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Speech biometrics can predict cerebellar dysfunction in multiple sclerosis

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### BACKGROUND

Speech production relies on motor control and cognitive processing, and is linked to cerebellar function. In diseases where the cerebellum is impaired, such as multiple sclerosis (MS), speech abnormalities are common and can be detected by instrumental assessments. However, the potential of speech metrics to be used to monitor cerebellar impairment in MS remains unexplored.

### AIM

To build an objectively measured speech score that reflects cerebellar function in MS.

### METHODS OVERVIEW

Potential predictors identified: 8 acoustic speech metrics

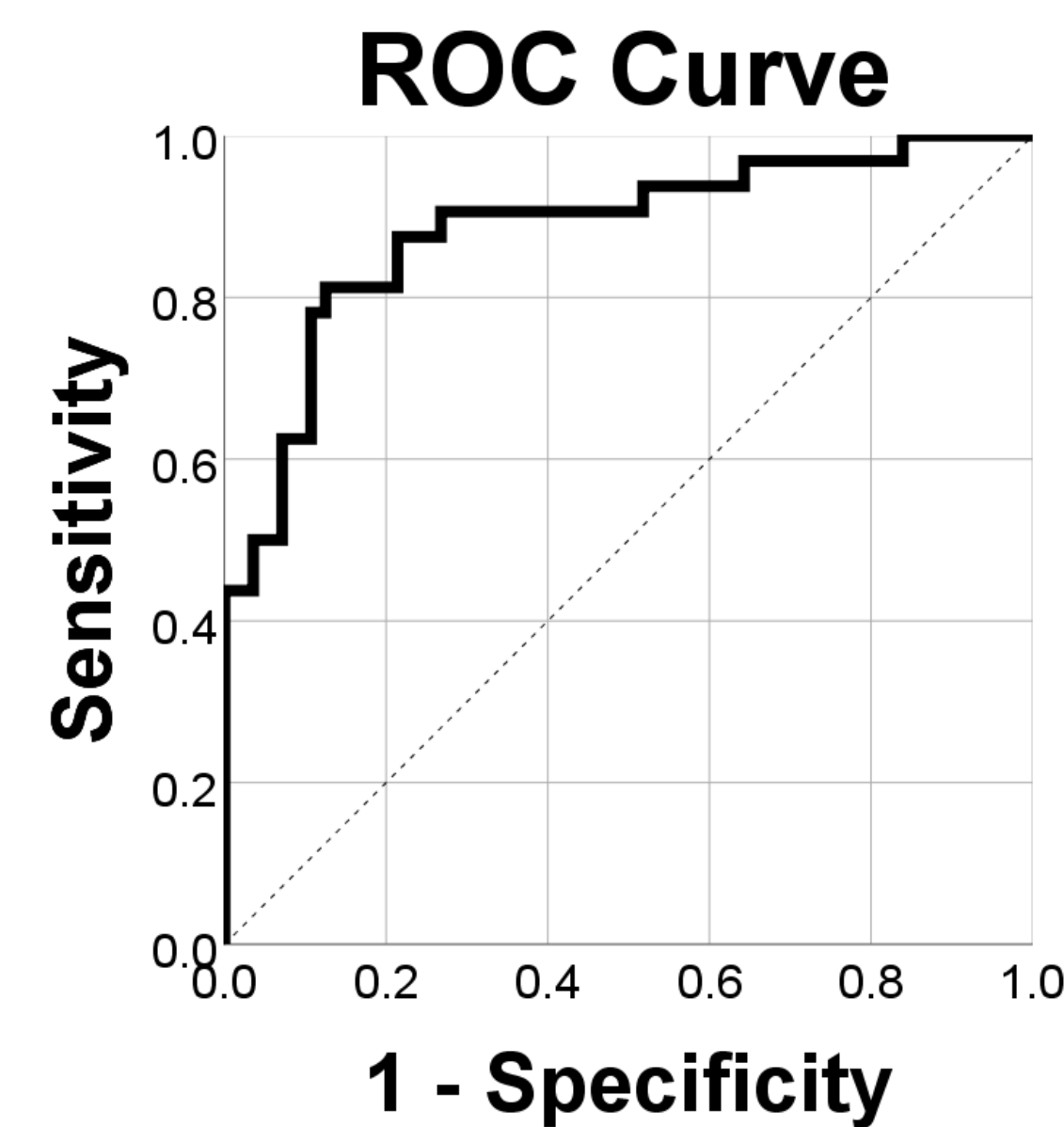
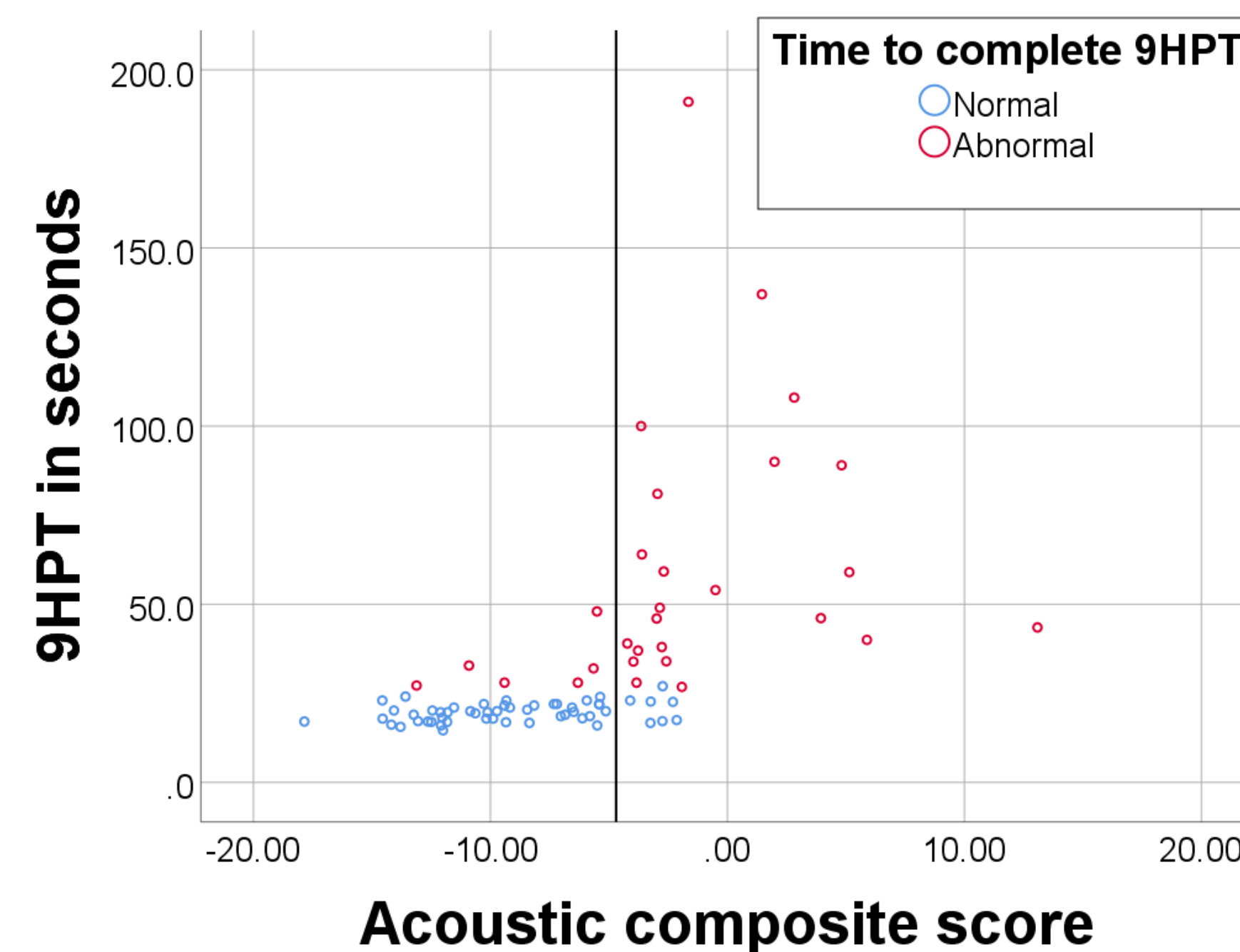
Regression modelling: target = SARA in people with MS (Scale for the Assessment and Rating of Ataxia)

4 speech metrics valid in the model

4 speech metrics condensed into acoustic composite score, used to predict abnormal 9-hole peg test (9HPT) in mixed cohort MS + HC, and for correlation with MRI measures and quality of life (MSIS-29).

# Speech biometrics can predict cerebellar dysfunction in Multiple Sclerosis

- Sensitivity 81.3%
- Specificity 87%
- Positive predictive value 78.8±14%



More in Noffs et al. Acoustic Speech Analytics Are Predictive of Cerebellar Dysfunction in Multiple Sclerosis. The Cerebellum, Jul/2020 <https://rdcu.be/b43s1>

### PARTICIPANTS

	MS cohort		HC	
N total	85		21	
Women	74%		71%	
	Mean	±SD	Mean	±SD
Age, years	47.8	±11.2	46	±14.3
Disease duration, years	14.6	±8.4		
9HPT, seconds	36.8	±31.2	18.2	±2.1
	Median	Range	Median	Range
SARA	8.5	0 to 36.5	0	0 to 3
FSS-cerebellar	2	0 to 4		
EDSS	4	1 to 8.5		

### RESULTS

Metrics in acoustic composite score

	t value in regression
Speech DDK rate	4.5
Frequency Instability, sustained vowel	3.7
Pause percentage, story telling	3.0
Energy instability, sustained vowel	2.6

Correlations, r (p value)

	A. Composite score	
MSIS-29	0.542	(<0.001)
Cerebellum WM volume	-0.312	(0.017)
Cerebellum GM volume	-0.223	(0.092)
Cerebellar lesion load	0.310	(0.017)
FSS-cerebellar	0.634	(<0.001)
9HPT	0.513	(<0.001)
SARA	0.745	(<0.001)