Multilevel Narrative Discourse Analysis in Older Adults With and Without Mild Cognitive Impairment

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Introduction

- Persons with mild cognitive impairment (pwMCI) may experience language deficits that affect their communicative participation, and subsequently their quality of life.[1]
- Discourse analysis (i.e., connected speech and language) has emerged as a powerful approach for understanding differences in language between pwMCI and cognitively unimpaired adults (CU).[2]
- The macrolinguistic qualities (e.g., cohesion, sequencing) of discourse may be particularly valuable for understanding language differences in pwMCI because they likely rely on multiple cognitive processes.[3-6]
- Current studies often only assess a single isolated macrolinguistic measure, which could lead to an incomplete understanding of macrolinguistic discourse production profiles in pwMCI.[7]

This study aims to quantify macrolinguistic language abilities of pwMCI compared to CU adults using a <u>multilevel</u> analytic approach of story narrative discourse.

Analysis of Narrative Discourse

- Transcripts of a storytelling task, the retelling of Cinderella,[8] were retrieved for 56 individuals from the Delaware Corpus of DementiaBank.[9]
- Participants were classified as MCI (n = 31) or CU (n = 25) based on NIA-AA criteria.[10]
- A multilevel macrolinguistic protocol **Main Concept, Sequencing, and Story Grammar (MSSG)** was applied through hand coding to each transcript to quantify six different macrolinguistic discourse variables (Table 1).[11,12]
- Analysis were conducted using a single coding sheet for each participant and scores were then consolidated for analysis.[12]

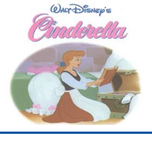


Figure 1. Story of Cinderella used for storytelling task

Table 1. MSSG Variables

Variable	Description and Score Range
Main Concept	Key information regularly produced by healthy controls (range: 0 - 102)
Sequencing	Logical ordering of main concepts (range: 0 - 102)
Main Concept (MC) + Sequencing	Sum of main concepts and sequencing scores (range: 0 - 204)
Essential Story Grammar	Main concepts assigned to one of 6 possible story grammar components (range: 0 - 34)
Total Episodic Components	Production of "initiation event," an "attempt" and a "direct consequence" (range: 0 - 15)
Episodic Complexity	Number of story episodes with greater than or equal to two essential story grammar components (range: 0 - 5)

Results

- Participants (n = 56) were between 60 - 91 years old (M = 70.34, SD = 7.5) and were predominantly White (91%) and highly educated (85% college degree)
- Non-parametric tests (Mood's median tests) yielded statistically significant between-group differences for each MSSG variable ($p < .05$).
- Effect sizes (φ) were medium, ranging from .31 - .43

Table 2. Descriptive Statistics MSSG variable

	MCI		CU	
	Median	**IQR**	**Median**	**IQR**
Main Concepts	51	28 - 69	80	65 - 84
Sequencing	54	29 - 69	79	66 - 84
MC + Sequencing	105	56 - 138	159	131 - 169
Story Grammar	18	10 - 24	27	22 - 29
Episodic Components	10	6 - 12	13	12 - 14
Episodic Complexity	4	2 - 5	5	4 - 5

All macrolinguistic variables were statistically significant between pwMCI and CU adult groups

Figure 2. Main Concept, Sequencing and MC + Sequencing

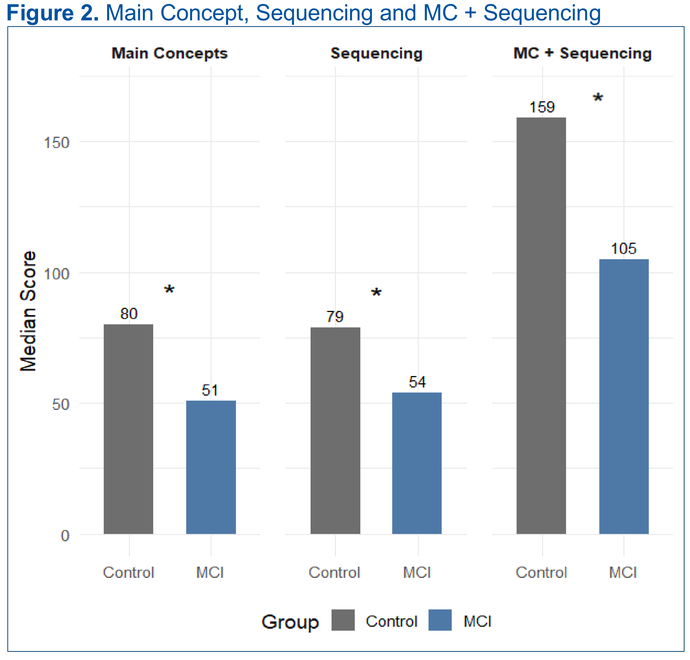
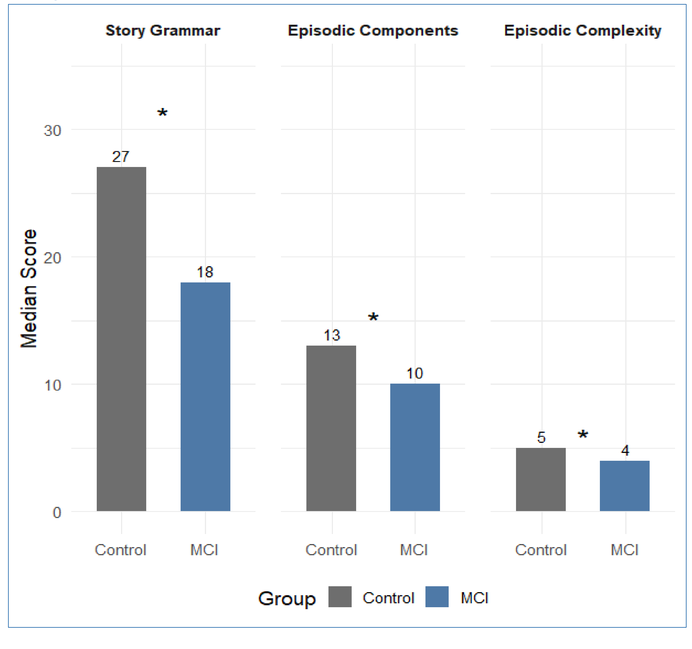


Figure 3. Story Grammar, Episodic Complexity and Episodic Components



Discussion

- pwMCI scored significantly lower on macrolinguistic variables compared to CU adults, with medium effect sizes.
- Compared to previous literature, median values for each MSSG variable produced by pwMCI reflect higher values than individuals with aphasia (aphasia < MCI < control).[11]
- These findings help address the gap characterizing multilevel macrolinguistic discourse production in pwMCI.

<u>Clinical Implications</u>

The MSSG analytic protocol is a clinician-friendly tool that may help characterize language in clients with MCI.

Clinicians can identify strengths and weaknesses in narrative discourse production which may help plan goals or treatment approaches.

Refer to Richardson et al., 2021 for a list of needed tools to carry out MSSG analyses

References

1. Yorkston, K. M., Bourgeois, M. S., & Baylor, C. R. (2010). Communication and aging. Physical Medicine and Rehabilitation Clinics, 21(2), 309-319. https://doi.org/10.1016/j.pmr.2009.12.011
2. Mueller, K. D., Koscik, R. L., Hermann, B. P., Johnson, S. C., & Turkstra, L. S. (2018). Declines in connected language are associated with very early mild cognitive impairment: Results from the Wisconsin Registry for Alzheimer's Prevention. Frontiers in Aging Neuroscience, 9, 437. https://doi.org/10.3389/fnagi.2017.00437
3. Coelho, C. A., Shadden, B. B., & Cherney, L. R. (2023). Discourse analysis in adults with and without communication disorders: An overview. In C. A. Coelho, B. B. Shadden, & L. R. Cherney (Eds.), Discourse analysis in adults with and without communication disorders. Plural Publishing.
4. Cummings, L. (2020). Language in dementia. Cambridge University Press. https://doi.org/10.1017/9781108758956
5. Marini, A., & Andreetta, S. (2016). Age-related effects on language production: A combined psycholinguistic and neurolinguistic perspective. In H. H. Wright (Ed.), Cognition, language, and aging (pp. 54–79). John Benjamins Publishing Company.
6. Wingfield, A., & Stine-Morrow, E. A. L. (2000). Language and speech. In F. I. M. Craik & T. A. Salthouse (Eds.), Handbook of aging and cognition (2nd ed.; pp. 359–416). Mahwah, NJ: Lawrence Erlbaum Associates.
7. Harris, J. L., Kiran, S., Marquardt, T. P., & Fleming, V. B. (2008). Communication wellness check-up©: Age-related changes in communicative abilities. *Aphasiology, 22*(7-8), 813–825. https://doi.org/10.1080/02687030701818034
8. Grimes, N. 2005. Walt Disney's Cinderella, New York: Random House.
9. Lanzi, A. M., Saylor, A. K., Fromm, D., Liu, H., MacWhinney, B., & Cohen, M. L. (2023). DementiaBank: Theoretical rationale, protocol, and illustrative analyses. *American Journal of Speech-Language Pathology, 32*(2), 426–438. https://doi.org/10.1044/2022_AJSLP-22-00281
10. Jack Jr, C. R., Bennett, D. A., Blennow, K., Carrillo, M. C., Dunn, B., Haeberlein, S. B., ... & Silverberg, N. (2018). NIA-AA research framework: toward a biological definition of Alzheimer's disease. Alzheimer's & Dementia, 14(4), 535-562. https://doi.org/ : 10.1016/j.jalz.2018.02.018
11. Richardson, J. D., Dalton, S. G., Greenslade, K. J., Jacks, A., Haley, K. L., & Adams, J. (2021). Main concept, sequencing, and story grammar analyses of Cinderella narratives in a large sample of persons with aphasia. *Brain Sciences*, *11*(1), 110. https://doi.org/10.3390/brainsci11010110
12. Greenslade, K. J., Stuart, J. E., Richardson, J. D., Dalton, S. G., & Ramage, A. E. (2020). Macrostructural analyses of Cinderella narratives in a large nonclinical sample. American Journal of Speech-Language Pathology, 29(4), 1923-1936. https://doi.org/10.1044/2020_AJSLP-19-00151

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NIH National Institute on Aging