

Correlation between Altoida's digital cognitive assessment and standard neuropsychological tests in individuals with mild cognitive impairment and cognitively healthy volunteers

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BACKGROUND

- Digital Biomarkers (DB) are increasingly utilized as exploratory endpoints and screening tools for inclusion in clinical trials.
- They facilitate frequent and unbiased measurements of cognitive/functional status, without the need of a trained rater.
- Altoida Inc. developed a tabled-based assessment using augmented reality (AR) which simulates activities of daily living.
- The assessment uses machine learning (ML) to evaluate cognitive and motoric abilities in approximately 10 minutes.

METHODS

- Dual-centre, cross-sectional cohort study (n=188; see Study Population Table).
- We included 84 (44.7%) participants from the Alzheimer's disease and other Cognitive Disorders Unit at Hospital Clinic Barcelona and 104 (55.9%) participants from the β-AARC cohort established at the Barcelonaβeta Brain Research Center.
- Participants received a neurological evaluation, neuropsychological test battery, and Altoida's digital biomarker assessment.
- They were classified according to their clinical status, as cognitively normal (CN; n=126; mean age: 67.6 (6.4) years; mean MMSE score: 28.5 (1.3) points; Clinical Dementia Rating (CDR)=0) or as having mild cognitive impairment (MCI; n=62; mean age: 71.0 (5.6; mean MMSE score: 25.6 (2.7) points; CDR=0.5).
- Mixed effect linear regression analysis with Wald's test on the coefficients was used to evaluate the correlation between DNS-MCI scores and neuropsychological tests; with patient ID was used as a random effect.
- Two-group comparisons of demographic variables were evaluated with a Student's t-test.

OBJECTIVE

- To investigate the correlation between Altoida's digital cognitive assessment / Digital Neurosignature-MCI (DNS-MCI) score and standard neuropsychological tests, including:
 - the Mini-Mental State Examination (MMSE)
 - the Free and Cued Selective Reminding Test (FCSRT)
 - the Trail Making Test (TMT)

DIGITAL COGNITIVE ASSESSMENT/DNS-MCI

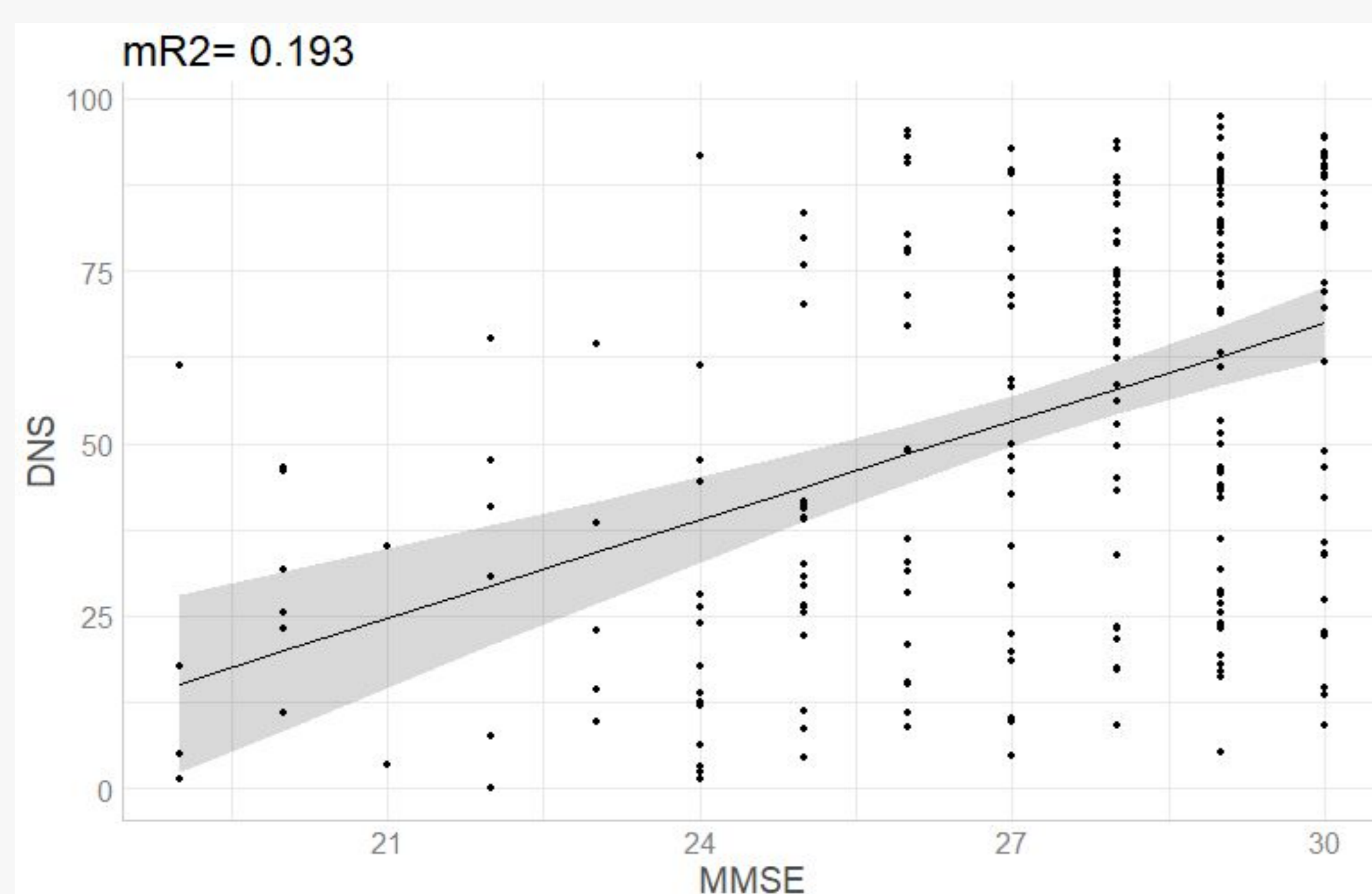
- The Altoida digital cognitive assessment is a research device based on AR and ML.
- It simulates conducting activities of daily living, providing an objective measure of cognitive and functional abilities.
- DNS-MCI is an ML model that can identify MCI/AD with 84% accuracy (Pipeline Version v1.56.0; 13Jun2023).

STUDY POPULATION

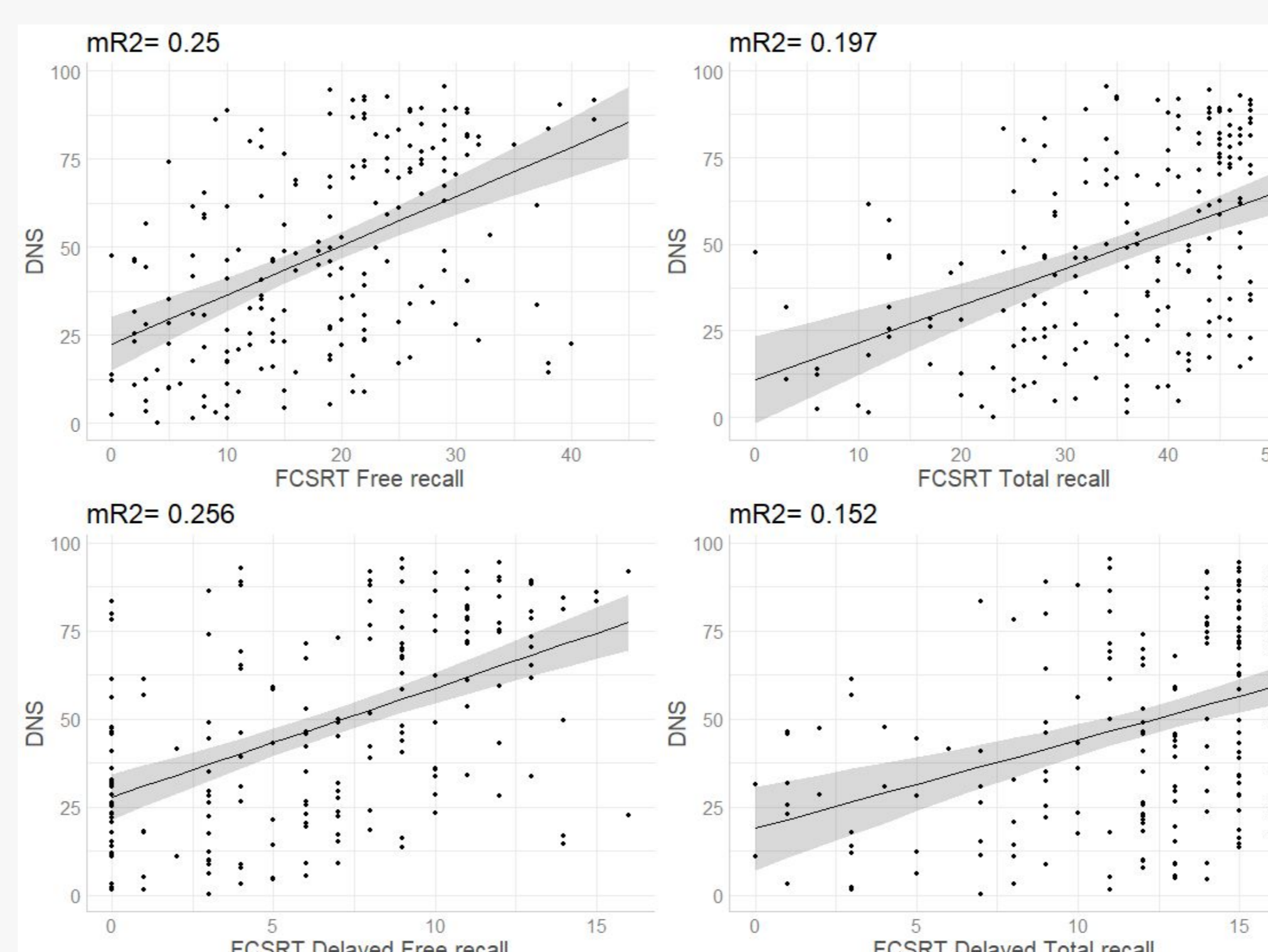
	Participant's characteristics by clinical group			P-value
	CN (N=126)	MCI (N=62)	Total (N=188)	
Center				
BBRC	96 (76.2%)	8 (12.9%)	104 (55.3%)	<0.001
Hospital Clinic	30 (23.8%)	54 (87.1%)	84 (44.7%)	
Sex				
female	67 (53.2%)	31 (50.0%)	98 (52.1%)	0.799
male	59 (46.8%)	31 (50.0%)	90 (47.9%)	
Age				
Mean (SD)	67.6 (6.40)	71.0 (5.58)	68.7 (6.33)	<0.001
Median [Min, Max]	67.0 [55.6, 80.6]	72.0 [50.0, 82.0]	68.9 [50.0, 82.0]	
YearsOfEducation				
Mean (SD)	14.3 (3.80)	12.3 (4.34)	13.7 (4.09)	0.0023
Median [Min, Max]	15.0 [6.00, 20.0]	12.0 [6.00, 20.0]	15.0 [6.00, 20.0]	
DNS				
Mean (SD)	66.4 (24.7)	36.2 (21.2)	56.3 (27.5)	<0.001
Median [Min, Max]	74.5 [4.51, 95.8]	32.7 [0.194, 92.7]	60.2 [0.194, 95.8]	
Missing	2 (1.6%)	0 (0%)	2 (1.1%)	
MMSE				
Mean (SD)	28.5 (1.34)	25.6 (2.72)	27.6 (2.34)	<0.001
Median [Min, Max]	29.0 [24.0, 30.0]	26.0 [19.0, 30.0]	28.0 [19.0, 30.0]	
Missing	1 (0.8%)	2 (3.2%)	3 (1.6%)	

RESULTS

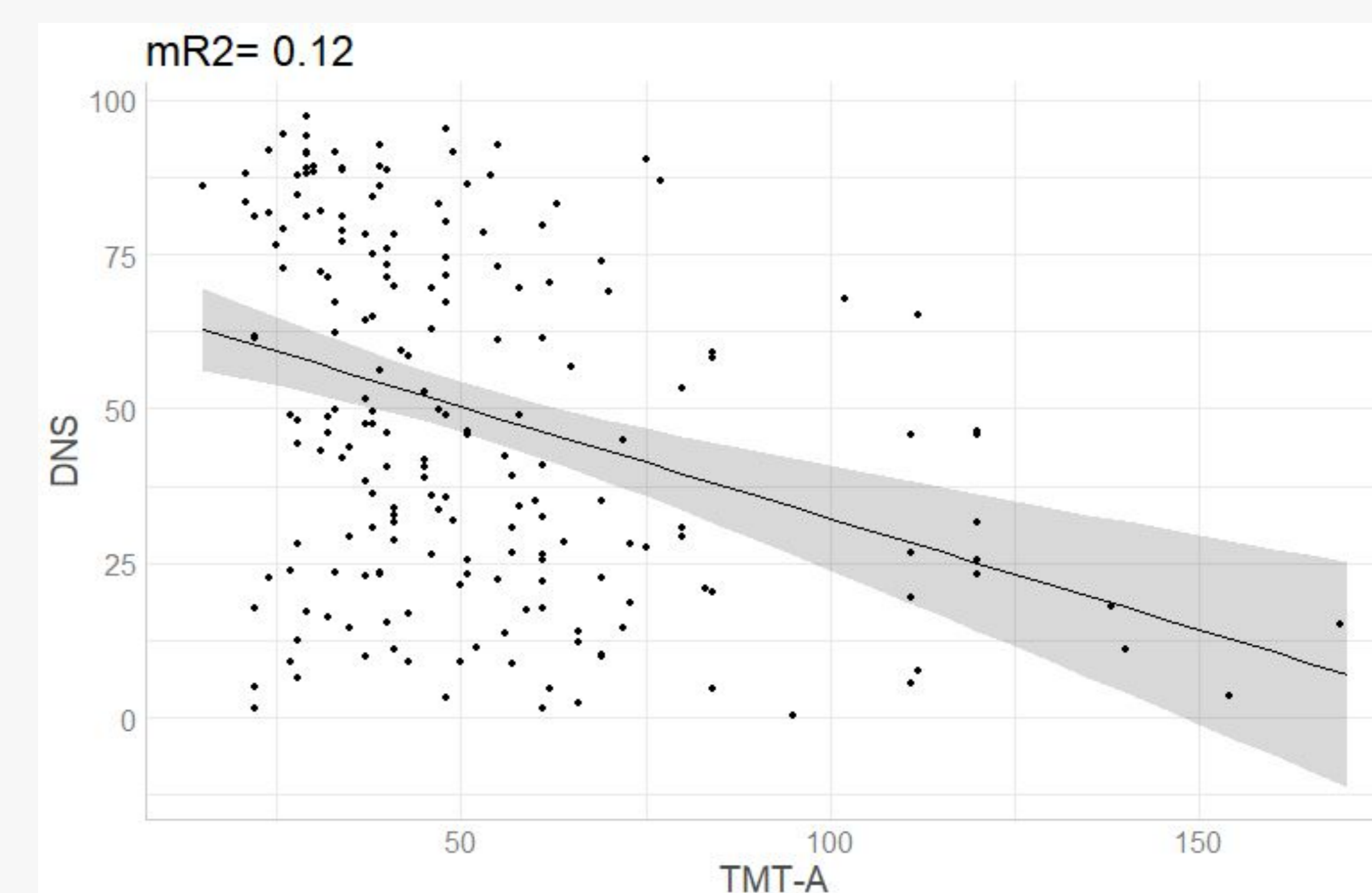
MMSE



FCSRT

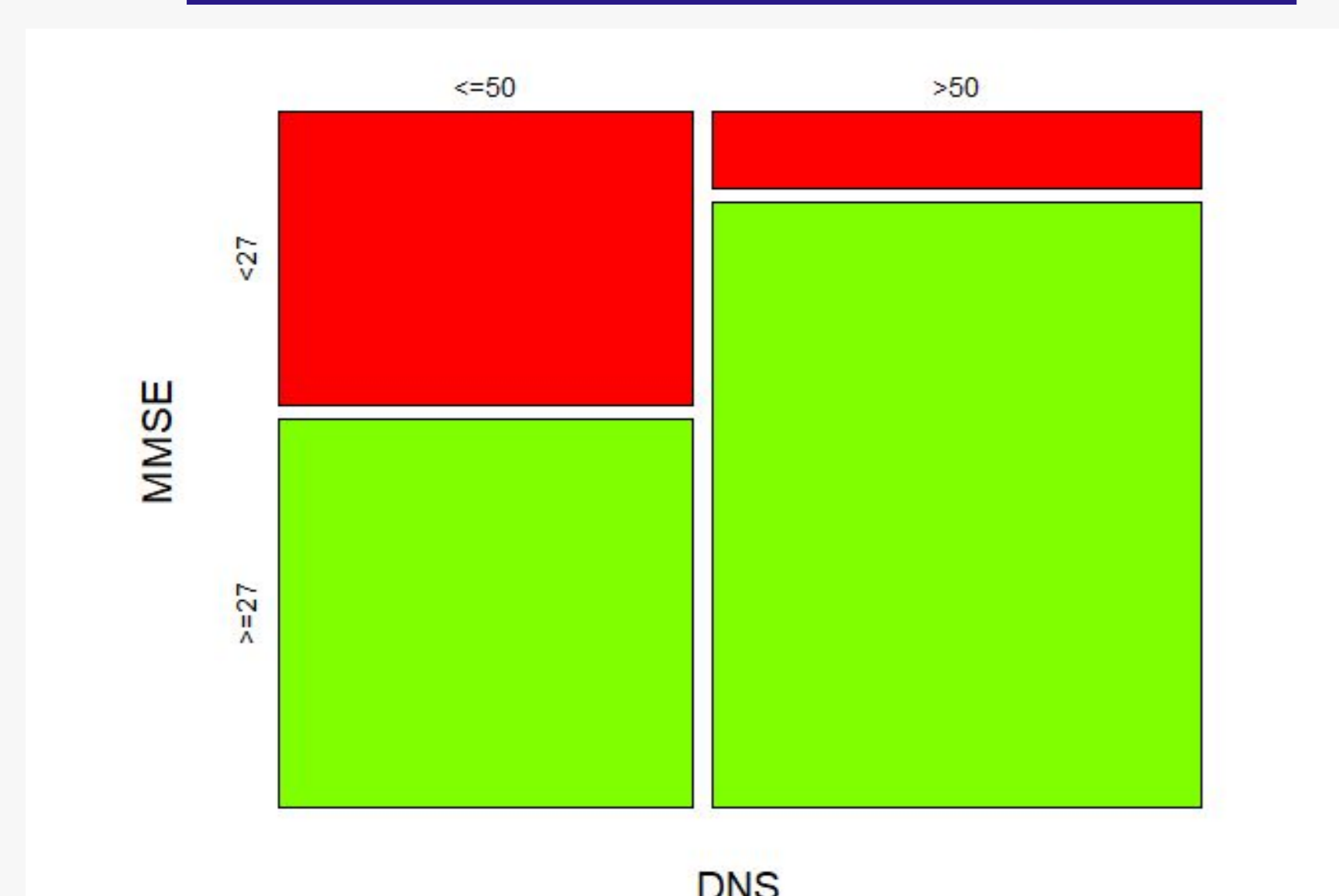


TMT-A



Linear regression analysis of Altoida DNS scores versus three different neurocognitive scales (MMSE, FCSRT, and TMT-A. mR²=Marginal R-squared.

DNS/MMSE CONCORDANCE ANALYSIS



Box size represents relative proportion of patients in each class

SUMMARY

- Altoida DNS-MCI score correlated with classical neuropsychological tests that are commonly used as a battery (lasting approximately 60-90 minutes) when evaluating patients in clinical research and clinical practice.
- Using DNS-MCI<50 and MMSE<27 as patient classifier leads to results that are mostly overlapping in high scores, with lower agreement on lower scores.
- Our research shows a correlation with MMSE (mR² 0.193), FCSRT (mR²= Free Recall 0.25; Delayed Free Recall: 0.256; Total Recall 0.197; Delayed Total Recall: 0.152) and TMT-A (mR²: 0.12)
- The next step is to expand our understanding by exploring correlations with other scales (e.g. IADLs)

Acknowledgments

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