

SPEECH PAUSE BEHAVIOR IN TRAUMATIC BRAIN INJURY IS DRIVEN BY COMORBID COGNITIVE IMPAIRMENT AND TASK DEMAND

RESEARCH GOAL

This study examines the impact of cognition and task demand on four speech measures shown to be indicative of neuromuscular dysfunction.

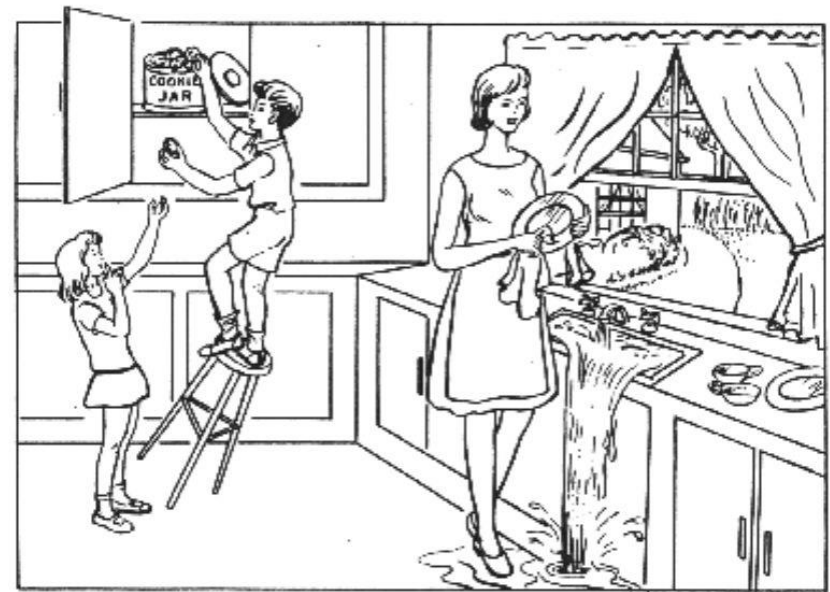
INTRODUCTION

- TBI can effect neuromotor control, language, and cognition, all of which are essential to speech production.
- Diagnosing speech impairment in traumatic brain injury (TBI) is difficult, as speech outcomes may be confounded by comorbid cognitive impairment.
- Several measurements have been identified as sensitive indicators of speech-motor decline in patients with ALS and MS: percentage of pause during a speaking task, articulation rate, diadochokinetic rate, and maximum phonation time.
- Non-motoric processes like cognition may have a measurable influence on these outcomes, particularly in percent pause (1,2).
- Tasks that are cognitively or linguistically demanding have been shown to increase speech pause behavior (3,4).

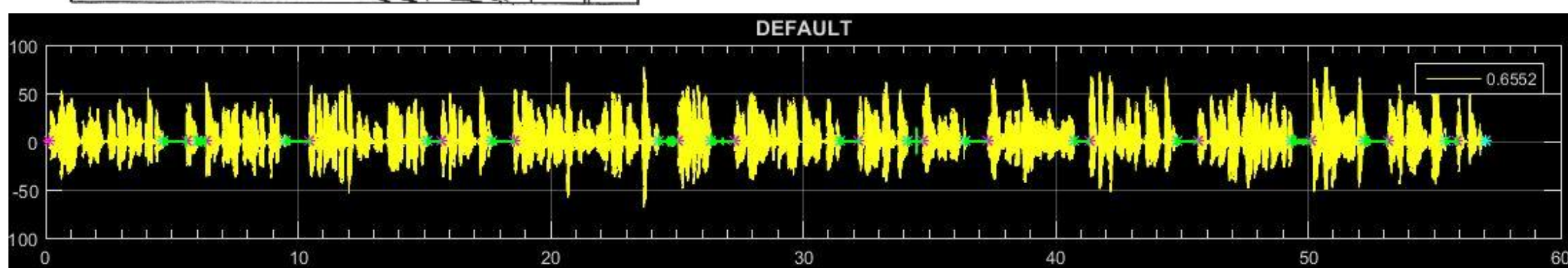
METHODS

20 patients with moderate to severe TBI and 7 controls participated. TBI patients were divided by cognitive scores measured by the Montreal Cognitive Assessment (MoCA): severe (MoCA <21) and moderate (MoCA 21-26). The control group had no cognitive impairment (MoCA >26).

All data collection was performed at the inpatient or outpatient clinic at Hospital das Clinicas, University of Sao Paulo Medial School (HC-FMUSP) in Brazil.



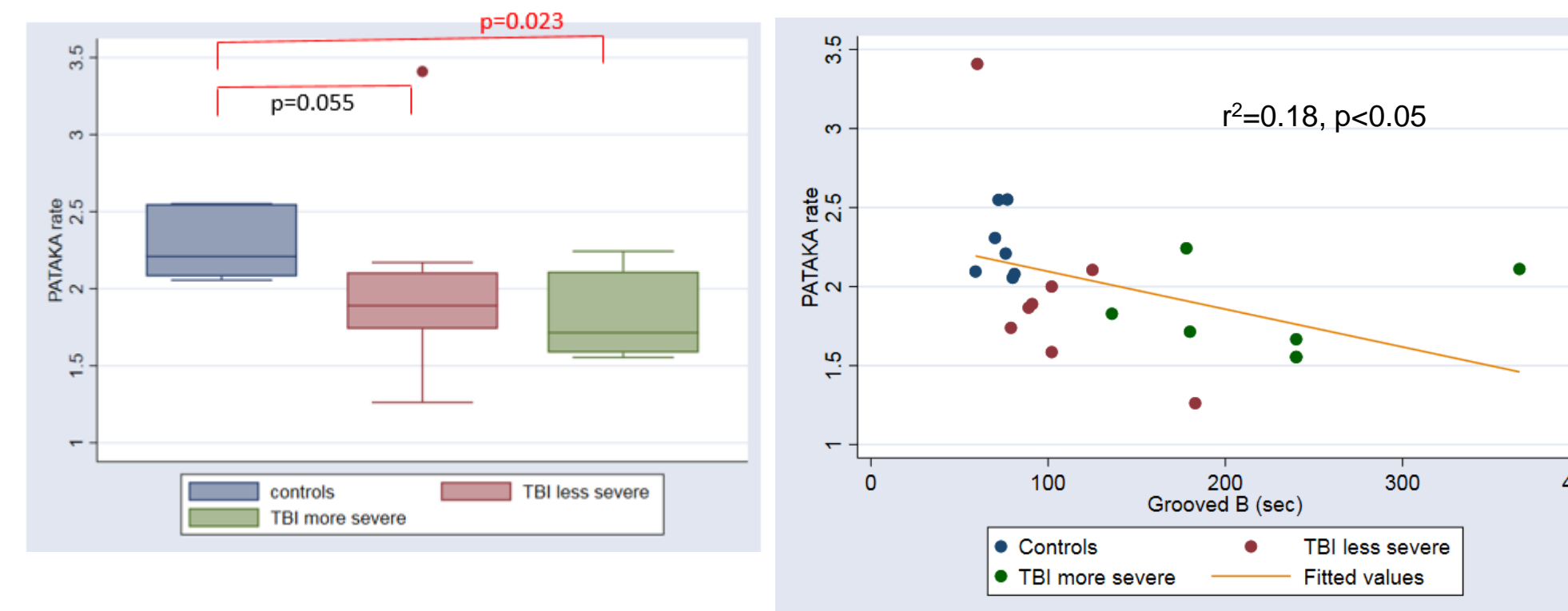
Tasks	Measures
Short sentence reading (4-5 words)	% Pause, articulation rate
Long sentence reading (10-14 words)	% Pause, articulation rate
Spontaneous speech (Cookie figure description)	% Pause, articulation rate
Recitation (Prayer)	% Pause, articulation rate
Alternating Motion Task (AMR) ("PATAKA")	Diadochokinetic (DDK) Rate
Sequential Motion Task (SMR) ("PA", "TA", "KA")	Diadochokinetic (DDK) Rate
Sustained phonation	Maximum phonation time
Metronomic counting	Maximum counting time



RESULTS

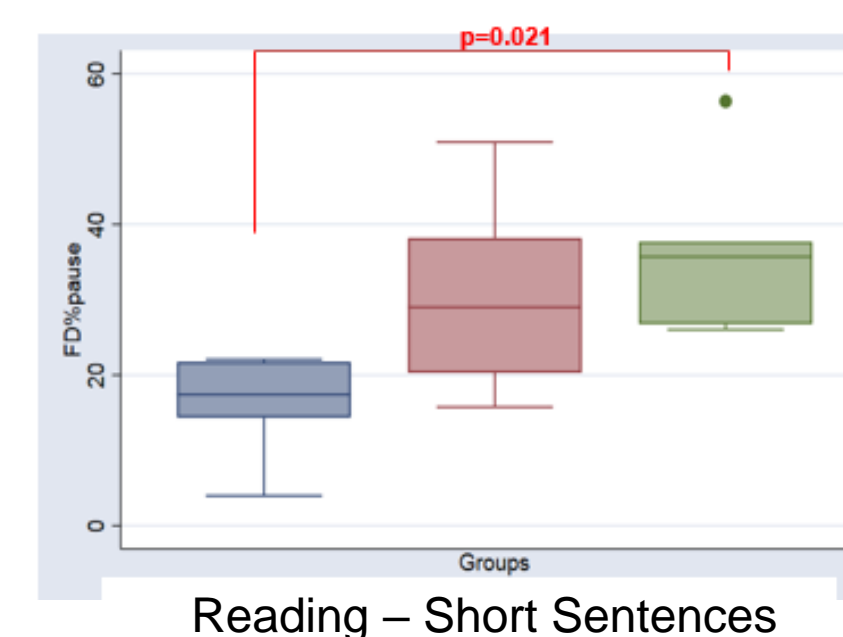
	controls (n=7)	TBI group1 (n=10)	TBI group2 (n=10)
	M ± SD [range]	M ± SD [range]	M ± SD [range]
Age (years)	36.85±7.55 [28-46]	32.8±14.22 [21-69]	45.4±15.76 [24-68]
Years of schooling	13.7±4.15 [8-17]	13±1.9 [10-16]	10.5±4 [4-15]
Duration of the illness (months)	NA	9.75±9.47 [1-26]	109.4±110.1[1-275]
Severity of the TBI	NA		
Mild		1	0
Moderate		2	3
Severe		6	6
HADS score	3.35±7.7 [2-13]	13.7±10.7 [3-30]	9.67±4.3 [4-17]

- For all analyses, we used Bonferroni correction and controlled for age and Hospital Anxiety and Depression Scale (HADS) scores.
- Group differences were shown for DDK PATAKA, Motor control of the non-dominant hand (Grooved B), and % pause (ps<0.05).
- No differences were found in articulation rate, DDK PA, TA, KA rate, or maximum phonation time (p>0.05).



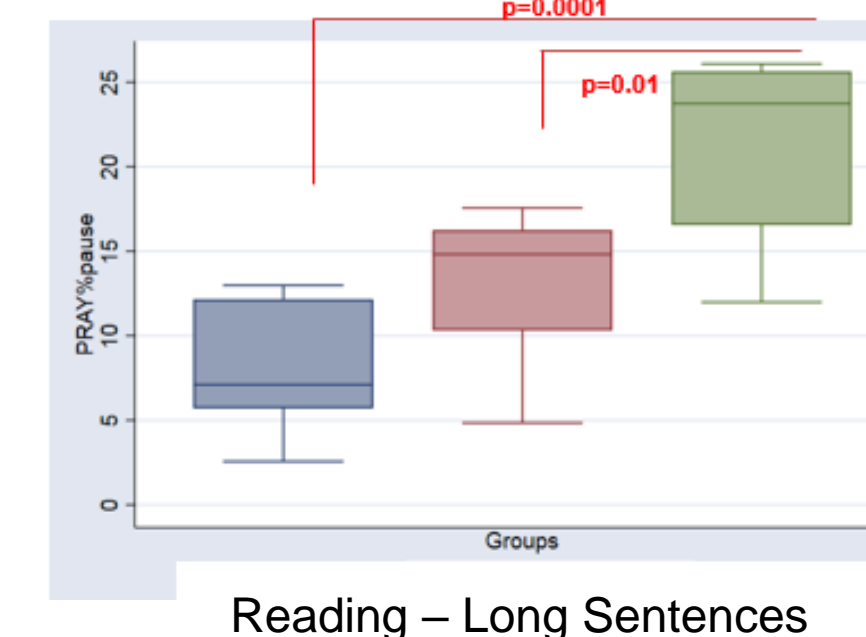
Differences in % Pause Across Tasks

Figure Description - Spontaneous Speech

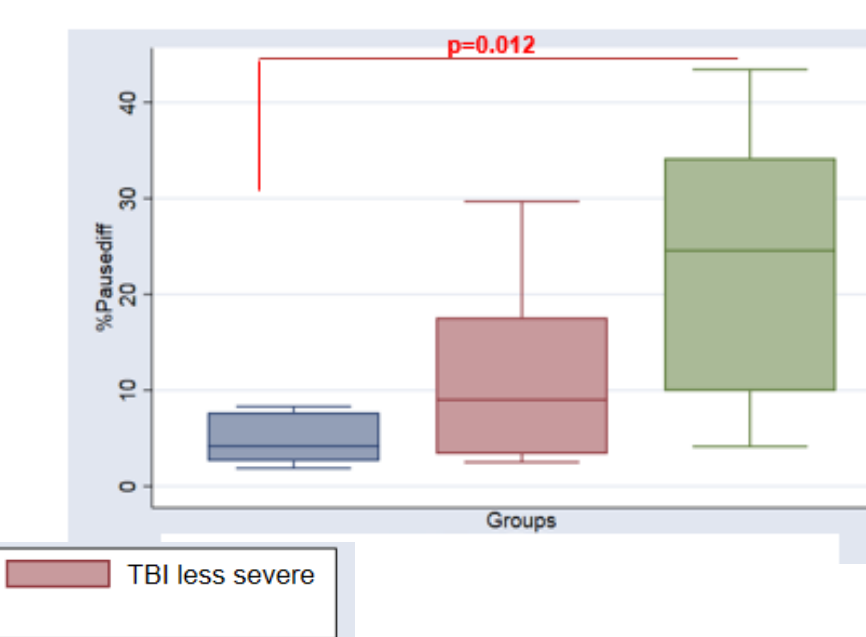
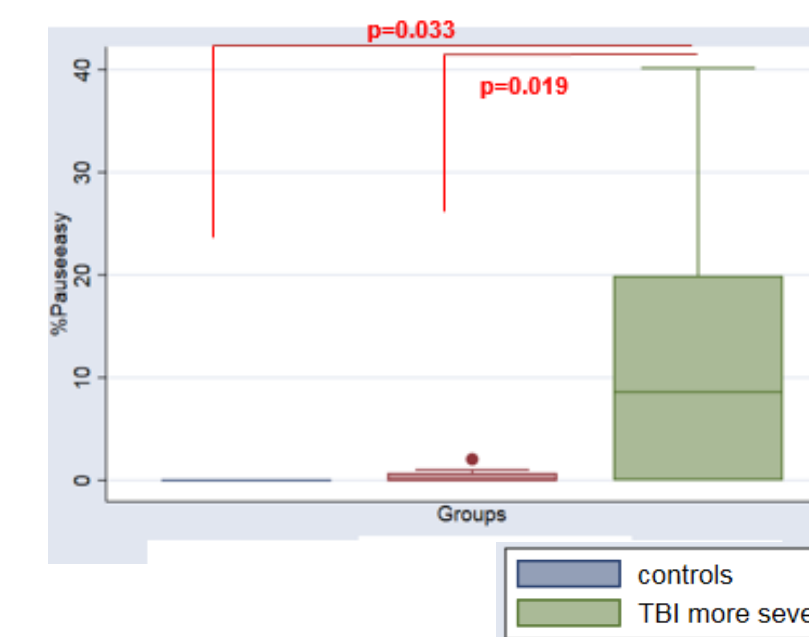


Reading - Short Sentences

Prayer - Recitation



Reading - Long Sentences



DISCUSSION

- It was the first study to analyze the cognitive role on pause behavior in different speech tasks in patients with TBI. Results show a distinctive pattern of % pause that varies with cognitive impairment and task demand.
- Patients with higher cognitive sequelae showed larger % pause than controls in all the speech tasks - spontaneous speech (figure description and recitation (pray), and reading (easy and difficult sentences). Across all groups, % pause was highest in spontaneous speech and lowest in short sentence reading.
- SMR DDK rate was declined in TBI, especially in the more cognitively severe sample. SMR DDK rate was associated to fine motor performance.
- The absence of differences in maximum counting, and maximum phonation time is indicative of preserved respiratory subsystem, in which cognition seems to play no role. Poor speech-motor outcomes in TBI, may be driven by cognitive impairment.

LIMITATIONS AND FUTURE DIRECTIONS

This is a preliminary study with small sample. More data have been collected to confirm the findings. The bulbar impairment in TBI and its association to cognition will be important to improve clinical care in this population.

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