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Multivariate analysis of perfusion and oxygenation patterns in asymptomatic unilateral carotid artery stenosis

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Advanced Cerebrovascular MRI: Pipes, Perfusion, Parametric Imaging & Predictive Models

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Declaration of Financial Interests or Relationships

Speaker Name: Jan Kufer

I have no financial interests or relationships to disclose with regard to the subject matter of this presentation.

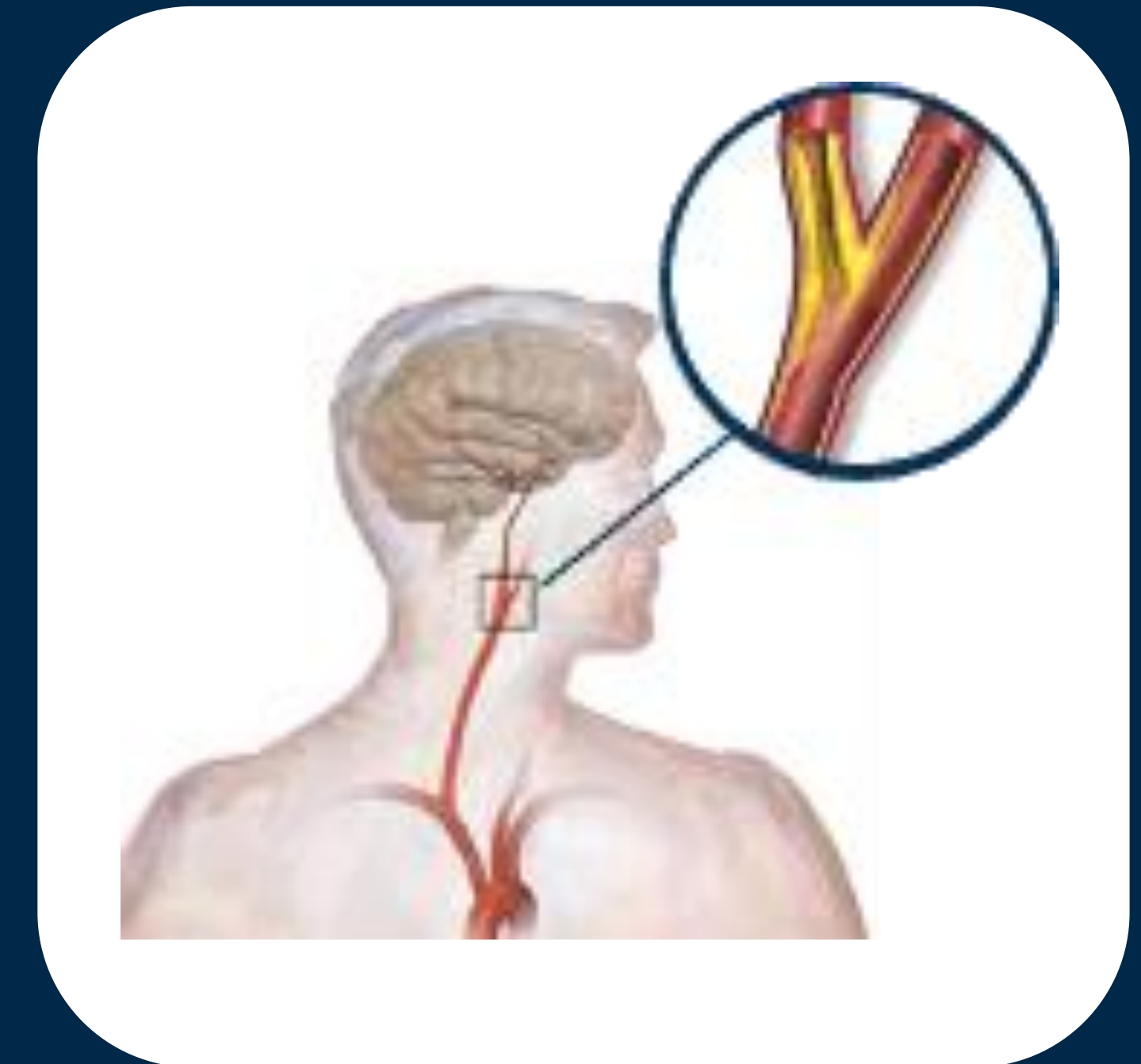
Background and Motivation

▶ Internal carotid artery stenosis (ICAS) is a prevalent condition in the elderly population¹

▶ Multimodal MRI of cerebral hemodynamics could inform treatment decisions in asymptomatic patients

▶ Improved understanding of the link between regional hemodynamics and clinical findings necessary

▶ Aim: Uncover covariance patterns of ICAS-related changes using Principle Component Analysis^{2,3}

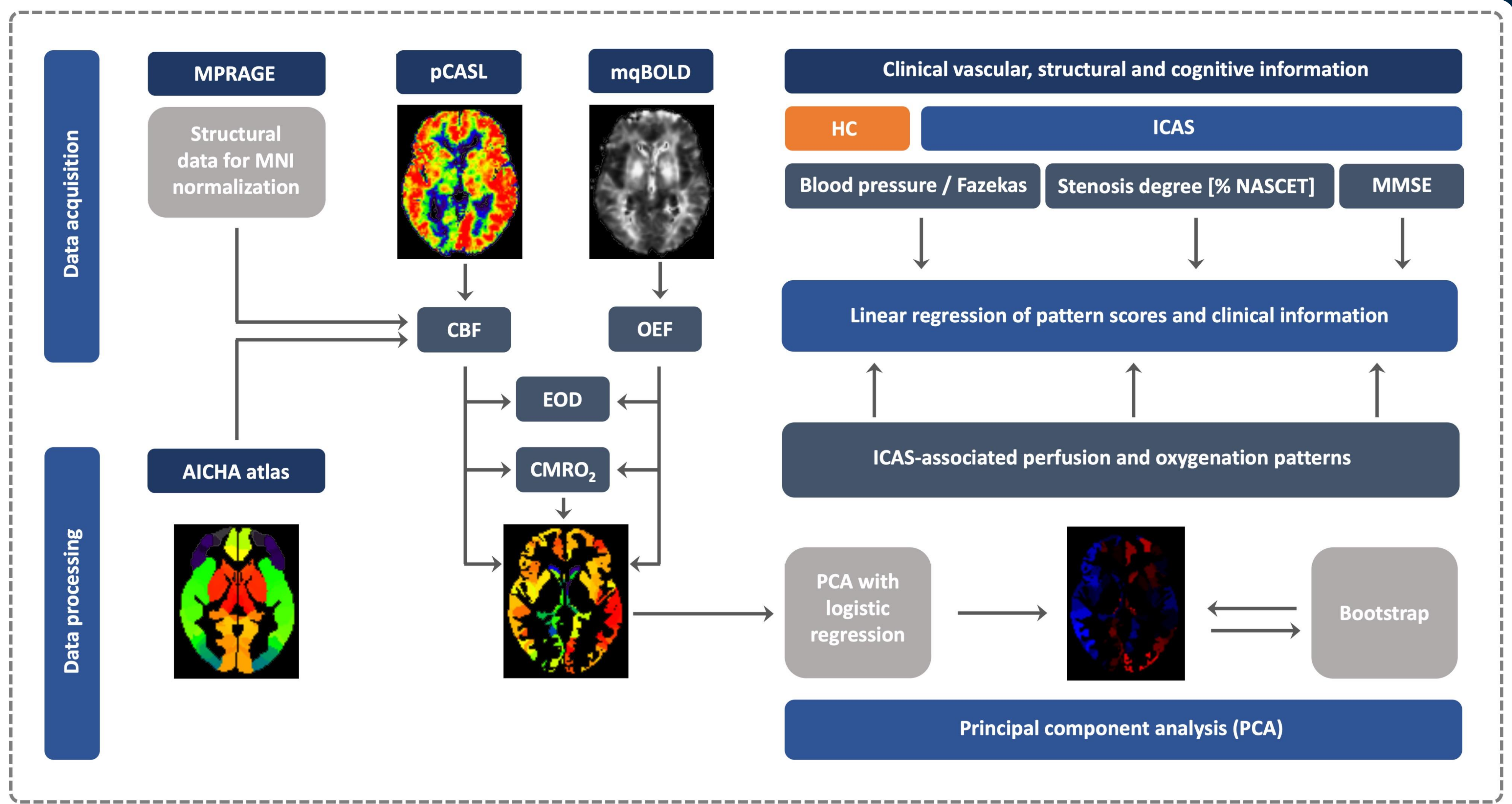


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Participants and Methods

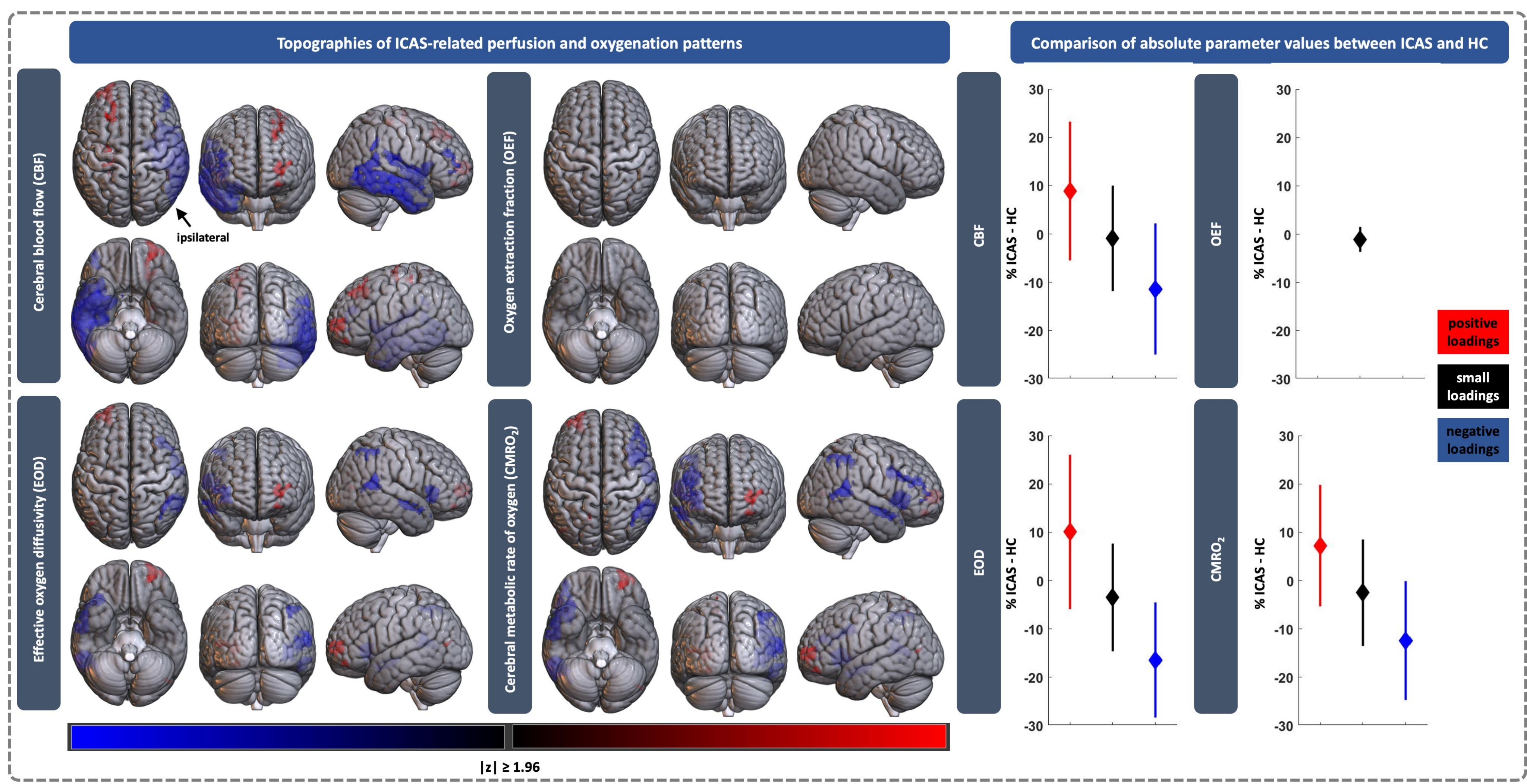
- 15 Right-sided ICAS
- Age 68.9 ± 8.0 y
- 6 female / 9 male
- Unilateral
- Asymptomatic
- > 70% NASCET

- 25 Healthy Controls
- Age 70.4 ± 4.8 y
- 14 female / 11 male

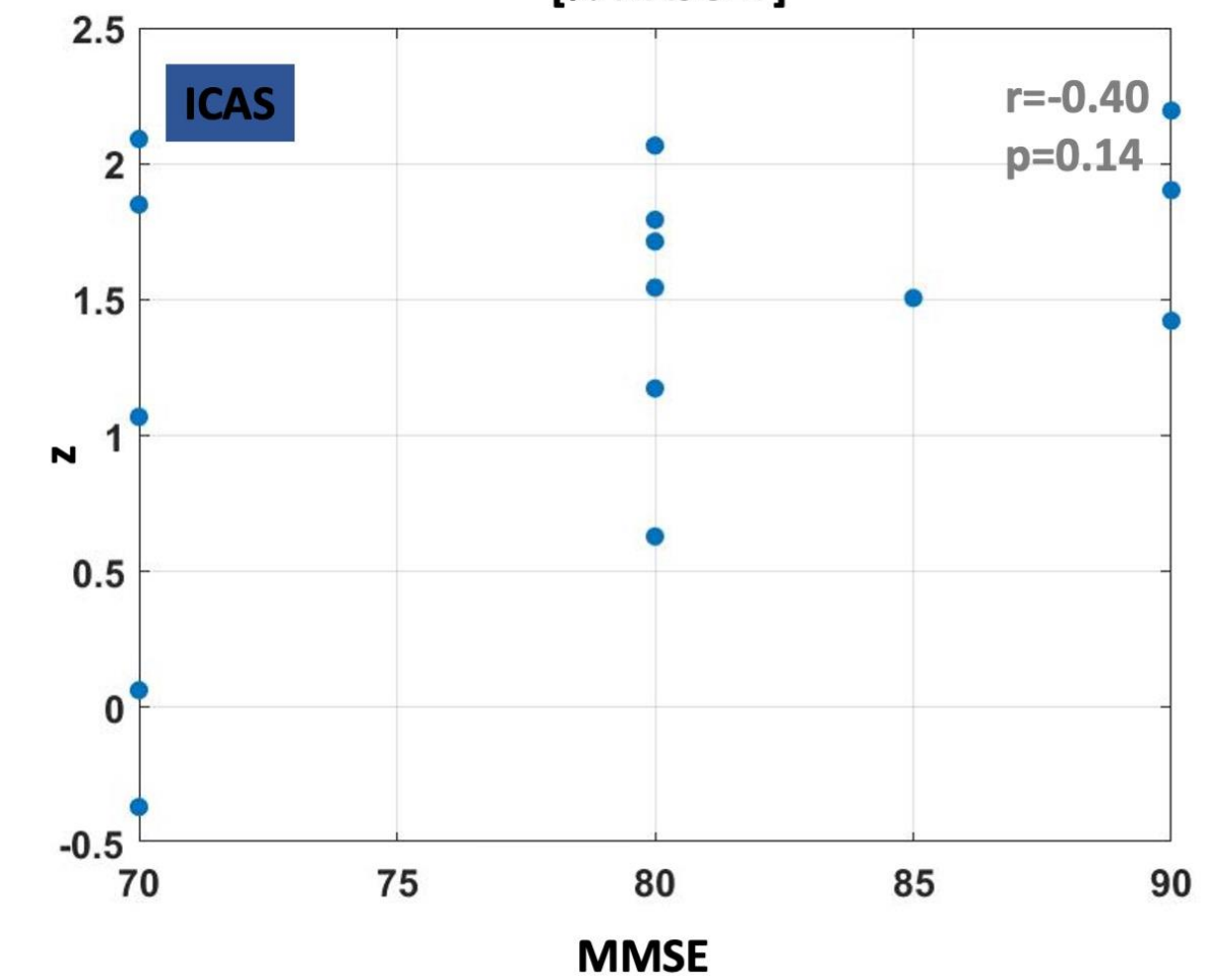
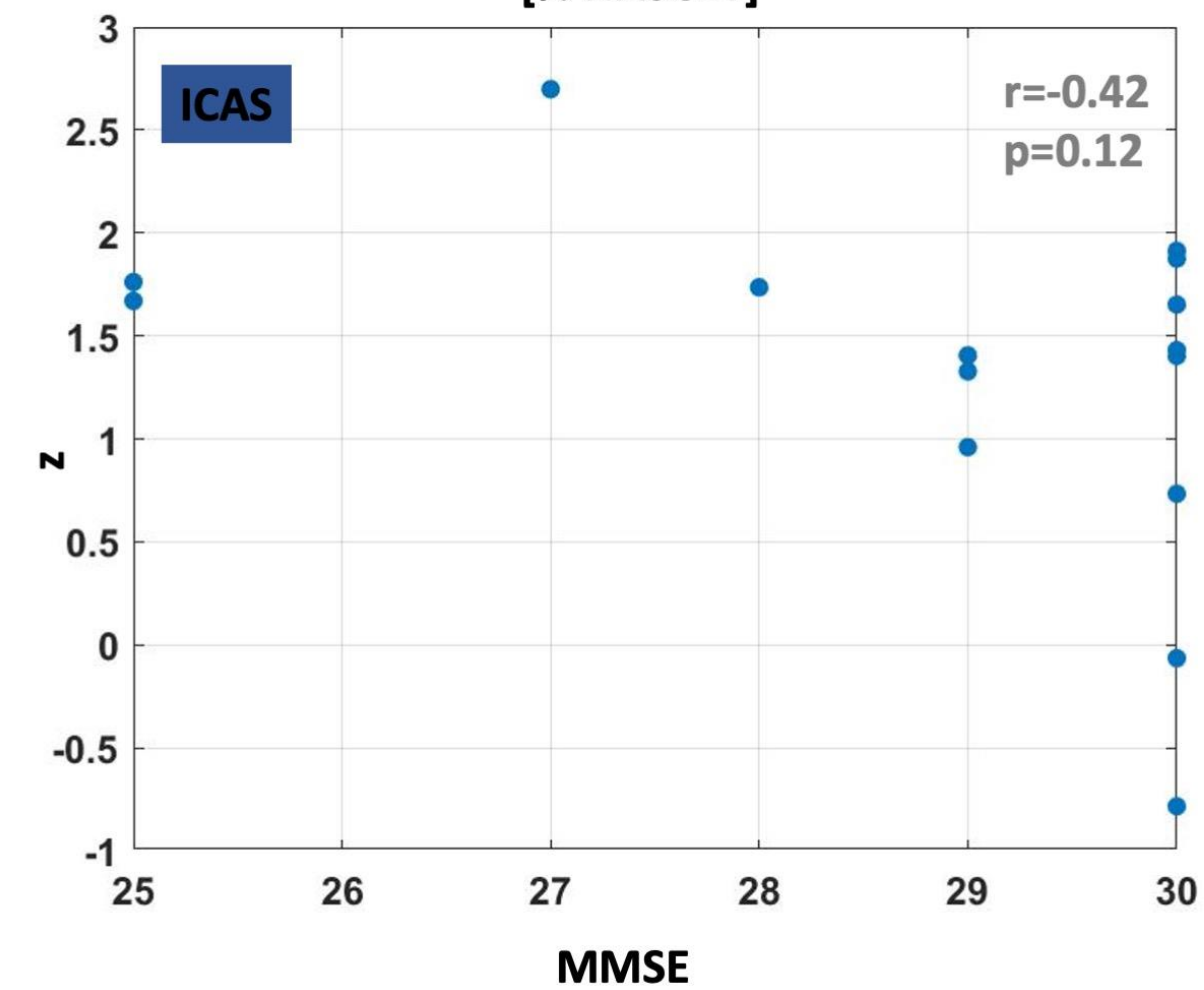
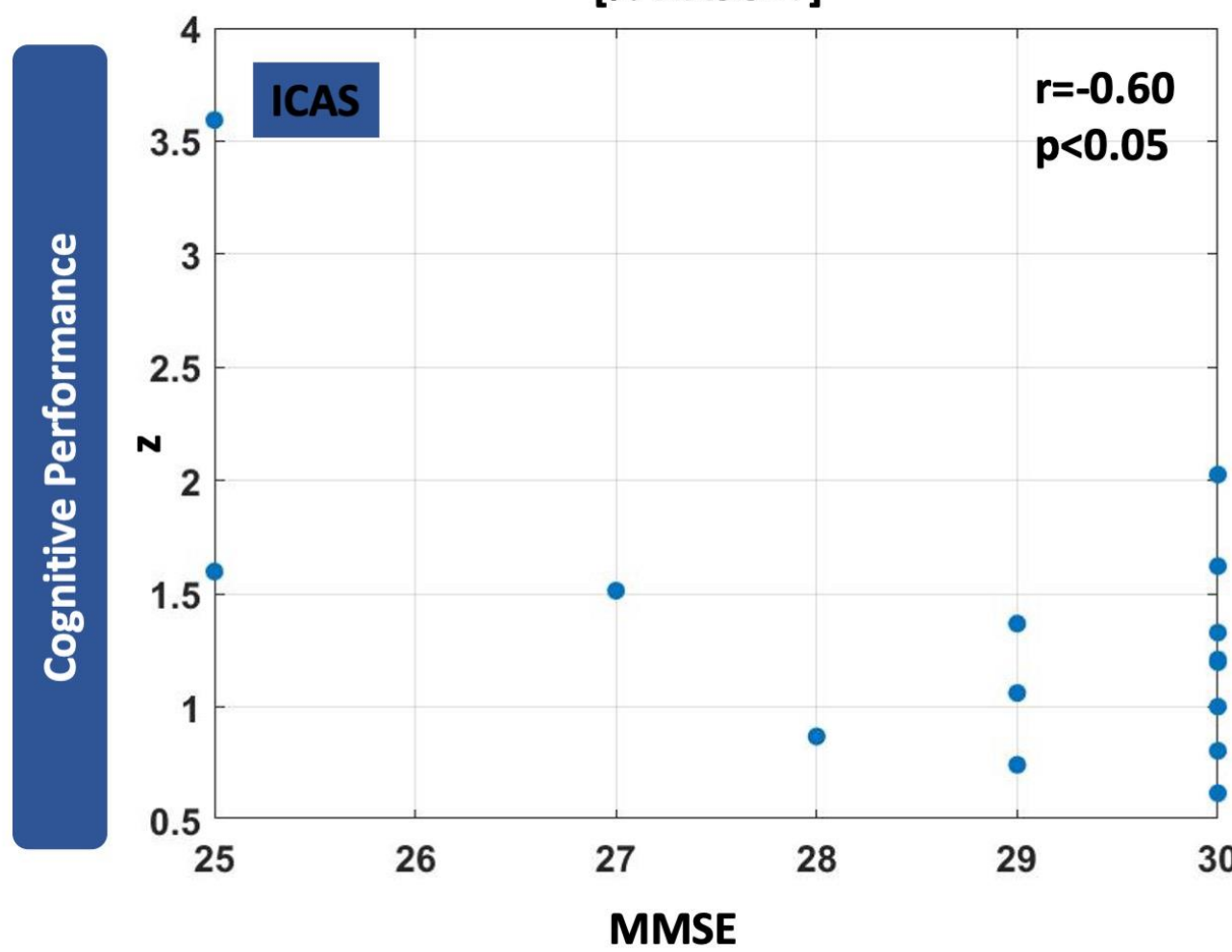
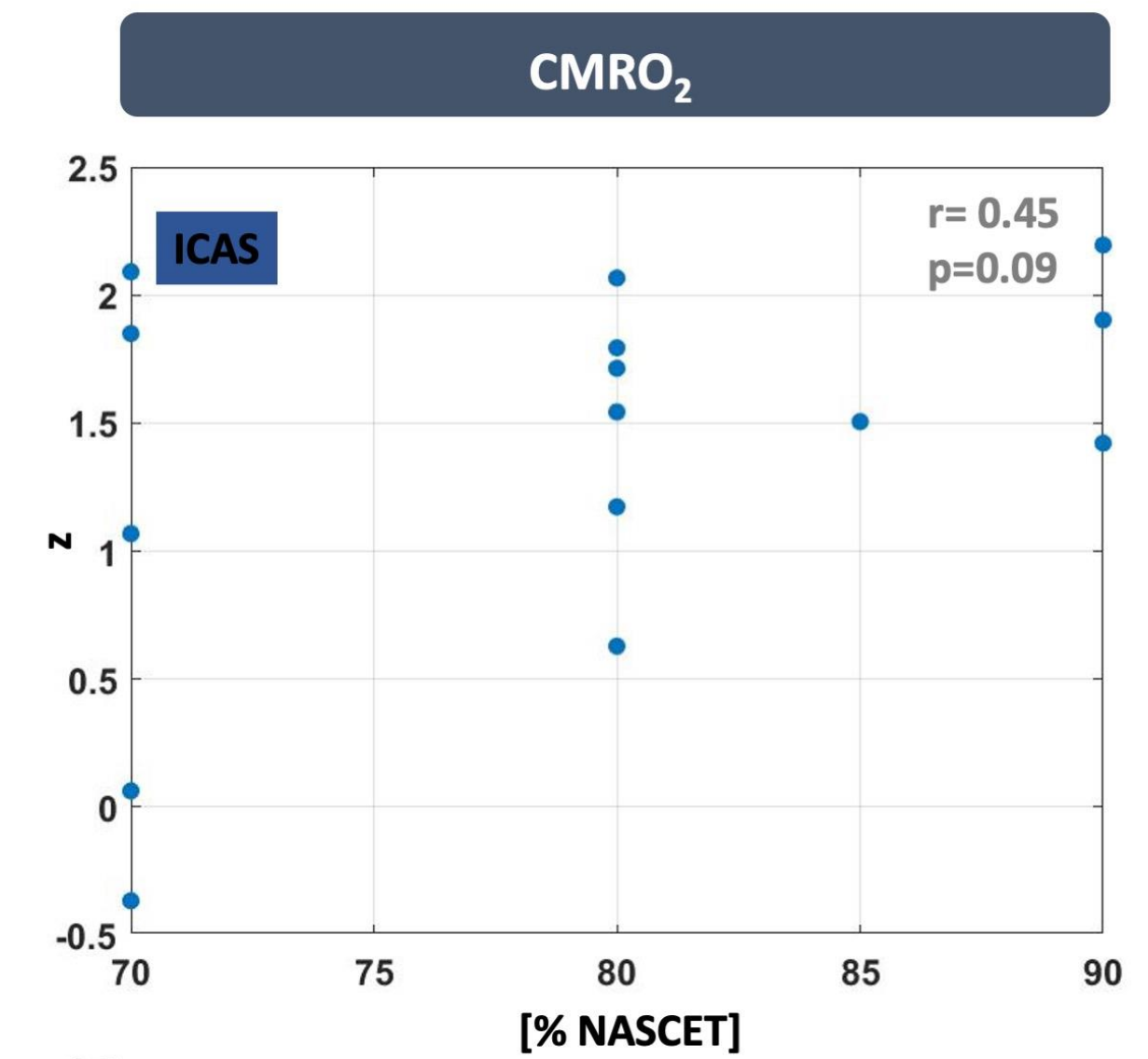
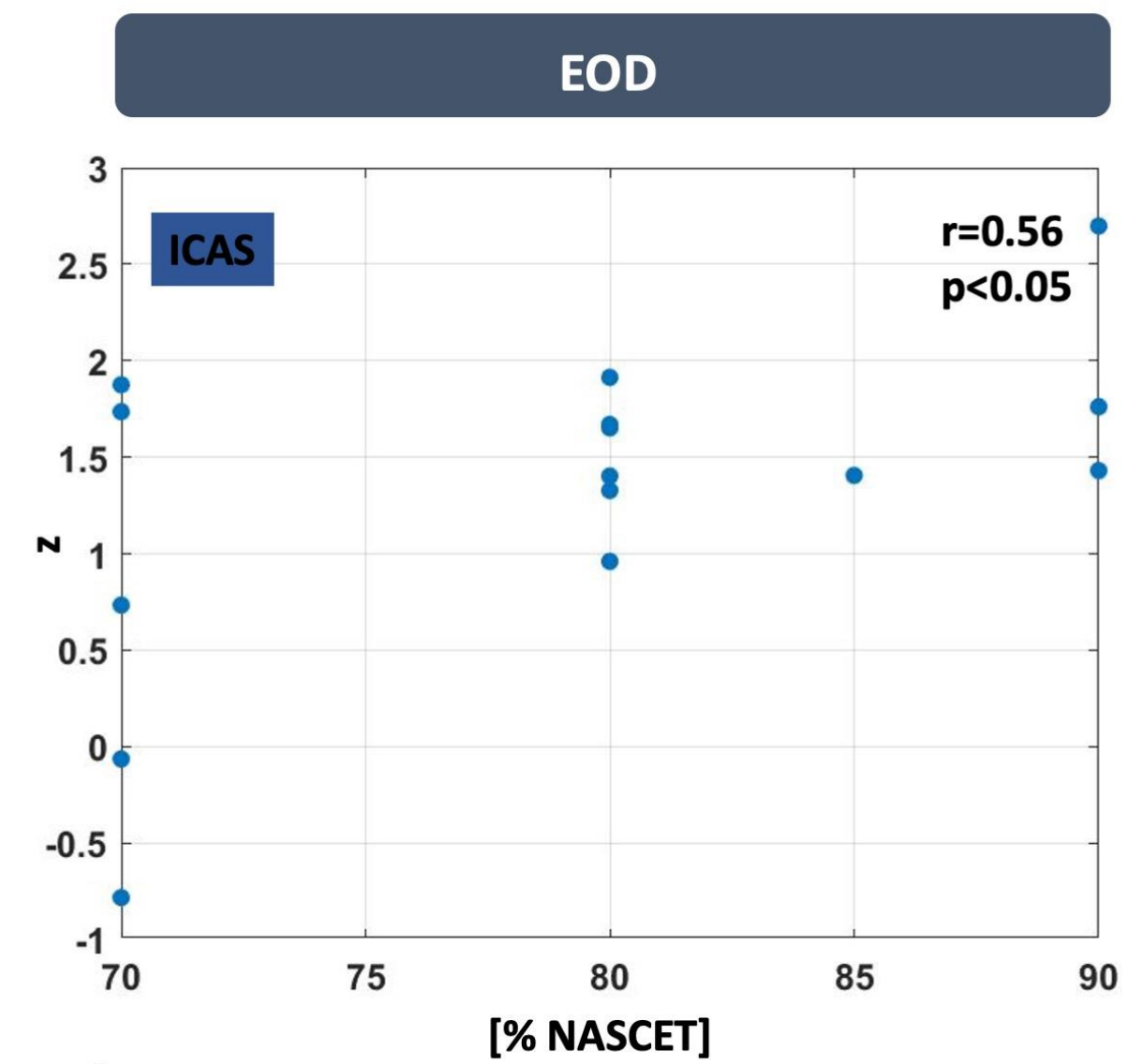
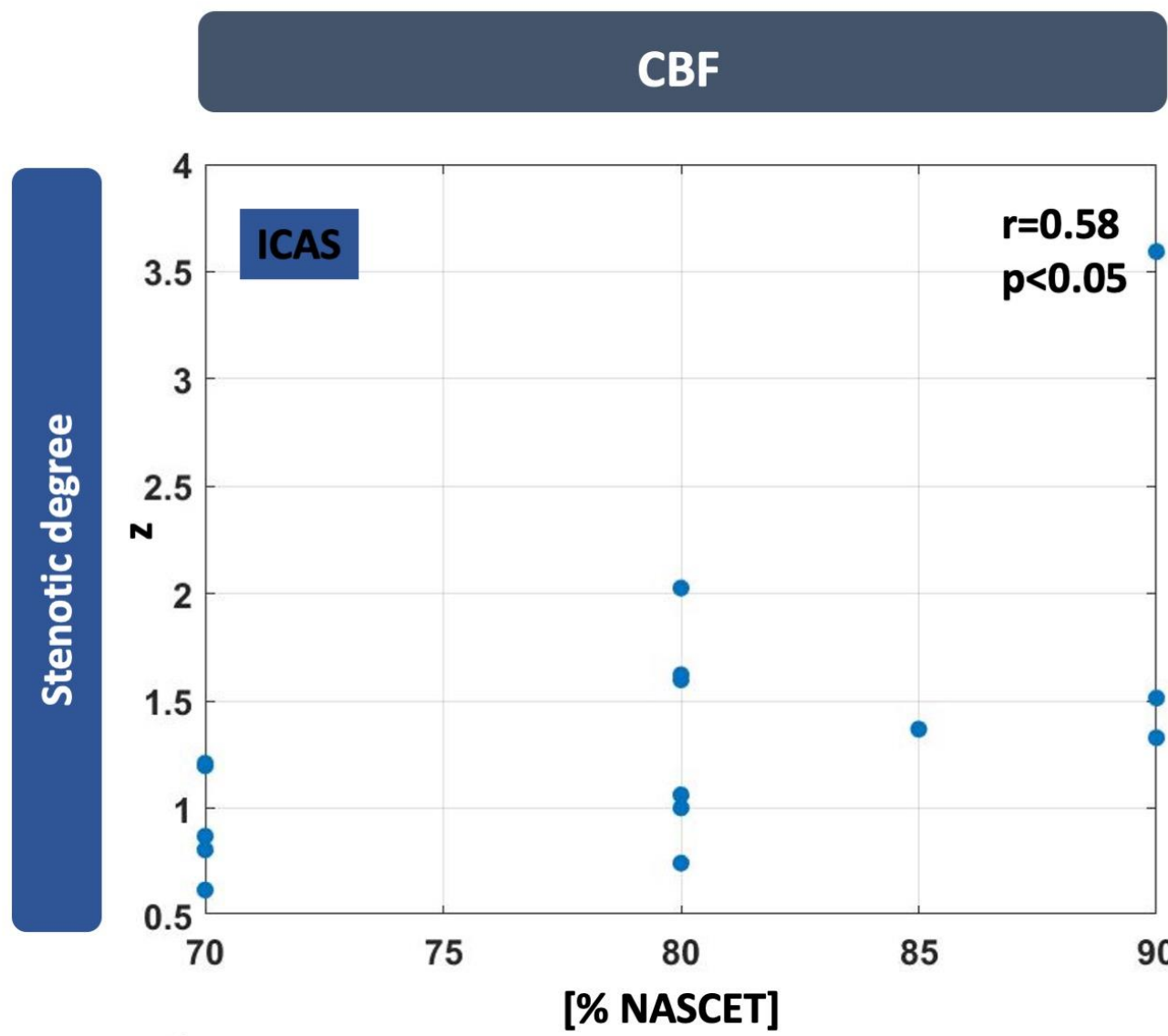


⁵AICHA atlas: Joliot et al. (2015) J Neurosci Methods 254: 46-59

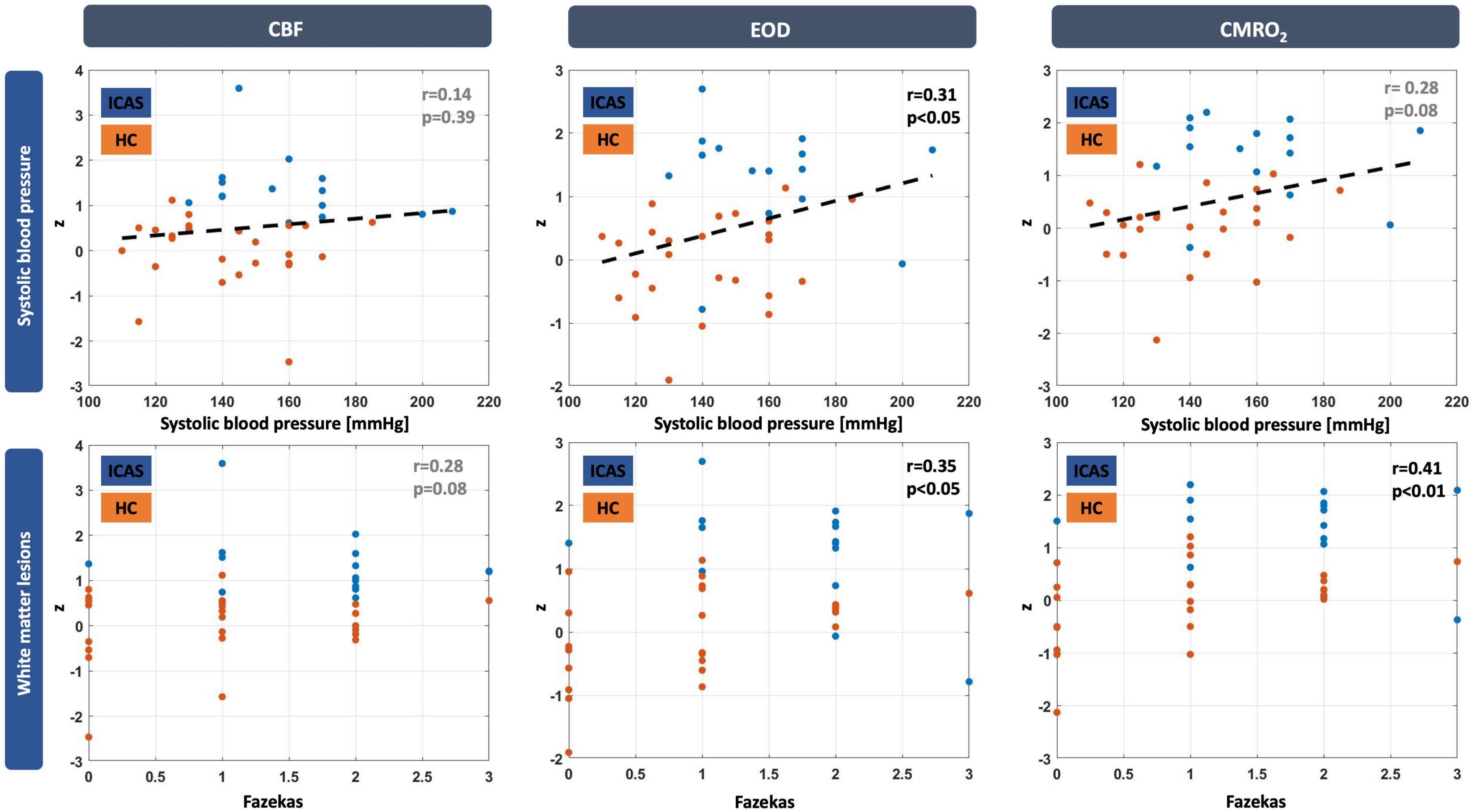
Results: Perfusion and oxygenation patterns



Results: Relationship with stenotic degree and MMSE



Results: Association with blood pressure and WML



Discussion

- ▶ **Complex topography of CBF, EOD and CMRO₂ changes involving both hemispheres that included watershed areas - in line with previous reports⁶**
- ▶ **CBF pattern could play a role in mediating the previously observed relationship between stenotic degree and MMSE⁷**
- ▶ **WML related to EOD/CMRO₂ across ICAS and HC - potentially due to subtle overlap with remote effects in small vessel disease⁸**
- ▶ **Correlation of EOD with blood pressure could point to additional capillary dysfunction - partially overlapping with reported patterns of GM changes in hypertension⁹**

⁶Kaczmarz et al. (2021) JCBFM 41: 380-396 ⁷Duan et al. (2023) Front Aging Neurosci 15:1128380 ⁸Ter Telgte et al. (2018) Nat Rev Neurol 14:387-398

⁹Schaare et al. (2019) Neurology 92(8):758-773

Conclusion



Successfully identified spatioregional CBF, EOD and CMRO₂ changes in ICAS



CBF associated with subtly lower cognitive performance in ICAS



Oxygenation patterns correlated with WML - but across ICAS and HC

Thank you very much for your attention!

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