

Cognition in MS



Cognitive symptoms can occur early in MS and present in up to **70%** of patients¹



92% (n/N=12/13) of studies in a systematic review found that lower scores on cognitive assessments were **significantly related to unemployment or reduced hours of work**²

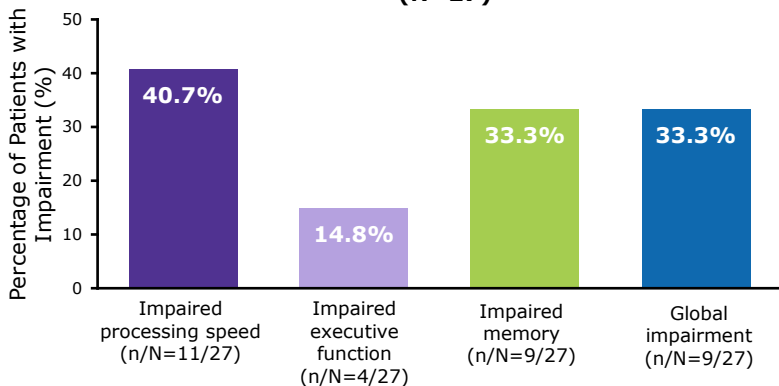


Cognitive impairment can arise early^{1,3}

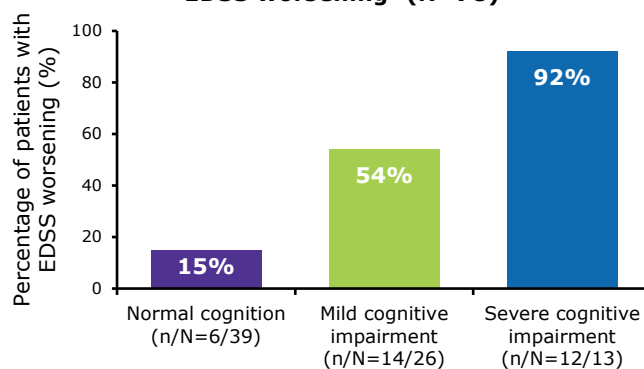


Early cognitive impairment may be associated with future disability⁴

Cognitive impairment in patients with RIS (N=27)^{3,a}



Percentage of patients who experienced EDSS worsening^b (N=78)^{4,c}



In a multicenter trial of 29 patients with RIS and 26 patients with RRMS, 27.6% of patients with RIS had cognitive impairment^d (similar to patients with RRMS), whereas lesion load and brain atrophy per MRI were comparable⁵



The SDMT is a reliable and valid measure of cognitive processing speed, a core cognitive ability that can be impacted in MS⁶

This represents an example of a subset from the full **SDMT⁶**

‡	§	°	∩	∣	∏	∩	≡	∫
1	2	3	4	5	6	7	8	9
∫	°	∩	∫	‡	§	∩	∏	∫
∫	°	∩	∫	‡	§	∩	∏	∫
∏	§	∫	∩	°	‡	∫	∫	∫
∏	°	∣	∩	∫	‡	∣	∏	∩
∏	°	∣	∩	∫	‡	∣	∏	∩



A **4-point change** (10% change) is widely accepted as a **clinically meaningful** change in cognitive function at a group level (eg, in clinical trials)^{7,e}



An **8-point change** may be a valid threshold for **detecting cognitive changes** in an individual patient⁷



Declining SDMT scores were **indicative of structural and functional changes in the brain** and were associated with **difficulty in day-to-day living activities**^{8,9,f}

^aRetrospective 8-year longitudinal study in patients with RRMS. ^bDefined as a sustained increase in the EDSS of at least 1 point when EDSS was 5.5 or less (a sustained increase in EDSS of 0.5 point when EDSS was more than 5.5) independently from relapses and confirmed at least 12 months later⁴; ^cSingle-center study of patients recruited into prospective cohort for clinical and MRI evaluation. ^dAs assessed with the Rao Brief Repeatable Battery, which incorporates tests of verbal memory, visual memory, attention, concentration, and information processing speed. ^eThe 4-point change refers to the minimum overall mean change in a group associated with a clinically relevant anchor such as employment⁷; ^fDefined as annual days of sickness absence or disability pension⁹.

EDSS, Expanded Disability Status Scale; MRI, magnetic resonance imaging; MS, multiple sclerosis; RIS, radiologically isolated syndrome; RRMS, relapsing-remitting MS; SDMT, Symbol Digit Modalities Test

1. Alosaimi FD, et al. *Behav Neurol.* 2017;2017:6847070; 2. Clemens L, Langdon D. *Mult Scler Relat Disord.* 2018;26:183-91; 3. Oh J, et al. *Mult Scler.* 2021;27:2199-208; 4. Pitteri M, et al. *Mult Scler.* 2017;23:848-54; 5. Amato MP, et al. *Neurology.* 2012;78:309-14; 6. Langdon DW, et al. *Mult Scler.* 2012;18:891-8; 7. Weinstock Z, et al. *Mult Scler.* 2022;28:1101-11; 8. Benedict RHB, et al. *Lancet Neurol.* 2020;19:860-71; 9. Kavaliunas A, et al. *Mult Scler J Exp Transl Clin.* 2019;5:2055217318822134

