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## Variation of the signing rate in LSF: Addressing the issue through video and mocap data

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## I. Introduction

### From the literature we know

- ✓ Older people (+65y.) commonly present a loss of hand strength / use gestures with reduced amplitude (Carmeli et al. 2003)
- ✓ Speech rate is vulnerable to the aging process (Duchin & Mysak 1987)
- ✓ There is a correlation between an increase in age and longer mean sign duration (Börstell et al. 2016)
- ✓ Motion capture allows for more abstract movement descriptors to be extracted and contributes to the analysis of movement quality (Wilbur & Malaia 2018)

### 1) Which impact of ageing on the prosody of LSF?

- With a focus on signing rate
- Looking for adaptive strategies

### 2) Are older signers, interactive discourse and mocap setting compatible?

- A collection of interactions between or with older deaf signers in LSF
- Testing mocap systems
  - 3D data to complement analysis on the basis of 2D
  - a step forward to get semi-automatic annotation

## 2. Method and data

- ✓ We adopted an articulatory ('phonetic') and data-based perspective
- ✓ Considering prosodic patterns that result from the combination of movements of manual and non-manual articulators (Wilbur 2009, Crasborn & van der Kooij 2013)

13 Older participants		
64-65 y.o	2M	2F
72-76 y.o	3M	2F
79-84 y.o	2M	2F

6 Young adult participants		
18-30 y.o	2M	4F

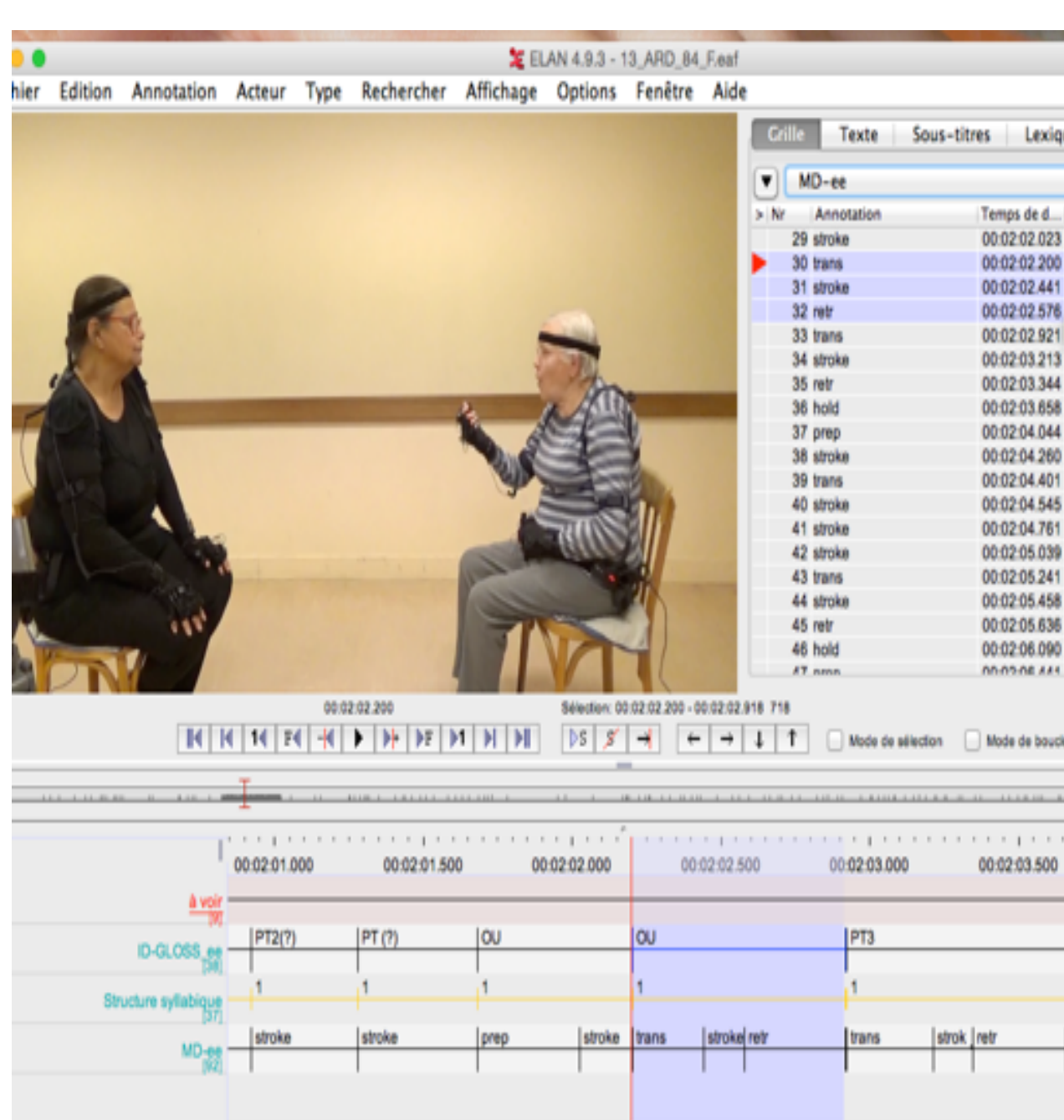
We adapted our recording protocol from CorpAGEst (Bolly & Boutet 2018)

- ✓ relatives or friends as interviewers
- ✓ 6 - 10 min interviews
- ✓ themes of the evolution of transport, access to care, culture and new technologies

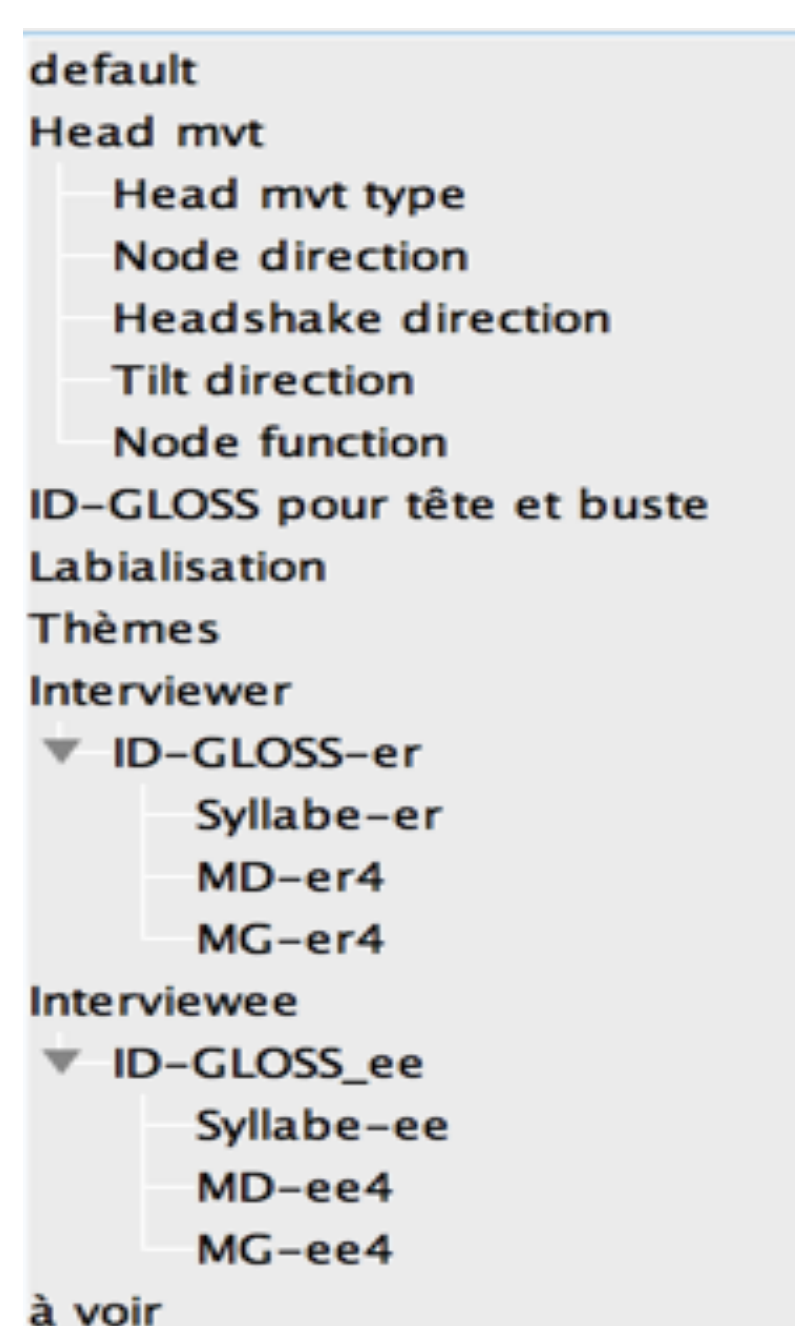
Participants use LSF as their main language

### A collection combining video (2D) and biomechanical (3D) data

#### Digital cameras



#### Manual annotation with ELAN\*\*



#### Motion capture systems



Equipping the participants with body straps



Calibration

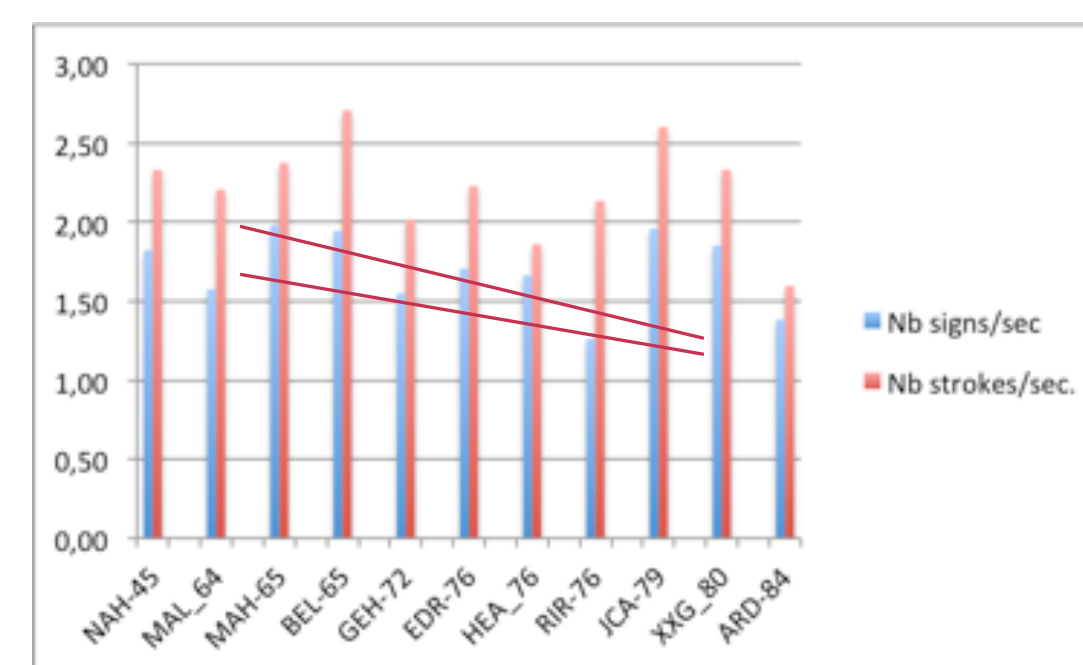


Interview

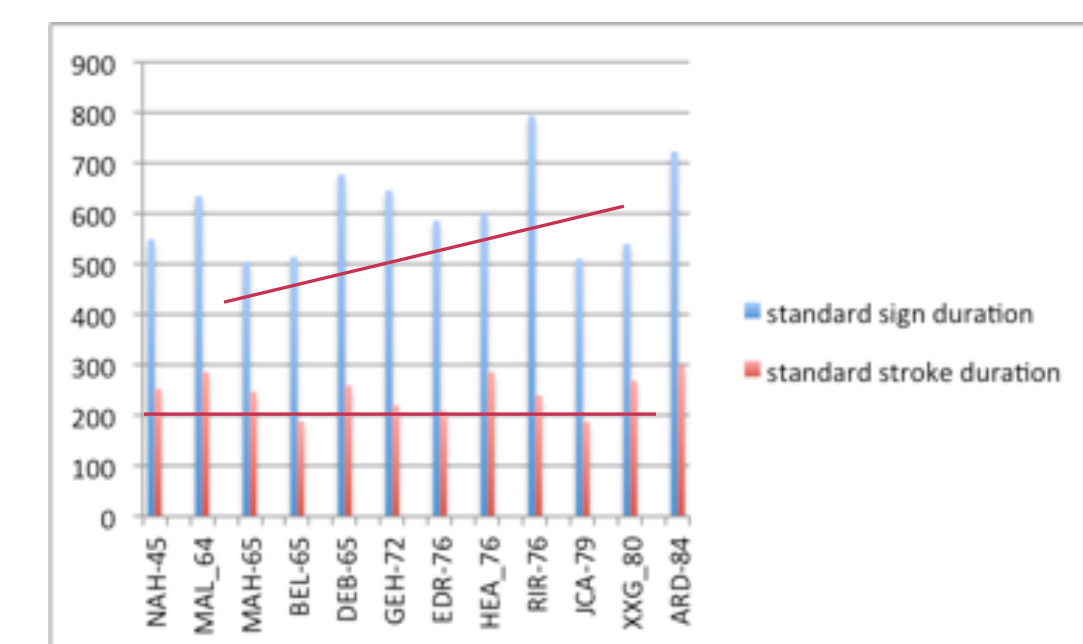
**Perception Neuron**  
(Inertial Measurement Unit sensors), to measure acceleration and relative position differences on xyz axis

## 3. Measures and avenues of investigation

### Signing rate 2D\_ELAN



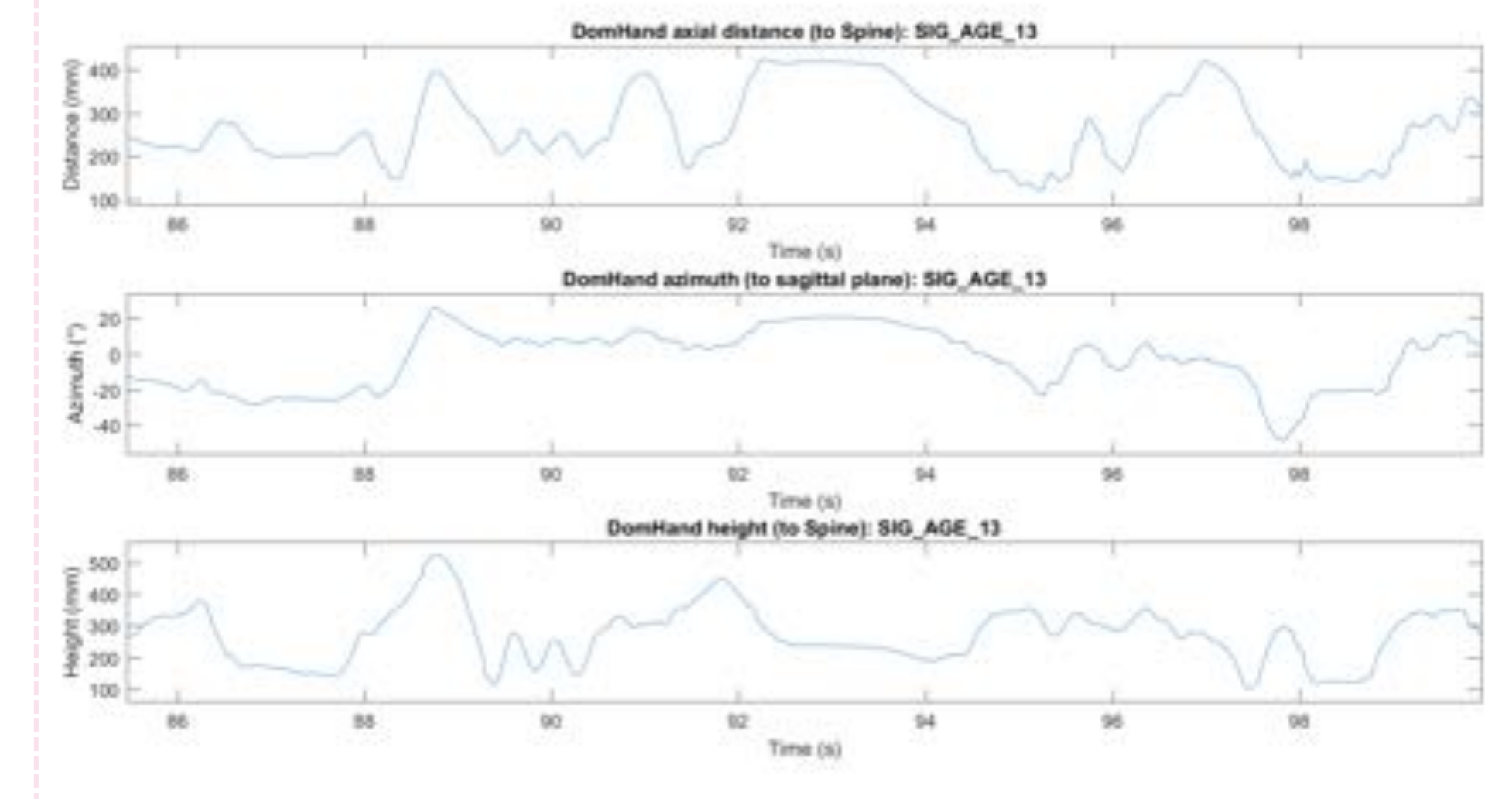
Ratio: signs or syllables / time



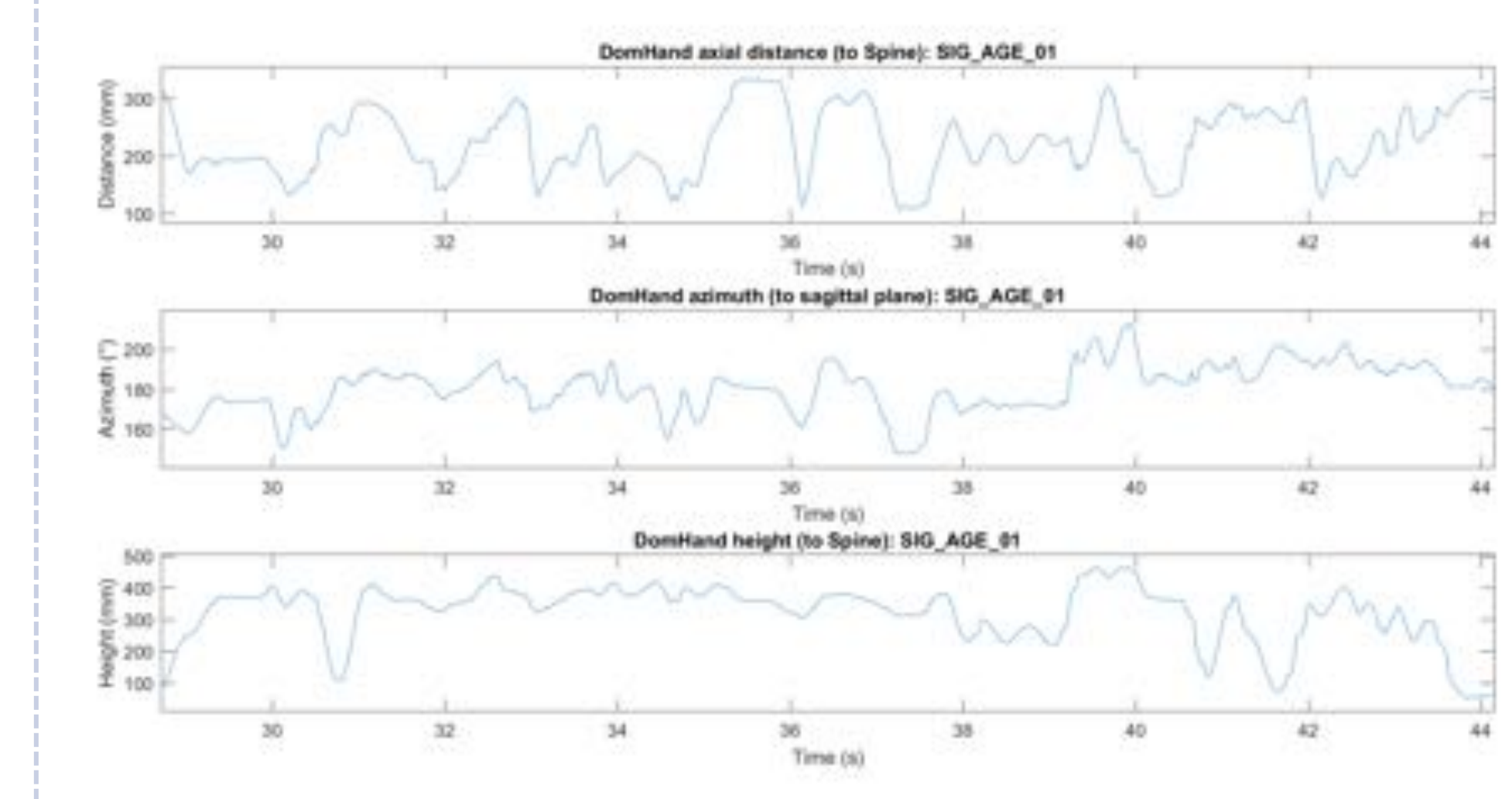
Sign and stroke standard duration

### Mvt amplitude / hand-torso 3D\_Neuron

#### Ex. of a 84 y.o. signer



#### Ex. of a 21 y.o. signer



### 1) We noted

- ✓ variations in rate within the older group (65 vs 84 y.o) and between older and young adult signers
- ✓ the stroke duration (vs sign duration) remains relatively stable about 0.25sec (Wilbur & Nolen 1986)
- ✓ the variation stems from the duration and nature of transitions

Frequency of body mvts as a marker?

### 2) The use of a motion capture system

- ✓ is feasible with older signers
- ✓ allows us to complement video data and to connect signing rate, range of motion as measurements of prosodic characterization for the older signers' production
- ✓ offers avenues of investigation by illustrating that the recorded older signers
  - ✓ are making fewer movements than the recorded younger ones
  - ✓ have a more contrasted, less homogeneous manual amplitude than younger ones
  - ✓ make more held movements than younger ones
  - ✓ raise their hands as high as younger ones, but don't stay high as long

## 4. In Progress

- ◆ Short term: to complete annotations and measures for the older corpus and younger data for comparison, and relevance of each marker.
- ◆ Semi-automatic detection of pauses or holds on mocap data and a finer analysis of articulation adjustment of older signers
- ◆ Longer term: to study (i) the linguistic specificities in the productions collected in interaction (speech turn, signing space, lexical and morphosyntactic variations, prosody in LSF), (ii) the possible markers of aging, whether ordinary or disturbed, in connection with existing studies on the articulatory manifestations of language or cognitive disorders (Tyrone & Woll, 2008; Tyrone, 2014) and (iii) adaptive strategies of older signers.

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## 6. Acknowledgements

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\*\*ELAN (Version 6.2) [Computer software]. (2021). Nijmegen: Max Planck Institute for Psycholinguistics, The Language Archive. Retrieved from <https://archive.mpi.nl/ta/elan>