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# Relative fundamental Frequency of voiced and voiceless stops and fricatives for different phonation types in normal French speakers

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# Relative fundamental frequency of voiced and voiceless stops and fricatives for different phonation types in normal French speakers

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## Background

- ◆ Fundamental frequency (F0) at vowel offset & onset higher for voiceless than for voiced consonants [1-3]
- ◆ Relative fundamental frequency (RFF) used to assess vocal effort in patients with more effort for lower RFF [4-7]

## Purposes

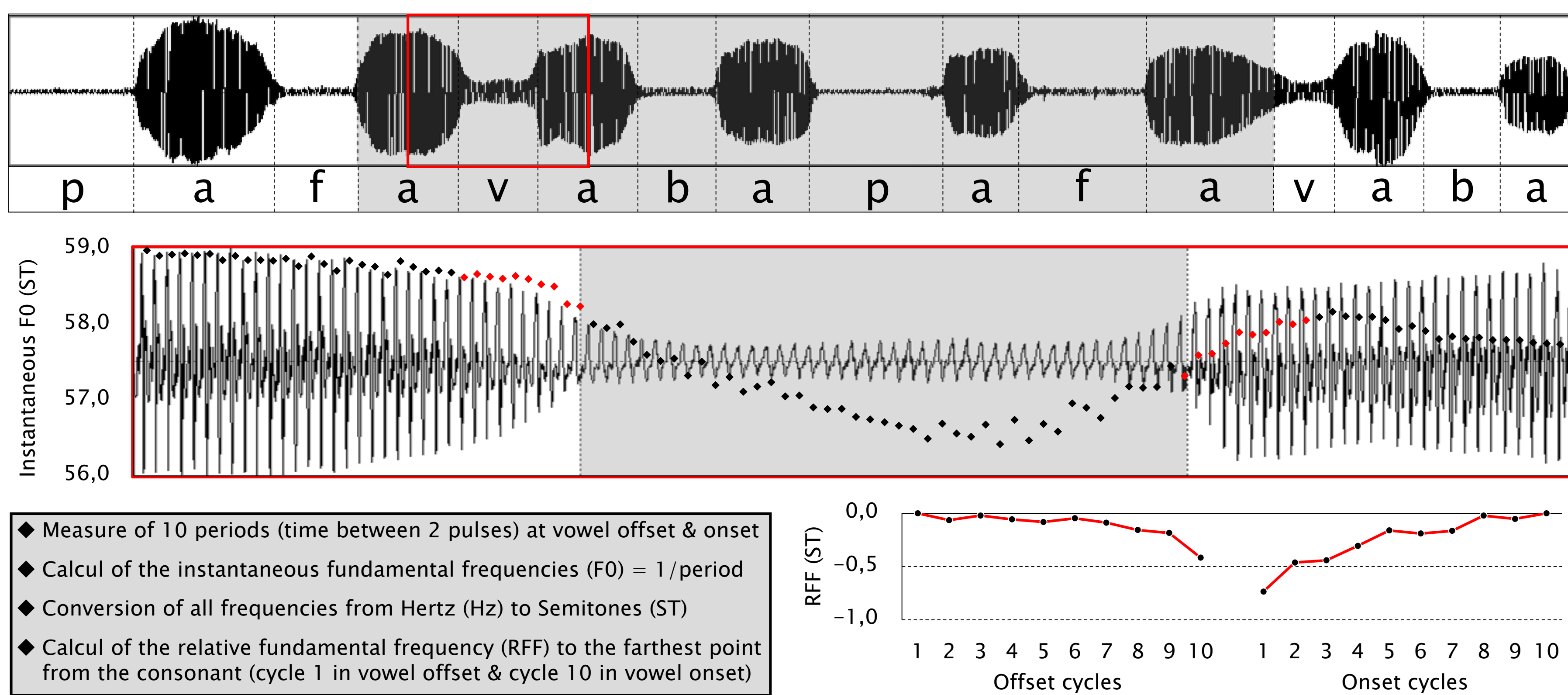
- ◆ To explore RFF variations according to the voicing & the manner contrasts
- ◆ ... & to the phonation types known to involve different levels of vocal effort
- ◆ To provide data for normal speakers

## Hypotheses

- ◆ RFF values will be lower for voiced than for voiceless stops & fricatives
- ◆ RFF values will be lower for high, loud & pressed phonations (more vocal effort) than for low, soft & breathy phonation (less vocal effort)

## Methodology

- ◆ 12 normal French speakers (6 women & 6 men)
- ◆ 4 consonants with voicing & manner contrast
- ◆ 7 phonations types : spontaneous (baseline), low or high, soft or loud & breathy or pressed
- ◆ Control of intra-speaker difference to baseline for pitch (F0), intensity (SLP) & quality (H1-H2)
- ◆ 24 trains of 8 syllables, like "pafavabapafavaba"
- ◆ For each, selection of the 4 central consonants
- ◆ Measure of the relative fundamental frequency on the 10 cycles of the vowel offset & onset



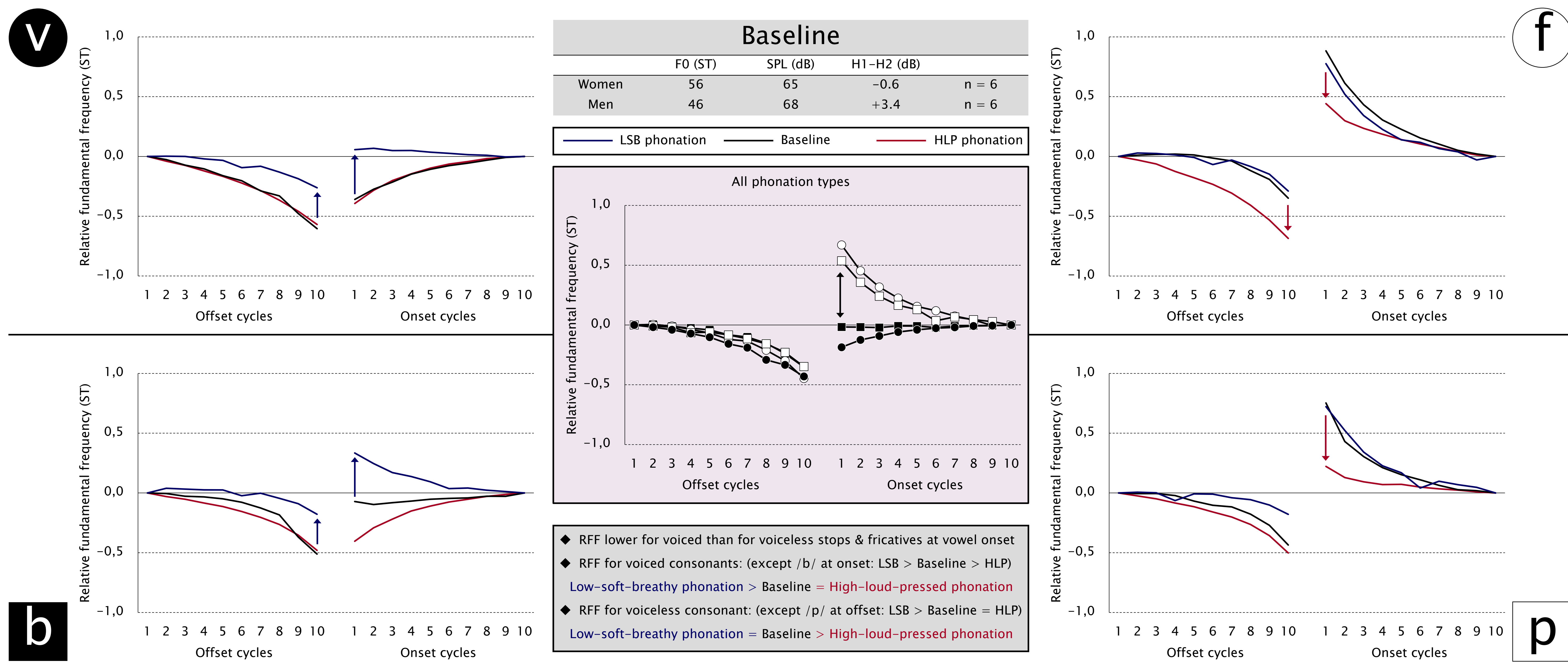
## Results

### Low-soft-breathy phonation

	$\Delta$ F0 (ST)	$\Delta$ SPL (dB)	$\Delta$ H1-H2 (dB)	
Low	-3.5	-0.4	-0.1	n = 11
Soft	-2.8	-8.8	+2.7	n = 11
Breathy	-0.9	-5.8	+6.3	n = 9
	<b>-2.5</b>	<b>-5.0</b>	<b>+2.7</b>	

### High-loud-pressed phonation

	$\Delta$ F0 (ST)	$\Delta$ SPL (dB)	$\Delta$ H1-H2 (dB)	
High	+6.3	+3.2	-1.3	n = 9
Loud	+5.2	+11.7	-5.1	n = 10
Pressed	+3.8	+9.2	-1.8	n = 7
	<b>+5.2</b>	<b>+8.1</b>	<b>-2.9</b>	



## Discussion

- ◆ RFF varies with vocal effort: higher RFF/lower effort in **LSB phonation** (+ voiceless consonants) & lower RFF/higher effort in **HLP phonation** (+ voiced consonants)
- ◆ Possible to decrease but not to increase the vocal effort for voiced consonants & possible to increase but not to decrease the vocal effort for voiceless consonants
- ➔ In spontaneous phonation: production of voiced consonants at their maximum vocal effort but production of voiceless consonants at their minimum vocal effort

## Perspectives

- ➔ Easy measurement of vocal effort in dysphonic patients on voiceless consonants

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