

Multi-parameter quantitative mapping of R1, R2*, PD, and MTsat is reproducible when accelerated with Compressed SENSE

Ronja C. Berg¹, Tobias Leutritz², Nikolaus Weiskopf², Christine Preibisch¹

¹ Technical University of Munich, School of Medicine, Klinikum rechts der Isar, Department of Neuroradiology, Munich, Germany

² Max Planck Institute for Human Cognitive and Brain Sciences, Department of Neurophysics, Leipzig, Germany



Session

Scientific Session: Acquisition and reconstruction

Date

08 October 2021

Time

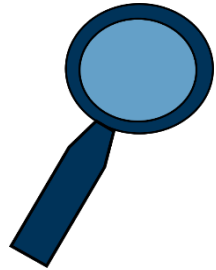
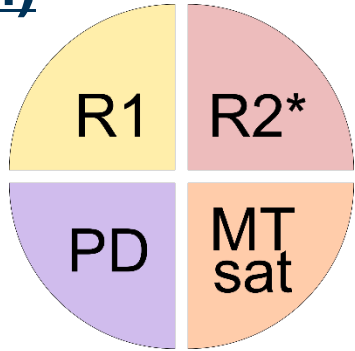
13:30 – 14:15

Program ID

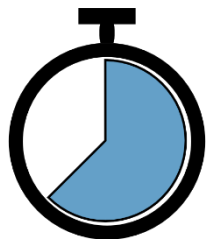
S3.06

No conflicts of interest to disclose with regard to the subject matter of this presentation.

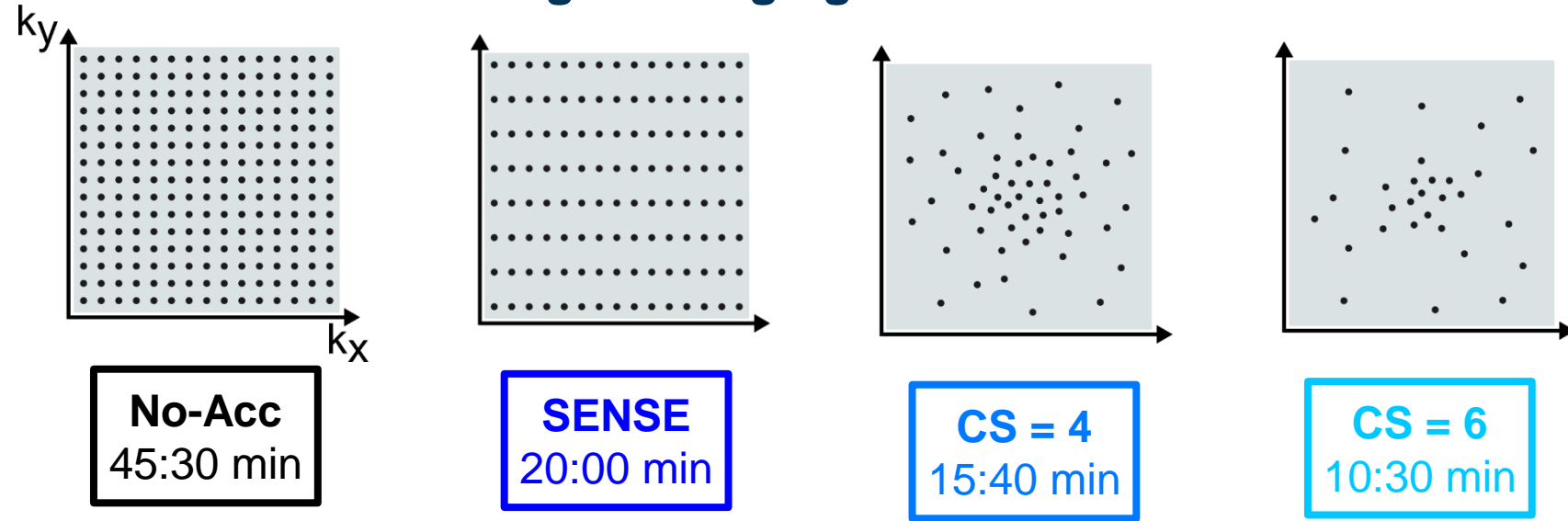
Multi-parameter mapping (MPM)



Problem: Scan duration



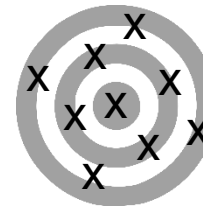
Solution: Higher imaging acceleration



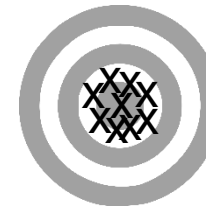
Open questions



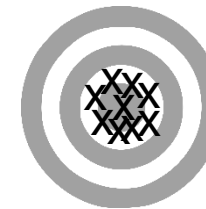
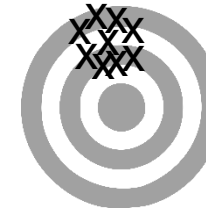
Visual appearance



Precision



Previous study



Accuracy



Cohort



- n = 5
- 3w/2m
- aged 23 - 49
- healthy

Protocols

No-Acc
45:30 min

SENSE
20:00 min

CS = 4
15:40 min

CS = 6
10:30 min

Scan
A

Scan
B

Scan
C

Scan
A

Scan
B

Scan
C

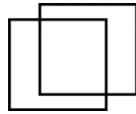
Scan
A

Scan
B

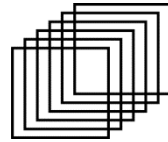
Scan
C

Imaging sequences

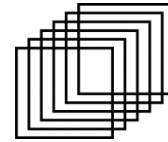
B1



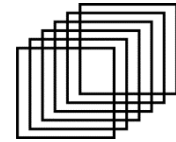
T1w



PDw

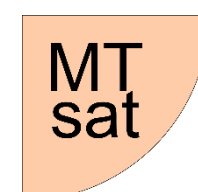
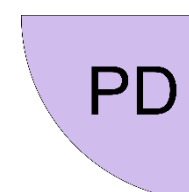
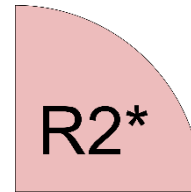
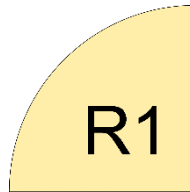


MTw



Processing: hMRI toolbox

3D actual flip angle imaging,
150° phase increment



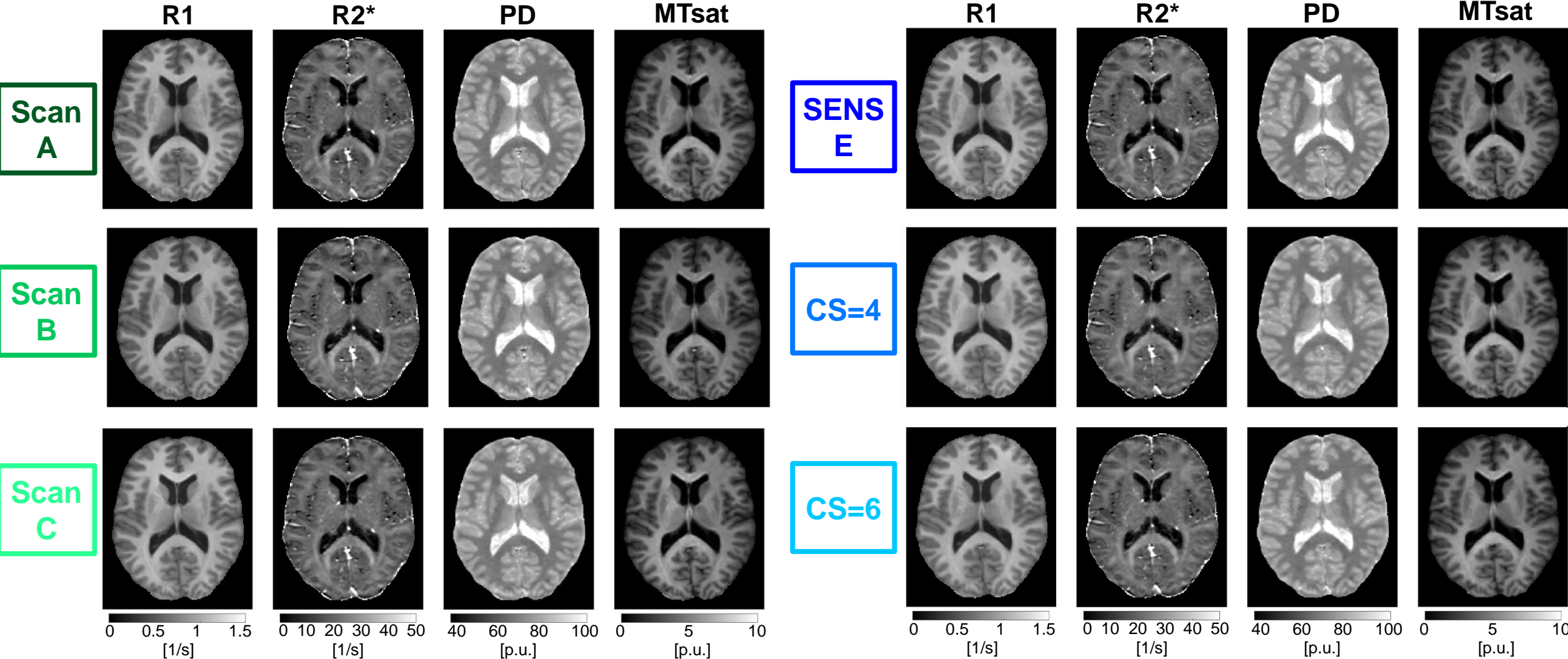
Repeatability

SENSE



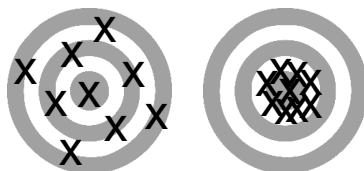
Reproducibility

Scan A



Repeatability

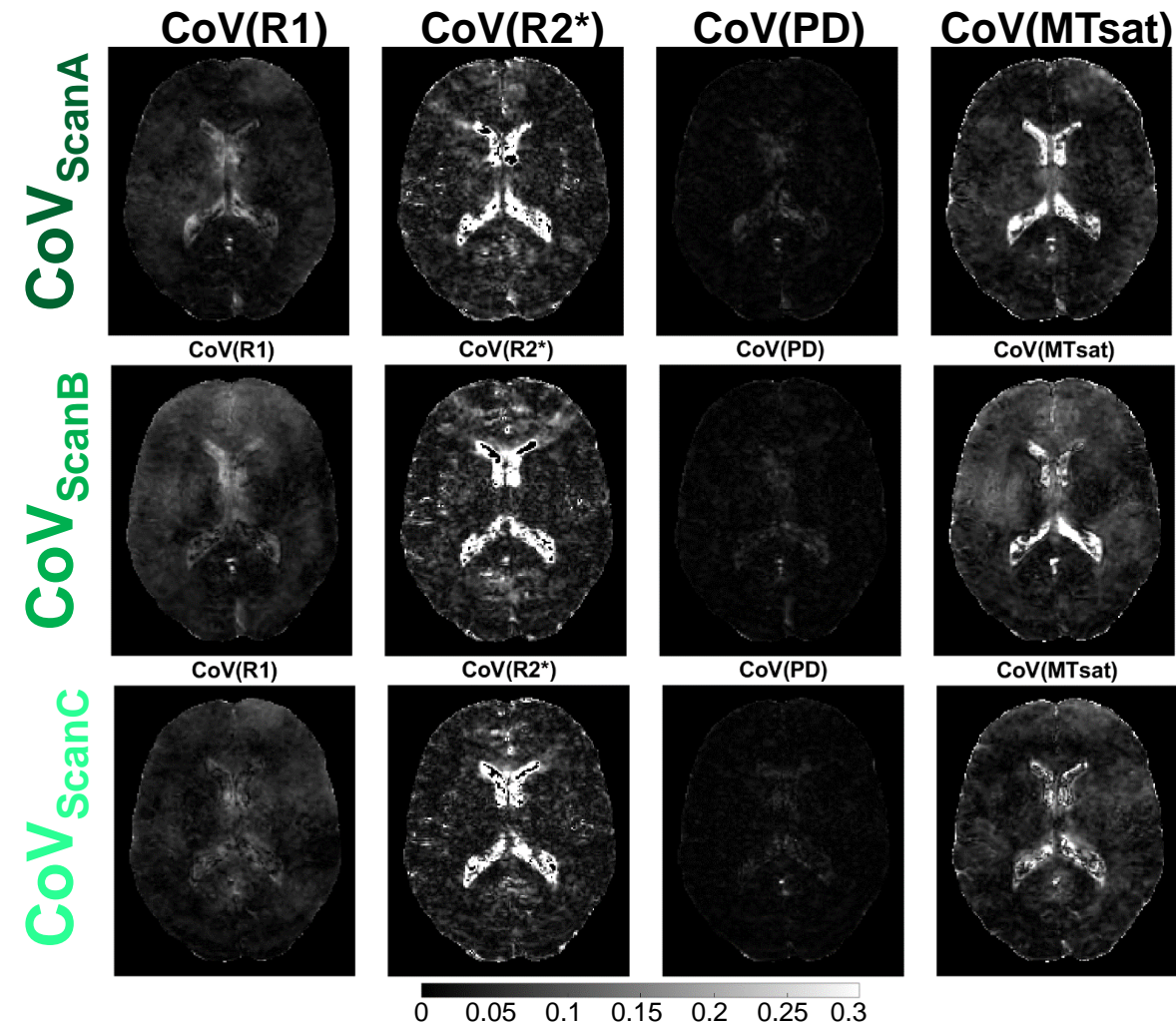
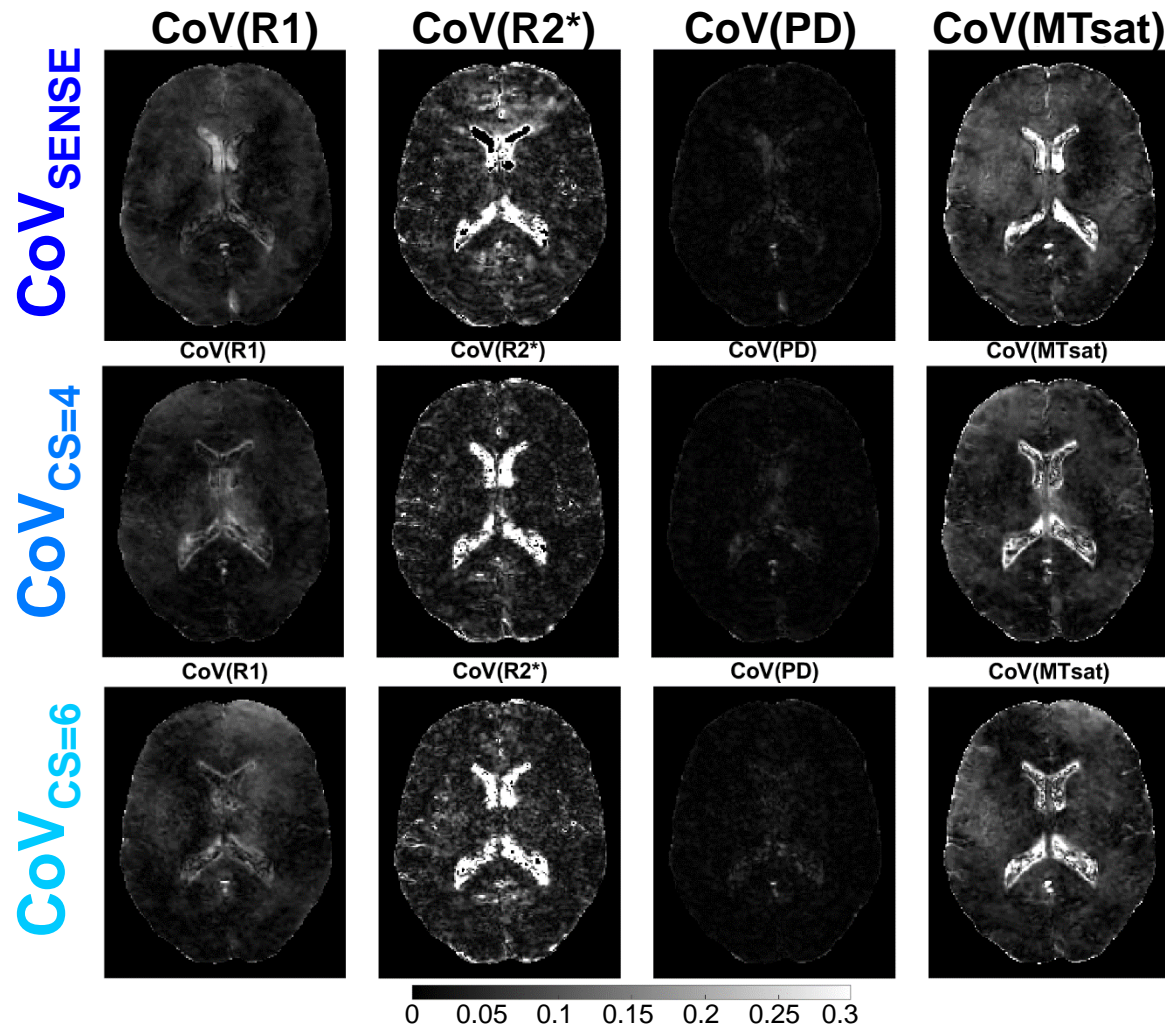
CoV [Scan A Scan B Scan C]



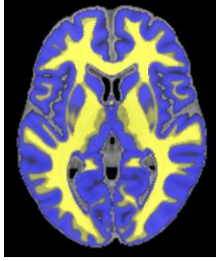
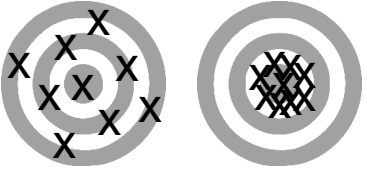
Reproducibility

CoV [SENSE CS=4 CS=6]

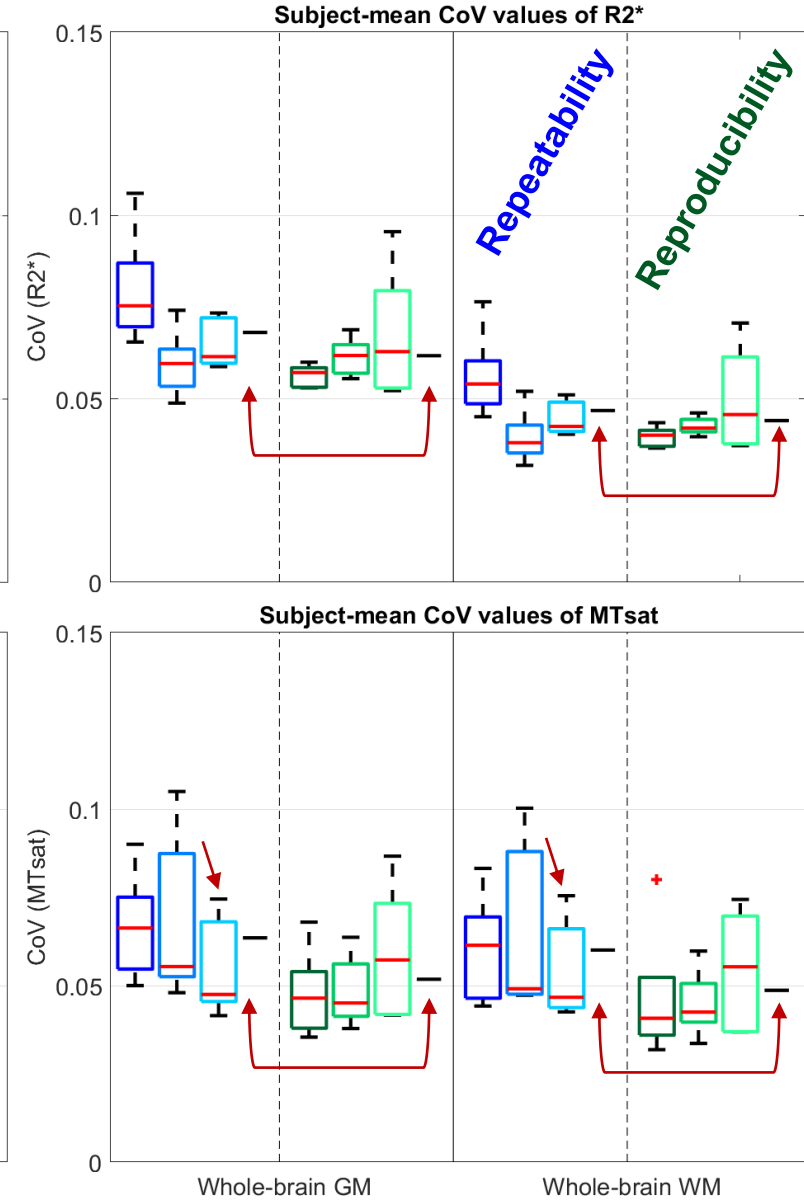
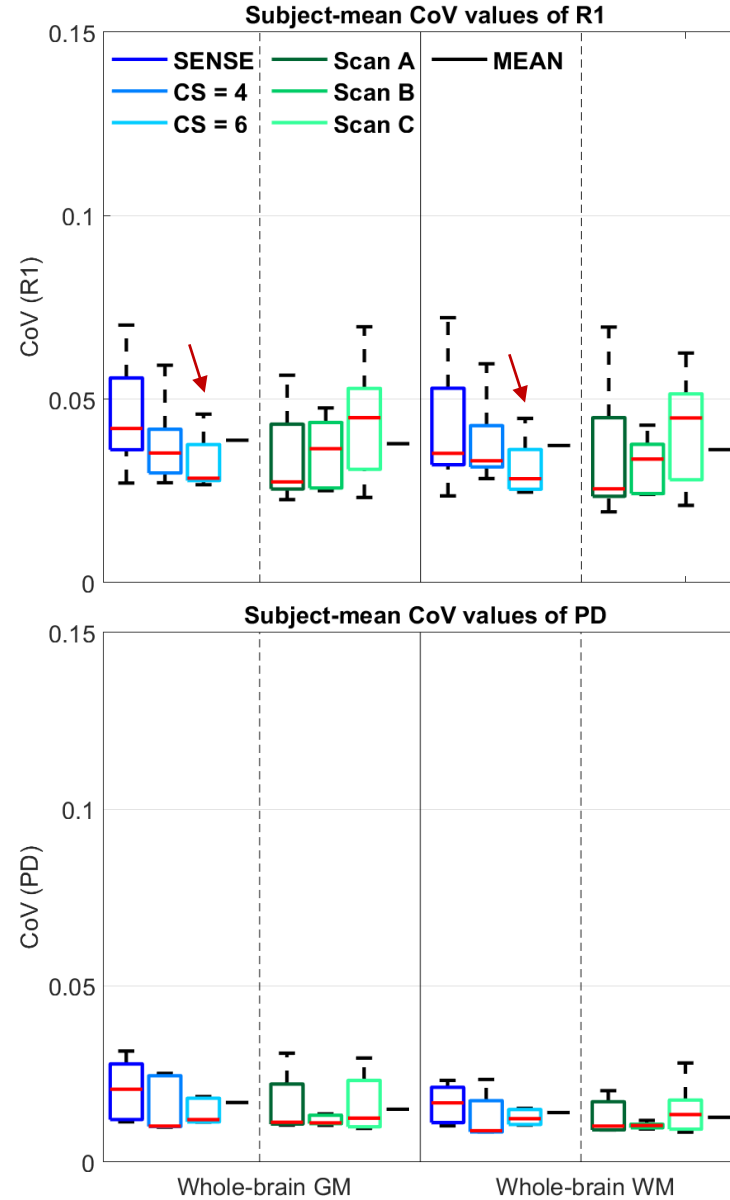
$$\text{CoV} = \frac{\sigma}{\mu}$$




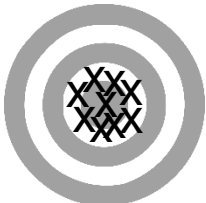


Precision

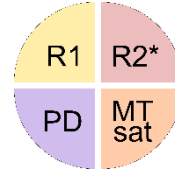


- Lowest variability for CS=6 in R1 and MTsat
- Lower mean reproducibility-based CoV (across imaging accelerations) for R2* and MTsat
→ high reproducibility



Accelerated multi-parametric mapping

- High visual similarity 
- Higher precision (lower variability) using CS = 6 
- Reproducible parameter maps using all imaging accelerations 
 - Compressed SENSE (up to CS=6) provides accurate MPM
 - CS is highly promising for diagnostic applications 



We highly appreciate support by the Friedrich-Ebert-Stiftung (FES) providing a PhD grant for Ronja Berg.

Thank you for your attention!