http://doi.org/10.47626/1516-4446-2024-3847

Supplementary Material S1 Neuropsychological assessment

We used the Brazilian version of all tests, which have been specifically adapted for Portuguese-speaking populations.

The **Montreal Cognitive Assessment** is a cognitive screening tool designed to detect mild cognitive impairment and early signs of dementia. It is a brief test commonly used in clinical and research settings to evaluate multiple cognitive domains, including visuospatial/executive, attention, memory, language, visuospatial abilities, executive function, and orientation. The maximum Montreal Cognitive Assessment score is 30 points, with higher scores indicating better cognitive performance. This version ensures cultural relevance and accommodates linguistic differences that could affect cognitive testing. For individuals with ≤ 12 years of education, an additional point is added to the final score. This adjustment accounts for the potential influence of lower formal education on test performance, helping ensure that the Montreal Cognitive Assessment score more accurately reflects cognitive ability rather than educational attainment.

The **Mini-Mental State Examination** is another widely used cognitive screening tool that assesses functions such as orientation, recall, attention, calculation, language, and the ability to follow simple commands. It is useful in identifying cognitive impairments, particularly in assessing the severity of dementia. Like the Montreal Cognitive Assessment, lower scores on the Mini-Mental State Examination suggest cognitive decline, and its maximum score is 30.

The **Frontal Assessment Battery** is specifically designed to assess executive functions and behaviors associated with the frontal lobe. It includes tasks that evaluate similarities, verbal fluency, inhibitory control, motor programming, mental flexibility, and sensitivity to interference. Its maximum score is 18 points.

The **Digit Span** subtest of the Wechsler Adult Intelligence Scale evaluates aspects of memory and cognitive control.

- **Forward Span**: Participants repeat a sequence of numbers in the same order, primarily assessing verbal short-term memory (maximum 16 points)
- **Backward Span**: Participants repeat a sequence of numbers in reverse order, evaluating executive function, working memory, and cognitive control. The difficulty increases with the length of the sequence, and higher scores indicate stronger performance (maximum 14 points).

The **Trail Making Test** is divided into two parts, each assessing different aspects of cognitive function:

- **Part A**: After an example in which the participants connect numbered circles from 1 to 8 without lifting the pencil from the paper, they then connect numbered circles in ascending order (1 to 25), assessing processing speed, visual scanning, and psychomotor ability.
- **Part B**: Again without lifting the pencil from the paper, participants alternate between numbers (in ascending order) and letters (in alphabetical order) - 1-A, 2-B, 3-C, etc., assessing more complex executive functions such as cognitive flexibility, attention, and task-switching, and processing speed. Performance is measured in seconds for each part, with longer times reflecting lower efficiency in these cognitive areas.

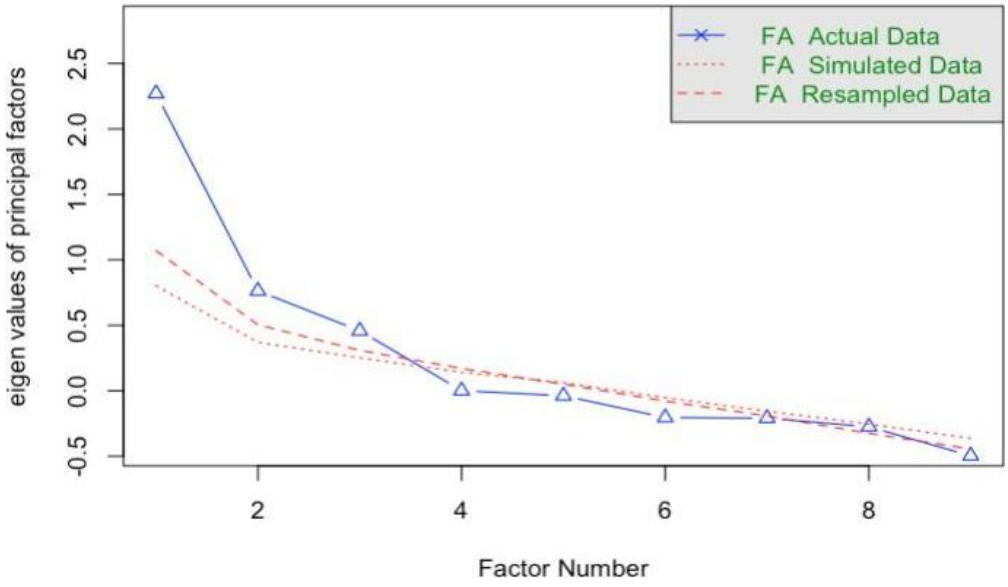
The **Digit Symbol-Coding** task, which is a subtest of the Wechsler Adult Intelligence Scale, measures processing speed, visual-motor coordination, and associative learning. Participants are required to quickly pair abstract symbols with corresponding numbers according to a provided key.
Performance is measured in terms of speed and accuracy: participants are given 90 seconds to complete as much coding as possible. A higher number of correct answers indicates better performance (a maximum of 120 symbols are to be coded, with 10 used as an example).

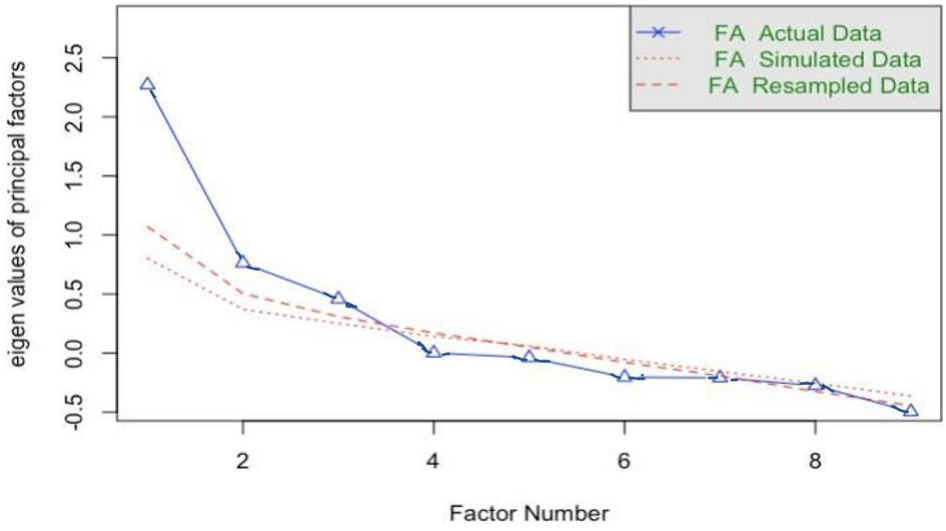
The **Stroop Color and Word Test** assesses cognitive control, specifically the ability to inhibit automatic response. Performance is measured in seconds for each part, with longer times indicating lower efficiency. Our Stroop version includes three tasks:

- **Color-naming**: Participants name the colors of printed blocks.
- **Word-reading**: Participants read color names printed in black ink.
- **Color-word**: Participants name the color of ink used to print the names of different color, which requires inhibiting their automatic response to read the word.

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Cognitive changes in post-stroke depression patients undergoing treatment with transcranial direct current stimulation: an exploratory, ancillary analysis of a randomized, sham-controlled clinical trial – Zanão T et al.

Supplementary Figure S1 Parallel analysis scree plot

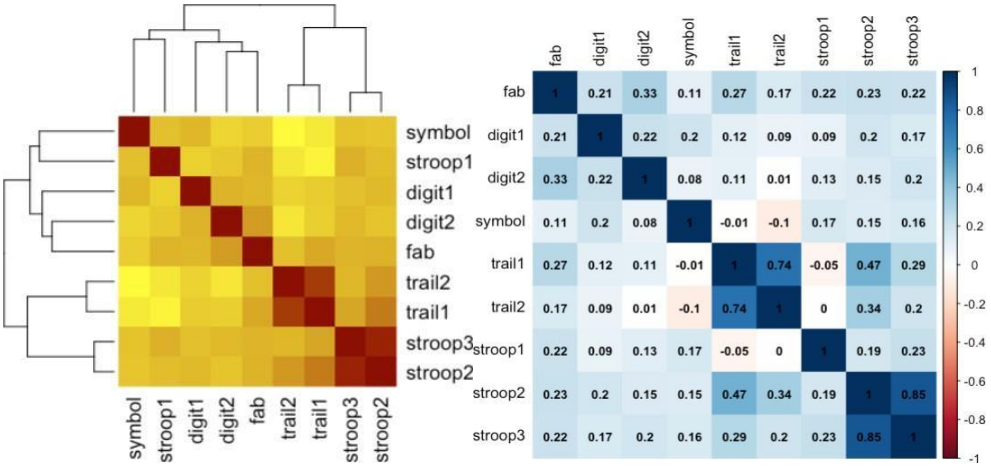




Parallel analysis compared the scree of factors by extracting factors until the real data's eigenvalues are less than the corresponding eigenvalues of a random data set of the same size. Parallel analysis suggested 3 factors. FA = factor analysis.

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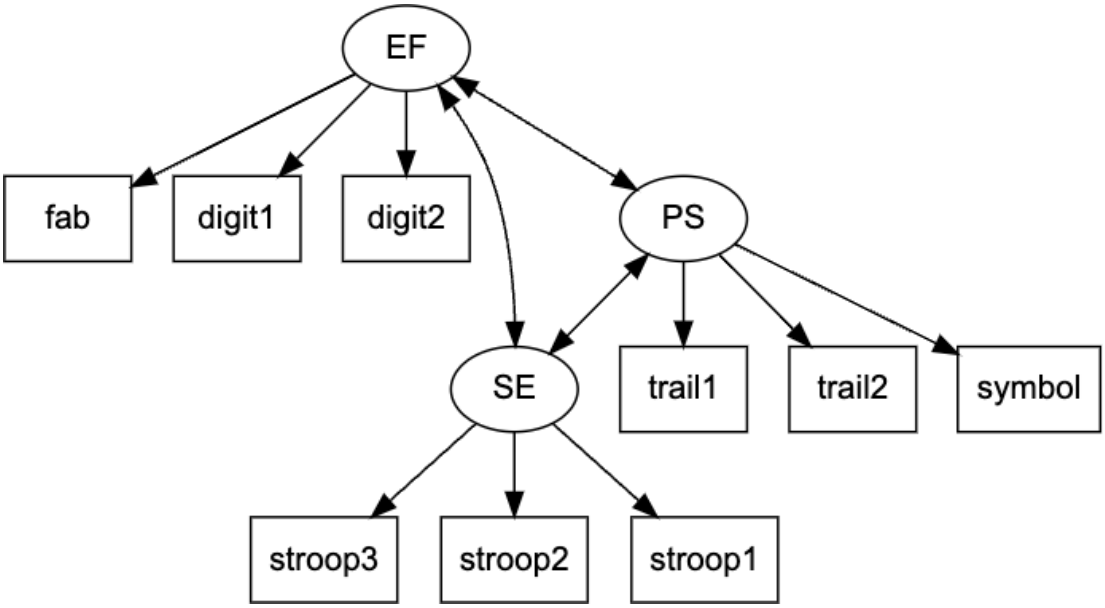
Supplementary Figure S2 Heatmap and plot for the correlation matrix between the tests included in the exploratory factor analysis

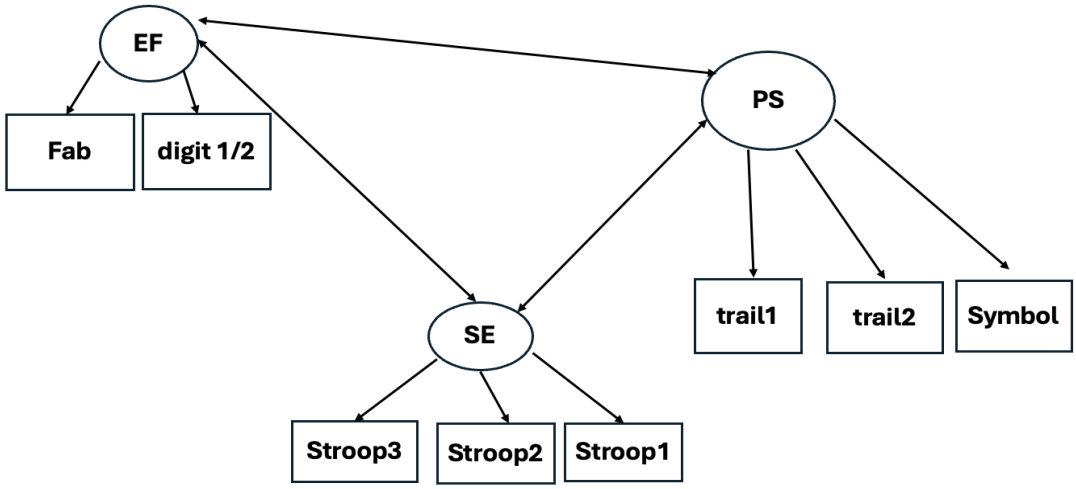


FAB = frontal assessment battery; Stroop 1 = Stroop color-naming; Stroop 2 = Stroop word-reading; Stroop 3 = Stroop color-word interference; Symbol = digit symbol coding task.

http://doi.org/10.47626/1516-4446-2024-3847

Supplementary Figure S3 Confirmatory factor analysis of neuropsychological tests for each cognitive domain





EF = executive function; FAB = frontal assessment battery; PS = processing speed; SE = Stroop effect; Stroop 1 = Stroop color-naming task; Stroop 2 = Stroop word-reading task; Stroop 3 = Stroop color-word interference task; Symbol = digit symbol coding task.

http://doi.org/10.47626/1516-4446-2024-3847

Supplementary Table S1 Fit indices for confirmatory factor analysis of cognitive domains

Fit index	Value
Chi-square	28.525
Degrees of freedom	24.000
p-value	0.239
CFI	0.962
AIC	504.268
BIC	536.931
RMSEA	0.073
SRMR	0.122

AIC = Akaike information criterion; BIC = Bayes information criterion; CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMR = standardized root mean residual.

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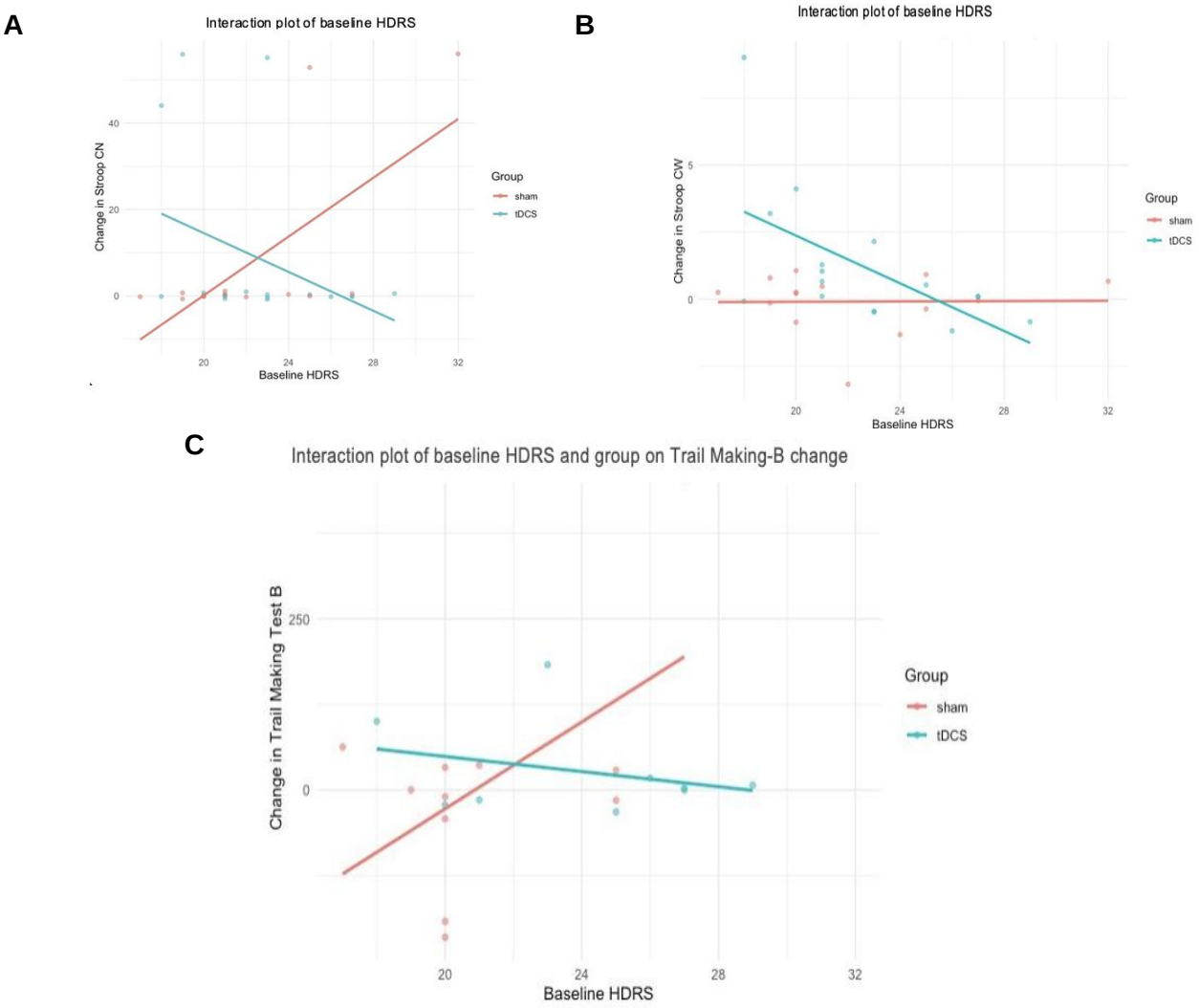
Supplementary Table S2 Unadjusted and adjusted changes in cognitive outcome for each test, Winsorized

Measure	sham-tDCS vs active-tDCS			
	Model	Difference	p-value	Effect size
MOCA	1	0.09 (0.16)	0.555	0.13(-0.44 to 0.71)
	2	0.08 (0.16)	0.639	0.11(0.71 to 0.68)
	3	0.08 (0.16)	0.644	0.11(-0.46 to 0.68)
MMSE	1	0.38 (0.20)	0.068	0.61(0.02 to 1.19)
	2	0.43 (0.21)	**0.049**	0.69 (0.09 to 1.27)
	3	0.43 (0.21)	**0.048**	0.69 (0.09 to 1.28)
FAB	1	-0.33 (0.18)	0.076	-0.56 (-1.14 to 0.028)
	2	-0.41 (0.18)	**0.027**	-0.69 (-1.28 to -0.10)
	3	-0.41 (0.18)	**0.028**	-0.69 (-1.28 to -0.10)
Digit span – forward	1	-0.17 (0.10)	0.110	-0.46 (-1.05 to 0.13)
	2	-0.17 (0.10)	0.102	-0.46 (-1.06 to 0.13)
	3	-0.17 (0.10)	0.099	-0.47 (-1.06 to 0.12)
Digit span – backward	1	0.05 (0.13)	0.735	0.13 (-0.46 to 0.71)
	2	-0.04 (0.13)	0.734	-0.12 (-0.71 to 0.46)
	3	-0.04 (0.13)	0.734	-0.12 (-0.71 to 0.46)
Digit symbol coding	1	-0.38 (0.25)	0.145	-0.56 (-1.23 to 0.12)
	2	-0.38 (0.28)	0.181	-0.56 (-1.24 to 0.12)
	3	-0.38 (0.28)	0.186	-0.56 (-1.23 to 0.12)
Trail making-A	1	-3.72 (3.44)	0.289	-0.22 (-0.84 to 0.40)
	2	-3.81 (3.67)	0.307	-0.23 (-0.85 to 0.40)
	3	-3.79 (3.67)	0.310	-0.23 (-0.85 to 0.40)
Trail making-B	1	9.04 (11.90)	0.456	-0.09 (-0.87 to 0.70)
	2	9.98 (12.35)	0.428	-0.09 (-0.87 to 0.70)
	3	10.05 (12.42)	0.428	-0.09 (-0.87 to 0.70)
Stroop CN	1	0.14 (1.22)	0.908	0.04 (-0.59 to 0.67)
	2	-0.15 (1.31)	0.910	-0.04 (-0.67 to 0.60)
	3	-0.11 (1.31)	0.931	-0.03 (-0.66 to 0.60)
Stroop WR	1	0.10 (0.11)	0.355	0.40 (-0.25 to 1.04)
	2	0.09 (0.11)	0.422	0.26 (-0.38 to 0.90)
	3	0.09 (0.11)	0.428	0.26 (-0.39 to 0.90)
Stroop CW	1	0.23 (0.15)	0.146	0.43 (-0.24 to 1.09)
	2	0.19 (0.16)	0.238	0.35 (-0.31 to 1.01)
	3	0.18 (0.15)	0.253	0.34 (-0.33 to 1.00)

CN = color-naming task; CW = color-word task; FAB = Frontal Assessment Battery; MMSE = Mini-Mental State Examination; MOCA = Montreal Cognitive Assessment; WR = word-reading task.

http://doi.org/10.47626/1516-4446-2024-3847

Supplementary Figure S4 Interaction plots of bidirectional associations with cognition



A) Stroop color-naming task. B) Stroop color-word interference task. C) Trail Making test-B. HDRS = 17-item Hamilton Depression Rating Scale; CN = color-naming; CW = color-word; tDCS = transcranial direct current stimulation.