# Speech planning in question-response interactions from a clinical perspective

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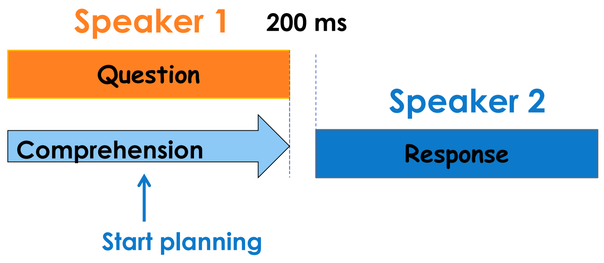
## Introduction

### *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

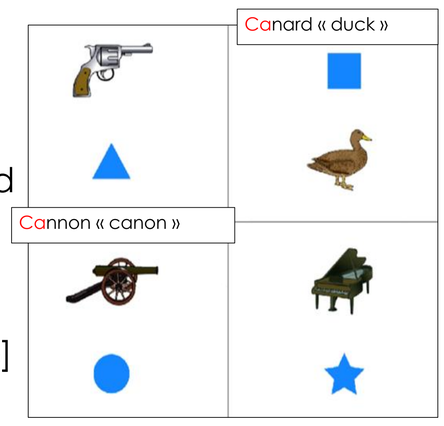
- Do cognitive impairment affect planning in interaction?
- Which is the role of early prosodic information in question comprehension and response planning?

## 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 rond?
(« is the duck above the star? And is the cannon/duck below the circle? »)

| | Accented | Deaccented |
|---|---|---|
| Anaphoric | canard ->CAnard **(incongruent)** | canard -> canard **(congruent)** |
| Non-anaphoric | canon -> CAnard **(congruent)** | canon -> canard **(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

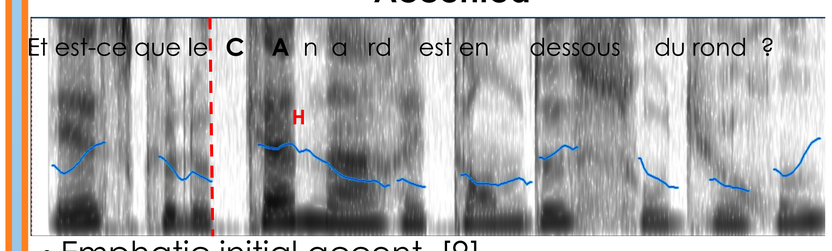
## Hypotheses

***1a.*** If prosody is used for reference resolution [7], accentuation on the ambiguous syllable should facilitate a non-anaphoric interpretation
***1b.*** 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

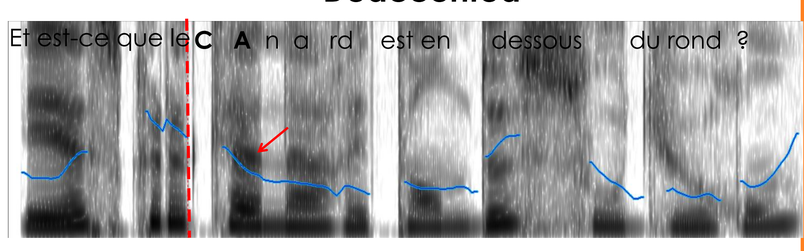
## Materials

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

**Accented**




**Deaccented**




• 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 |
| Desease 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 nevritis; optimal vision; no articulation troubles [10]

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

## Results

### *Fixation Proportions*

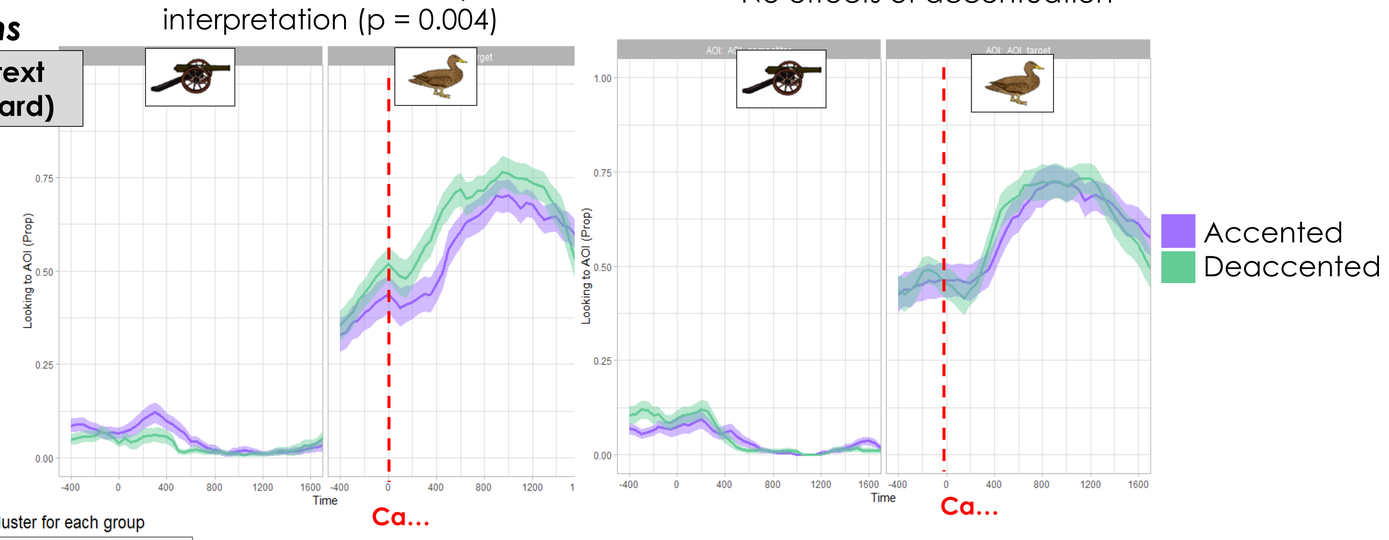
**Anaphoric context (canard -> canard)**

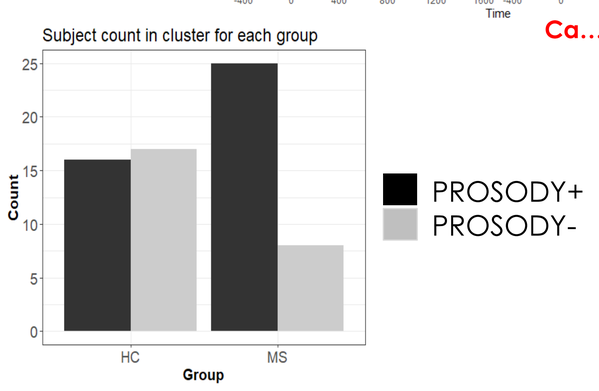
**MS**

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

**HC**

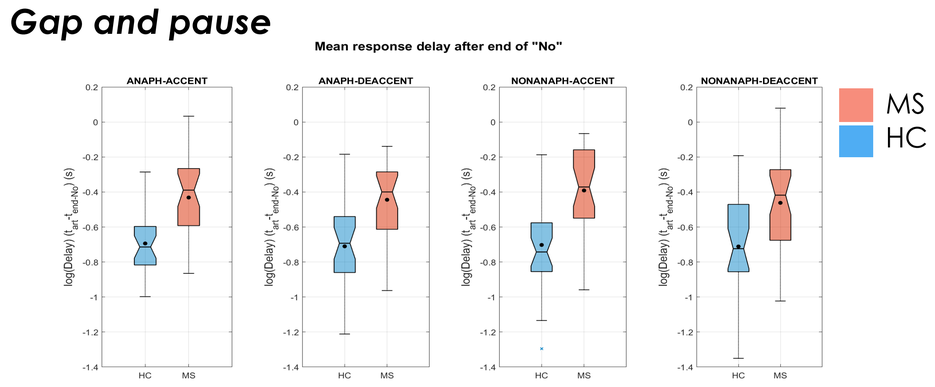
No effects of accentuation




- 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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