

# USING SPEECH TO FOLLOW-UP SLEEP DISORDERS

C. Beaumard, V.P. Martin, J.-L. Rouas, Y. Wu, P. Philip

## Sleep disorders and speech

Sleep disorders affect 1/3 of world's population and impact their daily and professional quality of life. It is also a major public health problem (20% of car accidents were caused by sleepiness).



Subjective sleepiness evaluation



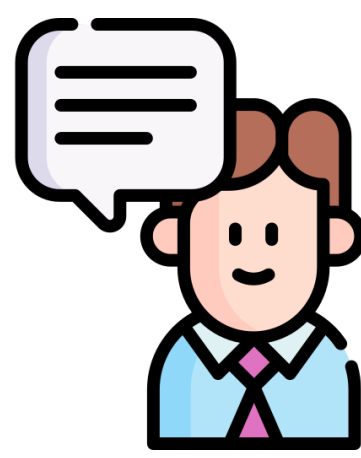
Objective sleepiness evaluation



Regular and frequent appointments needed to follow-up patients' symptoms evolution

↳ Difficult to set up

Clinicians use the *Ecological Momentary Assessment* method to follow-up patients symptoms evolution in ecological conditions



Speech is a useful modality because its collection is non invasive and passive

## Previous results: read speech

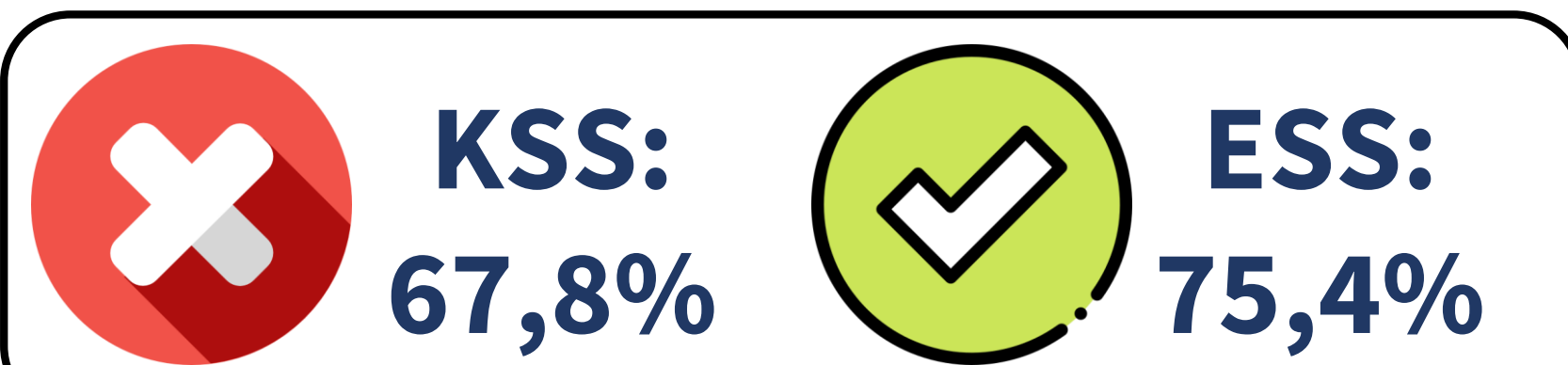
### Multiple Sleep Latency Test corpus (MSLTc)

- Recorded at the Bordeaux sleep clinic (France)
- 135 patients (675 recordings)
- Subjective and objective sleepiness
- Patients' characteristics and comorbidities

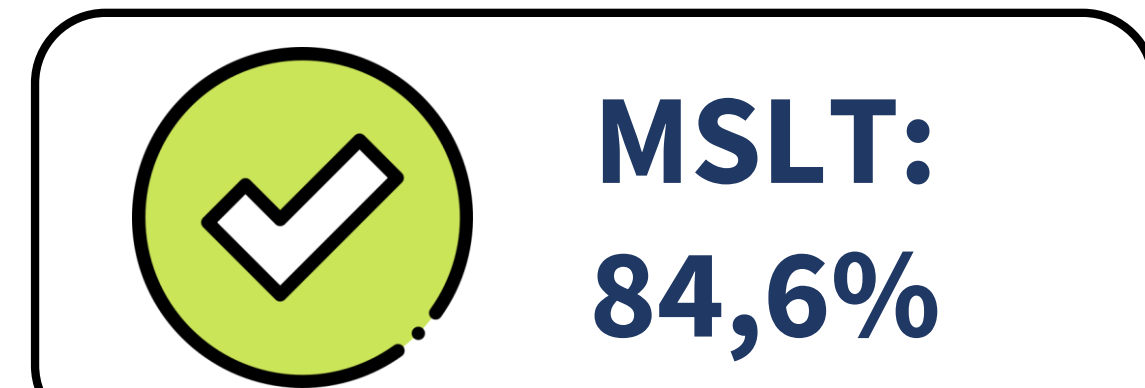


### Results (UAR)

Subjective sleepiness



Objective sleepiness



### Speech biomarkers extracted

- Acoustic features [1]
- Location and duration of pauses in read speech [2]
- Errors in Automatic Speech Recognition [3]

Pathological sleepiness can be automatically detected using speech biomarkers specific to read speech

But we need more ecological data collection  
→ spontaneous speech

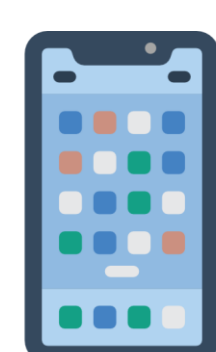
## Objectives of my thesis: spontaneous speech



### Medispeech corpus

Similar to the MSLTc but:

- Recordings with a smartphone
- 2 new tasks:



- Semi-spontaneous speech  
"Describe the rules of a game of your choice"
- Spontaneous speech  
"Is it difficult for you to get out of bed?"



### New speech biomarkers

- Phonetical and phonological analysis of speech [4]
- Validation of the previous biomarkers on spontaneous speech



### Perspectives

- Biomarkers of sleepiness in spontaneous speech
- Integrate speech analysis in clinical practice using mobile devices
- Other symptoms (fatigue, depression, anxiety...)



université de BORDEAUX



BORDEAUX INP LaBRI



[1] V. P. Martin *et al*, "Sleepiness detection on read speech using simple features", IEEE, 2019

[2] V. P. Martin *et al*, "Does sleepiness influence reading pauses in hypersomniac patients?", Speech Prosody, 2022

[3] V. P. Martin *et al*, "Automatic Speech Recognition systems errors for accident-prone sleepiness detection through voice", IEEE, 2021

[4] C. Beaumard *et al*, "Automatic detection of schwa in French hypersomniac patients", PFIA, 2023