

# Application of Shape analysis in Multiple Sclerosis: evaluation of hippocampal atrophy

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## Introduction

Multiple sclerosis (MS) is a demyelinating disease characterized by motor and cognitive symptoms, including memory deficit. In particular, recent studies emphasized the presence of episodic memory impairment in about 45-70% of MS patients. The hippocampus has a critical role in episodic memory and visuospatial learning and consolidation, therefore growing interest has aroused the study of this structure in SM patients [1]. In order to characterize the possible damage of this structure, we investigated, though a shape analysis, the pattern of hippocampus atrophy in large group of multiple sclerosis (MS) patients, in correlations with neuropsychological impairment, evaluated with Free and Cued Selective Reminding Test (FCSRT) [2].

## Methods

Sixty-one MS patients (32 females and 29 males; mean age:  $33.6 \pm 8.5$ ) underwent an accurate neurological examination, including Short battery of Rao and FCSRT performed by an experienced neuropsychologist unaware of clinical. MRI were acquired by a 3T scanner with 8-channel head coil (Discovery MR-750, GE, Milwaukee, WI, USA), including a whole-brain T1-weighted. A Shape Analysis, though the FMRIB's Software Library v5.0, has been performed to investigate the hippocampal geometrical properties, using statistical methods, starting by the T1-sequence in correlation with the FCSRT scores across subjects.

## Results

We found a significant correlation between delayed free recall (DFR) item of FCSRT and hippocampal shape. In particular, the interested region was located in the ventral area of the head corresponding to the subiculum in the left hippocampus.

## Conclusions

The aim of this work was to investigate the regional anatomical distribution of hippocampal shape changes and their correlation with performance in hippocampal-dependent memory tasks (FCSRT) in a sample of MS patients. The results showed a significant correlation between the subicular region and the scores in FCSRT, in particular the DFR. This finding could represent an important step in MS study, since the subiculum plays an important role in spatial navigation and mnemonic processing. The left hippocampus is well-known as responsible of the episodic memory, contributing to storage of verbal material. Moreover, it is the major synaptic relay for most of the CA1 neurons and the last synaptic efferent relay of the hippocampus prior to the cortex. These results could improve the knowledge of specific MS-related mnesic profile.

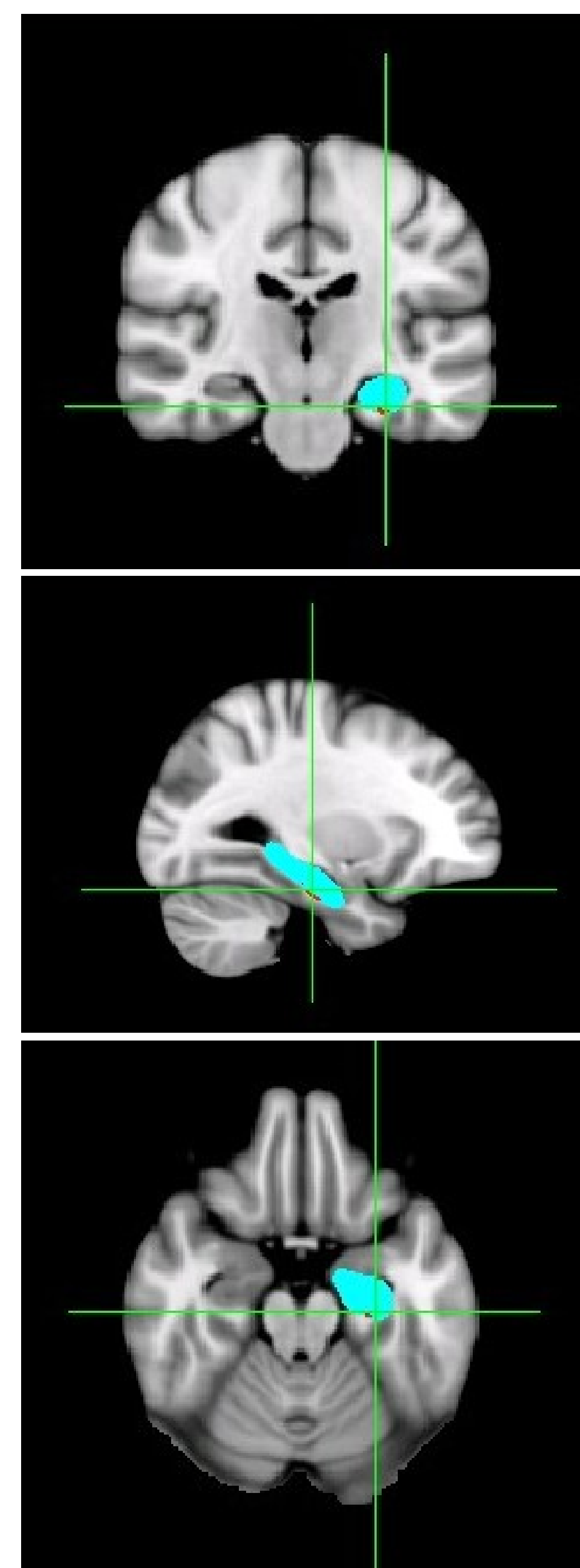


Fig.1: Framework of the analysis obtained through FSL software.

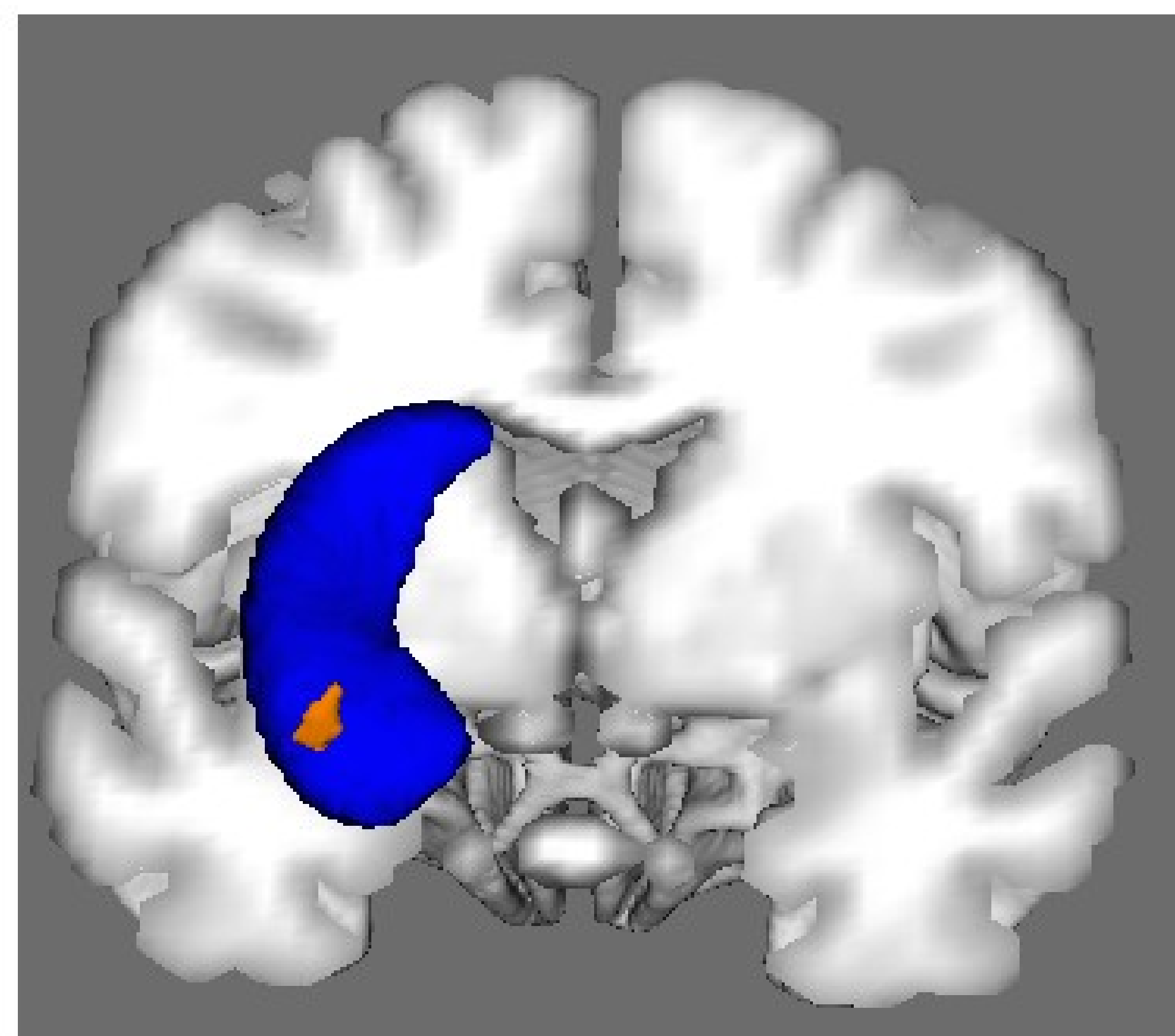


Fig.2: Frontal section of the Left Hippocampus, obtained through FSL.

## Bibliography

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