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Macrostructural Aspects of Narrative Discourse in Left- and Right-Hemisphere Stroke in Brazilian Portuguese Speakers with Low Education

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Introduction

In Brazil, 70% of stroke survivors do not return to their professional activities and 50% needs support to accomplish their daily activities (Agência Brasil, 2020). Also, people with lower socioeconomic status (SES) - measured by the level of education, occupation and income - present lower post-stroke functional outcome (e.g., Avan et al., 2019). Until today, limited research has been conducted in post-stroke patients with low SES. To address this gap, discourse analysis offers a multidimensional ecological evaluation of language (e.g., Bryant et al., 2016). Traditionally, macrostructural language processes have been associated with the right hemisphere (RH) (Myers, 1999) and microstructural processes with the left hemisphere (LH) (Barker et al., 2017). Discourse can be analyzed by focusing on the microstructure of language (e.g., word classes) or the macrostructure (e.g., coherence), or even by using measures at the interface of micro- and macro-structural structures (e.g., lexical informativeness) (Armstrong, 2000).

The first aim of this study was to determine if patients who suffered from a stroke in the LH and in the RH differ from participants with no brain damage for macrostructural processes and lexical informativeness in narrative discourse production. The second aim was to explore the relationships between the discourse measures and cognitive and sociodemographic measures.

Methods

Thirty-one individuals who had an ischemic stroke in the LH (n=15) or RH (n=16) without major persistent language impairments and sixteen age- and education-matched controls were recruited. They were all native speakers of Brazilian Portuguese with low SES. Participants underwent a short neuropsychological assessment and produced an oral description of sequential stories: *The dog story* (Hübner et al., 2019), *The car accident*

(Joanette et al., 1995), and *The cat story* (Ulatowska et al., 1981). Each sample was transcribed and analyzed. Discourse measures included cohesion, global coherence, macropropositions, narrativity and lexical informativeness.

Results

Data distribution for all five variables are represented in Figure 1. A significant effect of group was found on the cohesion score ($p = .001$). Post-hoc comparisons showed that both the LH and RH groups had lower performances than controls. A significant group effect was also found on global coherence ($p = .005$) with post-hoc comparisons revealing that the RH group had a lower performance than the healthy controls. Similarly, a significant group effect on the macropropositions score was found ($p = .040$). Post-hoc comparisons showed that the RH group had a lower performance than controls.

Correlation analyses are reported in Table 1. Unsurprisingly, moderate to strong associations between the discourse measures themselves were found. Among all other variables, the strongest correlations with all five discourse variables were found with naming. For instance, moderate correlations have been found between naming and macropropositions (**τ**=.43, p<.001), narrativity (τ=.46, p<.001) and lexical informativeness (τ=.50, p<.001).

Conclusions

These results underline the importance of conducting cognitive and language studies in LH and RH post-stroke patients to better specify the characteristics of connected speech. Furthermore, this research contributes to increase our knowledge of discourse production in lower SES populations which represent the majority in developing countries.

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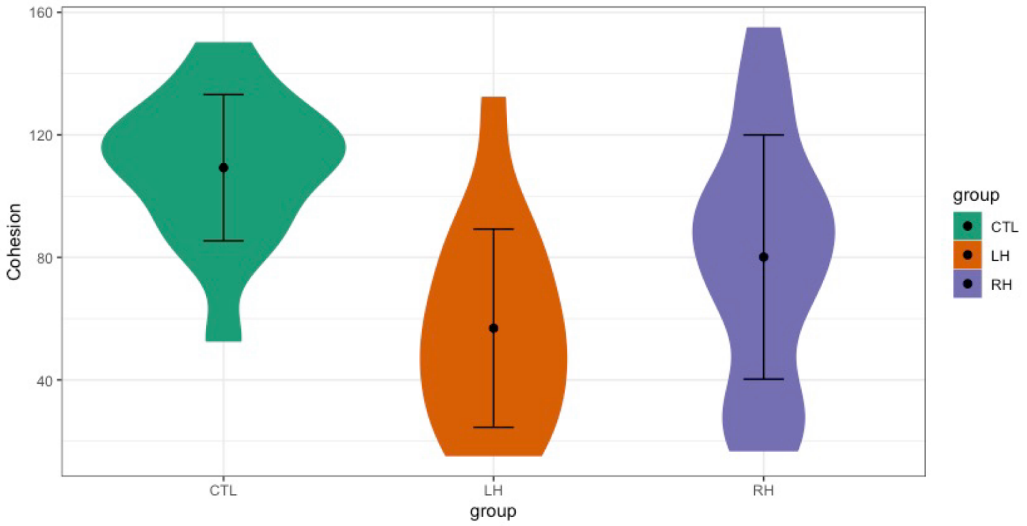
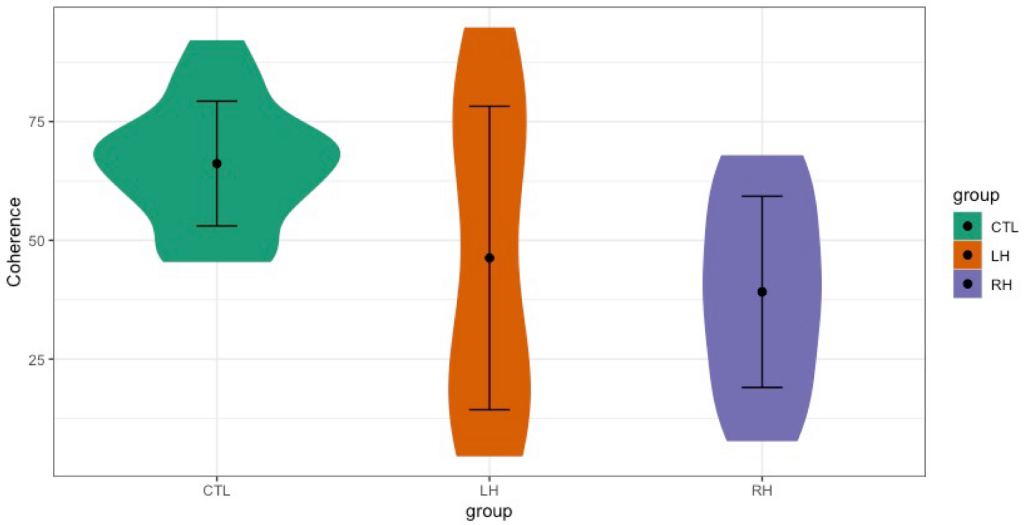
Figure 1. Violin plots of discourse variables' results for participants with a LH stroke (orange), participants with a RH stroke (purple) and age-matched healthy participants (green). Panel A. Distribution and mean cohesion scores for each group. Panel B. Distribution and mean coherence scores for each group. Panel C. Distribution and mean macroproposition scores for each group.

A)


160
120
80
40
Cohesion
CTL
LH
RH
group
group
CTL
LH
RH

B)


75
50
25
Coherence
CTL
LH
RH
group
group
CTL
LH
RH

C)

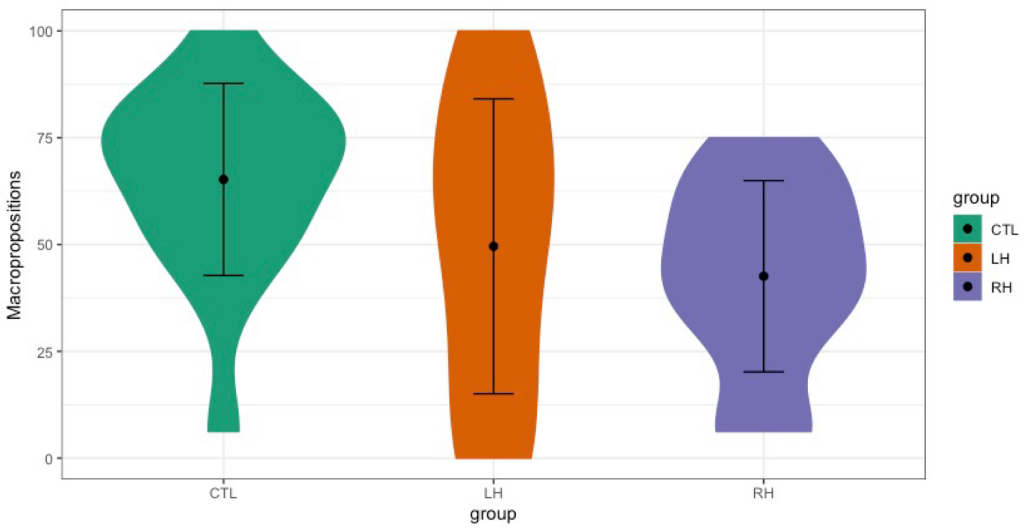

100
75
50
25
0
Macropropositions
CTL
LH
RH
group
group
CTL
LH
RH

Table 1. Correlations between discursive, sociodemographic, and cognitive variables.

Variables	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
1. Cohesion	.52***	.45***	.55***	.43§***	-.11§	.17	.27§	.33**	.35***	.42***	.34**	.27*	.33**	.33***
2. Coherence		.65***	.75***	.54***	-.02	.06	.21*	.27*	.27*	.27*	.39***	.30**	.37***	.27*
3. Macropropositions			.68***	.46***	-.06	.06	.15	.30**	.36***	.24*	.43***	.32**	.26*	.31**
4. Narrativity				.64***	-.08	.11	.23*	.42***	.38***	.31**	.46***	.34**	.41***	.35***
5. Lexical informativeness					-.26§	.25*	.25§	.32**	.32**	.36***	.50***	.43***	.26**	.36***
6. Age						-.43***	-.11§	-.15	-.03	-.15	-.12	-.08	-.14	-.34**†
7. Education							.24*	.19	.16	.22*	.13	.16	.27*	.27*
8. Socioeconomic status (SES)								.07	.17	.05	.15	.26*	.22*	.27*
9. Reading habits									.35**	.23*	.29**	.19	.15	.24*
10. Writing habits										.28*	.31**	.26*	.10	.21
11. MMSE											.46***	.31**	.19	.42***
12. Naming												.32***	.15	.35**
13. Verbal fluency													.23*	.43***
14. Digitspan														.25*
15. Wordspan														

*** p< .001; ** p<.005; * p<.05, but did not survive the Bonferonni correction

§ parametric tests have been used because both variables showed a normal distribution