Cognitive impairment predicts disability progression in MS patients

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BACKGROUND. Cognitive impairment (CI) affects a large proportion of MS patients and might reflect the disease progression. The prognostic value of the combination between cognitive and advanced MRI metrics (Cortical Thickness, CTh) has not been explored yet in a long-term follow-up study.

METHODS. 78 MS patients, currently followed at the Multiple Sclerosis Center of University Hospital of Verona, underwent cognitive assessment and had been followed-up for a median of 7 years (range: 4-13). At baseline, 71 were RR and 7 SP (age 37.8±10.5; disease duration 8.5±7.5).
MS patients were classified as follows:

CN (cognitively normal)
mild CI (mCI ≤ 2 pathological tests)
severe CI (sCI ≥ 3 pathological tests)

Disability progression evaluation
The progression of disability was defined as an increase of at least 1 point of EDSS for EDSS between 0 and 4.5, and of at least 0.5 point for EDSS higher than 4.5.

Cortical thickness evaluation
The estimation of the mean whole CTh was performed on the 3D-T1W sequence (1.5T MRI) of each patient using longitudinal stream of Freesurfer sofware.

RESULTS.
Disability progression (Δ-EDSS baseline-T1)
An ANCOVA showed a significant difference among the three groups (CN, mCI, sCI), $F(2,74) = 13.61$, $p < .001$ (**Fig. 1**). *Post hoc* analysis with Tukey's test revealed a significant difference between the CN and mCI groups ($p < .001$) and the CN and sCI groups ($p < .001$). No difference was found between the mCI and sCI goups ($p = .453$).

Cortical Thickness (Δ-CTh baseline-T1)
An ANCOVA showed a significant difference among the three groups (CN, mCI, sCI), $F(2,74) = 236.138$, $p < .001$ (**Fig. 2**). *Post hoc* analysis with Tukey's test revealed a significant difference between the CN and mCI groups ($p < .001$), the CN and sCI groups ($p < .001$), and the mCI and sCI goups ($p < .001$).

CI was the only significant predictor for disability progression (EDSS), $\beta = .289$, $t(76) = 2.898$, $p = .005$, as well as for cortical deterioration (CTh), $\beta = 3.067$, $t(76) = 12.852$, $p < .001$, with respect to CTh, EDSS, disease duration, age of onset, and age at baseline.
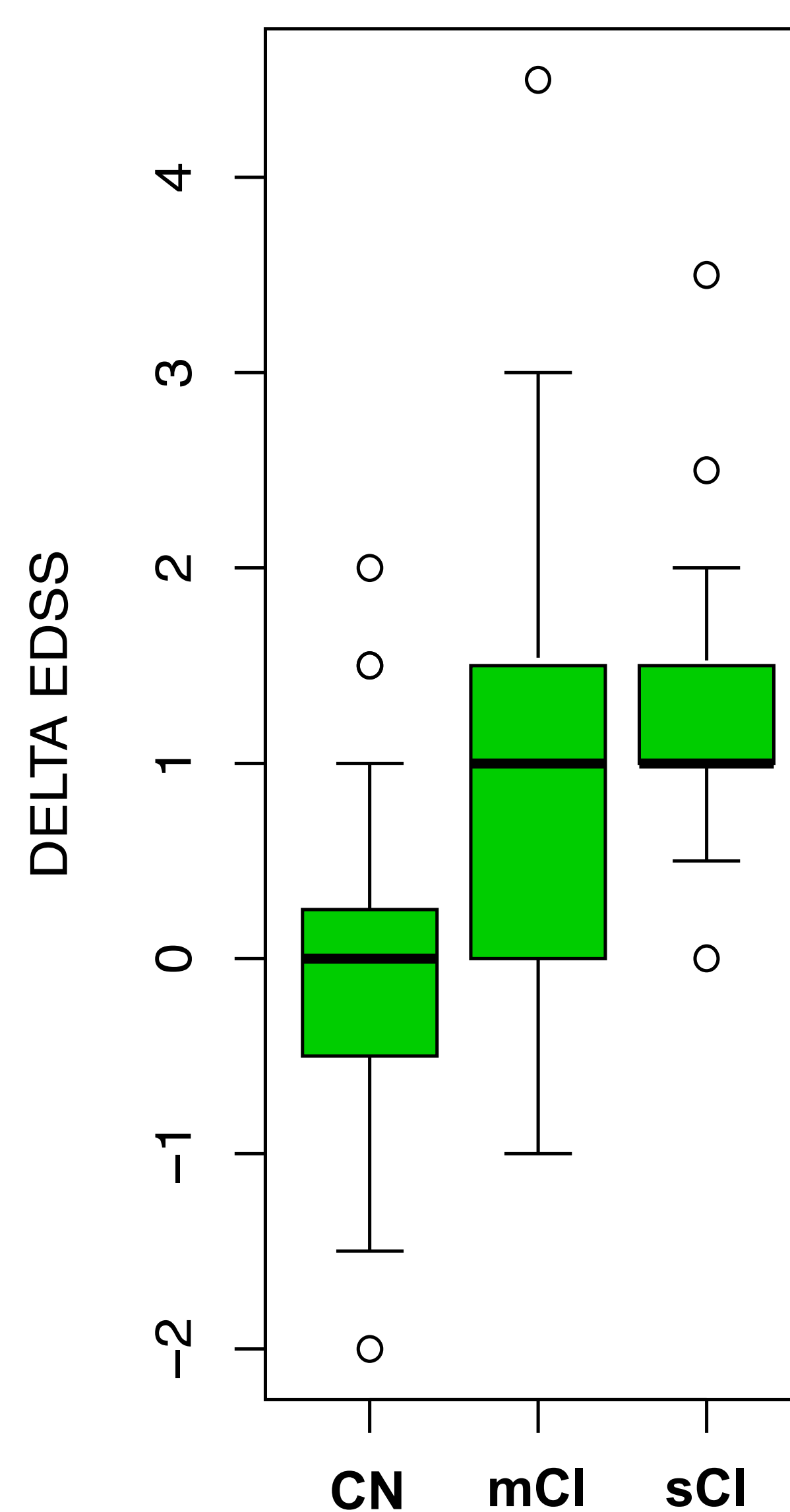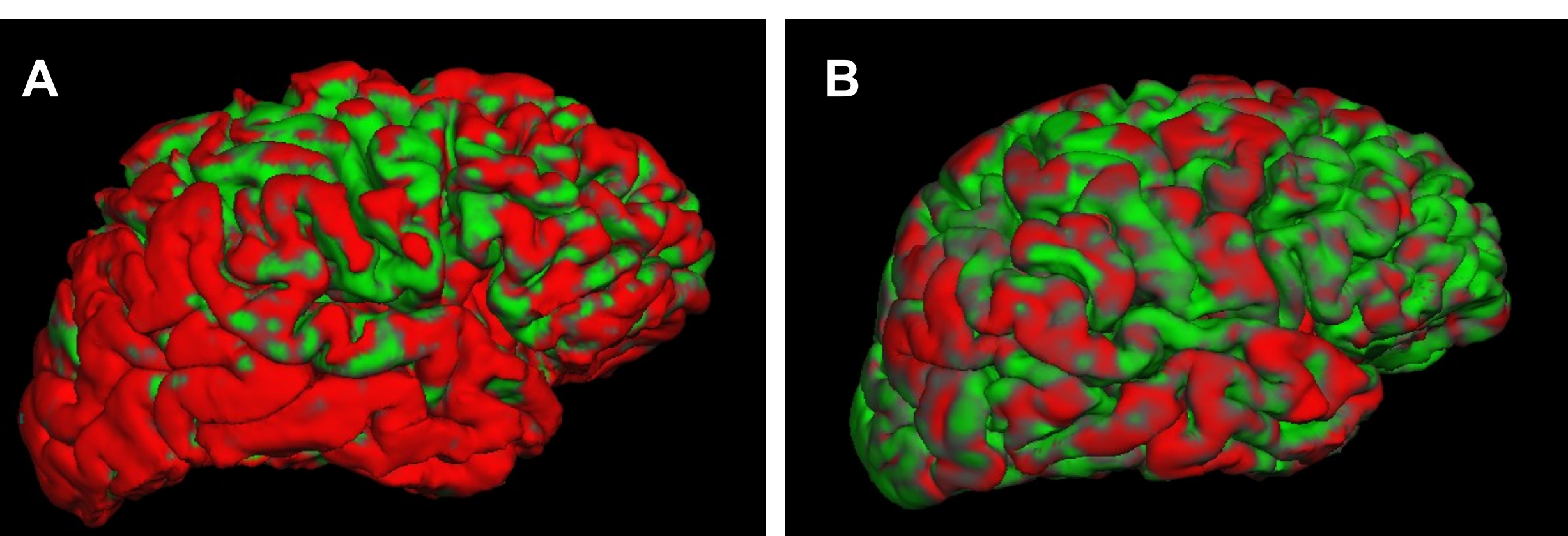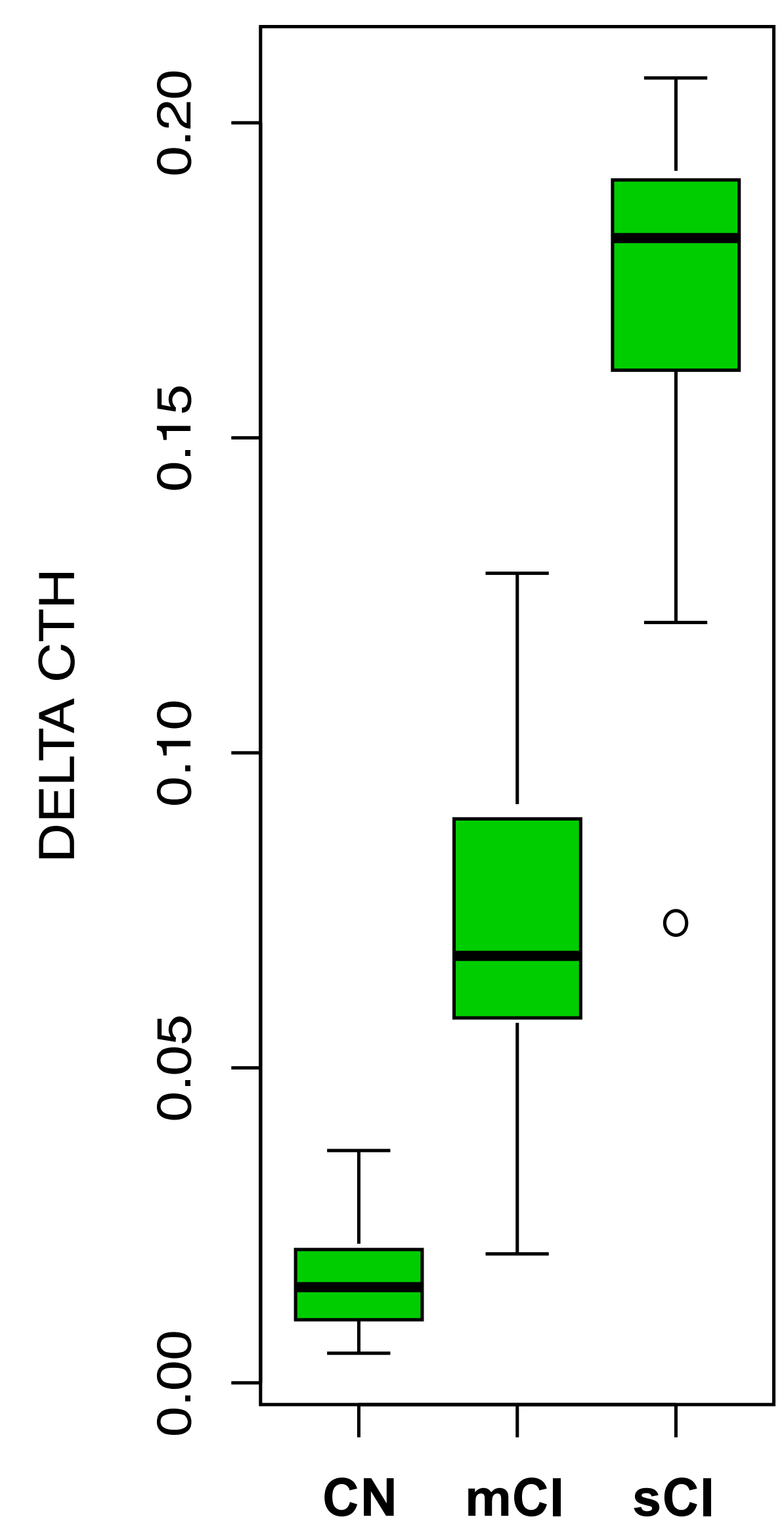

Fig. 1 **DELTA EDSS**

Fig. 2 **DELTA CTH**

CONCLUSIONS. The present results suggest that Cognitive Impairment can be the only predictor of gray matter deterioration (cortical thinning) and disability progression in MS patients. A comprehensive cognitive examination might therefore play a crucial role in clinical decision-making and should be always added to neurological and neuroradiological examinations.

FIGURES LEGEND. CTh reconstruction (performed with Freesurfer) of a 3D-T1W image of a RR patient with CI at T0 (**A**) and 7 years later (**B**). In green are depicted the cortical areas that had significant thinning with compared to a group of healthy controls.

References.
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