.0107	0.0008
		Postcentral sulcus	24	0.0131	0.0104	0.0010
Tongue	Left	Paracentral lobule and sulcus	35	0.0151	0.0095	0.0027
		Precentral gyrus	89	0.0125	0.0081	0.0015
		Postcentral gyrus	65	0.0117	0.0081	0.0015
		Central sulcus (Rolando's fissure)	190	0.0107	0.0077	0.0012
		Inferior part of the precentral sulcus	35	0.0096	0.0074	0.0012
		Postcentral sulcus	93	0.0103	0.0069	0.0008
		Superior parietal lobule (lateral part of P1)	32	0.0086	0.0068	0.0007
		Supramarginal gyrus	33	0.0078	0.0068	0.0006
		Superior part of the precentral sulcus	16	0.0086	0.0066	0.0007
		Subcentral gyrus (central operculum) and sulci	18	0.0070	0.0064	0.0003
		Middle frontal gyrus (F2)	14	0.0066	0.0062	0.0002
	Right	Paracentral lobule and sulcus	27	0.0116	0.0082	0.0019
		Postcentral gyrus	79	0.0120	0.0078	0.0014
		Precentral gyrus	86	0.0110	0.0075	0.0011
		Subcentral gyrus (central operculum) and sulci	19	0.0093	0.0073	0.0008
		Superior frontal gyrus (F1)	10	0.0087	0.0072	0.0007
		Central sulcus (Rolando's fissure)	91	0.0097	0.0068	0.0009
		Superior parietal lobule (lateral part of P1)	15	0.0091	0.0068	0.0009
		Supramarginal gyrus	11	0.0082	0.0068	0.0007
		Postcentral sulcus	27	0.0085	0.0067	0.0007

5. Relational Task: Match and Relation Conditions

Subtask	Hemisphere	Destrieux atlas	Vertices	Max value	Mean value	Std
Match	Left	Calcarine sulcus	45	0.0674	0.0312	0.0185
		Superior occipital gyrus (O1)	57	0.0695	0.0284	0.0128
		Occipital pole	32	0.0539	0.0246	0.0121
		Superior occipital sulcus and transverse occipital sulcus	30	0.0323	0.0173	0.0050
		Cuneus (O6)	38	0.0312	0.0168	0.0052
		Lingual gyrus, lingual part of the medial occipito-temporal gyrus (O5)	10	0.0267	0.0163	0.0054

		Middle occipital sulcus and lunatus sulcus	27	0.0234	0.0150	0.0027
		Superior parietal lobule (lateral part of P1)	20	0.0233	0.0144	0.0037
		Middle occipital gyrus (O2, lateral occipital gyrus)	48	0.0260	0.0144	0.0034
		Angular gyrus	44	0.0220	0.0140	0.0024
		Inferior temporal gyrus (T3)	16	0.0150	0.0133	0.0011
		Superior temporal sulcus (parallel sulcus)	12	0.0216	0.0132	0.0027
	Right	Occipital pole	64	0.0637	0.0272	0.0126
		Calcarine sulcus	36	0.0359	0.0211	0.0075
		Superior occipital gyrus (O1)	57	0.0398	0.0199	0.0074
		Planum temporale or temporal plane of the superior temporal gyrus	24	0.0378	0.0188	0.0078
		Lateral aspect of the superior temporal gyrus	45	0.0371	0.0184	0.0068
		Middle temporal gyrus (T2)	31	0.0324	0.0181	0.0061
		Middle occipital sulcus and lunatus sulcus	27	0.0255	0.0167	0.0042
		Cuneus (O6)	32	0.0282	0.0161	0.0047
		Middle occipital gyrus (O2, lateral occipital gyrus)	29	0.0257	0.0160	0.0036
		Supramarginal gyrus	83	0.0308	0.0155	0.0046
		Superior occipital sulcus and transverse occipital sulcus	47	0.0245	0.0151	0.0038
		Subcentral gyrus (central operculum) and sulci	11	0.0144	0.0132	0.0007
		Precuneus (medial part of P1)	12	0.0174	0.0132	0.0018
		Angular gyrus	43	0.0240	0.0130	0.0024
		Parieto-occipital sulcus (or fissure)	10	0.0125	0.0118	0.0003
Relation	Left	Calcarine sulcus	44	0.0610	0.0309	0.0158
		Superior occipital gyrus (O1)	55	0.0785	0.0308	0.0137
		Occipital pole	30	0.0577	0.0287	0.0133
		Superior occipital sulcus and transverse occipital sulcus	26	0.0322	0.0196	0.0044
		Cuneus (O6)	36	0.0342	0.0192	0.0057
		Middle occipital sulcus and lunatus sulcus	22	0.0285	0.0178	0.0033
		Middle occipital gyrus (O2, lateral occipital gyrus)	40	0.0291	0.0176	0.0037
		Superior parietal lobule (lateral part of P1)	16	0.0251	0.0172	0.0038
		Angular gyrus	47	0.0282	0.0170	0.0031
		Inferior temporal gyrus (T3)	16	0.0184	0.0160	0.0014
		Superior temporal sulcus (parallel sulcus)	18	0.0282	0.0159	0.0033
	Right	Occipital pole	58	0.0758	0.0330	0.0153
		Planum temporale or temporal plane of the superior temporal gyrus	22	0.0434	0.0233	0.0094
		Calcarine sulcus	34	0.0398	0.0232	0.0085
		Superior occipital gyrus (O1)	57	0.0409	0.0232	0.0075
		Lateral aspect of the superior temporal gyrus	43	0.0460	0.0222	0.0083
		Middle temporal gyrus (T2)	41	0.0405	0.0212	0.0078
		Cuneus (O6)	32	0.0339	0.0195	0.0056
		Middle occipital gyrus (O2, lateral occipital gyrus)	30	0.0296	0.0187	0.0036
		Supramarginal gyrus	75	0.0370	0.0185	0.0057
		Middle occipital sulcus and lunatus sulcus	25	0.0260	0.0184	0.0036
		Superior occipital sulcus and transverse occipital sulcus	45	0.0276	0.0172	0.0040
		Subcentral gyrus (central operculum) and sulci	11	0.0189	0.0166	0.0012
		Triangular part of the inferior frontal gyrus	10	0.0200	0.0164	0.0021
		Angular gyrus	58	0.0290	0.0160	0.0027
		Precuneus (medial part of P1)	12	0.0194	0.0158	0.0018
		Sulcus intermedius primus (of Jensen)	10	0.0148	0.0140	0.0004

6. Social Task: Social and Random Conditions

Subtask	Hemisphere	Destrieux atlas	Vertices	Max value	Mean value	Std
Social	Left	Superior occipital gyrus (O1)	43	0.0203	0.0122	0.0032
		Superior occipital sulcus and transverse occipital sulcus	32	0.0167	0.0115	0.0026
		Occipital pole	18	0.0147	0.0109	0.0018
		Middle occipital sulcus and lunatus sulcus	27	0.0136	0.0104	0.0017
		Calcarine sulcus	35	0.0144	0.0102	0.0016
		Middle occipital gyrus (O2, lateral occipital gyrus)	47	0.0153	0.0092	0.0015
		Cuneus (O6)	16	0.0112	0.0090	0.0009
		Angular gyrus	33	0.0095	0.0086	0.0006
		Superior temporal sulcus (parallel sulcus)	52	0.0114	0.0085	0.0008
	Right	Middle occipital sulcus and lunatus sulcus	29	0.0189	0.0119	0.0034
		Occipital pole	47	0.0176	0.0114	0.0026
		Superior occipital gyrus (O1)	38	0.0147	0.0110	0.0017
		Calcarine sulcus	15	0.0146	0.0107	0.0022
		Superior occipital sulcus and transverse occipital sulcus	52	0.0184	0.0100	0.0021
		Cuneus (O6)	16	0.0136	0.0100	0.0019
		Middle temporal gyrus (T2)	29	0.0118	0.0094	0.0011
		Lateral aspect of the superior temporal gyrus	57	0.0131	0.0093	0.0012
		Angular gyrus	64	0.0133	0.0092	0.0012
		Postcentral gyrus	21	0.0112	0.0092	0.0009
		Precentral gyrus	12	0.0112	0.0092	0.0009
		Middle occipital gyrus (O2, lateral occipital gyrus)	31	0.0132	0.0091	0.0012

		Planum temporale or temporal plane of the superior temporal gyrus	34	0.0117	0.0091	0.0010
		Supramarginal gyrus	69	0.0103	0.0087	0.0007
		Postcentral sulcus	51	0.0098	0.0087	0.0005
		Superior temporal sulcus (parallel sulcus)	58	0.0095	0.0084	0.0005
		Parieto-occipital sulcus (or fissure)	14	0.0097	0.0083	0.0005
Random	Left	Superior occipital gyrus (O1)	43	0.0297	0.0182	0.0048
		Occipital pole	18	0.0236	0.0179	0.0030
		Superior occipital sulcus and transverse occipital sulcus	36	0.0267	0.0177	0.0043
		Middle occipital sulcus and lunatus sulcus	31	0.0217	0.0164	0.0028
		Calcarine sulcus	35	0.0217	0.0158	0.0024
		Middle occipital gyrus (O2, lateral occipital gyrus)	57	0.0251	0.0149	0.0024
		Cuneus (O6)	13	0.0169	0.0141	0.0013
		Angular gyrus	31	0.0160	0.0141	0.0010
		Superior temporal sulcus (parallel sulcus)	54	0.0180	0.0136	0.0012
	Right	Middle occipital sulcus and lunatus sulcus	31	0.0305	0.0191	0.0056
		Occipital pole	48	0.0286	0.0190	0.0039
		Superior occipital gyrus (O1)	40	0.0241	0.0176	0.0029
		Calcarine sulcus	13	0.0228	0.0174	0.0034
		Superior occipital sulcus and transverse occipital sulcus	57	0.0305	0.0165	0.0036
		Cuneus (O6)	16	0.0204	0.0158	0.0027
		Middle occipital gyrus (O2, lateral occipital gyrus)	35	0.0221	0.0147	0.0023
		Middle temporal gyrus (T2)	30	0.0196	0.0146	0.0019
		Angular gyrus	66	0.0198	0.0145	0.0017
		Lateral aspect of the superior temporal gyrus	49	0.0205	0.0145	0.0019
		Planum temporale or temporal plane of the superior temporal gyrus	24	0.0179	0.0142	0.0016
		Postcentral gyrus	17	0.0155	0.0139	0.0008
		Supramarginal gyrus	77	0.0167	0.0136	0.0010
		Posterior transverse collateral sulcus	13	0.0160	0.0135	0.0013
		Postcentral sulcus	50	0.0152	0.0134	0.0007
		Superior temporal sulcus (parallel sulcus)	37	0.0152	0.0132	0.0008

7. Working Memory Task

Part 1: 0-back Conditions (Body, Faces, Places, Tools)

Subtask	Hemisphere	Destrieux atlas	Vertices	Max value	Mean value	Std
0bk-back Body	Left	Calcarine sulcus	21	0.0995	0.0758	0.0193
		Occipital pole	16	0.0943	0.0602	0.0175
		Superior occipital gyrus (O1)	25	0.0642	0.0485	0.0073
		Middle occipital gyrus (O2, lateral occipital gyrus)	64	0.0536	0.0457	0.0044
		Middle occipital sulcus and lunatus sulcus	62	0.0598	0.0451	0.0052
		Anterior occipital sulcus and preoccipital notch (temporo-occipital incisure)	50	0.0536	0.045	0.0048
		Inferior occipital gyrus (O3) and sulcus	26	0.0614	0.0444	0.0056
		Angular gyrus	34	0.0508	0.044	0.0033
		Superior occipital sulcus and transverse occipital sulcus	34	0.0541	0.0431	0.0047
		Superior temporal sulcus (parallel sulcus)	52	0.0487	0.041	0.0028
	Right	Superior occipital gyrus (O1)	43	0.0633	0.05	0.0069
		Middle occipital sulcus and lunatus sulcus	58	0.0582	0.0494	0.0045
		Inferior occipital gyrus (O3) and sulcus	22	0.0635	0.0491	0.0084
		Anterior occipital sulcus and preoccipital notch (temporo-occipital incisure)	49	0.0603	0.0486	0.0058
		Occipital pole	35	0.0606	0.0479	0.0069
		Middle occipital gyrus (O2, lateral occipital gyrus)	49	0.0631	0.0471	0.006
		Calcarine sulcus	26	0.0615	0.0452	0.0077
		Superior temporal sulcus (parallel sulcus)	54	0.0616	0.0452	0.0069
		Cuneus (O6)	11	0.0523	0.0448	0.0042
		Superior occipital sulcus and transverse occipital sulcus	70	0.0594	0.0443	0.0049
		Middle temporal gyrus (T2)	15	0.0519	0.0429	0.004
		Angular gyrus	40	0.0465	0.0413	0.0025
		Inferior temporal sulcus	13	0.0446	0.0409	0.0016
		Planum temporale or temporal plane of the superior temporal gyrus	16	0.0463	0.0401	0.0022
		Lateral occipito-temporal gyrus (fusiform gyrus, O4-T4)	13	0.0432	0.0399	0.0019
		Parieto-occipital sulcus (or fissure)	11	0.046	0.0397	0.0024
		Supramarginal gyrus	21	0.041	0.0387	0.0012
0bk-back Faces	Left	Calcarine sulcus	22	0.0788	0.0604	0.014
		Superior occipital gyrus (O1)	21	0.0644	0.0534	0.008
		Occipital pole	15	0.0718	0.0506	0.0107
		Middle occipital sulcus and lunatus sulcus	62	0.072	0.0502	0.0059
		Middle occipital gyrus (O2, lateral occipital gyrus)	69	0.0778	0.0499	0.0072
		Superior occipital sulcus and transverse occipital sulcus	52	0.0739	0.0492	0.009
		Anterior occipital sulcus and preoccipital notch (temporo-occipital incisure)	30	0.0517	0.0434	0.0035

		Inferior occipital gyrus (O3) and sulcus	17	0.0583	0.0431	0.0048
		Angular gyrus	28	0.0523	0.0431	0.0037
		Superior temporal sulcus (parallel sulcus)	41	0.0495	0.0418	0.0033
	Right	Middle occipital sulcus and lunatus sulcus	58	0.0726	0.0573	0.006
		Superior occipital gyrus (O1)	36	0.0706	0.0541	0.0097
		Inferior occipital gyrus (O3) and sulcus	22	0.0651	0.0526	0.0074
		Middle occipital gyrus (O2, lateral occipital gyrus)	53	0.0657	0.0512	0.0078
		Occipital pole	39	0.0683	0.0506	0.0072
		Calcarine sulcus	28	0.0711	0.0493	0.0096
		Superior temporal sulcus (parallel sulcus)	43	0.0604	0.0484	0.0071
		Superior occipital sulcus and transverse occipital sulcus	77	0.0653	0.0467	0.0072
		Anterior occipital sulcus and preoccipital notch (temporo-occipital incisure)	38	0.057	0.0458	0.0053
		Angular gyrus	59	0.0606	0.044	0.0055
		Lateral occipito-temporal sulcus	24	0.0515	0.0437	0.0036
		Intraparietal sulcus (interparietal sulcus) and transverse parietal sulci	12	0.0476	0.042	0.0029
		Lateral aspect of the superior temporal gyrus	11	0.0486	0.042	0.0038
		Lateral occipito-temporal gyrus (fusiform gyrus, O4-T4)	18	0.0491	0.042	0.0036
		Medial occipito-temporal sulcus (collateral sulcus) and lingual sulcus	20	0.0484	0.0417	0.0035
		Parieto-occipital sulcus (or fissure)	21	0.0448	0.0402	0.0018
		Supramarginal gyrus	18	0.0442	0.0401	0.0016
		Middle temporal gyrus (T2)	19	0.0463	0.0401	0.0023
		Inferior temporal sulcus	11	0.0402	0.039	0.0009
0bk-back Places	Left	Calcarine sulcus	23	0.067	0.0503	0.0117
		Occipital pole	13	0.0615	0.0447	0.0083
		Superior occipital gyrus (O1)	24	0.0559	0.0428	0.0057
		Middle occipital gyrus (O2, lateral occipital gyrus)	60	0.055	0.0424	0.0044
		Angular gyrus	36	0.0505	0.0421	0.0044
		Inferior occipital gyrus (O3) and sulcus	17	0.0433	0.0393	0.0018
		Middle occipital sulcus and lunatus sulcus	56	0.0518	0.0392	0.0034
		Superior occipital sulcus and transverse occipital sulcus	41	0.046	0.0388	0.003
		Superior temporal sulcus (parallel sulcus)	58	0.0471	0.0386	0.0031
		Anterior occipital sulcus and preoccipital notch (temporo-occipital incisure)	35	0.0425	0.0371	0.0023
		Inferior temporal sulcus	10	0.0381	0.0367	0.0013
		Cuneus (O6)	18	0.04	0.0363	0.0016
	Right	Superior occipital gyrus (O1)	41	0.0566	0.0457	0.006
		Middle occipital gyrus (O2, lateral occipital gyrus)	54	0.0764	0.0455	0.0097
		Middle occipital sulcus and lunatus sulcus	58	0.0522	0.0429	0.0044
		Superior occipital sulcus and transverse occipital sulcus	92	0.0608	0.0427	0.0058
		Calcarine sulcus	19	0.0558	0.0426	0.0075
		Occipital pole	34	0.0632	0.0416	0.0066
		Angular gyrus	68	0.0607	0.0409	0.0071
		Inferior occipital gyrus (O3) and sulcus	16	0.0494	0.0406	0.005
		Intraparietal sulcus (interparietal sulcus) and transverse parietal sulci	34	0.0578	0.0404	0.0071
		Anterior occipital sulcus and preoccipital notch (temporo-occipital incisure)	34	0.0479	0.0401	0.0037
		Superior temporal sulcus (parallel sulcus)	42	0.049	0.0401	0.0049
		Cuneus (O6)	15	0.0537	0.04	0.0059
		Lateral aspect of the superior temporal gyrus	10	0.0445	0.0387	0.0035
		Parieto-occipital sulcus (or fissure)	17	0.044	0.0366	0.0027
		Middle temporal gyrus (T2)	11	0.0391	0.0364	0.0016
		Supramarginal gyrus	20	0.0386	0.0363	0.0014
0bk-back Tools	Left	Calcarine sulcus	33	0.0878	0.0552	0.0191
		Occipital pole	12	0.0745	0.0507	0.0118
		Superior occipital gyrus (O1)	35	0.067	0.0485	0.0111
		Middle occipital gyrus (O2, lateral occipital gyrus)	64	0.0584	0.0444	0.0044
		Middle occipital sulcus and lunatus sulcus	60	0.055	0.0431	0.0044
		Angular gyrus	30	0.0484	0.0428	0.0031
		Superior occipital sulcus and transverse occipital sulcus	47	0.0568	0.0427	0.0062
		Anterior occipital sulcus and preoccipital notch (temporo-occipital incisure)	41	0.0497	0.0413	0.0036
		Superior temporal sulcus (parallel sulcus)	55	0.0476	0.0401	0.0034
		Inferior occipital gyrus (O3) and sulcus	15	0.0467	0.0401	0.0029
		Cuneus (O6)	20	0.0488	0.0397	0.0031
	Right	Middle occipital sulcus and lunatus sulcus	58	0.0565	0.0489	0.0045
		Superior occipital gyrus (O1)	41	0.0593	0.046	0.0062
		Middle occipital gyrus (O2, lateral occipital gyrus)	50	0.0582	0.0454	0.0056
		Anterior occipital sulcus and preoccipital notch (temporo-occipital incisure)	35	0.0536	0.0444	0.005
		Inferior occipital gyrus (O3) and sulcus	18	0.0554	0.043	0.0054
		Occipital pole	36	0.0568	0.0426	0.0048
		Superior temporal sulcus (parallel sulcus)	41	0.0523	0.0424	0.0054

		Superior occipital sulcus and transverse occipital sulcus	86	0.0533	0.042	0.005
		Calcarine sulcus	24	0.0551	0.0415	0.0062
		Angular gyrus	75	0.0557	0.0409	0.0044
		Intraparietal sulcus (interparietal sulcus) and transverse parietal sulci	13	0.0496	0.0403	0.0044
		Cuneus (O6)	22	0.0499	0.0399	0.0035
		Planum temporale or temporal plane of the superior temporal gyrus	11	0.0427	0.0378	0.0022
		Supramarginal gyrus	20	0.0412	0.0372	0.0016
		Parieto-occipital sulcus (or fissure)	14	0.0412	0.0369	0.0016

Part 2: 2-back Conditions (Body, Faces, Places, Tools)

Subtask	Hemisphere	Destrieux atlas	Vertices	Max value	Mean value	Std
2-back Body	Left	Calcarine sulcus	32	0.1067	0.0693	0.0251
		Occipital pole	17	0.0890	0.0563	0.0145
		Superior occipital gyrus (O1)	43	0.0874	0.0551	0.0139
		Middle occipital sulcus and lunatus sulcus	62	0.0706	0.0545	0.0072
		Lingual gyrus, lingual part of the medial occipito-temporal gyrus (O5)	4	0.0676	0.0541	0.0097
		Middle occipital gyrus (O2, lateral occipital gyrus)	74	0.0707	0.0528	0.0073
		Inferior occipital gyrus (O3) and sulcus	18	0.0602	0.0526	0.0045
		Anterior occipital sulcus and preoccipital notch	53	0.0597	0.0494	0.0057
		Superior occipital sulcus and transverse occipital sulcus	56	0.0731	0.0485	0.0088
		Angular gyrus	51	0.0615	0.0475	0.0061
		Superior temporal sulcus (parallel sulcus)	60	0.0598	0.0468	0.0048
		Cuneus (O6)	11	0.0553	0.0451	0.0045
		Supramarginal gyrus	12	0.0443	0.0422	0.0016
	Right	Superior occipital gyrus (O1)	35	0.0720	0.0540	0.0078
		Inferior occipital gyrus (O3) and sulcus	17	0.0661	0.0529	0.0078
		Middle occipital sulcus and lunatus sulcus	58	0.0630	0.0507	0.0047
		Middle occipital gyrus (O2, lateral occipital gyrus)	46	0.0617	0.0493	0.0053
		Anterior occipital sulcus and preoccipital notch	49	0.0589	0.0484	0.0047
		Superior occipital sulcus and transverse occipital sulcus	63	0.0768	0.0467	0.0072
		Occipital pole	33	0.0624	0.0462	0.0051
		Calcarine sulcus	28	0.0617	0.0461	0.0060
		Superior temporal sulcus (parallel sulcus)	57	0.0574	0.0448	0.0047
		Middle temporal gyrus (T2)	17	0.0552	0.0447	0.0049
		Angular gyrus	39	0.0576	0.0441	0.0040
		Inferior temporal sulcus	13	0.0497	0.0437	0.0023
		Intraparietal sulcus and transverse parietal sulci	10	0.0468	0.0431	0.0023
2-back Faces	Left	Calcarine sulcus	22	0.0949	0.0729	0.0182
		Occipital pole	18	0.0848	0.0563	0.0160
		Middle occipital sulcus and lunatus sulcus	62	0.0763	0.0553	0.0052
		Superior occipital gyrus (O1)	30	0.0690	0.0519	0.0095
		Inferior occipital gyrus (O3) and sulcus	21	0.0585	0.0518	0.0055
		Middle occipital gyrus (O2, lateral occipital gyrus)	73	0.0774	0.0511	0.0070
		Anterior occipital sulcus and preoccipital notch	56	0.0572	0.0498	0.0029
		Inferior temporal sulcus	14	0.0616	0.0491	0.0084
		Superior occipital sulcus and transverse occipital sulcus	66	0.0717	0.0482	0.0085
		Angular gyrus	33	0.0538	0.0463	0.0048
		Lateral occipito-temporal sulcus	18	0.0552	0.0441	0.0055
		Middle temporal gyrus (T2)	13	0.0532	0.0440	0.0039
		Superior temporal sulcus (parallel sulcus)	47	0.0506	0.0429	0.0031
		Cuneus (O6)	12	0.0461	0.0414	0.0026
		Supramarginal gyrus	12	0.0433	0.0397	0.0016
	Right	Middle occipital sulcus and lunatus sulcus	58	0.0637	0.0547	0.0043
		Middle occipital gyrus (O2, lateral occipital gyrus)	52	0.0694	0.0512	0.0075
		Inferior occipital gyrus (O3) and sulcus	20	0.0595	0.0504	0.0063
		Superior occipital gyrus (O1)	37	0.0625	0.0482	0.0063
		Calcarine sulcus	23	0.0633	0.0482	0.0077
		Superior occipital sulcus and transverse occipital sulcus	83	0.0667	0.0476	0.0072
		Anterior occipital sulcus and preoccipital notch	42	0.0573	0.0470	0.0046
		Superior temporal sulcus (parallel sulcus)	43	0.0654	0.0465	0.0074
		Occipital pole	29	0.0592	0.0452	0.0055
		Angular gyrus	26	0.0523	0.0430	0.0044
		Cuneus (O6)	11	0.0497	0.0430	0.0037
		Intraparietal sulcus and transverse parietal sulci	15	0.0481	0.0426	0.0032
		Middle temporal gyrus (T2)	10	0.0466	0.0425	0.0025
		Inferior temporal sulcus	10	0.0429	0.0405	0.0012
		Lateral occipito-temporal sulcus	15	0.0422	0.0397	0.0012
2-back Places	Left	Calcarine sulcus	33	0.0819	0.0548	0.0159
		Occipital pole	13	0.0672	0.0510	0.0090
		Middle occipital gyrus (O2, lateral occipital gyrus)	69	0.0670	0.0508	0.0066
		Anterior occipital sulcus and preoccipital notch	56	0.0613	0.0487	0.0050
		Superior occipital gyrus (O1)	22	0.0638	0.0486	0.0075

		Inferior occipital gyrus (O3) and sulcus	18	0.0555	0.0476	0.0050
		Middle occipital sulcus and lunatus sulcus	62	0.0611	0.0476	0.0059
		Superior temporal sulcus (parallel sulcus)	63	0.0607	0.0465	0.0058
		Angular gyrus	44	0.0584	0.0460	0.0062
		Superior occipital sulcus and transverse occipital sulcus	54	0.0552	0.0442	0.0048
		Middle temporal gyrus (T2)	13	0.0562	0.0437	0.0053
		Cuneus (O6)	23	0.0442	0.0407	0.0020
		Intraparietal sulcus and transverse parietal sulci	12	0.0471	0.0403	0.0026
		Supramarginal gyrus	10	0.0394	0.0384	0.0007
	Right	Middle occipital sulcus and lunatus sulcus	58	0.0607	0.0517	0.0046
		Inferior occipital gyrus (O3) and sulcus	20	0.0732	0.0492	0.0085
		Middle occipital gyrus (O2, lateral occipital gyrus)	46	0.0676	0.0474	0.0068
		Calcarine sulcus	28	0.0587	0.0469	0.0059
		Superior occipital gyrus (O1)	39	0.0577	0.0465	0.0057
		Anterior occipital sulcus and preoccipital notch	43	0.0543	0.0461	0.0047
		Occipital pole	24	0.0552	0.0439	0.0049
		Superior temporal sulcus (parallel sulcus)	35	0.0521	0.0438	0.0042
		Superior occipital sulcus and transverse occipital sulcus	78	0.0557	0.0432	0.0047
		Angular gyrus	47	0.0581	0.0430	0.0052
		Inferior temporal sulcus	10	0.0472	0.0423	0.0029
		Cuneus (O6)	17	0.0537	0.0417	0.0046
		Middle temporal gyrus (T2)	13	0.0465	0.0414	0.0032
		Intraparietal sulcus and transverse parietal sulci	11	0.0463	0.0412	0.0028
2-back Tools	Left	Calcarine sulcus	24	0.0683	0.0522	0.0114
		Superior occipital gyrus (O1)	30	0.0720	0.0477	0.0081
		Occipital pole	13	0.0616	0.0472	0.0078
		Middle occipital gyrus (O2, lateral occipital gyrus)	65	0.0629	0.0464	0.0056
		Middle occipital sulcus and lunatus sulcus	62	0.0588	0.0451	0.0050
		Angular gyrus	43	0.0525	0.0436	0.0048
		Inferior occipital gyrus (O3) and sulcus	17	0.0529	0.0435	0.0032
		Superior occipital sulcus and transverse occipital sulcus	43	0.0579	0.0431	0.0057
		Anterior occipital sulcus and preoccipital notch	54	0.0496	0.0430	0.0026
		Superior temporal sulcus (parallel sulcus)	62	0.0514	0.0425	0.0038
		Middle temporal gyrus (T2)	18	0.0509	0.0418	0.0041
		Cuneus (O6)	11	0.0459	0.0411	0.0026
	Right	Middle occipital sulcus and lunatus sulcus	58	0.0574	0.0478	0.0049
		Middle occipital gyrus (O2, lateral occipital gyrus)	44	0.0554	0.0473	0.0046
		Inferior occipital gyrus (O3) and sulcus	14	0.0600	0.0449	0.0072
		Lateral aspect of the superior temporal gyrus	27	0.0575	0.0441	0.0059
		Calcarine sulcus	24	0.0542	0.0441	0.0048
		Superior temporal sulcus (parallel sulcus)	41	0.0558	0.0434	0.0054
		Anterior occipital sulcus and preoccipital notch	31	0.0516	0.0432	0.0040
		Occipital pole	27	0.0539	0.0432	0.0037
		Superior occipital gyrus (O1)	34	0.0499	0.0430	0.0032
		Planum temporale of the superior temporal gyrus	32	0.0527	0.0423	0.0046
		Superior occipital sulcus and transverse occipital sulcus	62	0.0525	0.0421	0.0039
		Middle temporal gyrus (T2)	13	0.0486	0.0420	0.0038
		Angular gyrus	55	0.0508	0.0415	0.0036
		Parieto-occipital sulcus (or fissure)	12	0.0440	0.0400	0.0022
		Supramarginal gyrus	35	0.0431	0.0397	0.0020

TABLE SVI

EXTENDED CLASSIFICATION ACCURACY COMPARISON ACROSS MODELS AT 100% SAMPLE RATIO

Task	Classification Accuracy (%, Mean ± Standard error)					
	3D CNN	3D ResNet	Attnetion-based 3D CNN	3D EfficientNet	3D ConvNeXt*	3D ConvNeXt**
Emotion	94.8 ± 0.3	94.9 ± 0.3	95.0 ± 0.3	95.3 ± 0.3	95.5 ± 0.3	**95.6 ± 0.3**
Gambling	65.2 ± 0.3	65.4 ± 0.2	65.7 ± 0.2	65.6 ± 0.5	66.1 ± 0.2	**66.2 ± 0.2**
Language	96.2 ± 0.2	97.1 ± 0.2	97.1 ± 0.1	97.3 ± 0.1	**97.3 ± 0.1**	**97.3 ± 0.1**
Motor	94.0 ± 0.3	94.4 ± 0.2	94.4 ± 0.2	94.7 ± 0.2	94.9 ± 0.2	**95.0 ± 0.2**
Relational	77.9 ± 0.3	79.1 ± 0.2	79.0 ± 0.3	79.3 ± 0.2	79.5 ± 0.2	**79.8 ± 0.3**
Social	89.7 ± 0.5	90.8 ± 0.2	90.9 ± 0.2	90.9 ± 0.2	90.9 ± 0.2	**91.1 ± 0.2**
Working Memory	64.2 ± 0.5	72.5 ± 0.2	72.7 ± 0.5	73.8 ± 0.5	74.3 ± 0.5	**74.4 ± 0.5**

* Residual connections applied to all stages (original configuration); ** Residual connections applied to Stages 1–3.