

Background

- Mild Cognitive Impairment (MCI) affects approximately 22% adults over 65 and is considered a prodromal stage of dementia (Alzheimer's Association, 2024).
- A hallmark symptom is word-retrieval difficulty, which stems from semantic memory and executive function decline (Macoir et al., 2024; Ahmed et al., 2013).
- Verbs are informative markers demanding both the access to lexical meaning and integration into syntactic structure (Williams et al., 2021).
- Verbs are categorized based on its **semantic weight** (Gordon, 2008)
 - Light verbs (e.g., do, make) are semantically general, highly frequent, and highly interconnected with other concepts.
 - Heavy verbs (e.g., whisper, assemble) carry richer lexical meaning and conveys clear meaning intrinsically.
- Vulnerability patterns are predicted by two theories of word-retrieval deficit: **Inhibition Deficit Hypothesis (IDH)** predicts that impaired inhibition interrupts suppressing many competing alternatives (Zacks & Hasher, 1994),
 - suggesting that MCI speakers may have difficulty producing light verbs. • Transmission Deficit Hypothesis (TDH) predicts that weakened
 - semantic connections reduce activation for less-frequent items (MacKay & Burke, 1990), suggesting that heavy verbs may be difficult to produce.
- Previous dementia studies found reduced heavy verb use and compensatory reliance on light verbs (Kim & Thompson, 2004; Kintz & Wright, 2022). However, studies relied on proportions out of total words or verbs, which can display a relative outcome instead of actual reduction, and relied on one type of discourse, limiting generalizability across different discourse contexts.

Aims

- The aims of the current study are as follows
 - Aim 1: To determine whether individuals with MCI differ from healthy older adults (HOA) in light and heavy verb production. • Aim 2: To identify whether the observed differences in verb production
- vary according to different types of discourse tasks. • We hypothesized that both light and heavy verb use will be reduced in MCI due to impaired semantic memory and executive functions, according to the IDH and TDH predictions.
- Also, different light and heavy verb production patterns will appear according to different discourse contexts, due to unique characteristics of each task.

Method

- **Participants:** 27 individuals with MCI, and 24 (HOA) matched with age, gender, and education were collected via Delaware Corpus in DementiaBank (Lanzi et al., 2023; see Table 1).
- **Tasks:** To account for multiple discourse contexts, 5 different tasks were tested, all followed by a standardized protocol.
 - **Picture description:** The Cookie Theft scene
 - **Storytelling**: Cat Rescue (single scene), The Norman Rockwell picture of Coming & Going (sequential scene), and the Cinderella story
 - **Procedural Narrative**: Making a peanut butter and jelly sandwich.
- Analysis:
 - CLAN (MacWhinney, 2014) was used to obtain the raw frequency of light or heavy verbs, heavy to light verbs ratio, and number of light or heavy verbs per utterance from each discourse tasks.
 - Using R Statistical Software (v4.4.1), linear and generalized linear mixed models were conducted, including random effects for participants and fixed effects for the two groups and 5 discourse tasks. Type 3 Wald chi square tests were used to check overall fixed effects.

Discourse Task Effects on Verb Production in Mild Cognitive Impairment

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Table 1. Participant demographics

Variable -	MCI (N=27)		HOA (N=24)		b
	Μ	SD	Μ	SD	- P
Age	71.19	8.246	68.96	6.477	.293
Gender	Male=5, F	emale=22	Male=3, F	emale=21	.555
Education	6.59	1.600	7.33	1.711	.117
BNT-SF	14.07	0.917	14.63	0.647	.018*
MoCA	24.30	2.658	27.58	1.586	< .001***

Note. P-values indicate the results of chi-square test for gender and independent samples t-test for all other variables. *p<.05, ***p<.001, HOA=healthy older adults, MCI=mild cognitive impairment, SD=standard deviation, BNT-SF=Boston Naming Test-Short Form, MoCA=Montreal Cognitive Assessment

Results

- Overall language production across discourse tasks revealed that the MCI group produced significantly fewer total words (p = .027), nouns (p = .011), and verbs (p = .041) compared to HOA, with no significant differences in the number of utterances (p = .245).
- Group and task effect results of each verb metrics are as follows (see Table 2, Figure 1-3):

Table 2. Mixed-effects model and Type 3 Wald chi square test results of light and heavy verb metrics

Metric	Group Effect	Task Effect	Interaction	
Number of	No statistical difference	Significant	None	
light verbs	$(\beta = 0.10, SE = 0.06, z = 1.73, p = .084)$	$(\chi^2 = 409.19, p < .001)$	INOTIE	
Number of	MCI < HOA **	Significant	Nono	
heavy verbs	$(\beta = 0.12, SE = 0.05, z = 2.31, p = .002)$	$(\chi^2 = 393.81, p < .001)$	INONE	
Heavy to light	No statistical difference	Significant	None	
verb ratio	$(\beta = -0.04, SE = 0.06, t_{49} = -0.71, p = .483)$	$(\chi^2 = 65.22, p < .001)$	INOTIE	
Light verbs	MCI < HOA *	Significant	Nono	
per utterances	$(\chi^2 = 4.03, p = .045)$	$(\chi^2 = 31.24, p < .001)$	INOTE	
Heavy verbs	MCI < HOA **	Significant	Nono	
per utterances	$(\beta = 0.06, SE = 0.03, t_{49} = 2.22, p = .003)$	$(\chi^2 = 136.49, p < .001)$	inone	

Note. **p<.01, ***p<.001, HOA=healthy older adults, MCI=mild cognitive impairment

- studies (Kim & Thompson, 2004; Kintz & Wright, 2022).

 - MCI (Faroqi-Shah & Milman, 2018).
- - facilitating content-specific verbs.

 - identifying language deficits in MCI.
- driving verb-semantic declines

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Conclusion

Across discourse contexts, the MCI group produced significantly fewer heavy verbs than HOA, which suggests that early cognitive decline disproportionately affects retrieval of semantically specific verbs, aligning with previous dementia

When accounting for overall utterance production, both light and heavy verb usage per utterance were significantly lower in the MCI group.

• Suggests an avoidance of using verbs overall, or a reduction of light verb production due to executive function and syntactic demands, aligning with our initial predictions based on the IDH (Zacks & Hasher, 1994).

Usage of light verbs in connected speech requires specifying additional linguistic context (e.g., objects or complements), and their high interconnectedness may further burden the inhibitory control impaired in

Discourse context significantly influenced verb production across both groups.

• The Cookie Theft picture description task elicited the highest use of heavy verbs, likely due to visual scaffolding reducing episodic memory demands and

• The procedural narrative task elicited the fewest heavy verbs, likely due to its formulaic structure, promoting repetitive, generic verbs.

• These findings highlight the importance of diverse discourse assessments for

Future research should incorporate explicit syntactic measures, executive function skills, and tightly matched discourse probe designs to isolate mechanisms

References

Acknowledgement: We sincerely thank all participants from Dementiabank and collaborators for their contributions to this research.