

Cognitive function in pediatric onset MS is largely independent from routine clinical parameters

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Objective

To determine the factors that predict cognitive impairment in pediatric-onset multiple sclerosis (POMS)

Background

Pediatric-Onset Multiple Sclerosis (POMS) is rare among patients of Multiple sclerosis (MS) with approximately 5% of MS patients being diagnosed under the age of 18. POMS is associated with cognitive impairment in at least 30% of cases. These cognitive deficits directly impact quality of life, sometimes requiring special educational programs for school aged children. POMS is a relative rare condition with few reliable predictors of cognitive impairment have remained unclear and vary across studies with relatively small sample sizes.

The Symbol Digit Modalities Test or SDMT is a common screening measure for cognitive impairment in MS clinical and research practice. It is considered to test a subject's information processing ability over a brief administration period.

Using the SDMT as a measure of cognitive impairment, we tested clinical and demographic correlates to identify factors that predict cognitive impairment in POMS.

Methods

Confirmed POMS patients were consecutively evaluated and recruited from the outpatient center. Patients were administered the SDMT as well as several other measures of clinical and research utility, such as the Kurtzke Expanded Disability Status Scale (EDSS) and the Wide Range Achievement Test 3rd edition (WRAT-3).

Measures were repeated at a second visit (alternate form) for a subset. Scores were converted to age-normative z scores for analyses. Any patients who were experiencing a relapse or had taken steroids within a month of assessment were excluded from analyses.

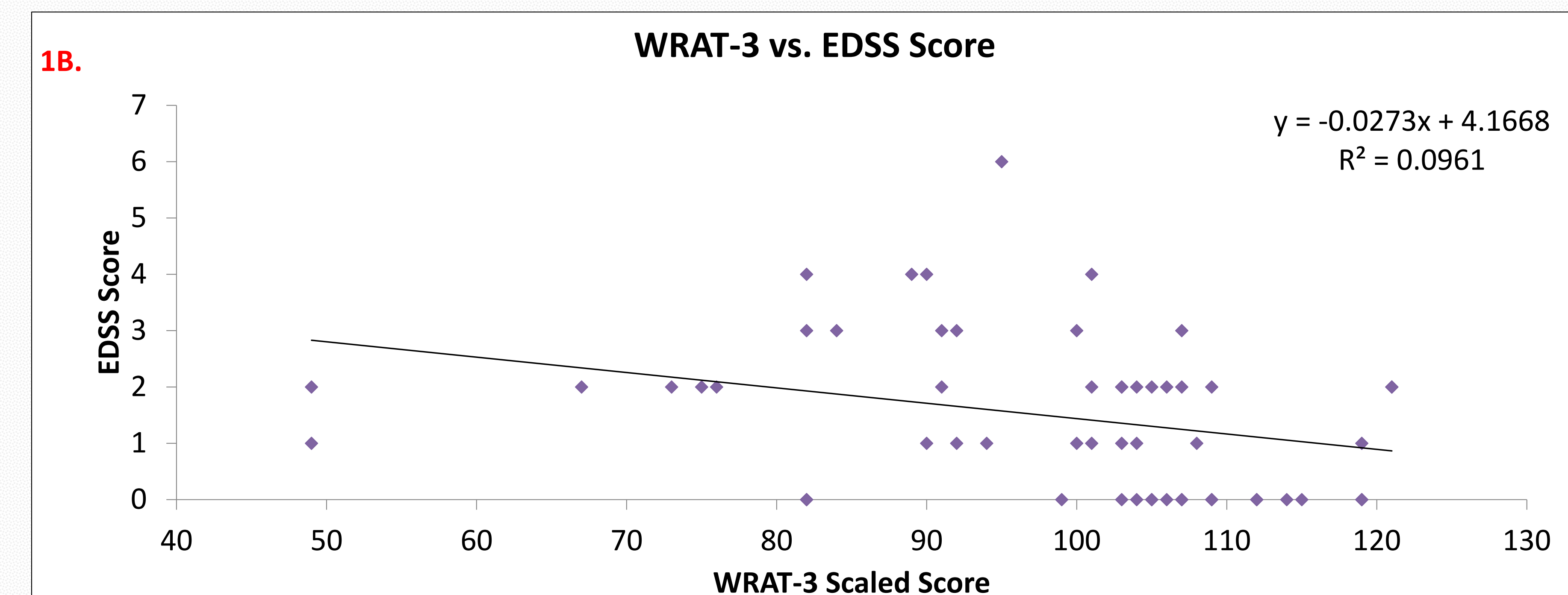
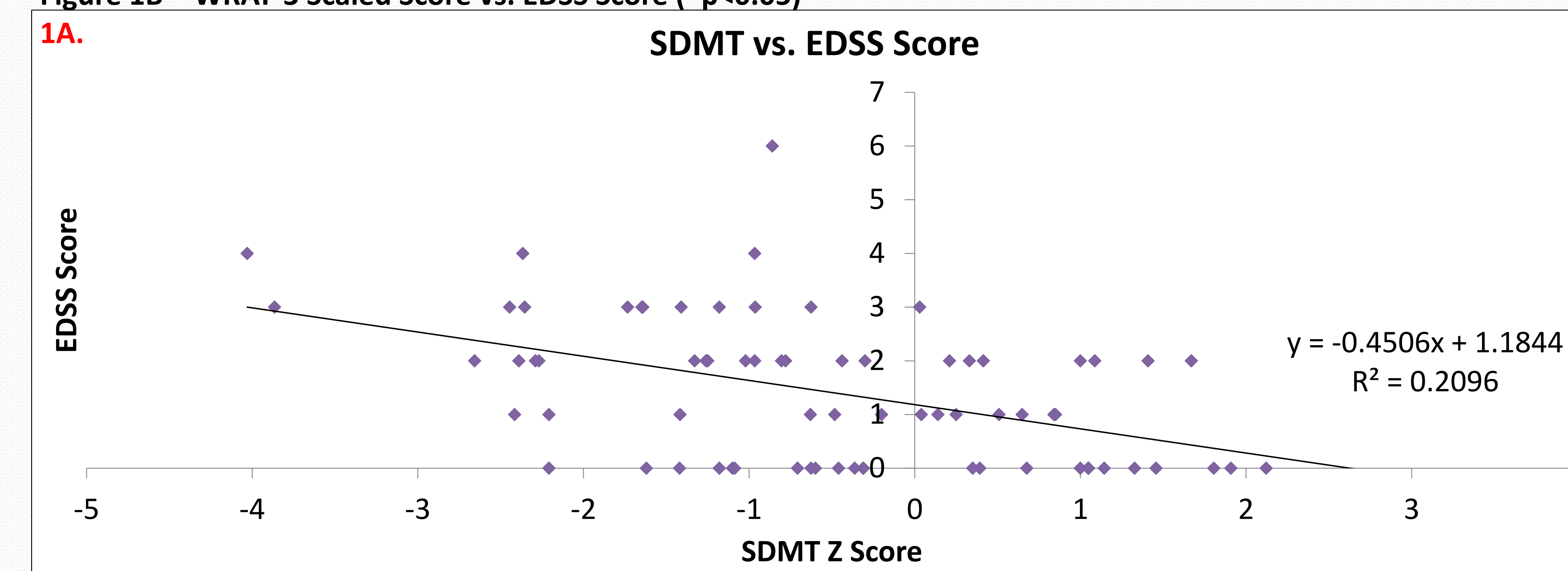
Table 1: Clinical and Demographic Characteristics

Clinical Characteristics	POMS Sample (n=100)	Retest Sample (n=48)
Age (Mean±SD)	16.3±2.8	16.6±2.4
Disease Duration (Years, Mean±SD)	2.2±2.5	2.4±2.3
Age of Onset (Years, Mean±SD)	14.0±3.3	14.17±2.8
EDSS (Median, Range)	1 (0-6)	1 (0-6)
Clinical Characteristics	POMS Sample (n=100)	Retest Sample (n=48)
Gender (%Female)	59	54
Ethnicity (%Hispanic)	28	28
Race (%)	-	-
Caucasian:	57	63
African American:	30	31
Asian:	2	2
Mixed/Other:	7	4
Unknown/Unreported:	4	-

Figure 1: Determining Predictors

Figure 1A – SDMT Z Score vs. EDSS Score (p<0.001)**

Figure 1B – WRAT-3 Scaled Score vs. EDSS Score (*p<0.05)



Results

POMS participants (n=100) successfully met study eligibility criteria and were recruited. Of these participants, 59% were female with a mean age of 16.3 years. Full clinical characteristics are described in Table 1. Initial SDMT M=50.6 ±13.4, z score=-0.29±1.46, indicating low average performance overall, which is consistent with the POMS literature .

Lower SDMT z score was predicted by higher EDSS (r=-0.44, p<0.001, Figure 1A) but not disease duration (r=-0.18) or age of onset (r=-0.09).

Poorer WRAT-3 reading recognition (functioning as an estimate of premorbid functioning) weakly predicted both EDSS (r=-0.31, p=0.02, Figure 1B) and SDMT z score (r=0.26, p=0.07), suggesting a stronger disease impact for those with lower premorbid reserves. See Figure 1 for each respective statistically significant correlation.

The sample with repeat SDMT (n=48) indicated overall group improvement, M=56.9 ±12.4, z-score=-0.34±1.3, with only n=7 declining more than 1 standard deviation. Change in SDMT, improvement or worsening, was not linked to any clinical (EDSS, age of onset) or demographic predictors.

Conclusions

- In this large sample, low performance in initial SDMT scores is consistent with literature reported in POMS samples.
- Cognitive impairment is linked only to disease severity.
- At least initially, cognitive functioning remains stable for most individuals and routine clinical parameters do not identify those at risk for future decline.
- The SDMT is a sensitive initial screen, but interpretation of follow-up assessment is still limited due to a lack of multiple time point control norms.

References

1. Charvet LE, Beekman R, Krupp LB. **The Symbol Digit Modalities Test is a sensitive and specific screen for cognitive impairment in pediatric multiple sclerosis.** J Neurol Sci. 2014 Jun 15;341(1-2):79-84.
2. Julian LJ, Serafin D, Charvet L, Ackerman J, Benedict RHB, Braaten E, Brown T, O'Donnell EH, Parrish J, Preston T, Zaccariello M, Belman A, Chitnis T, Gorman M, Ness J, Patterson M, Rodriguez M, Waubant E, Weinstock-Guttman B, Yeh A, Krupp LB. **Cognitive Impairment Occurs in Children and Adolescents With Multiple Sclerosis: Results From a United States Network.** J Child Neurology, 2013 Jan;28(1):102-10.