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Speech planning in question-response interactions from a clinical perspective

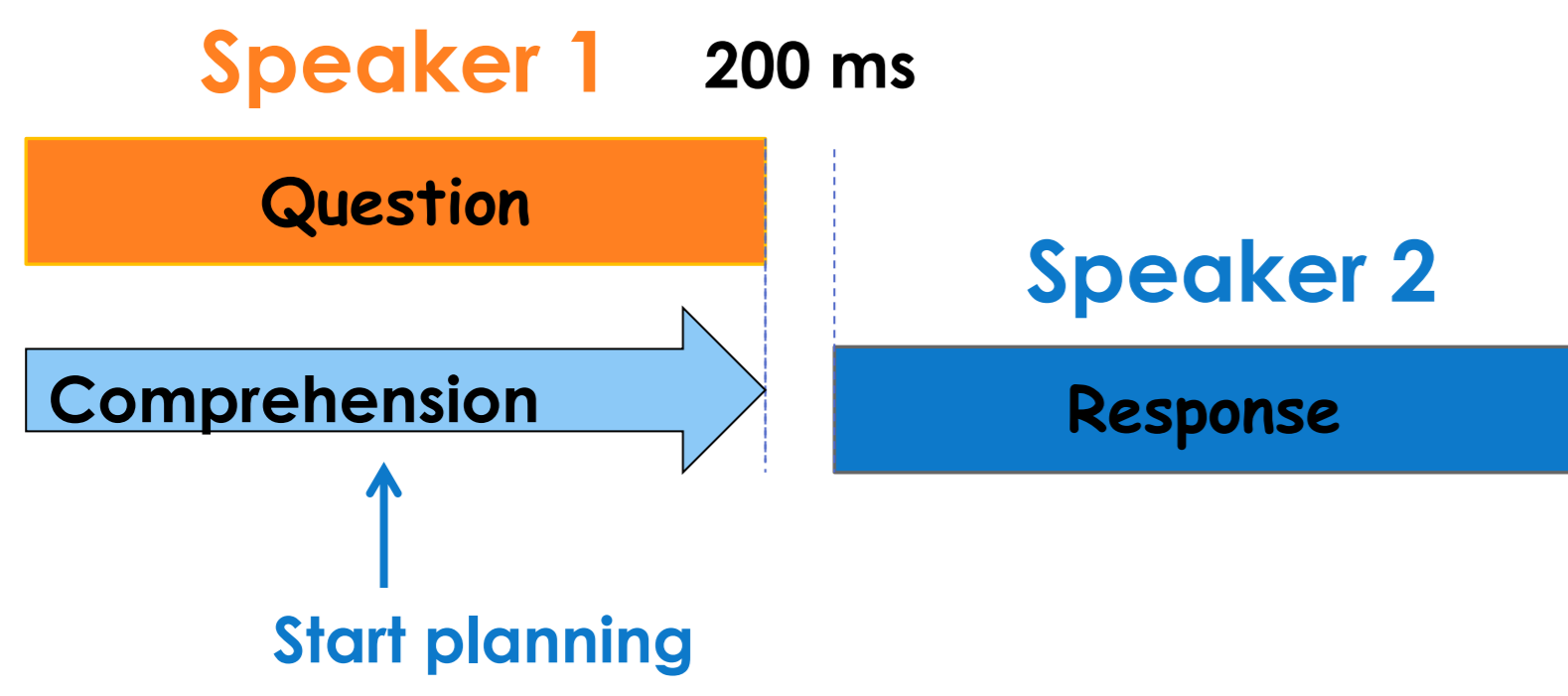
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Introduction

1. Speech planning in interaction



- Overlap between question comprehension and response planning [1, 2]
- Comprehension and planning strategies vary across individuals, depending on their cognitive abilities (e.g., speed of processing, [3, 4, 5])

2. Multiple Sclerosis (MS)

- Demyelinating lesions in the brain and spinal cord
- Cognitive impairment up to 65% patients with MS: deficits in planning and decision making, working memory, attention and speed of processing [6]

Research questions

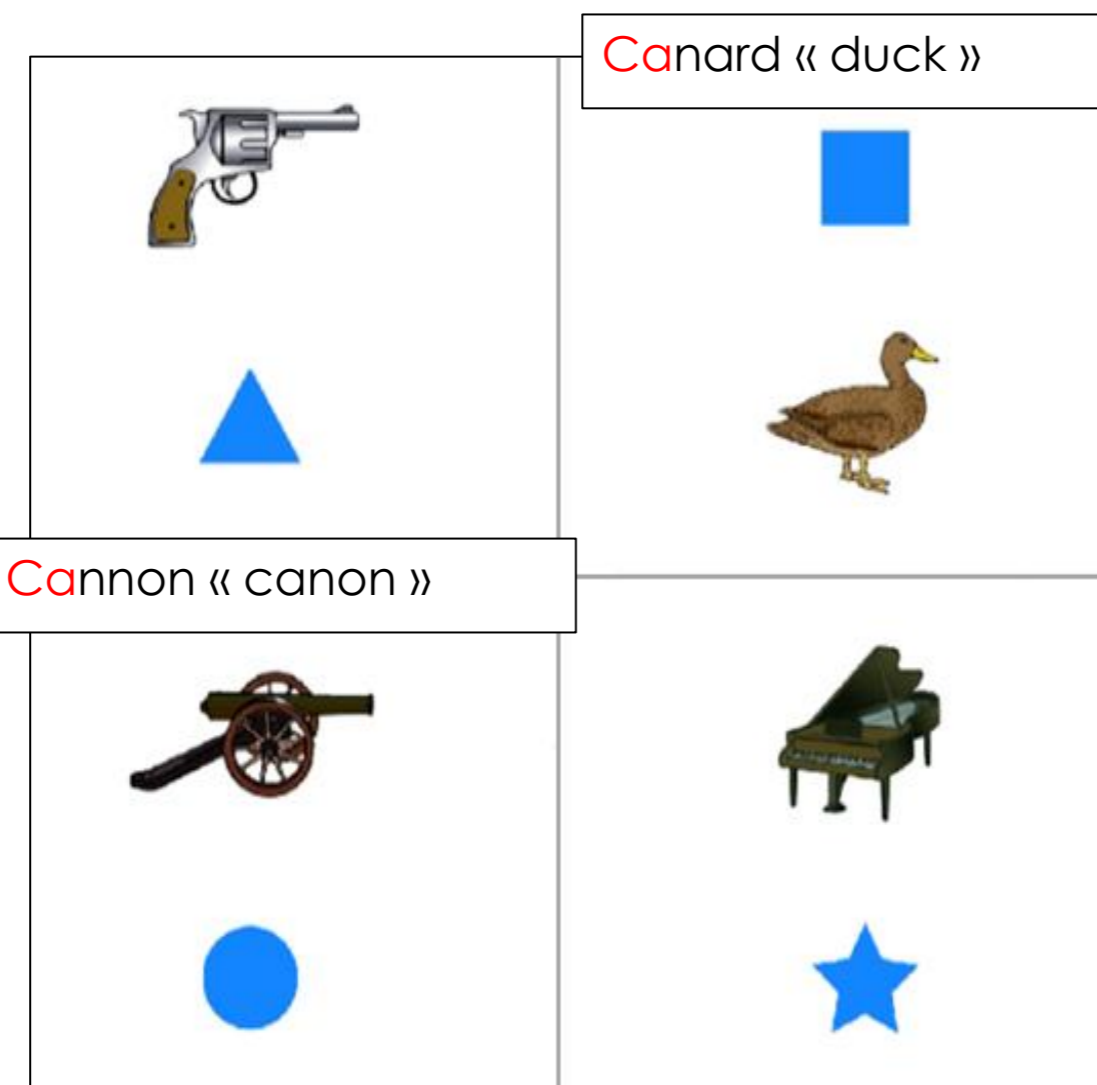
- Do cognitive impairment affect planning in interaction?
- Which is the role of early prosodic information in question comprehension and response planning?

Procedure

- Question-response game: Participants orally replied to 24 trials consisting of a sequence of two pre-recorded questions (Q1 and Q2).
- Monitoring eye movements to lexical competitors during Q2 comprehension + latencies of speech responses [7]

Questions:

- 24 pairs of imageable nouns with similar phonetic onset, matched for lexical frequency (= 33.5) and number of syllables (=2)
- Standardized pictures [3]



Q1: Est-ce que le canon/canard est au dessus de l'étoile?
 Q2: Et est-ce que le canard est en dessous du carré?
 (« is the duck above the star? And is the cannon/duck below the circle? »)

	Accented	Deaccented
Anaphoric	canard -> C anard (incongruent)	canard -> c anard (congruent)
Non-anaphoric	canon -> C anard (congruent)	canon -> c anard (incongruent)

Response to Q2:

Non le canard est en dessous du carré

gap pause
 (« No, the duck is below the square »)

Statistics:

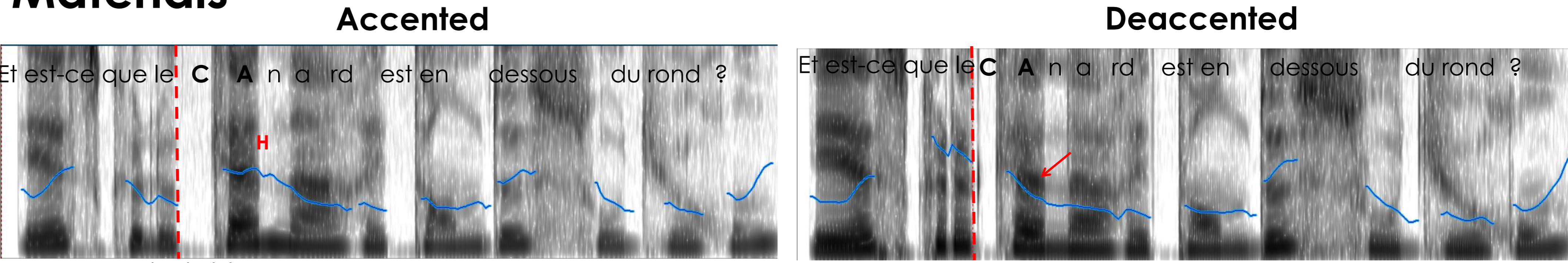
- Cluster-based permutation analysis
- Linear mixed models

Hypotheses

- If prosody is used for reference resolution [7], accentuation on the ambiguous syllable should facilitate a non-anaphoric interpretation
 - If accentuation is not reliable in French to infer the contrastive status of a word [8], listeners should use more segmental information
2. Given that planning a response is cognitively more demanding than understanding a question, differences between MS and HC will emerge more strongly on speech latencies

Materials

Q2: « And is the duck above the circle? »



• Emphatic initial accent [9]

Participants

Demographics	HC n = 35	MS n = 35
Age	34.1 (9.3)	34.6 (8.7)
Gender	29 F + 6 M	29 F + 6 M
Disease Duration		4.94 (3.5)
EDSS		1.38 (0.99)

- 35 patients of early stages of relapsing-remitting Multiple Sclerosis (MS) + 35 Healthy Controls (HC)
- **Inclusion criteria** : no relapses at the time of the study; no optic neuritis; optimal vision; no articulation troubles [10]

Neuropsychological tests	HC	MS	p
PASAT	46 (9.2)	41 (11.6)	0.048
SDMT	55.2 (5.7)	52.4 (8.9)	0.003
S-fluency	32.1 (6.7)	35.6 (7.4)	0.043
P-Fluency	22.8 (7.1)	26.7 (5.09)	0.011
LN-Seq	6.6 (1.3)	6.1 (1.1)	0.059

- Speed of processing
- Verbal fluency
- Working memory

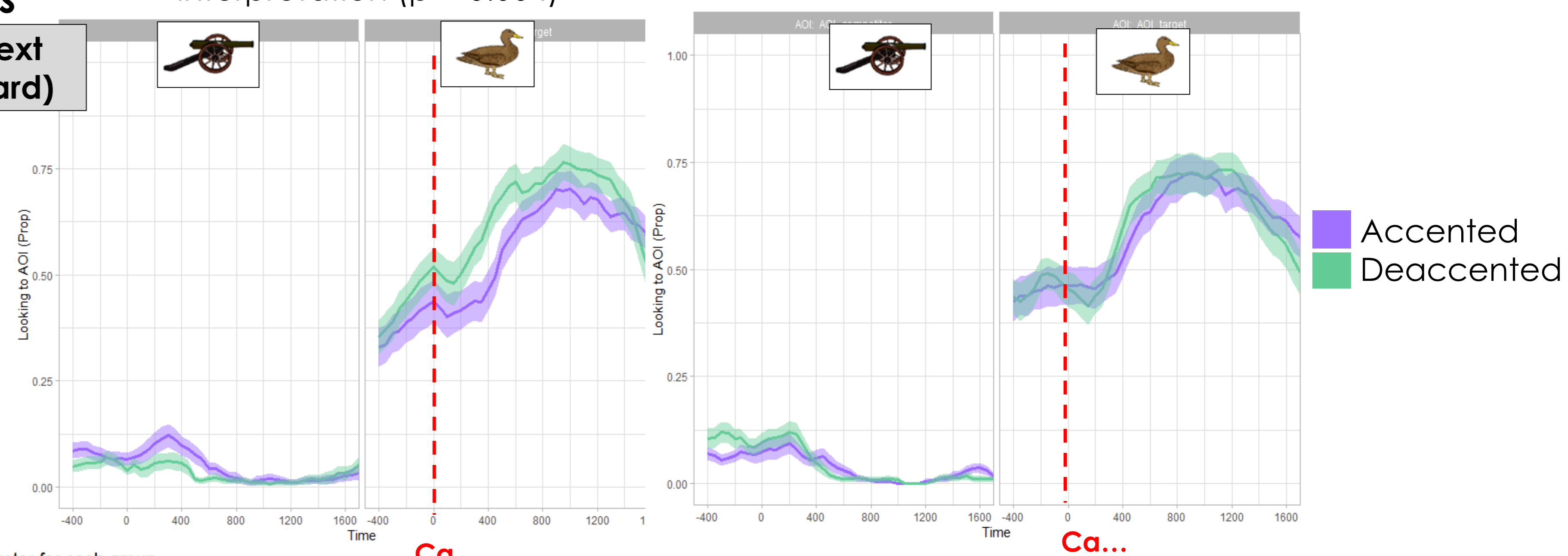
Results

Fixation Proportions

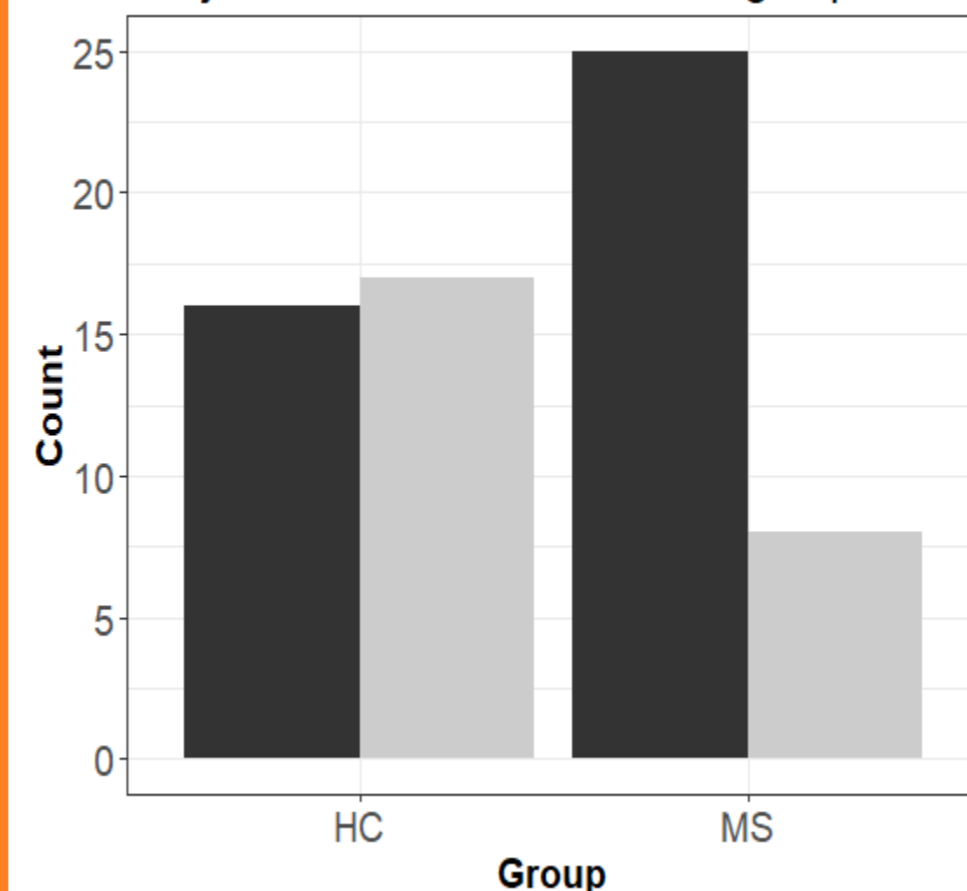
Anaphoric context (canard -> canard)

MS: Accent leads to non-anaphoric interpretation (p = 0.004)

HC: No effects of accentuation

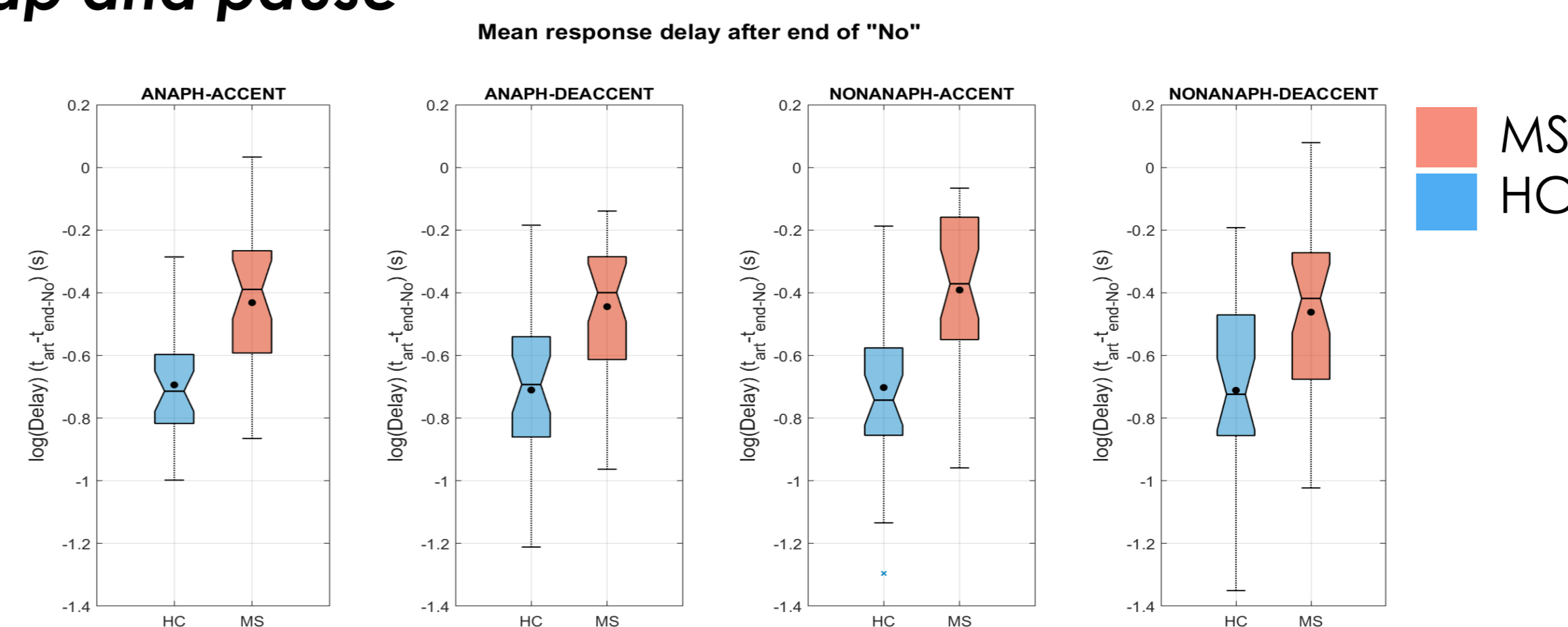


Subject count in cluster for each group



- For both MS and HC: PROSODY- subgroup relies on segmental information; PROSODY+ subgroup relies on both prosody and segments
- MS group relies more on prosody than HC group
- For HC only, lower speed of processing scores for the PROSODY+ subgroups (PASAT : t=3.8, p < 0.001)

Gap and pause



No differences in gaps but longer pauses for MS (456 ms) than for HC (273 ms) (t=-5.11, p<.01)

Discussion

Question comprehension ...

- MS patients are more sensitive than HC to coherence between accentuation and discourse status: Rapid integration of early prosodic information
- HC are fast (as reflected in the sharp rise of fixation proportions) even if they disregard prosody
- Subtle differences when looking at patterns of performance according to the use of prosodic and segmental information
- The use of the accent might be strategic: individuals with more limited processing of resources (as in the PROSODY+ subgroup for HC, or in the MS group) might need multiple sources of information for reference resolution [2, 4]

Response planning...

- No differences in gap duration
- Pause duration after "Non" much longer in MS than in HC: within-turn pause used to plan the full response as a strategy to preserve turn-taking

-> correlations with cognitive scores?

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