Cerebral atrophy and cognitive reserve in Multiple Sclerosis: a MRI study

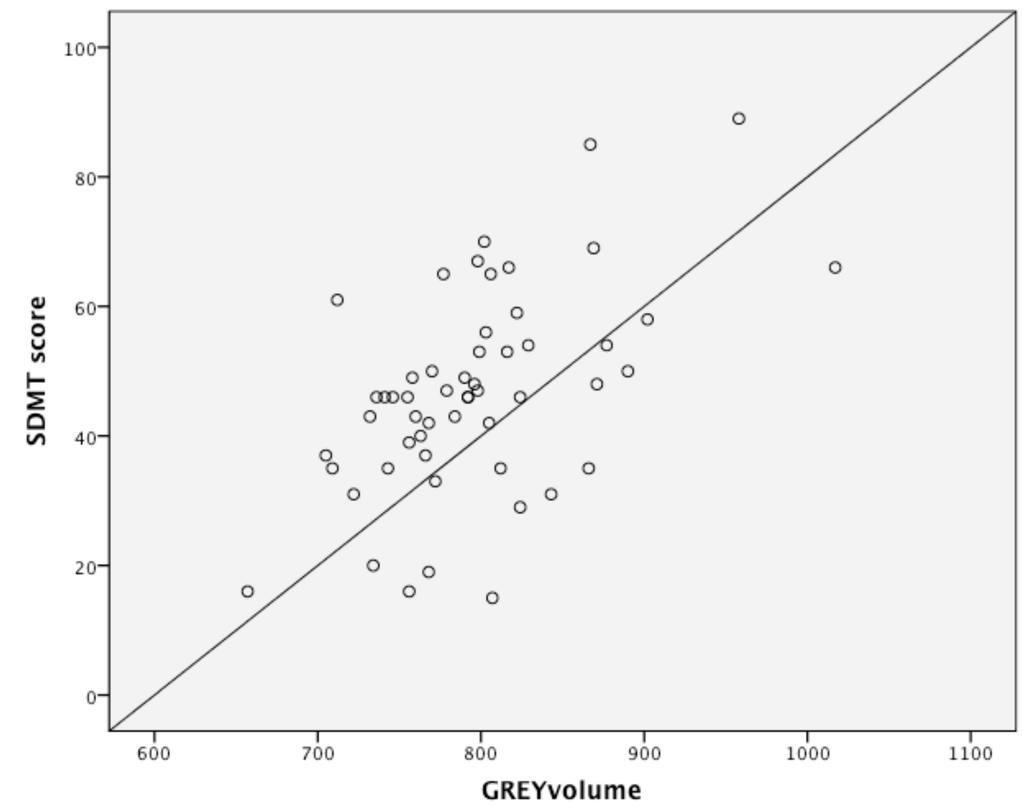
Fenu Giuseppe [1], Cabras Federico[1-2], Lorefice Lorena [1], Frau Jessica [1], Coghe Giancarlo [1], Loi Luciano [2], Sechi Vincenzo[2], Contu Franco[2], Murru Sergio[2], Lai Virgilio[2], Mallus Stefano[2], Boi Maurizio[2], Sbrescia Gennaro[2], Barracciu Maria Antonietta[2], Cocco Eleonora [1], Marrosu Maria Giovanna [1]

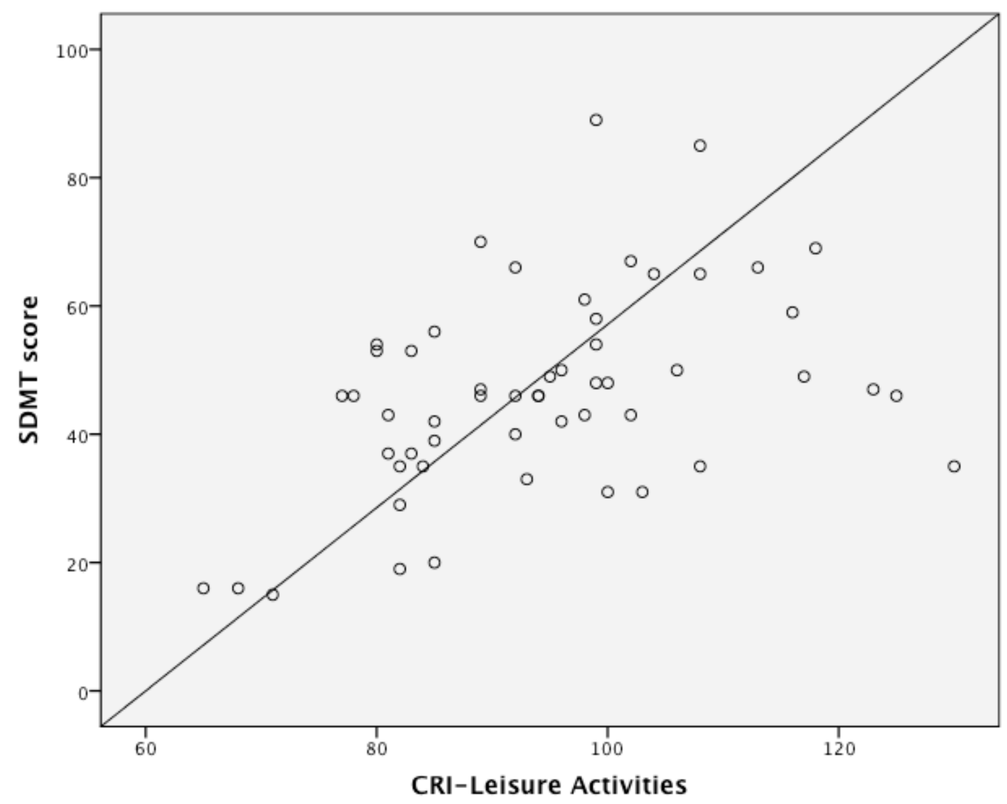
1 Multiple Sclerosis Center, University of Cagliari, 2 Radiology Unit, Binaghi Hospital

Background: Cognitive impairment is a common symptom in MS associated with MRI measures, especially with cerebral atrophy (CA). A possible role of Cognitive Reserve Theory (CR) in MS has frequently been suggested. Aim of this study is to evaluate the role of CR in MS and the relationship between CR and CA.

Methods: A group of 54 MS patients (MS) and 16 healthy controls (HC) were recruited. Exclusion criteria: corticosteroids and/or relapse in the previous month for MS and consuming psychoactive drugs. Neuropsychological assessment (NPA) was performed using BICAMS Italian normative values (Goretti et al., 2014). CR was evaluated by CR Index Questionnaire (CRIq, Nucci et al., 2012), a semi-structured interview validated for Italian populations, composed by 4 score: Total, Education, Working and Leisure Time. MS and HC underwent brain MRI using 1.5 T MR imaging system. Post-processing to obtain Normalized Volume of Brain (NBV), Grey Matter (NGV) and White Matter (NWV) volume was performed using SIENAX.

Results: No significant difference was detected between MS and HC regarding age (mean: 44.0+-10.6 vs 48.0 +-9.9 p=ns), gender (F/M: 38/16 vs 9/7 p=ns) and education (mean: 11.6 +-4.1 vs12.8 +-4.8 p=ns). Clinical features of MS were: EDSS (mean: 2.5+-1.6), years of disease duration (mean: 11.7+-7.8). Raw score of NPA in MS: SDMT: mean 46.5+-15.7; CVLT-II: 45.5+-11.8; BVMT-R: 22.2+- 8.3. T Test showed a significant difference between MS and HC regarding NBV ml (mean 1477.54+-81.6 vs 1518.8+-41.4 p=0.009), NWV ml (mean 682.0,+-39.2 vs 716.8+-21.9 p=0.000), while no significant difference regarding NGV ml (mean 795.5, SD 63.0 vs 801.9+-32.1 p=ns) was found. Pearson Test showed a correlation between NGV and all NPA score (SDMT: r=0.53, p=0.000 (Fig 1); CVLT: r=0.35, p=0.004; BVMT: r=0.414, p=0.001), while no correlation between NGV, NGV and NBV and NPA in HC was detected. CRIq Score showed a correlation with all NPA, especially CRI-Leisure time score (SDMT: r= 0.44 (Fig 2), p=0.000; CVLT: r=0.396, p=0.002; BVMT: r=0.399, p=0.001). ANOVA shoved a relationship between SDMT and both NGV (p=0.000 CI 95% 0.06-0.17) and CRI- leisure activities (p=0.001 CI 95% 0.17-0.65) (Fig.3).





Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	-88,262	22,724		-3,884	,000	-133,882	-42,641
	GREYvolume	,120	,027	,481	4,473	,000	,066	,174
	CRI-Leisure	,413	,119	,374	3,477	,001	,175	,652

a. Dependent Variable: SDMT score

Conclusion

Our data suggested that CR could play a role in cognition in MS, particularly the activity in leisure time (i.e. reading, social and artistic activities), supporting a better cognitive functioning and balancing brain pathology. Larger studies are needed to establish how and when enhancing CR could improve cognition in MS.