INTRODUCTION

- Cognitive impairment is common in multiple sclerosis (MS), affecting 40–60% of patients
- A subset of MS patients smoke cannabis for relief of pain, muscle spasticity, or anxiety
- However, recent evidence suggests that cannabis use has a deleterious effect on cognitive functioning in MS patients (Honarmand et al., 2011).
- Given the high prevalence of cognitive impairment, and the effects of MS on gray matter and white matter, MS patients who smoke cannabis may show further declines in cognition, which may be tied to structural changes in gray and/or white matter.

PURPOSE

To determine the association between cannabis use, cognitive functioning, and structural brain changes in MS patients.

METHODS

Patients

- MS patients who smoke cannabis (n = 20) and patients who are cannabis-naïve (n = 19)
- All patients had a confirmed diagnosis of relapsing-remitting MS according to McDonald et al (2001) criteria.
- Patient groups matched for age, sex, level of education, and disease characteristics (see Pavisian et al., 2014).

Neuropsychological tests

- All patients were given the Brief Repeatable Neuropsychological Battery:
  1) Buschke Selective Reminding Test (SRT)
  2) Rao 10/36 Spatial Recall Test (10/36)
  3) Controlled Oral Word Association Test (COWAT)
  4) Symbol Digit Modalities Test (SDMT)
  5) Paced Auditory Serial Addition Test (PASAT) (2 s)

Drug screening

- Patients screened for cannabis use via urine sample and salivary assay (NarcoCheck) for THC metabolite.

ANALYSES

Pre-processing

- T1-weighted and FLAIR MRI images
- White matter lesions appearing hyperintense on FLAIR and hypointense on T1 images were filled using the Lesion Segmentation Toolbox (Schmidt et al., 2012)
- Filled T1 scans were segmented using VM8 and non-linear DARTEL normalization
- T1 scans were also segmented using FreeSurfer, to obtain subcortical volumes for follow-up analyses

Statistical analyses

- Behavioural partial least squares analysis (PLS) (Krishnan et al., 2011): data-driven, multivariate technique that extracts latent variables that maximize the covariance between brain data and test performance
- PLS determines whether a) there is an association between gray matter, white matter and neuropsychological test scores, and b) whether this association differs across groups.

RESULTS

ROI analysis (FreeSurfer)

- Hippocampal volumes were differentially correlated with verbal memory across groups (Zdiff = 1.73, p <.05, 1-tailed)
- Conversely, thalamic volumes were similarly associated with processing speed in both groups.

CONCLUSIONS

- MS patients who smoke cannabis showed a stronger and more widespread association between brain volume loss and cognitive performance, suggesting cannabis has a moderating effect on the link between brain tissue and cognition.
- Hippocampal gray and white matter were particularly sensitive to this effect.
- One possibility is that cannabis-naïve MS patients can recruit other regions to compensate for regional volume loss, whereas cannabis-smoking patients cannot mount a compensatory response.

REFERENCES