Supplementary material

A large and rich EEG dataset for modeling human visual object recognition

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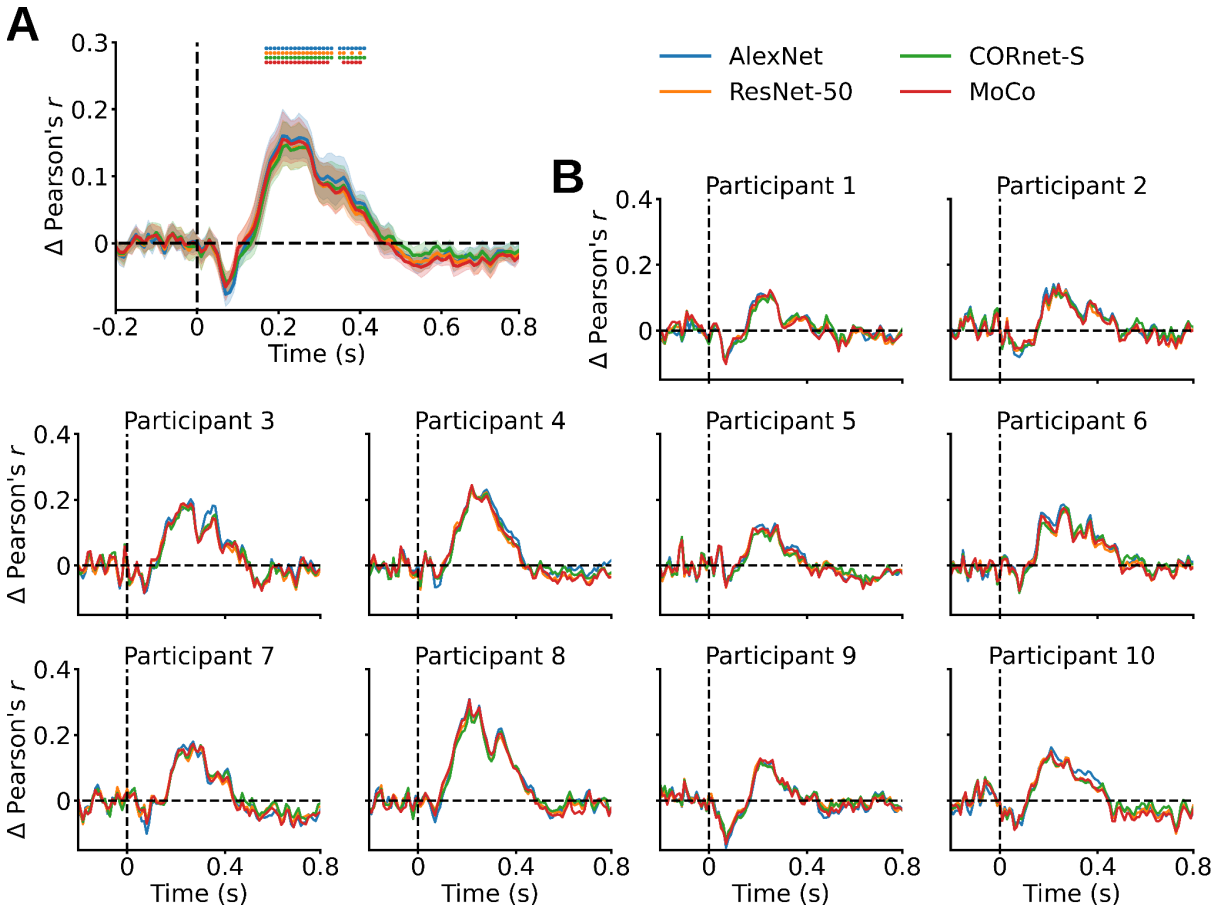
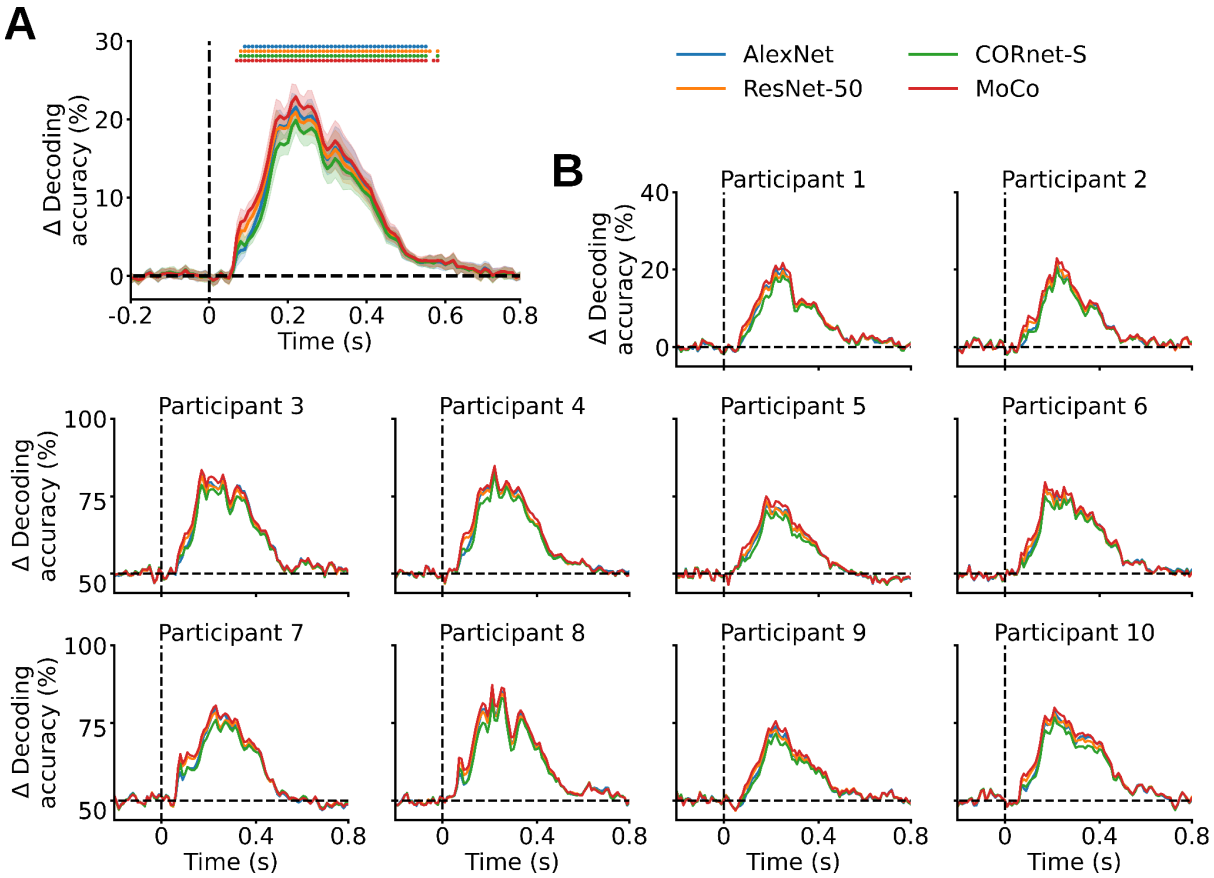
SUPPLEMENTARY FIGURES

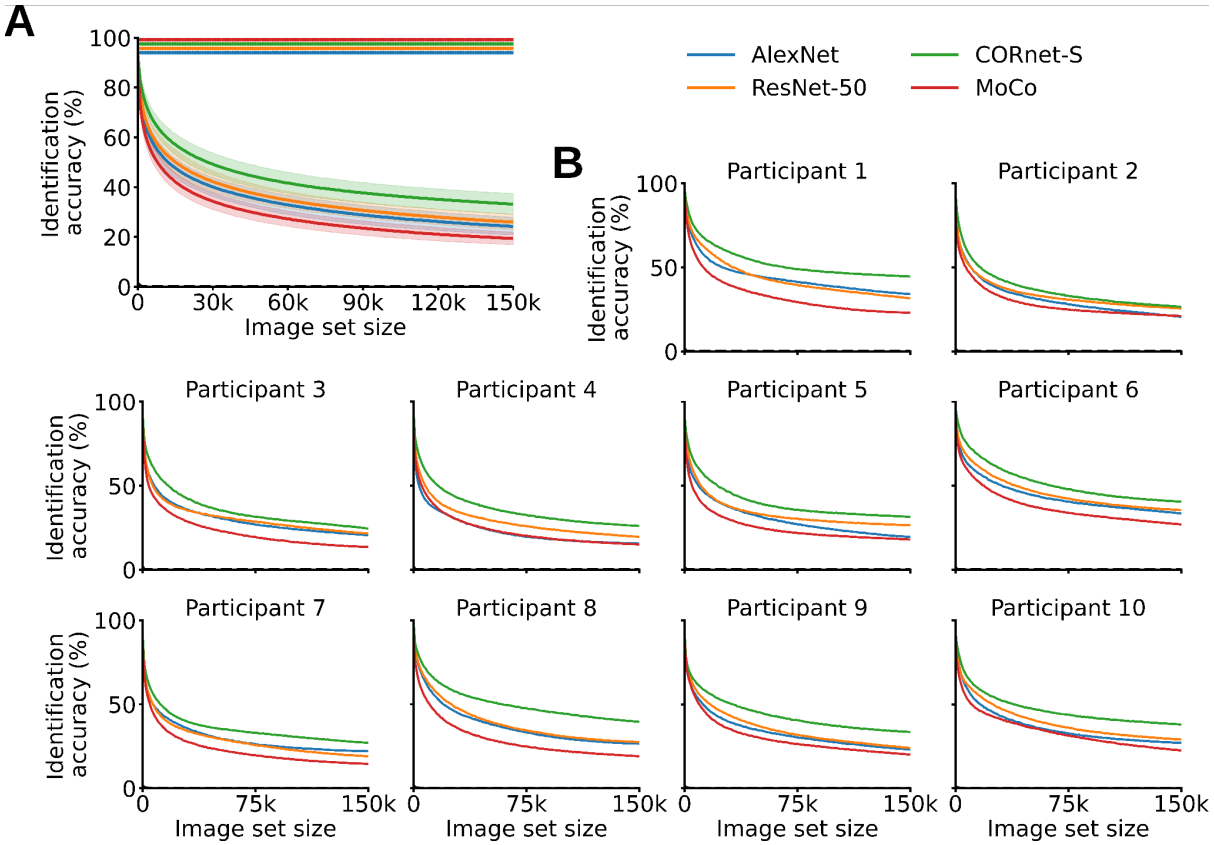
SUPPLEMENTARY TABLES



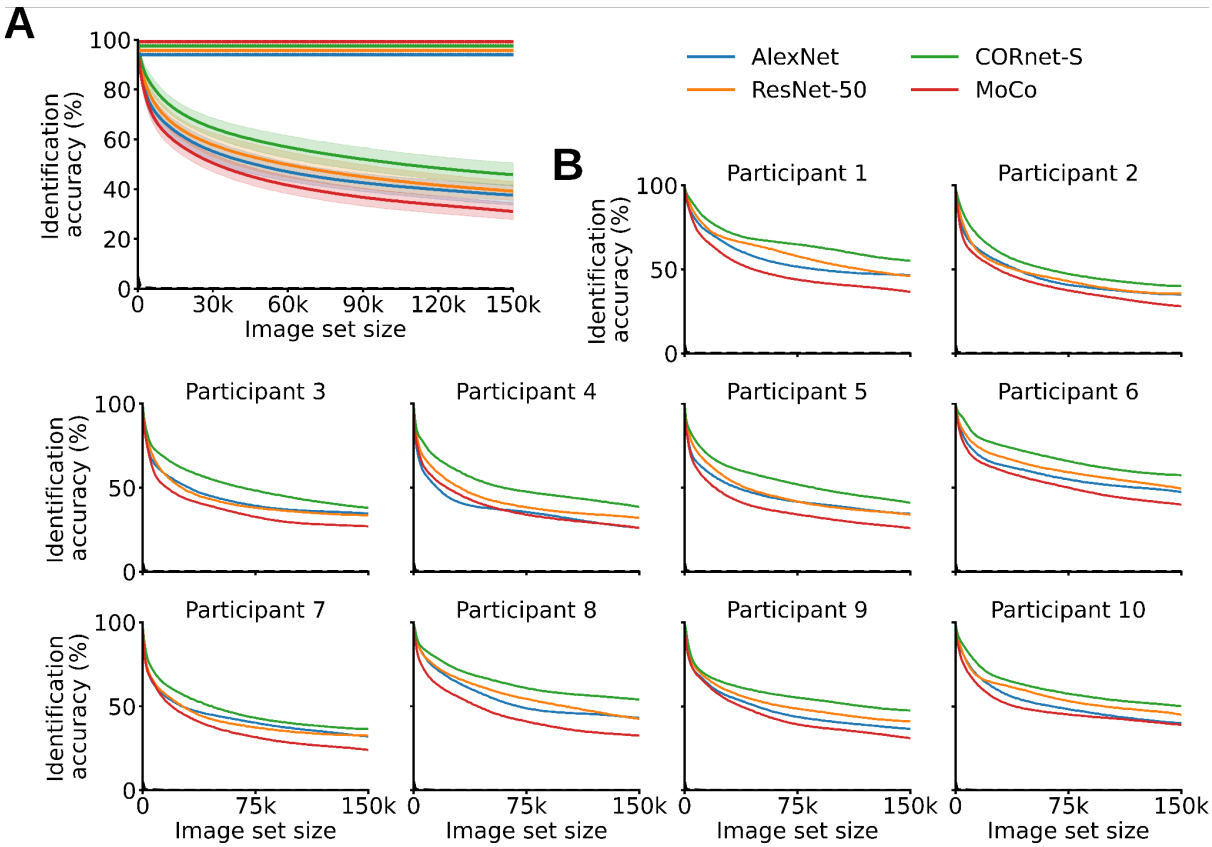
Supplementary Figure 1. Difference between the correlation results and the noise ceiling lower bound estimates. (**A**) The differences averaged across participants are significantly above zero between 170ms and 410ms, with peaks at 210-220ms ($P < 0.05$, one-sample one-sided t-test, Bonferroni-corrected). (**B**) Individual participants' results. Error margins, asterisks and black dashed lines as in **Figure 3**.



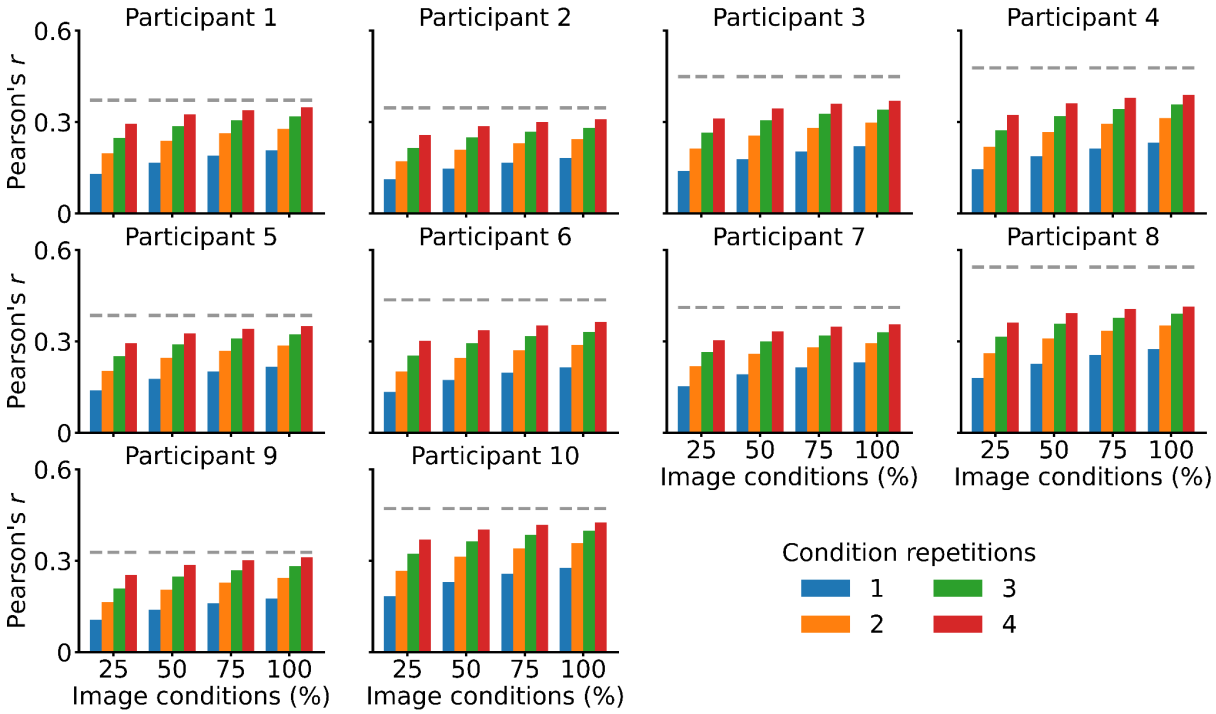
Supplementary Figure 2. Difference between the pairwise decoding results and the noise ceiling lower bound estimates. (**A**) The differences averaged across participants are significantly above zero between 70ms and 580ms, with peaks at 220ms ($P < 0.05$, one-sample one-sided t-test, Bonferroni-corrected). (**B**) Individual participants' results. Error margins, asterisks and black dashed lines as in **Figure 3**.



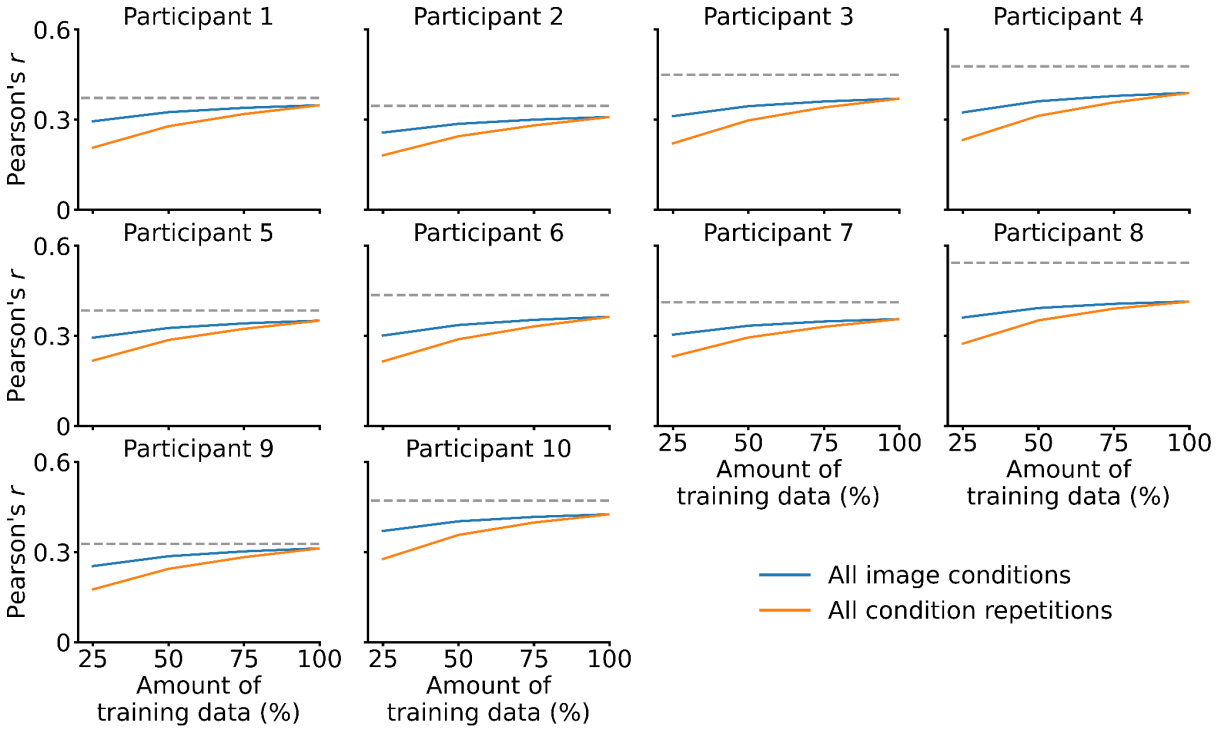
Supplementary Figure 3. Zero-shot identification, the three most correlated candidate image conditions. Zero-shot identification of the BioTest data using the SynTest data and the synthesized EEG visual responses to the 150,000 ILSVRC-2012 validation and test image conditions (SynImagenet), with the correct image condition falling within the three most correlated image conditions. (**A**) Zero-shot identification results averaged across participants. With a SynImagenet set size of 0 the synthesized data of AlexNet, ResNet-50, CORnet-S, MoCo significantly identify the BioTest data with accuracies of, respectively, 90.6%, 91%, 93.65%, 88.7%. (P < 0.05, one-sample one-sided t-test, Bonferroni-corrected). With a SynImagenet set size of 150,000 the synthesized data of AlexNet, ResNet-50, CORnet-S, MoCo significantly identify the BioTest data with accuracies of, respectively, 24.2%, 25.95%, 33.15%, 19.35%. (**B**) Individual participants' results. Error margins and black dashed lines as in **Figure 3**. Asterisks as in **Figure 5**.



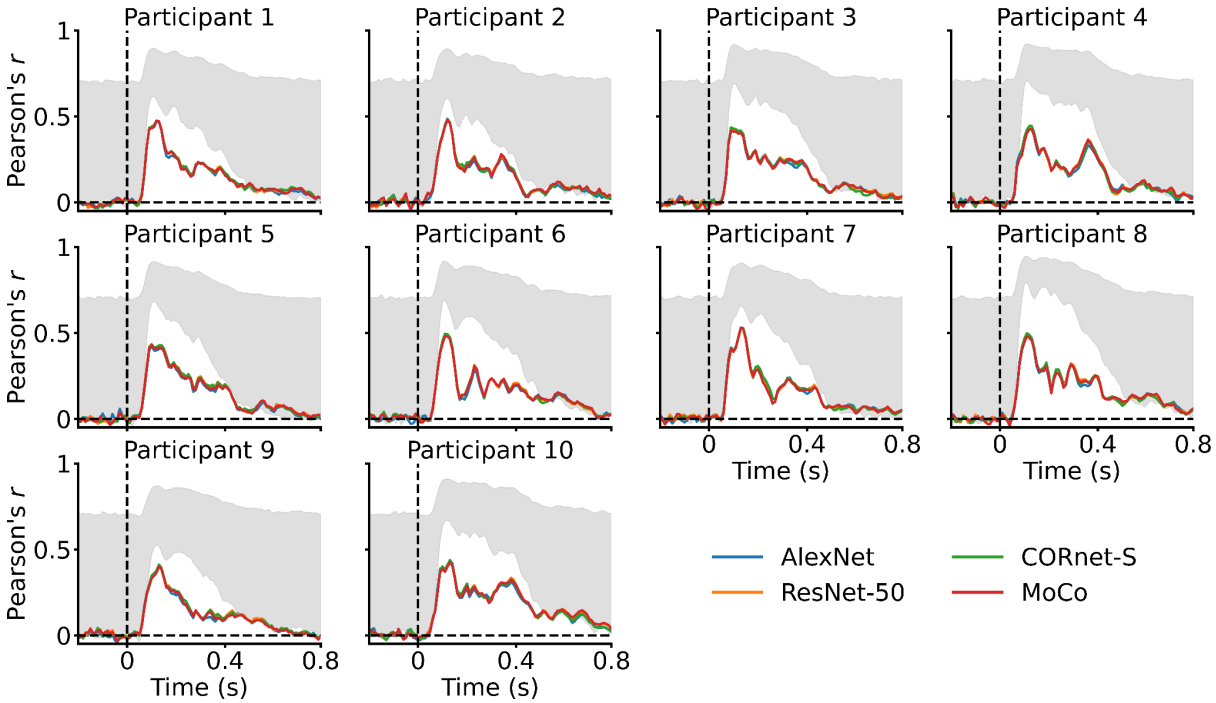
Supplementary Figure 4. Zero-shot identification, ten most correlated candidate image conditions. Zero-shot identification of the BioTest data using the SynTest data and the synthesized EEG visual responses to the 150,000 ILSVRC-2012 validation and test image conditions (SynImagenet), with the correct image condition falling within the ten most correlated image conditions. (**A**) Zero-shot identification results averaged across participants. With a SynImagenet set size of 0 the synthesized data of AlexNet, ResNet-50, CORnet-S, MoCo significantly identify the BioTest data with accuracies of, respectively, 97.55%, 97.7%, 99.05%, 97.05%. ($P < 0.05$, one-sample one-sided t-test, Bonferroni-corrected). With a SynImagenet set size of 150,000 the synthesized data of AlexNet, ResNet-50, CORnet-S, MoCo significantly identify the BioTest data with accuracies of, respectively, 37.55%, 39.15%, 45.8%, 31%. (**B**) Individual participants' results. Error margins and black dashed lines as in **Figure 3**. Asterisks as in **Figure 5**.



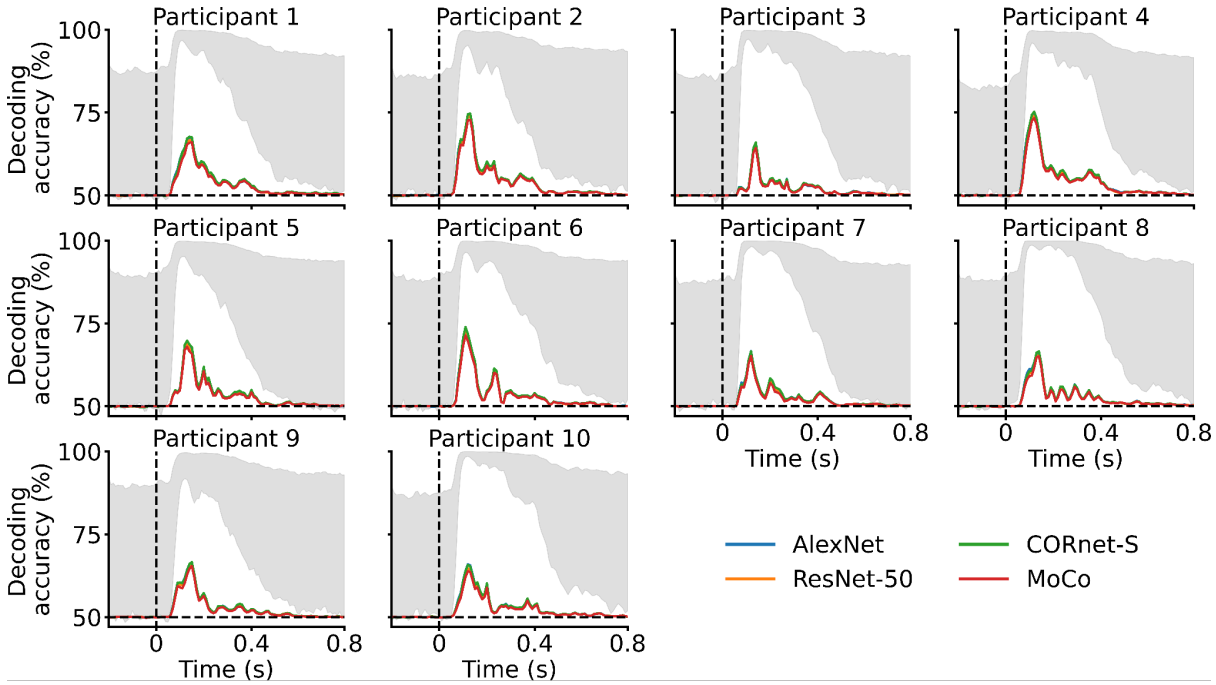
Supplementary Figure 5. Effect of image conditions and condition repetitions on linearizing encoding models' prediction accuracy, individual participants' results. Gray dashed lines as in **Figure 6**.



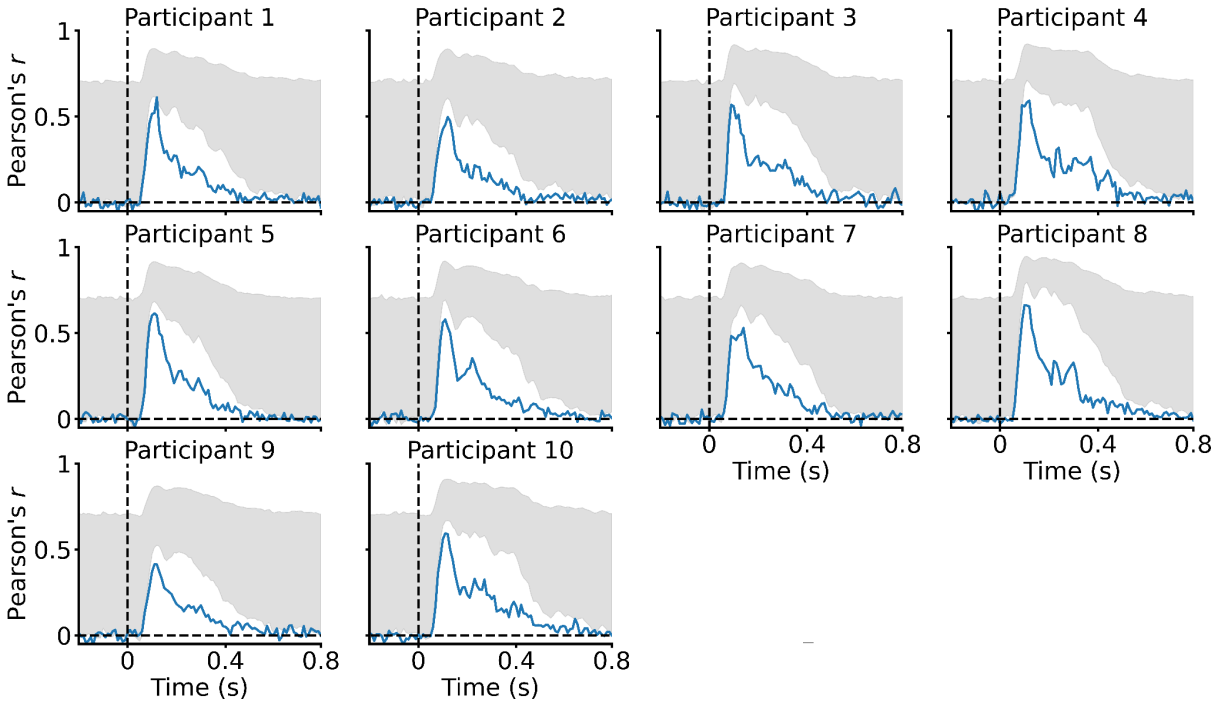
Supplementary Figure 6. Contribution of image conditions and condition repetitions on linearizing encoding models' prediction accuracy, individual participants' results. Gray dashed lines as in **Figure 6**.



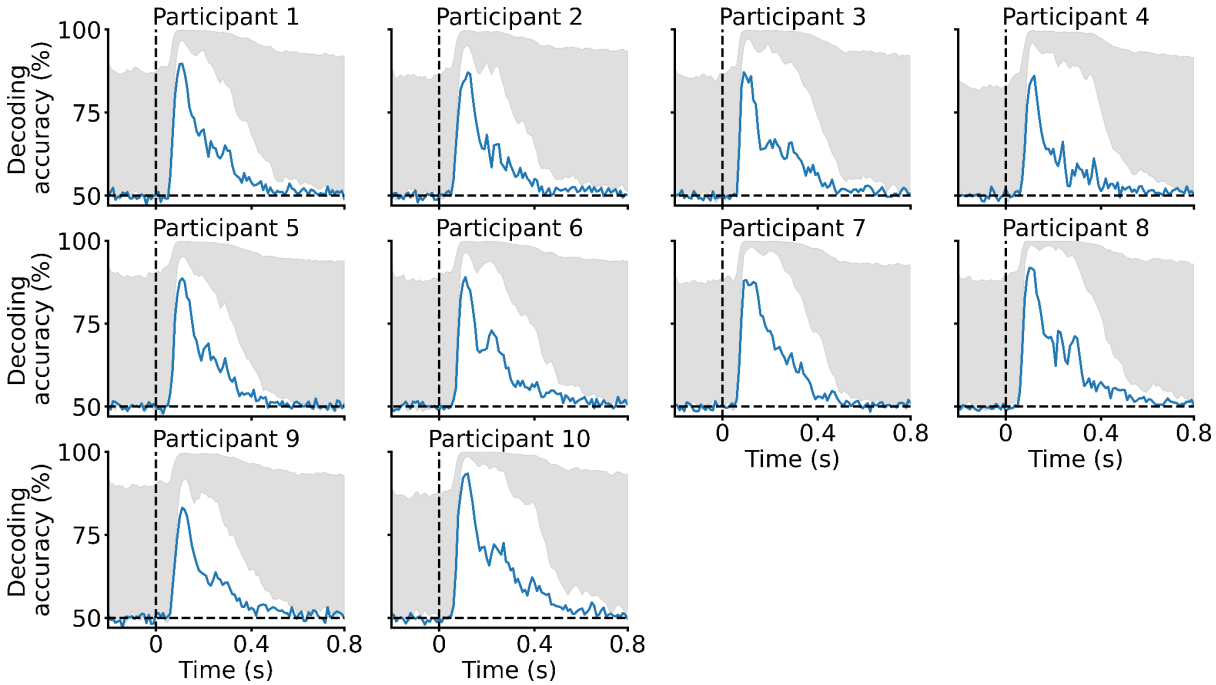
Supplementary Figure 7. Evaluating the prediction accuracy of linearizing encoding models which generalize to novel participants through correlation, individual participants' results. Gray areas and black dashed lines as in **Figure 3**.



Supplementary Figure 8. Evaluating the prediction accuracy of linearizing encoding models which generalize to novel participants through pairwise decoding, individual participants' results. Gray areas and black dashed lines as in **Figure 3**.



Supplementary Figure 9. Evaluating the end-to-end encoding models' prediction accuracy through correlation, individual participants' results. Gray areas and black dashed lines as in **Figure 3**.



Supplementary Figure 10. Evaluating the end-to-end encoding models' prediction accuracy through pairwise decoding, individual participants' results. Gray areas and black dashed lines as in **Figure 3**.

	Identification accuracy < 10%				Identification accuracy < 0.5%			
	AlexNet	ResNet-50	CORnet-S	MoCo	AlexNet	ResNet-50	CORnet-S	MoCo
Participant 1	2.12E+07	8.12E+06	2.65E+09	1.26E+06	3.38E+12	2.26E+11	9.46E+17	3.32E+09
Participant 2	1.03E+06	5.83E+06	3.35E+06	3.21E+06	2.20E+09	6.52E+11	4.59E+10	7.25E+11
Participant 3	1.05E+06	1.40E+06	2.61E+06	2.63E+05	3.20E+09	6.57E+09	2.75E+10	8.38E+07
Participant 4	4.35E+05	8.94E+05	2.85E+06	3.76E+05	9.49E+08	2.33E+09	3.02E+10	3.74E+08
Participant 5	6.98E+05	1.83E+07	5.18E+07	1.14E+06	5.91E+08	5.08E+13	2.33E+14	3.57E+10
Participant 6	1.84E+07	1.86E+07	3.41E+07	4.24E+06	2.41E+12	1.74E+12	4.06E+12	8.52E+10
Participant 7	2.23E+06	7.09E+05	8.31E+06	3.49E+05	7.95E+10	9.34E+08	1.21E+12	3.49E+08
Participant 8	2.11E+06	2.52E+06	4.11E+07	7.77E+05	8.70E+09	1.27E+10	7.81E+12	1.72E+09
Participant 9	1.55E+06	1.53E+06	1.18E+07	1.12E+06	5.67E+09	3.79E+09	6.23E+11	4.95E+09
Participant 10	4.27E+06	4.08E+06	1.01E+08	1.01E+06	1.16E+11	4.66E+10	2.30E+14	9.80E+08
Average	5.30E+06	6.20E+06	2.91E+08	1.37E+06	6.01E+11	5.35E+12	9.47E+16	8.57E+10

Supplementary Table 1. Extrapolating the zero-shot identification accuracy, three most correlated candidate image conditions. The zero-shot identification accuracy is extrapolated as a function of candidate image set sizes. The values in the table indicate the candidate image set sizes required for the identification accuracy to drop below 10% and 0.5%.

	Identification accuracy < 10%				Identification accuracy < 0.5%			
	AlexNet	ResNet-50	CORnet-S	MoCo	AlexNet	ResNet-50	CORnet-S	MoCo
Participant 1	7.76E+08	2.11E+07	9.75E+08	3.27E+07	1.60E+16	3.34E+11	4.16E+15	7.03E+12
Participant 2	1.81E+07	9.79E+06	2.99E+07	2.38E+06	2.04E+12	2.33E+11	3.09E+12	6.30E+09
Participant 3	4.99E+07	5.18E+07	9.74E+06	2.93E+06	7.16E+13	1.15E+14	1.06E+11	3.08E+10
Participant 4	2.65E+06	1.42E+07	3.32E+07	2.55E+06	1.42E+10	1.65E+12	4.05E+12	1.44E+10
Participant 5	1.96E+07	9.22E+06	1.77E+07	2.54E+06	2.34E+12	2.16E+11	3.79E+11	1.47E+10
Participant 6	3.63E+08	2.53E+08	7.38E+08	1.45E+07	1.09E+15	2.28E+14	1.67E+15	2.70E+11
Participant 7	8.34E+06	2.51E+07	1.70E+07	1.53E+06	2.24E+11	1.36E+13	1.13E+12	4.02E+09
Participant 8	1.41E+08	1.73E+07	1.55E+09	4.30E+06	1.90E+14	2.73E+11	2.16E+16	2.40E+10
Participant 9	1.99E+07	5.35E+07	3.48E+08	5.37E+06	1.60E+12	1.40E+13	9.77E+14	5.83E+10
Participant 10	3.43E+07	1.18E+08	6.37E+08	3.11E+08	4.12E+12	6.30E+13	3.45E+15	4.96E+15
Average	1.43E+08	5.73E+07	4.35E+08	3.80E+07	1.73E+15	4.37E+13	3.19E+15	4.97E+14

Supplementary Table 2. Extrapolating the zero-shot identification accuracy, ten most correlated candidate image conditions. The zero-shot identification accuracy is extrapolated as a function of candidate image set sizes. The values in the table indicate the candidate image set sizes required for the identification accuracy to drop below 10% and 0.5%.