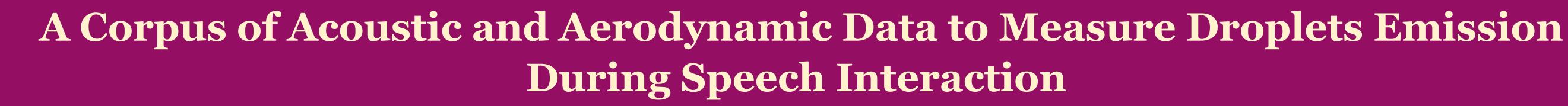




The Speed-Vel Project



anR





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Aim

The aim of the SpeeD-Vel project is to analyse the production of droplets during speech interaction

Phonetic conditions

Intensity (normal vs. loud) Articulation of sounds (consonant and vowel type) Prosody (focus)

- Introduction
- Respiratory pathogens such as SARS-COV-2 can be transmitted by droplets generated not only by breathing [3] coughing [1] and sneezing [2], but also by speech [4, 5, 6]. Droplet emission in speech seems to be modulated by specific properties of speech [4, 5, 6, 7]:
- Intensity (normal vs. loud) Articulation of sounds (vowel and consonant type) Voicing (voiced vs. unvoiced sounds)

HOWEVER

- Limited number of studies on this topic
- Small number of participants [6]
- Focus only on droplet emission rate [4]
- single words, of syllables Use and phonemes [4, 5, 6].
- No studies on the effects of prosody: focus \longrightarrow physiological effort with an

Interaction of these factors

(Experiment 3)

(Experiment 1 & 2)

Physiological measures

Airflow velocity and direction

Number and size of droplets

increase in fo, intensity, and articulatory precision at the local level [8]

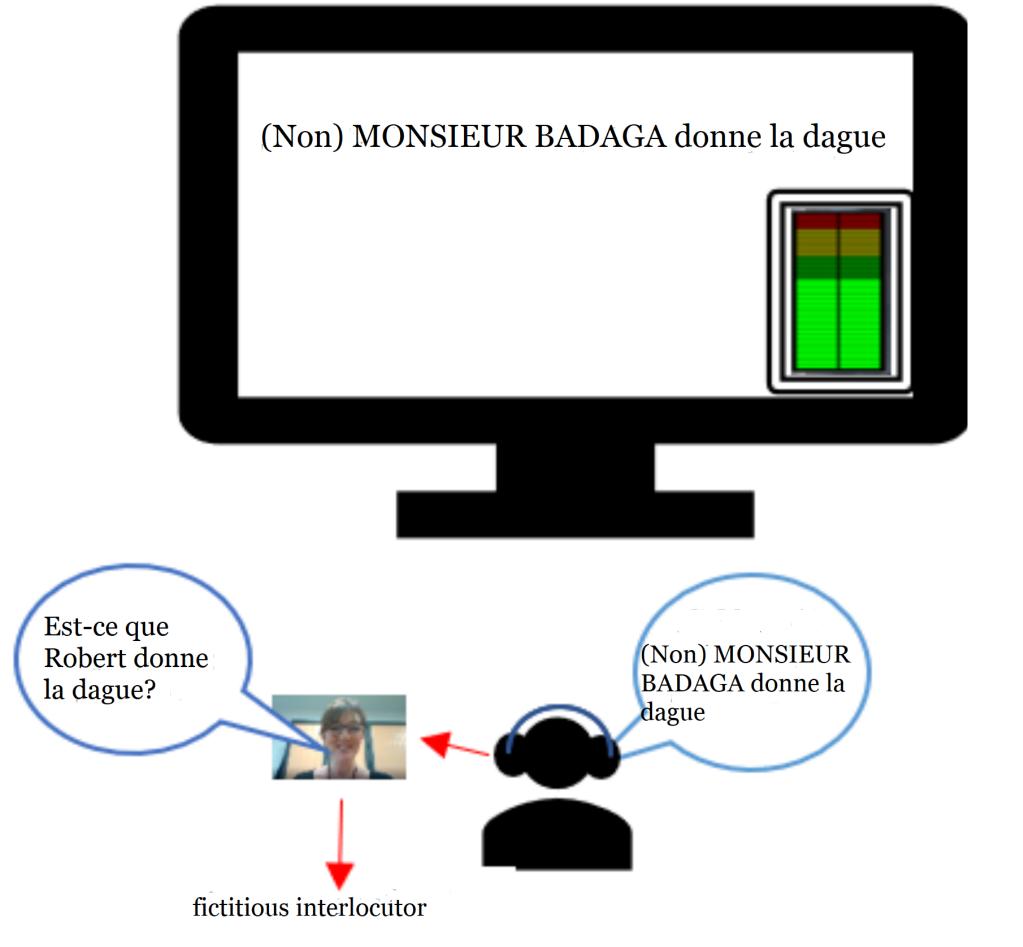
Ling	guist	ic ta	sks

Task 1: Dictated Pseudowords

- 12 pseudowords (*viziji, boudougou*) X 3 repetitions: syllables contrasted by voicing (voiced vs. unvoiced), articulation mode (plosives, fricatives), vowel type (/a/, /u/, /i/)
- Intensity (vumeter)

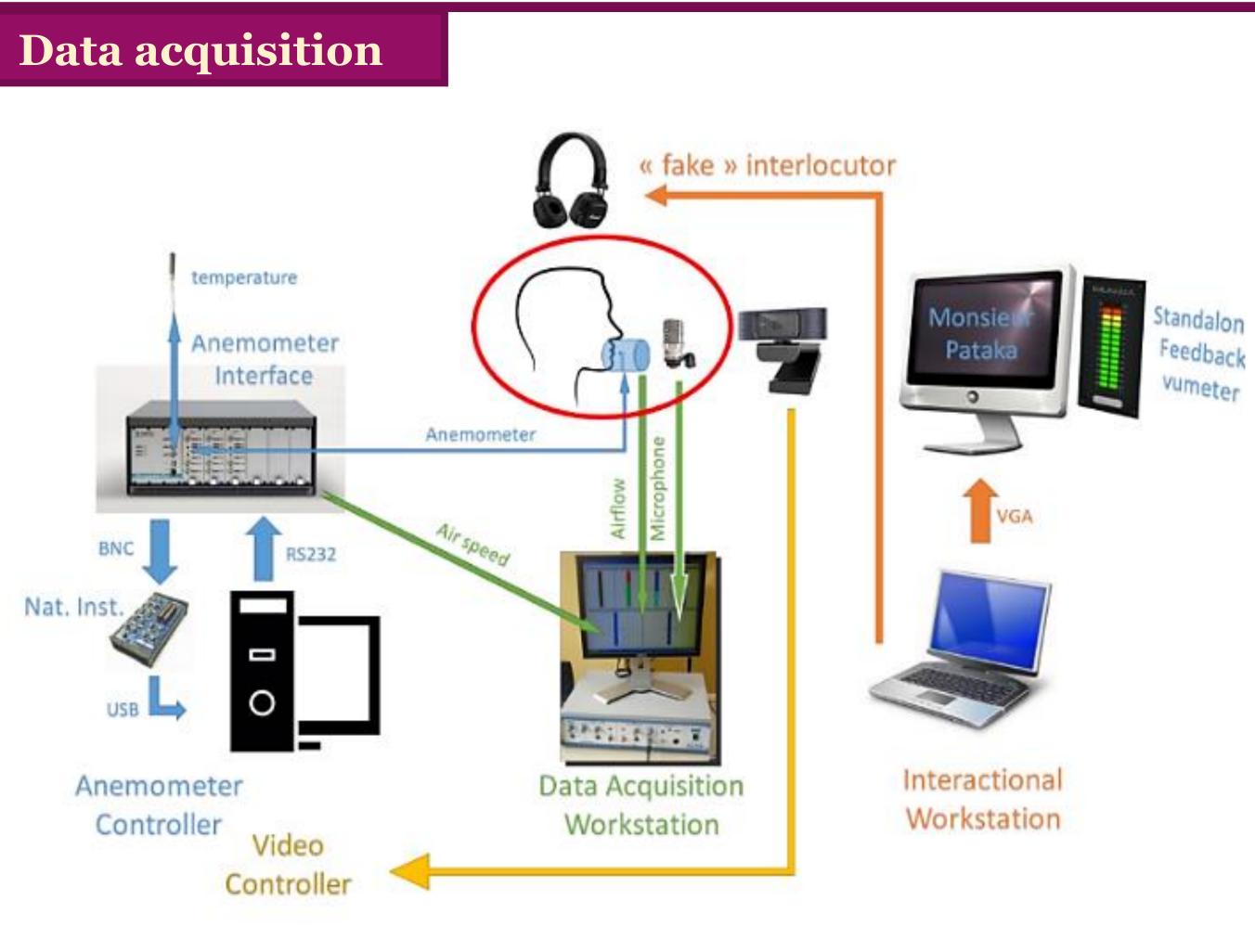
Task 2 : Prosodic Focus in Interaction

- 10 sentences X 3 repetitions
- Focus conditions (no focus vs. focus)
- Pseudowords embedded in carrier sentences
- The speaker answers pre-recorded questions
- Fictitious interlocutor
- Intensity (vumeter)



No focus condition				
Pre-recorded questions	Answers			
Qu'est-ce qu'il se passe ? 'What is going on?'	Monsieur Badaga donne la dague 'Mr Badaga gives the dagger'			
Qu'est-ce qu'il se passe ? 'What is going on?'	Monsieur Vazaja joue le joker 'Mr Vazaja plays the joker'			
Focus condition				
Est-ce que Robert donne la dague? 'Does Robert give the dagger?'	(Non) MONSIEUR BADAGA donne la dague '(No). MR BADAGA gives the dagger'			
Est-ce que Christian joue le joker ? 'Does Christian play the joker?'	(Non) MONSIEUR VAZAJA joue le joker '(No). MR VAZAJA plays the joker'			

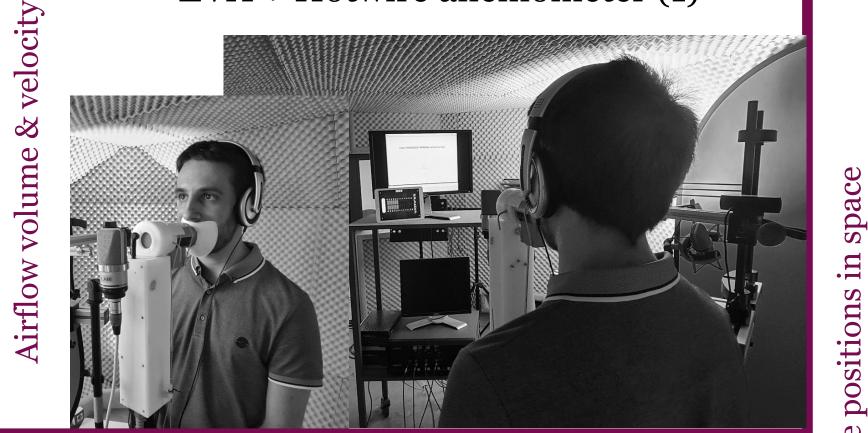
Examples of stimuli used in Task 2



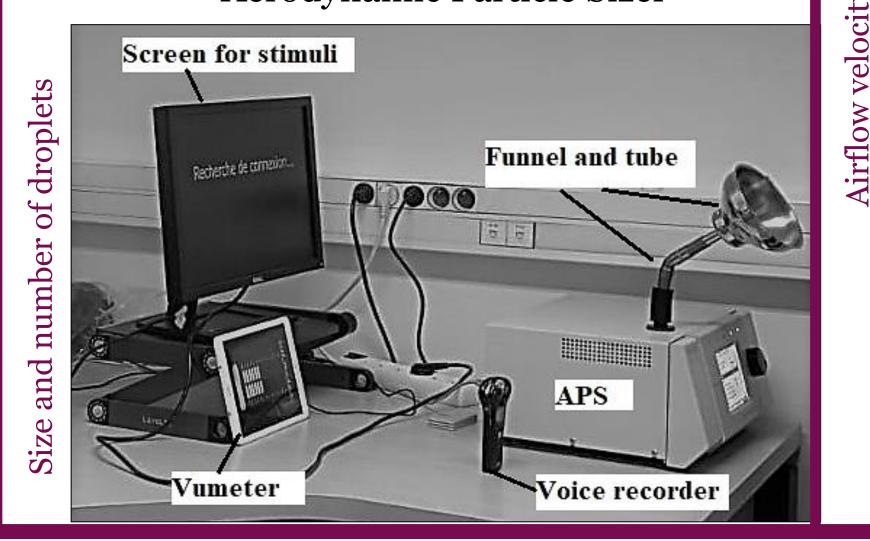
Workstations employed in the experiments

Experiment 1

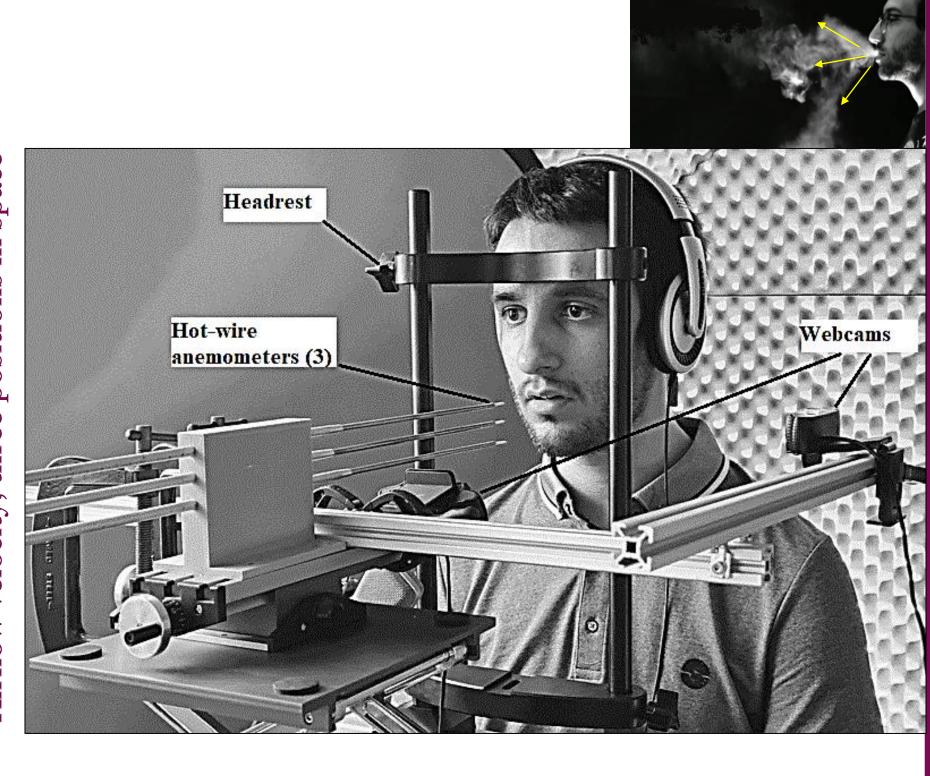
EVA + Hotwire anemometer (1)



Experiment 3 Aerodynamic Particle Sizer



Experiment 2 Hotwire anemometer (3)



- 23 French Native Speakers
- Same participants for all three experiments
- Demographic questionnaire

Approved by the Ethics Committee of Aix-Marseille University

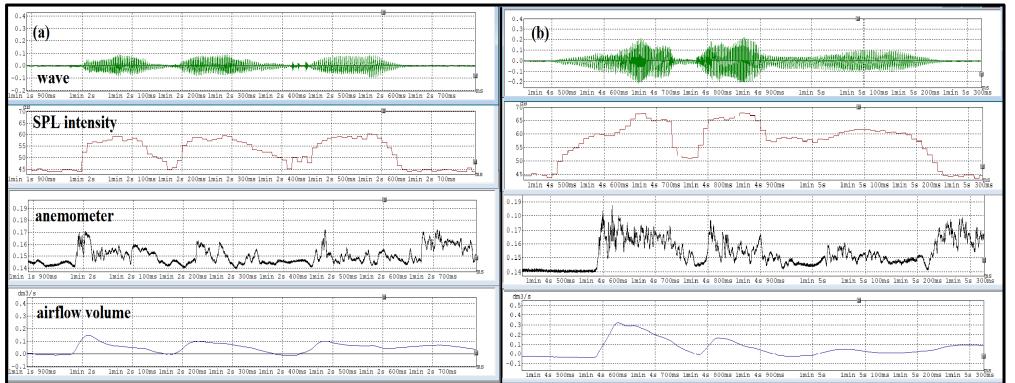
IMPACT



→ 1 speaker (F7)

References

Experiment 1 (EVA + 1 Anemometer) /Budugu/ spoken with normal (a) vs. loud voice (b)

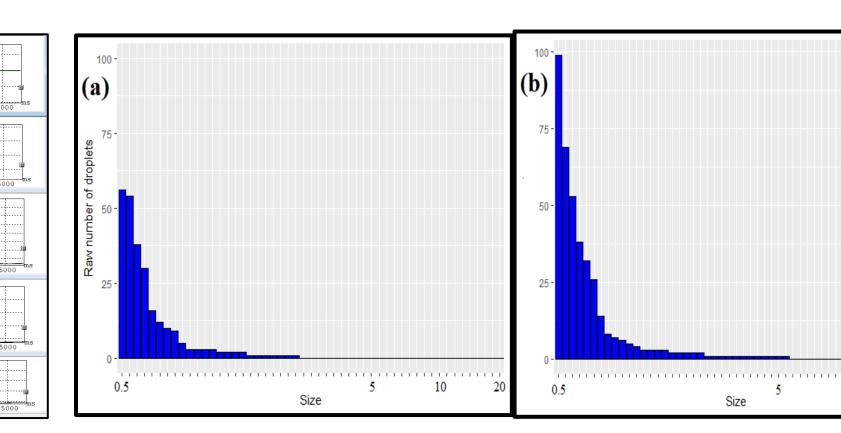


MANAM m. M. n. Mars why have all anemometer

Experiment 2 (3 Anemometers)

MONSIEUR VAZAJA venge le voisin 'MR VAZAJA avenges

the neighbour' spoken with normal (a) vs. loud voice (b)



Airflow volume (l/s) and velocity (m/s): Pseudowords spoken with loud > normal voice

Airflow velocity (m/s): Sentences spoken with loud > normal voice Number and size (ms) of droplets: Loud > normal

Experiment 3 (APS)

/Badaga/ spoken with normal voice (a) vs. loud voice (b)

- Impact on the calibration of protective devices (physical distance, masks) A new corpus of physiological data
- Improving models on speech production and speech physiology

[1] Zayas, G. et al. (2012). Cough aerosol in healthy participants: fundamental knowledge to optimize droplet-spread infectious respiratory disease management. BMC pulmonary medicine, 12(1), 1-12. [2] Bourouiba, L., et al., (2014). Violent expiratory events: on coughing and sneezing. Journal of Fluid Mechanics, 745, 537-563 [3] Jones, R. M., & Brosseau, L. M. (2015). Aerosol transmission of infectious disease. Journal of occupational and environmental medicine, 57(5), 501-508. [4] Asadi, S., et al. (2019). Aerosol emissior and superemission during human speech increase with voice loudness. *Scientific reports*, 9(1), 1-10. [5] Asadi, S., et al., (2020). Effect of voicing and articulation manner on aerosol particle emission during human speech. PloS one, 15(1), e0227699. 6] Abkarian, M., Mendez, S., Xue, N., Yang, & Stone, H. A. (2020). Speech can produce jet-like transport relevant to spreading asymptomatic virus. Proceedings of the National Academy of Sciences, 117(41), 25237-25245. [7] Giovanni, A., et al. (2020). Transmission of droplet-conveyed infectious agents such as SARS-CoV-2 by speech and vocal during speech therapy exercises preliminary experiment concerning airflow velocity. European Archives of Oto-Rhino-*Laryngology*, 1-6. [8] Gussenhoven, C. Foundations of intonational meaning: Anatomical and physiological factors. Topics in Cognitive Science, Vol. 8/2, 2016, 425-434.