

Impact of Computer Aided Diagnosis on Radiology Reporting of Memory Clinic Patients



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Background

MRI supports dementia differential diagnosis, but characteristic patterns are often subtle and difficult to visually detect.

To assist radiologists, computer-aided diagnostic (CAD) systems are increasingly available.

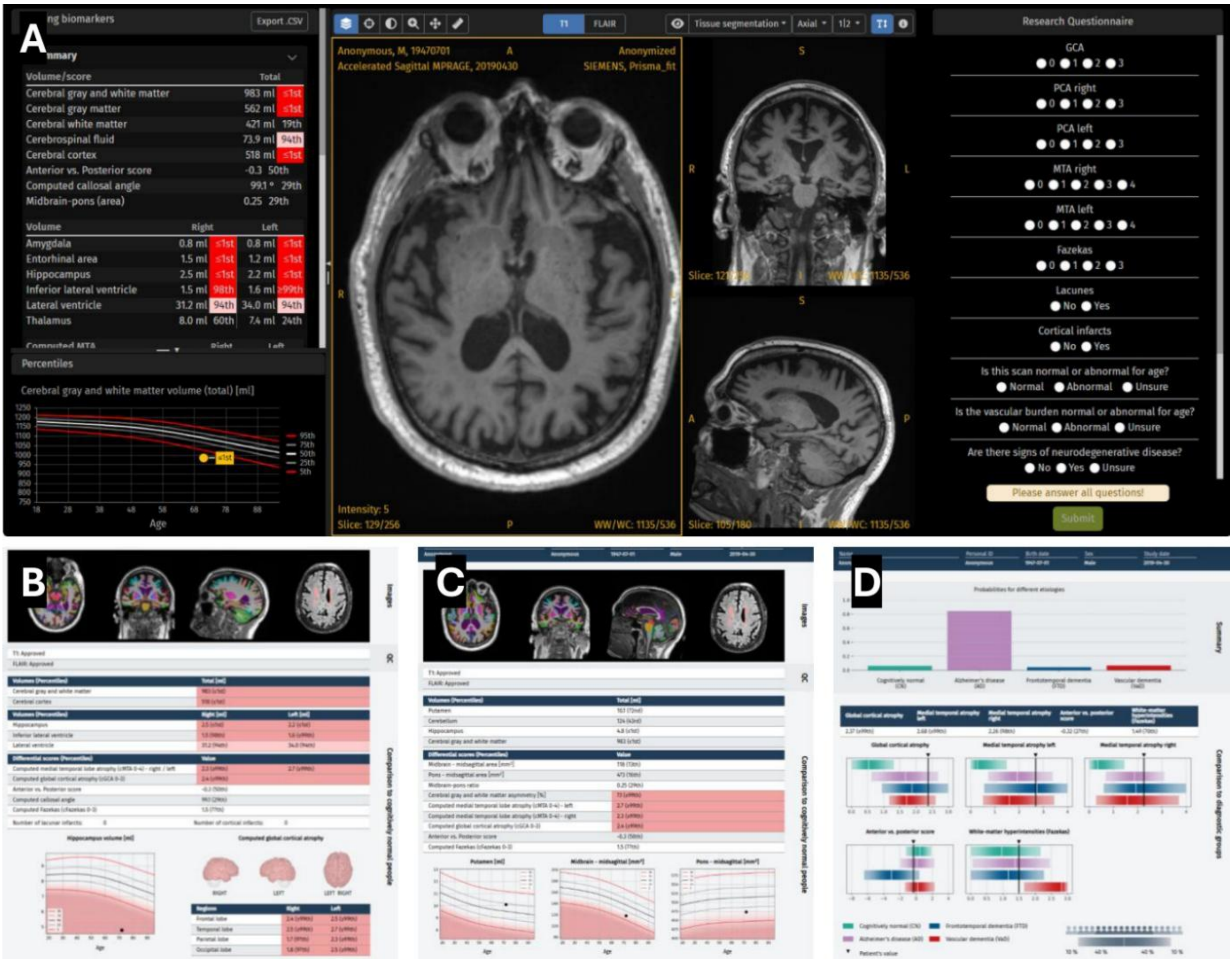
Clinical impact of these systems remains underinvestigated.

Aim

To assess the effect of CAD assistance on radiologist performance regarding:

- 1) Diagnostic accuracy in identifying dementia
- 2) Differential diagnosis
- 3) Diagnostic confidence

Methods: CAD System



A: Left: Imaging markers compared to reference population. Middle: T1 and FLAIR MRI viewer. Right: Reporting form

B: Dementia report
C: Parkinson-plus report
D: Differential diagnosis report

Methods: Multi-Reader Multi-Case Design

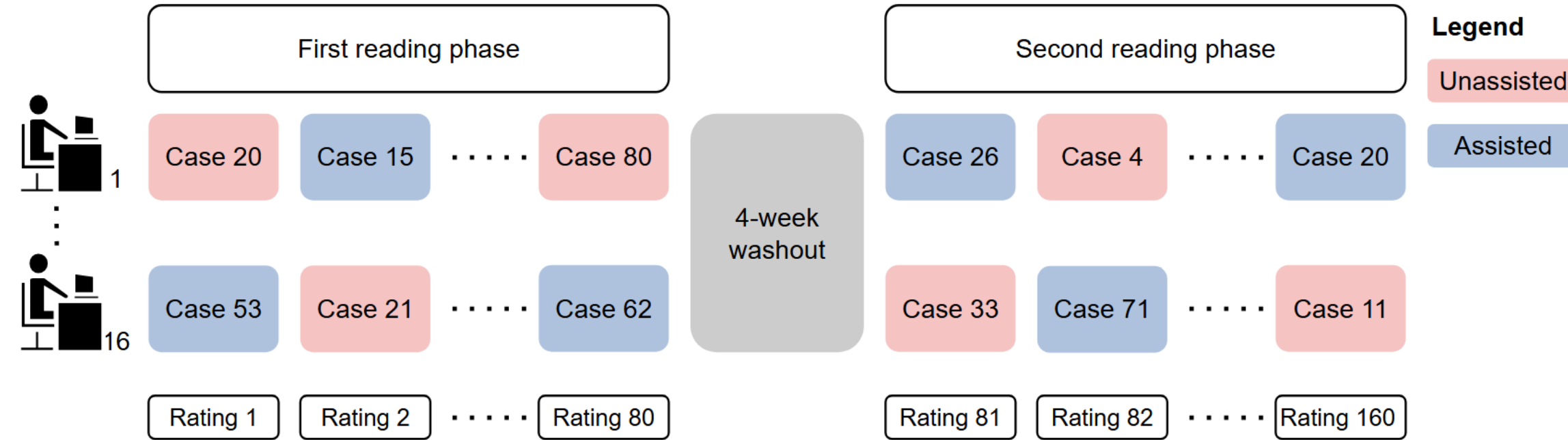
Cases:

- Included from the Amsterdam Dementia Cohort (ADC) and Amsterdam Aging Cohort (AAC).
- 80 cases spanning 6 diagnostic categories (SCD: 19, AD: 26, FTD: 10, VaD: 10, DLB: 10, and PSP: 5).

Readers:

- 16 readers from 11 centers participated.
- 12 neuroradiologists, 2 general radiologists, 2 final-year radiology residents.
- Median of 17 years of experience (range: 6-37 years).

Design:



Methods: Analysis

Diagnostic Accuracy

- Outcome: reader performance, quantified with AUC per reader and condition.
- Differences in AUC tested using the DBM method for MRMC designs.

Differential Diagnosis

- Outcome: binary agreement with the multidisciplinary consensus diagnosis.
- Binomial linear mixed model (LMM) with random effects for reader and case and a fixed effect for CAD.

Diagnostic Confidence

- Outcome: Self-reported confidence on 5-point scale.
- Cumulative-linked LMM with random effects for reader and case and a fixed effect for CAD.

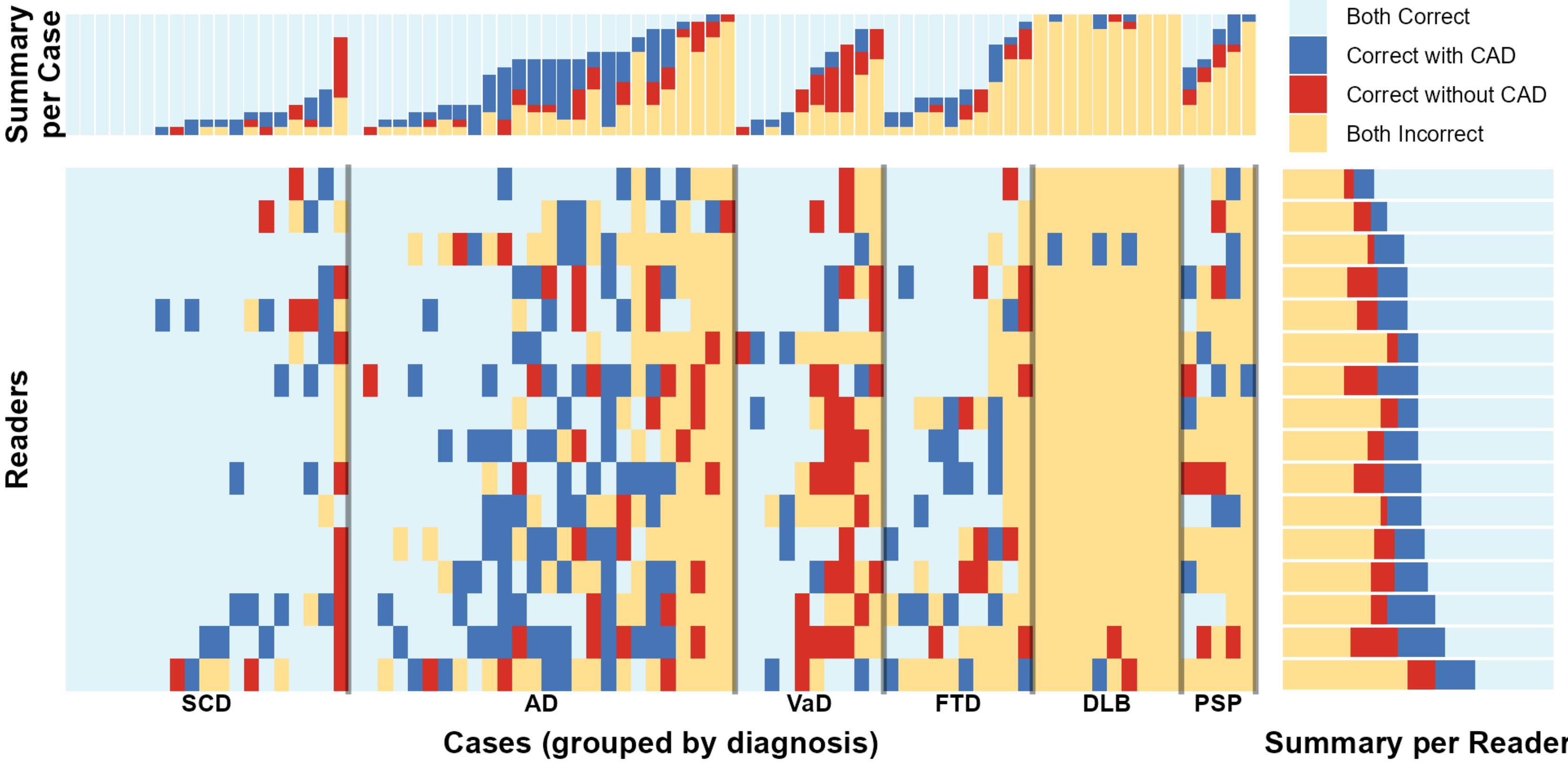
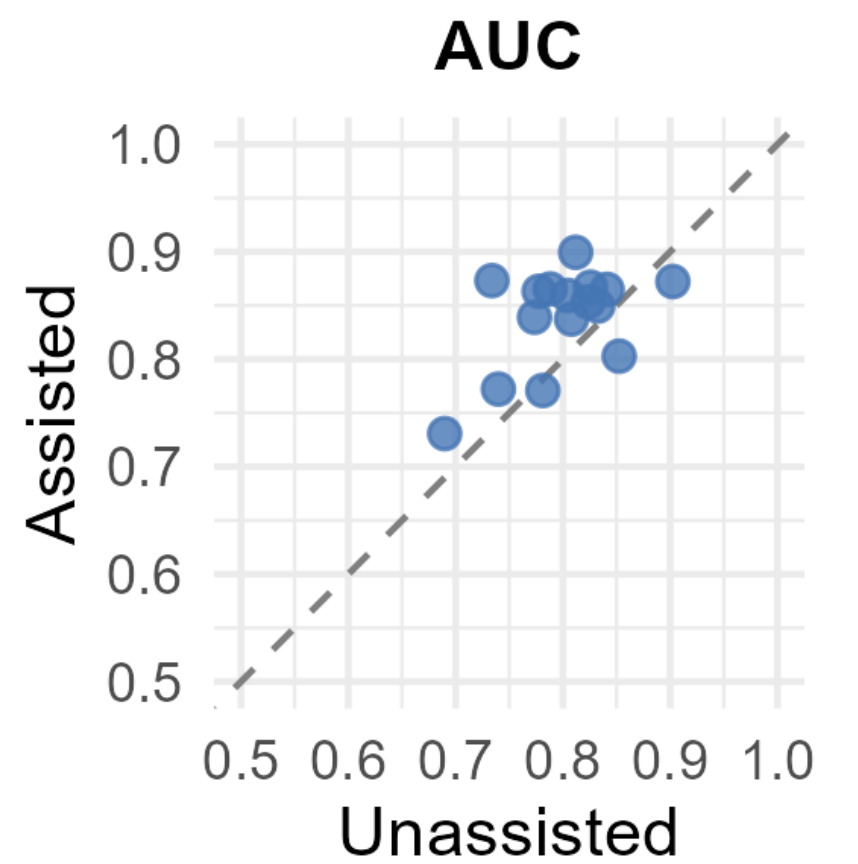
Results

Diagnostic Accuracy

- AUC increased from 0.80 to 0.84 ($\Delta = 0.040$; 95% CI 0.01-0.07; $p = 0.01$).

Differential Diagnosis

- CAD increased the odds of identifying the underlying etiology.
- Odds increased by 1.54 (95% CI 1.11-2.13; $p = 0.01$).
- Accuracy increase from 60.2% to 69.9% for the average case/reader pair.



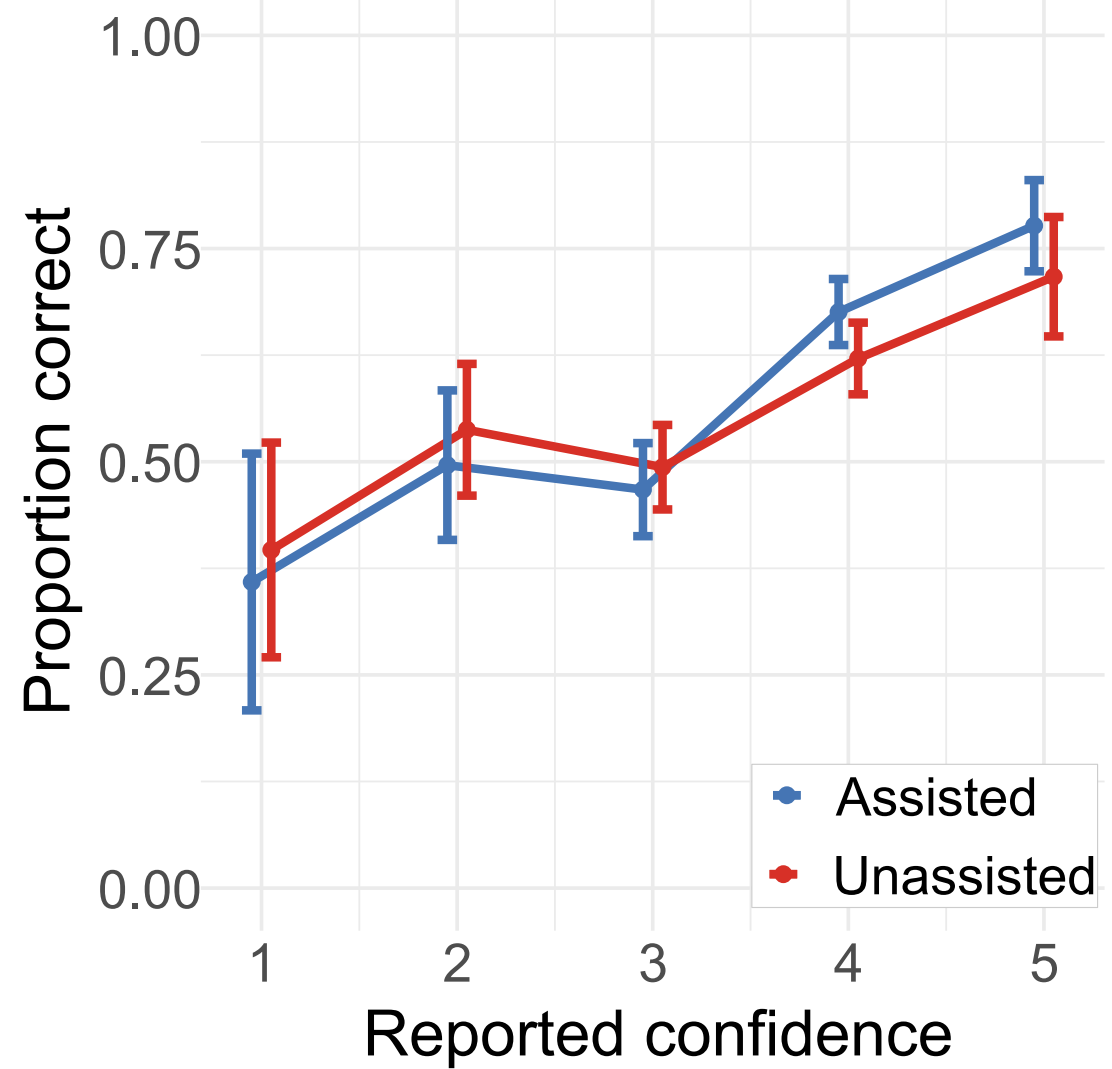
Diagnostic Confidence

Confidence reporting

- Radiologists were more likely to report a higher confidence level when assisted.
- The odds increased by 1.68 (95% CI 1.43-1.97).

Calibration

- The relation between self-reported and objective performance was not altered by CAD assistance.



Take Home Message

Computer-aided diagnostic assistance improved radiologists' identification of dementia in memory clinic patients. It helped identify the underlying etiology and increased diagnostic confidence.