CORRELATION BETWEEN QUANTITATIVE AND QUALITATIVE ASSESSMENTS OF WHITE MATTER HYPERINTENSITIES IN PATIENTS FROM THE MEMENTO MULTICENTRE MEMORY CLINIC COHORT

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QYNAPSE

BACKGROUND

White matter hyperintensities (WMH) can be visualized as **abnormal T2 signal** in the periventricular, deep and subcortical white matter on Magnetic Resonance Imaging (MRI).

WMH increase with age and are associated with stroke, cognitive decline and dementia. The **most common visual rating scale** that is widely used by clinician to assess WMH in the clinical setting is the **Fazekas scale** (Fazekas et al., 1987).
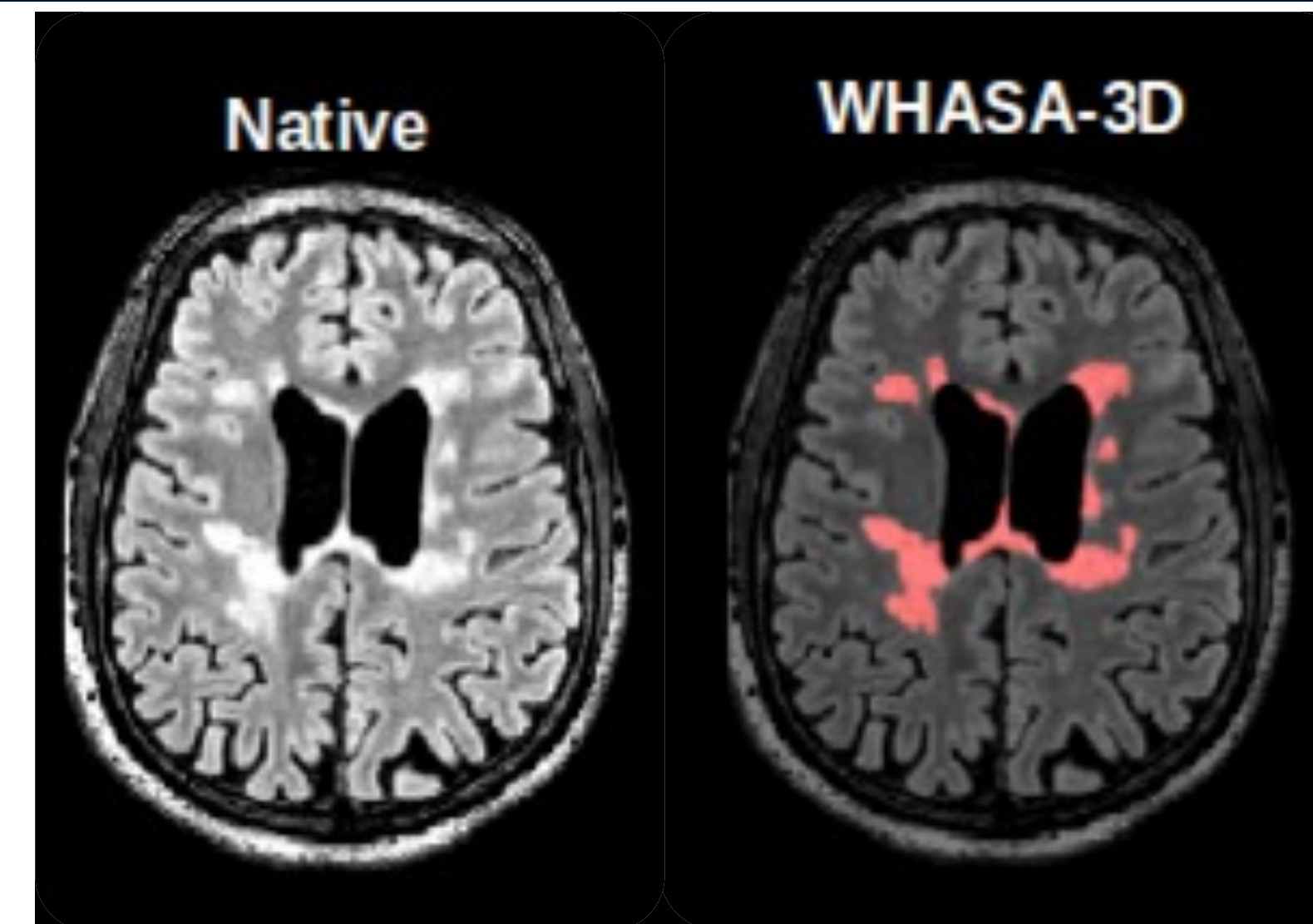

Figure 1. Examples of the automated WHASA-3D WMH quantification and corresponding Native T2 Flair image

A number of automated methods for quantifying WMH have been developed, such as **WHASA-3D** (White matter Hyperintensities Automatic Segmentation Algorithm – 3D) algorithm; however, large-scale investigations of their correspondence with these widely used scales is lacking

OBJECTIVES

To assess the relationship between the Fazekas scores in a multi-centre memory clinic population and WMH volume calculated using the **WHASA-3D**[1] automated method included in the **QyScore®** an **FDA-approved** and **CE-marked image analysis software**.

METHODS

- **1959** participants from the MEMENTO cohort (Age 71.02 +/- 8.61, 1218 (62%) Female, MMSE 27.95 +/- 1.91) had who had undergone both a 3DT1 and T2 FLAIR MRI image were analyzed with **QyScore®**

- **814** had amyloid status from CSF or PET, of which **216** were **amyloid-positive** (A+)

- WMH volumes are reported in mL, expressed as a **% of intra-cranial volume (ICV)**

Figure 2. Examples of Fazekas scale ratings

- Fazekas deep white matter (DWM) scores (range from 0 to 3 in severity) were provided by expert neuroradiologists

- Spearman's rank correlation was used to ascertain the relationship between Fazekas deep white matter (DWM) scores and quantitative WMH measurements derived using WHASA-3D
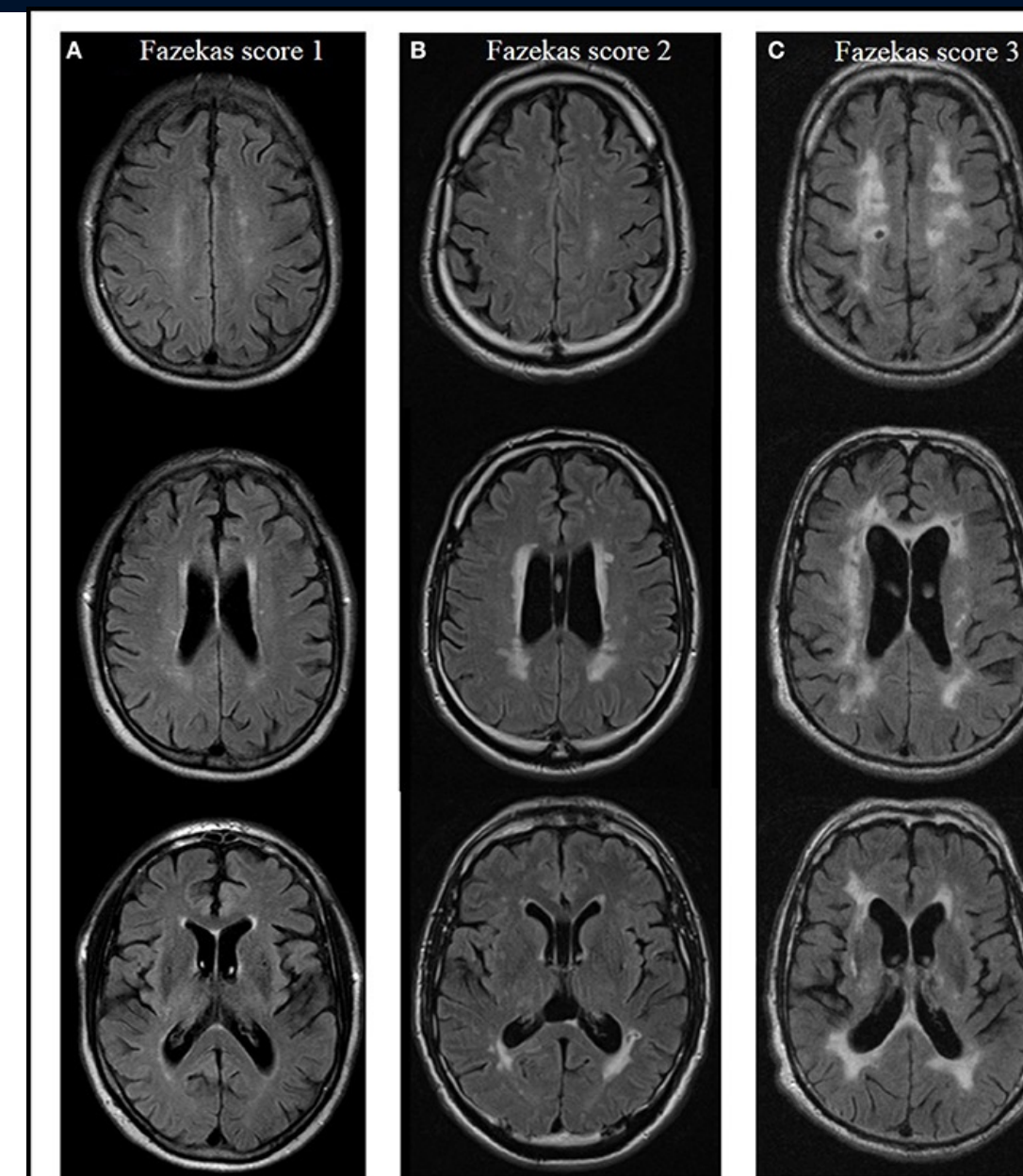
RESULTS

- There was a **significant positive correlation** between Fazekas DWM scores and WMH volumes %ICV for the whole sample (**0.76** $p<0.001$), as well for the amyloid positive (**0.81**; $p<0.001$) and negative (**0.72**; $p<0.001$) patients (Figure 3A).

RESULTS

- The correlation was also significant ($p<0.001$) for all groups when separated by clinical diagnosis

- **Subjective cognitive complaint (SCC)** patients (N= 305) demonstrated a correlation between QyScore's® WHASA-3D volumetric WMH analysis and the Fazekas DWM score of **0.66**

- Mild cognitive impairment **(MCI)** patients (N = 1638) demonstrated a correlation between the Fazekas DWM scores WMH %ICV of **0.77**

- The small subset of patients with a diagnosis of dementia (N = 7) also demonstrated a strong significant correlation at **0.89**

Table 1: Demographics and spearman's ranked correlation score by clinical diagnosis

Diagnosis	N	Age	No. (%) Female	MMSE	Average WMH %ICV	Correlation
SCC	305	69.87 +/- 8.03	197 (65%)	28.86 +/- 1.17	0.2	0.66
MCI	1683	71.2 +/- 8.69	1014 (60%)	27.81 +/- 1.95	0.4	0.77
Dementia	7	73.3 +/- 7.79	4 (57%)	24.1 +/- 1.95	1.1	0.89

Average WMH by Fazekas (DMW) scores split by amyloid status

Average WMH by Fazekas scores split by clinical diagnosis

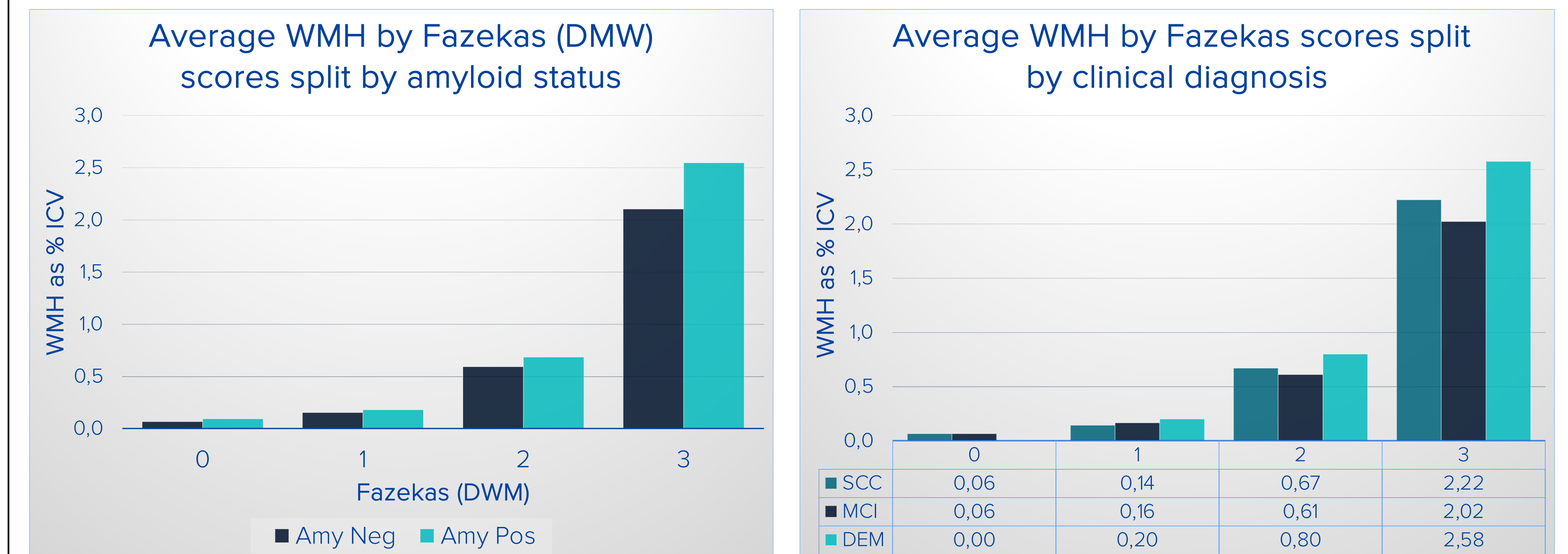|	0	1	2	3
SCC	0,06	0,14	0,67	2,22
MCI	0,06	0,16	0,61	2,02
DEM	0,00	0,20	0,80	2,58

Figure 3: Average WMH (%ICV) shown for each of the 4 categories of Fazeka scales in the cohort split A) by amyloid status and B) by clinical diagnosis

CONCLUSIONS

- The automated quantification of ICV-corrected WMH were well-correlated to Fazekas DWM scores.

- Considering visual rating of WMH is time consuming and suffers from intra and inter-operator variability, the quantitative assessment of WMH load provided by QyScore® may improve the assessment of patients with cognitive impairment.

[1]Tran et al. (2022) Neuroimage Clinical; [2]Sartor et al. (2017) Frontiers