



Raising awareness of glottal control for the production of /h/-initial and vowel-initial words by French learners of L2 English

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Outline



Intrusive *aitches* in L2 English

Aspiration and glottalisation (acoustics and articulation)

Experiment

Results

Conclusion and perspectives



French speakers of L2 English :

Propensity to produce some aspiration noise at the onset of vowel-initial words

- Phonemic contrast:

I ate ou I hate?

- Ambiguity removed by the context:
- Why do they do that?

French speakers do not « interpret » the initial glottal stop properly
(Adamczewski et Keen 1973)

→ In English: vowel-initial words can be pronounced with

- (vowel) glottalisation (Dilley et al 1996; Fuchs 2015)
- glide insertion (Davidson & Erker 2014) = linking (Huart 2002) = continuous voicing in hiatus

contexts



Outline

Intrusive *aitches* in L2 English



Aspiration and glottalisation (acoustics and articulation)

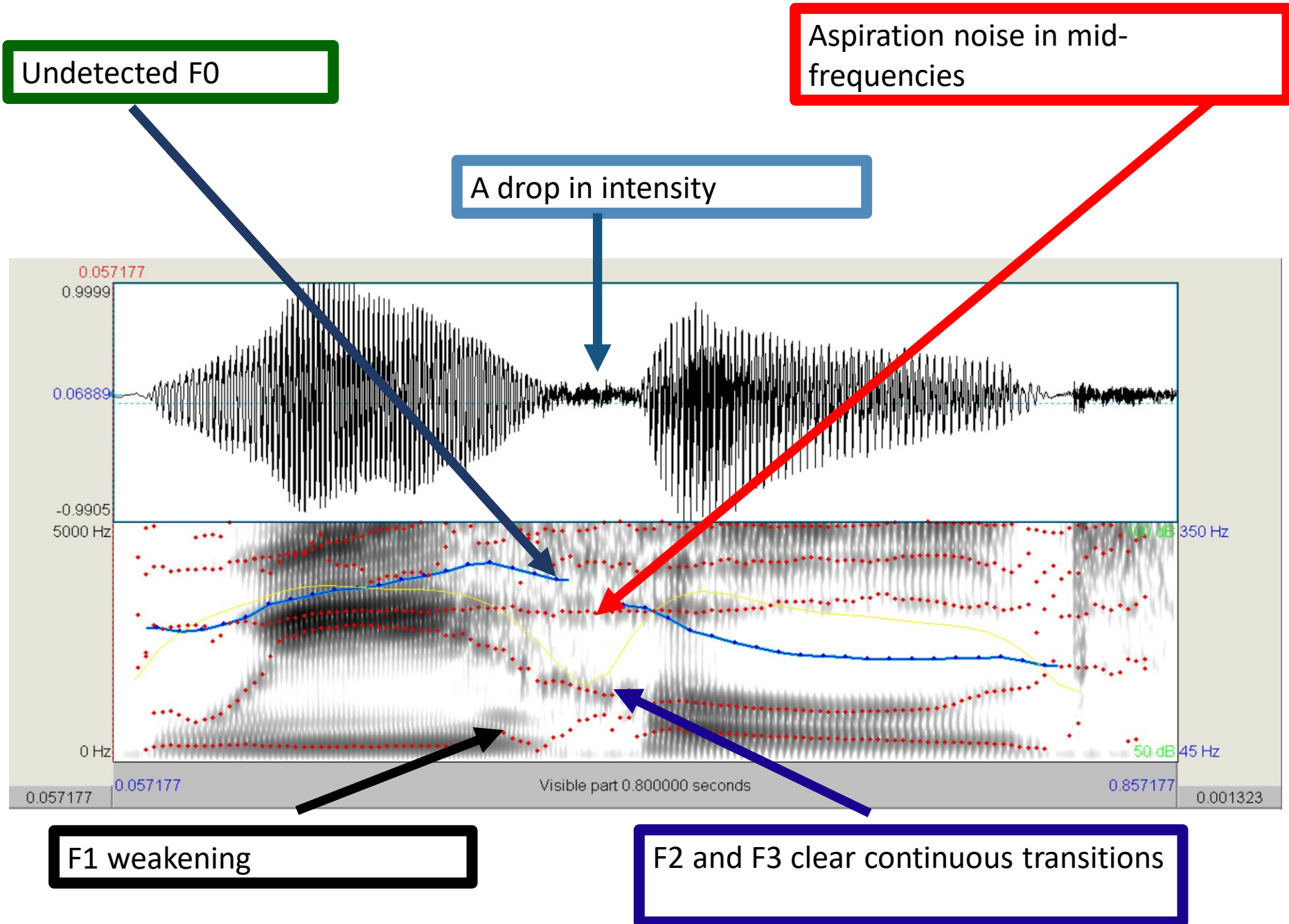
Experiment

Results

Conclusion and perspectives

/h/

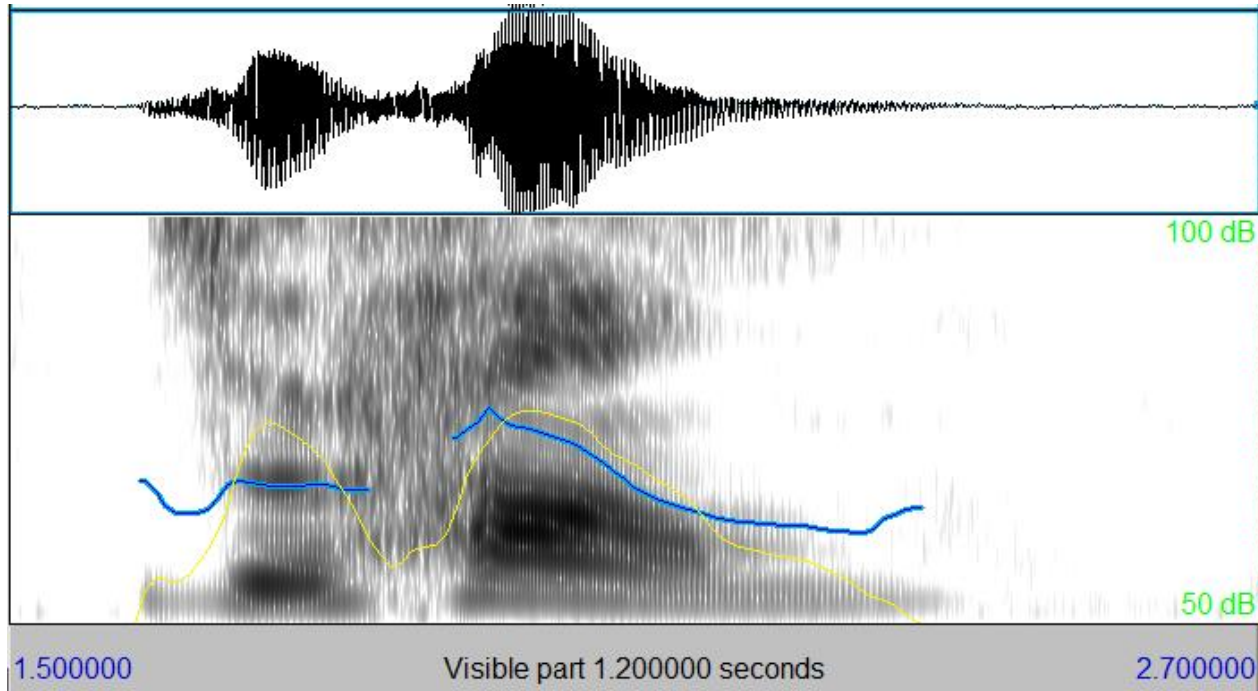
SBE: *we hold*



Glottalisation vs Aspiration : acoustics



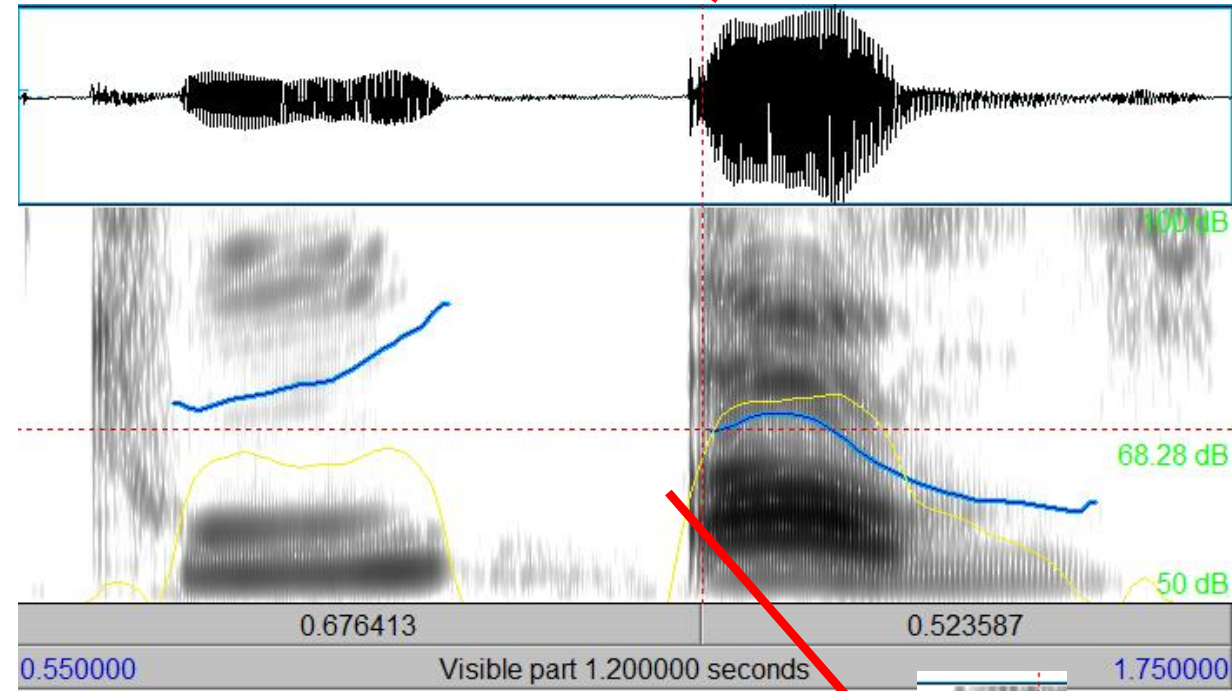
Aspiration



FR 10: « the harm »



Glottalisation



FR10: « two arms »

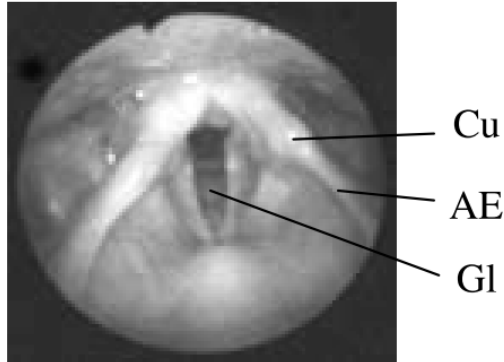
REFERENCES: [Pierrehumbert & Talkin 1991](#); [Dilley et al. 1996](#); [Redi & Shattuck-Hufnagel 2001](#); [Garellek 2014](#), [Davidson & Erker 2014](#), [Fuchs 2015](#)



Glottalisation vs Aspiration: articulation

Aspiration

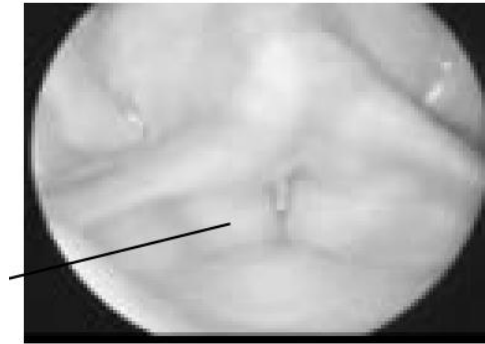
Glottis : open + tense



(a) glottal fricative [h]

Glottalisation

Glottis : closed + tense



(c) glottal stop [ʔ]

Illustrations taken from [Esling 2005: Laryngeal Articulator Model](#)

Research question

Exare (2017) :

Intrusive [h] = uncontrollable ~~slip of the tongue?~~ Lack of glottal control !

Glottal settings = automatised / unconscious processes → learnable?

Can students LEARN glottal gestures?

- to avoid intrusive aitches?
- to produce glottalisation or linkings on request?

If they're given adequate instruction, **can they control their glottis** in order to produce what is expected ?



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Intrusive *aitches* in L2 English

Aspiration and glottalisation (acoustics and articulation)



Experiment : how to raise awareness of one's glottal settings ?

Results

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An ecological experiment

GOAL:

Train a group of high schoolers into controlling their glottis

2 conditions: before and after the training session

QUESTIONS: After the training:

1. Can the participants produce fewer intrusive aspirations in #V contexts?
2. Can they produce more licit productions in V-V contexts?
3. Do they produce fewer elisions in /h/-initial words?
4. Are they aware of what they produce?
5. Does awareness correlate with level?
6. Does the ability to produce correct V-V transitions correlate with level?



Participants: high-school learners

Number: 23

Age: 16-17 y.o.

Level: A2-B1 (L2 English) - intermediate

DAY 1: First Production Task = PRE-TRAINING test

- Reading of 18 noun phrases + distractors with:
- 9 h-initial words (eg: *the heart*)
- 9 vowel-initial words (eg: *the art; we ask*)
- From a .ppt presentation
- Ecological conditions : the school's headsets – Audacity – Computer room

Day 1

Day 10

Day 14



DAY +10 : Training session

a 2-hour course

[30 slides](#)





Goal: awareness of

perception + production of
aspiration – glottalisation phonetic contrast
at V#V boundaries
improving glottal control
through metaphonetic input

4 principles

1. Explicit instruction

/h/ prononcé intensément / fortement


<p>His job is interesting!</p>  <p>I have a dog</p> 	 	<p>Déterminant en tête de phrase</p> <p>H</p> <p>Verbe lexical</p> <p>H</p>
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/h/ prononcé faiblement selon le mot, sa place dans le mot ou dans la phrase

<ul style="list-style-type: none"> Tell me about his job  <p>→ Déterminants <i>his / her</i> en milieu de phrase en position inaccentuée</p>	<ul style="list-style-type: none"> I 've never been to Britain = HAVE auxiliaire I 've got a cat
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Training

The hobby



Comment prononcer deux voyelles qui se suivent?
(exp: the art)

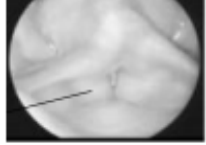


Option 1: linking

<ul style="list-style-type: none"> Avec [w] léger <p>two eyes =</p> <p>« two w eyes »</p> 	<ul style="list-style-type: none"> Avec [j] léger <p>three apples =</p> <p>« three j apples »</p> 	<ul style="list-style-type: none"> Avec [r]: léger et articulé à l'avant de la bouche <p>four eggs =</p> <p>« four r eggs »</p> 
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Comment prononcer deux voyelles qui se suivent?

Option 2: glottalisation

Glottalisation
La glotte se ferme brusquement
Le son est une consonne occlusive

 <p>(c) glottal stop [ʔ]</p> 	 <p>glottal fricative [h/]</p>
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Entraînez vous 

<ul style="list-style-type: none"> Say it Do it Go out Never again We eat 	<ul style="list-style-type: none"> The animal The
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2. Articulatory principles

La glotte pour le bruit d'aspiration

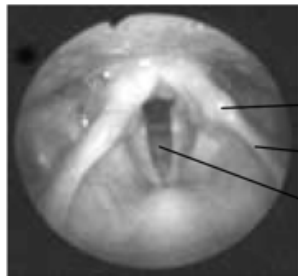
(= pour prononcer /h/)



Le son produit est une consonne fricative. L'air sort par la glotte bien ouverte et il se produit un bruit d'aspiration lors du passage de l'air à la glotte

est bien ouverte

Quel symbole préférez-vous?



(a) glottal fricative [h]

Cu -
AE -
Gl



9

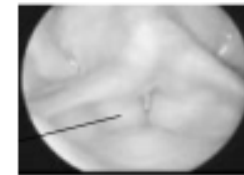
Comment prononcer deux voyelles qui se suivent?

Option 2: glottalisation

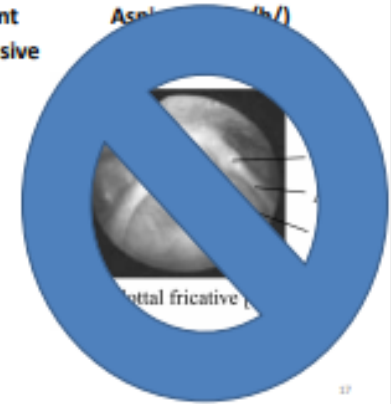
Glottalisation

La glotte se ferme brusquement
Le son est une consonne occlusive

Aspiration (/h/)



(c) glottal stop [ʔ]



17

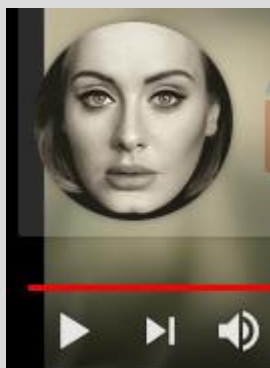
Entraînez vous



- Say it
- Do it
- Go out
- Never again
- We eat
- The animal
- The



3. Auditory cues



Ecoutez



- La chanson d'Adèle: « Hello »
<https://www.youtube.com/watch?v=YQHsXMglC9A>
- → repérez
- - des glottalisations initiales de mot
- - des aspirations initiales de mot
- - des linkings


Ecoutez


- -des glottalisations initiales de mot
– It's me; I was (wondering)
- -des aspirations initiales de mot
– Hello, heal, healing
- -des enchaînements
- After all




4. Visual iconic help, chosen by students (road signs)




En résumé: les symboles pour vous aider

Glottaliser: 

Réaliser /h/ = aspirer:  

Lier : 

19

Aspiration	Glottalisation	Linking / continuous voicing
The harm 	The art 	The air 

Day 1

Day 10

Day 14



DAY + 14: Second Production (reading) Task = POST-TRAINING TEST

The learners:

- Read the same 18 target phrases (no distractors)
- Triggering pictures
- Were expected to determine the type of sandhi they had just realised:
« glottalisation » vs « linking » vs « aspiration »

Three apples



Poor animal !

Vous avez le choix:

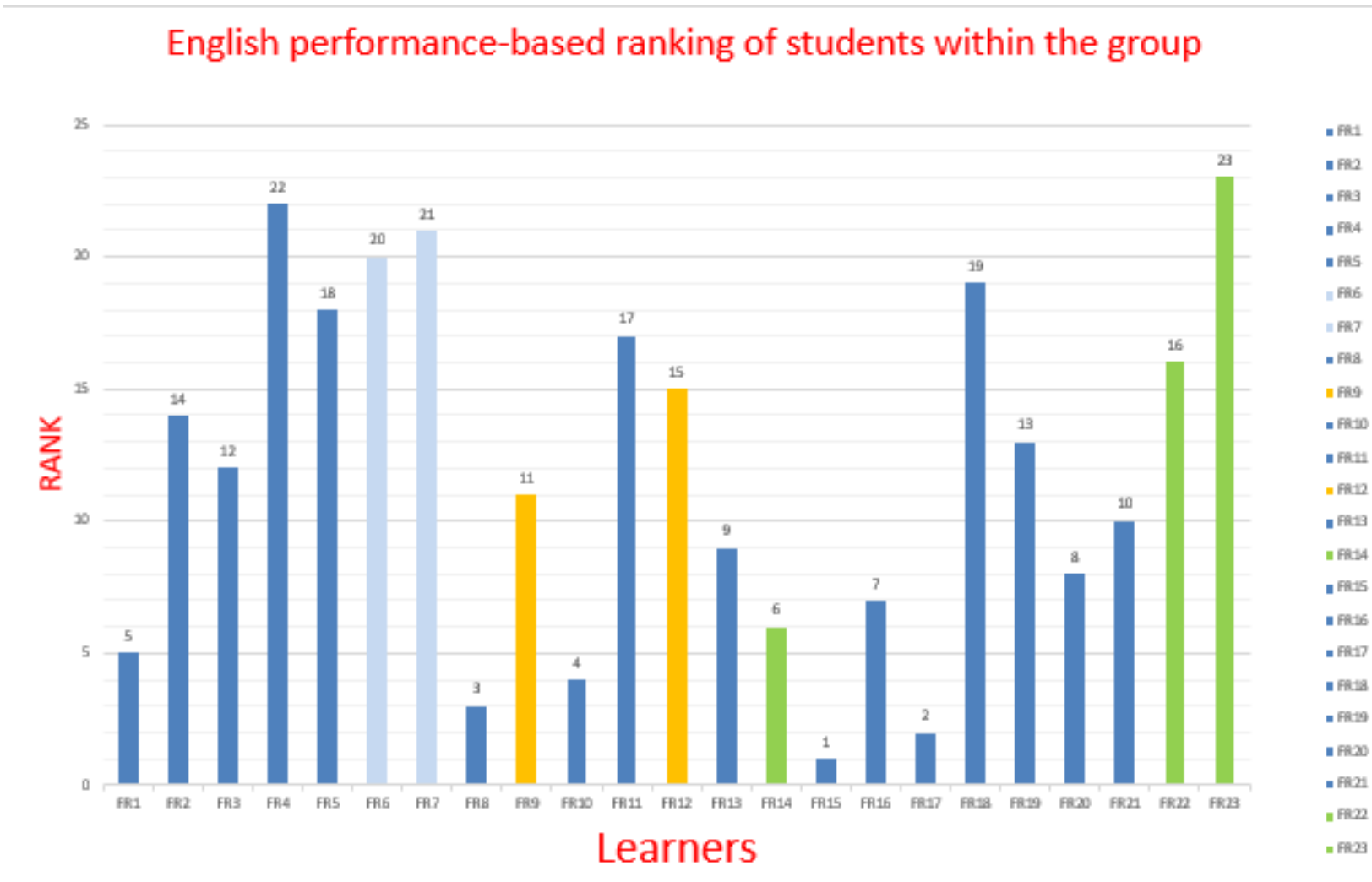


Dites ce que vous avez produit, selon vous...

- Onsets: analysed and coded: G (glottalised vowel) or H (intrusive aspiration) or L (linking)



Limited sample of participants: 16 subjects (out of 23)



23 students
3 sessions.

16 subjects

(23 – 7 irregularly attending students)

1st recording: ~~FR14, FR22, FR23~~

2nd recording :
FR9, FR12, FR14, FR22, FR23:
recorded one month later

~~FR6, FR7~~



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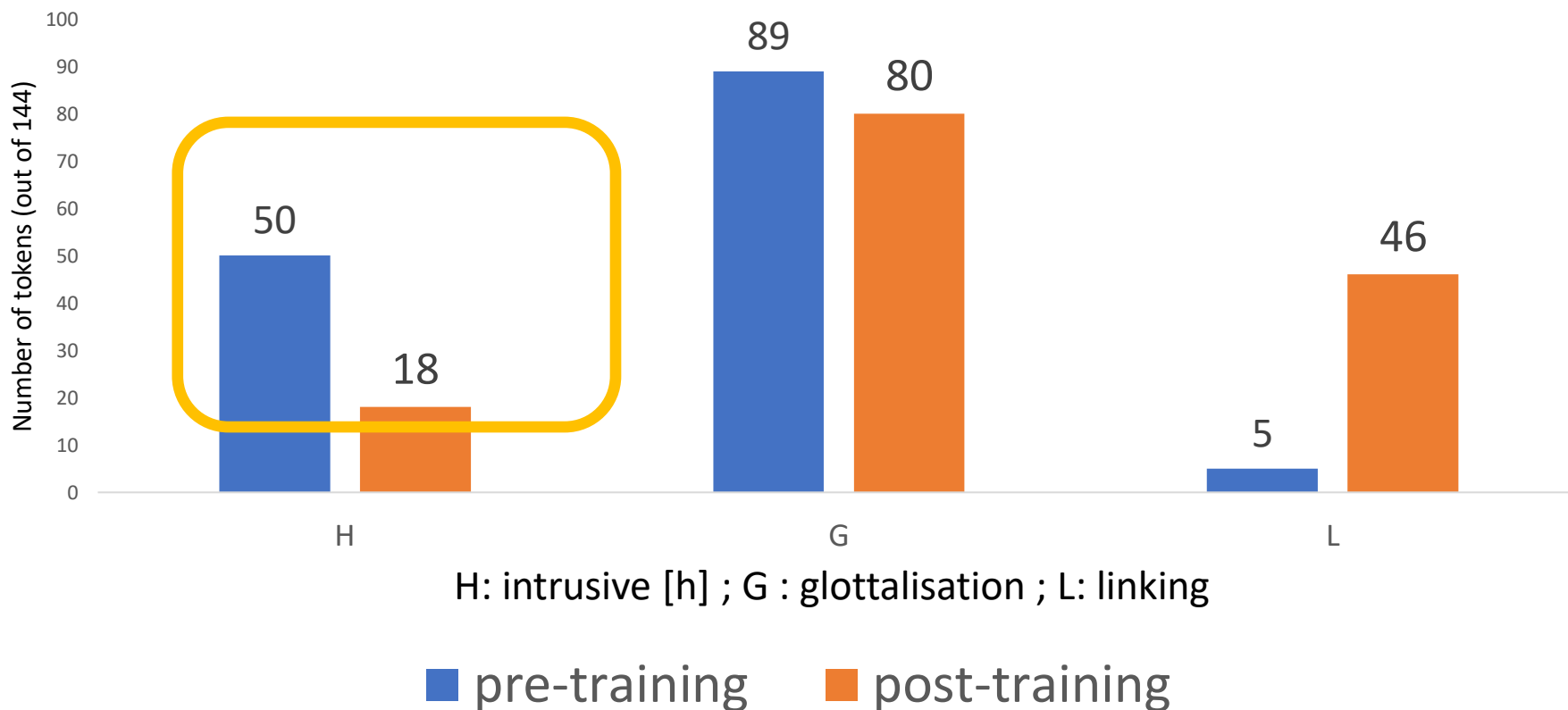
Results

6 questions

1. Did the participants produce fewer intrusive aspirations in #V contexts?
2. Did the participants produce more licit productions in V-V contexts?
3. Did they elide less in /h/-initial words?
4. Were they aware of what they produced?
5. Does awareness correlate with level?
6. Does the ability to produce correct V-V transitions correlate with level?

1. Did the participants produce fewer intrusive aspirations in #V-contexts?

Type of production for #V phrases

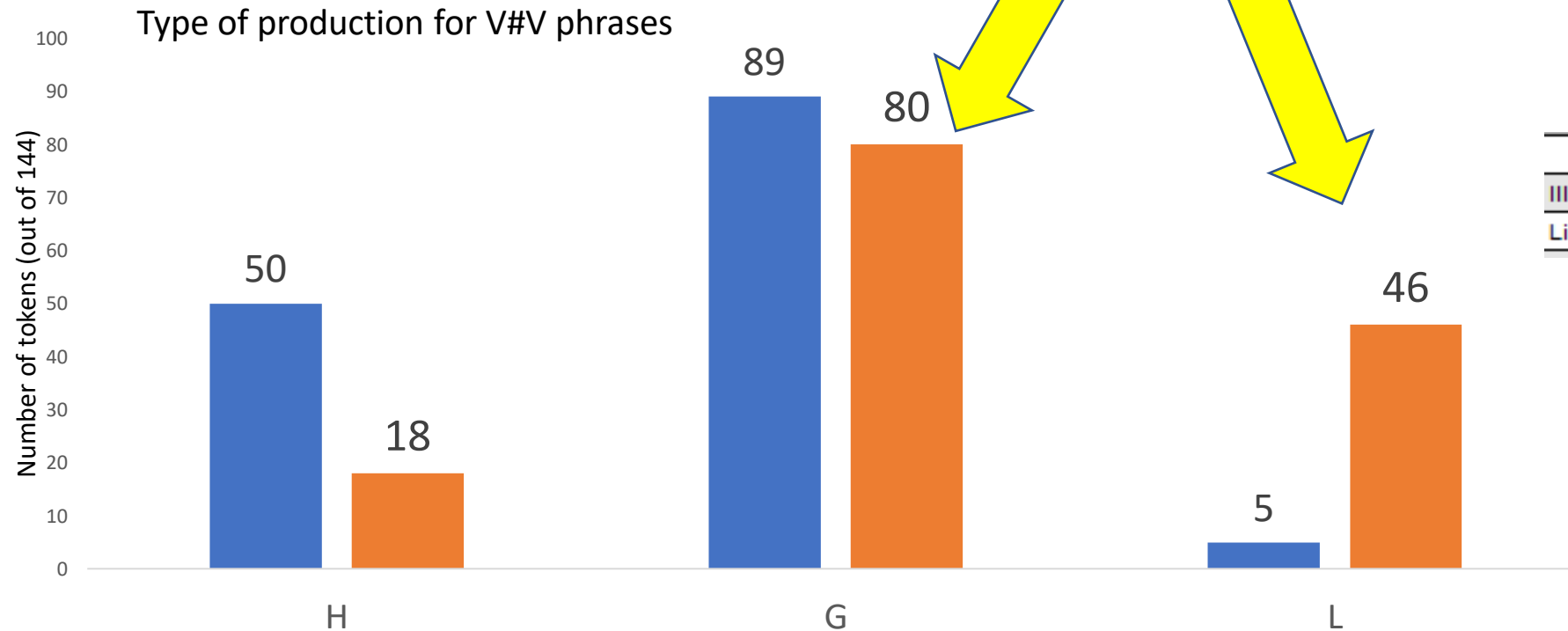


Results

6 questions

1. Did the participants produce fewer intrusive aspirations in #V contexts? YES
2. Did the participants produce more licit productions in V-V contexts?
3. Did they elide less in /h/ initial words?
4. Were they aware of what they produced?
5. Does awareness correlate with level?
6. Does the ability to produce correct V-V transitions correlate with level?

2. Did the participants produce more licit hiatus resolving strategies ?



H: intrusive aich; G : glottalisation ; L: linking

■ pre-training ■ post-training

Licit vs illicit
strategies before
and after training

	pre-training	post-training
Illicit strategy (H)	50 (34.00) [7.53]	18 (34.00) [7.53]
Licit strategy (G, L)	94 (110.00) [2.33]	126 (110.00) [2.33]

The chi-square statistic is 19.7134.
The p -value is $< .00001$.
The result is significant at $p < .01$.



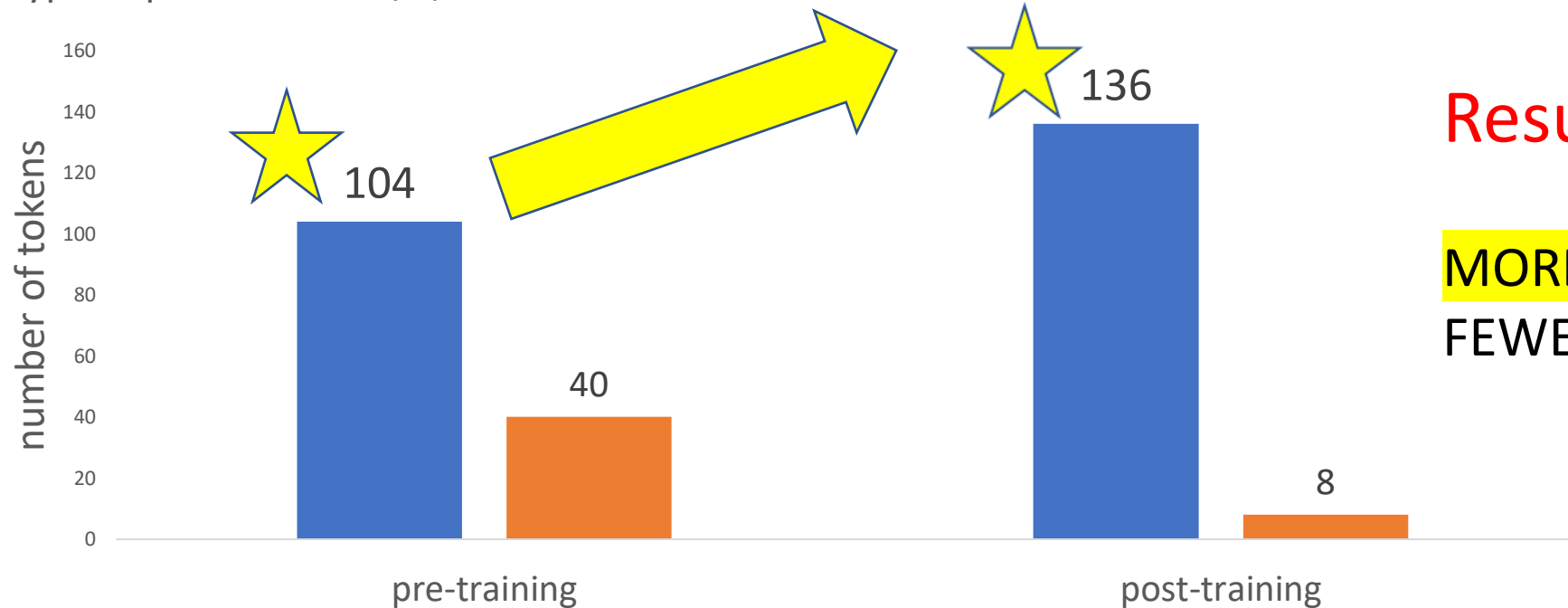
Results

6 questions

1. Did the participants produce fewer intrusive aspirations in #V contexts?
2. Did the participants produce more licit productions in V-V contexts?
YES
3. Did they elide less in /h/ initial words?
4. Were they aware of what they produced?
5. Does awareness correlate with level?
6. Does the ability to produce correct V-V transitions correlate with level?

3. Did they elide less in /h/-initial words? (eg: the hobby)

Type of production at /h/-initial word onset



Result for the GROUP

MORE licit /h/
FEWER illicit glottalisations

Number of aspirations (H) and glottalisations (G) in 2 conditions before and after training

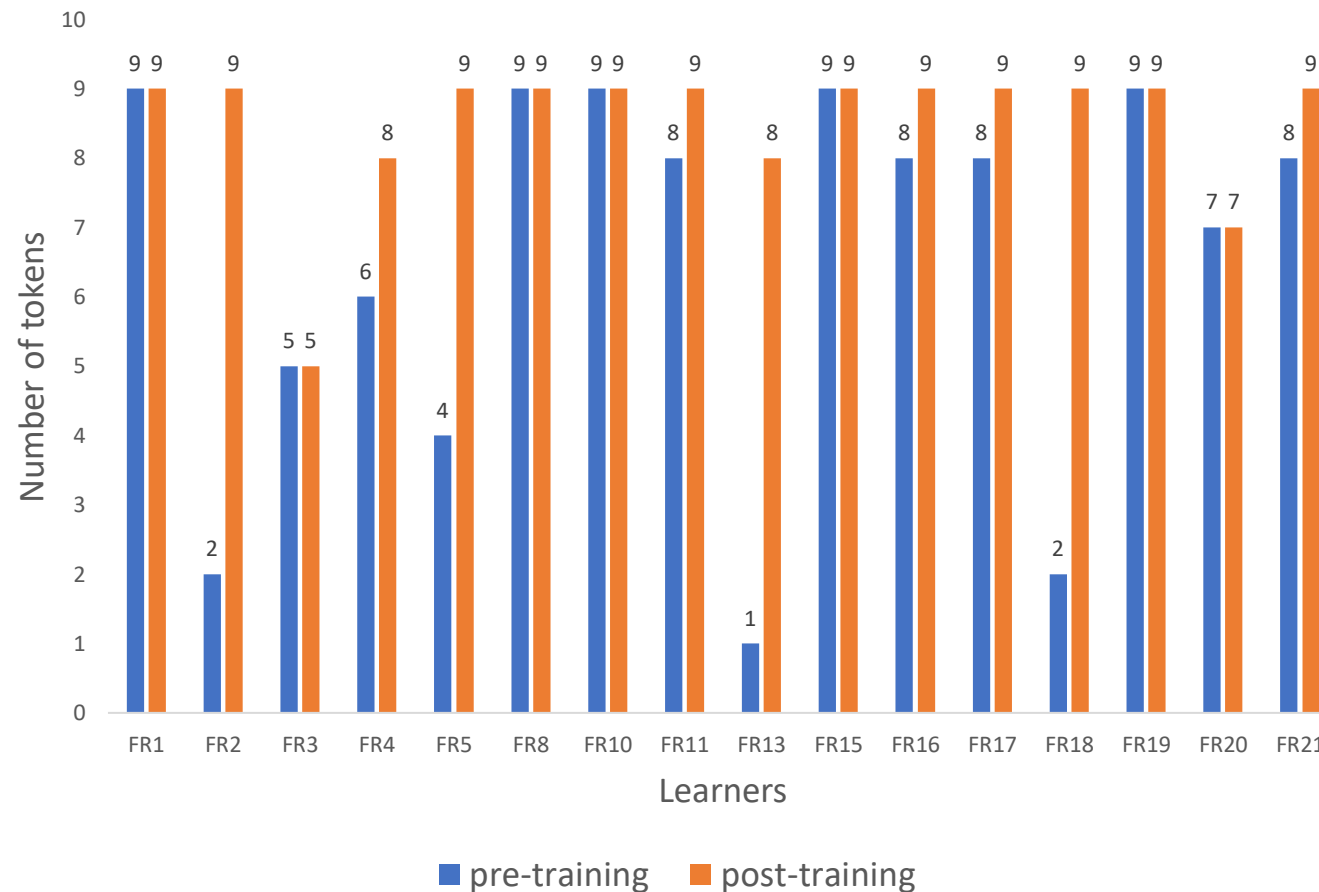
■ H ■ G



Kamiyama, Kühnert, & Vaissière (2011)

Did they elide less in /h/-initial words?

Number of correct realizations of /h/ in /h/-initial words by 16 French learners of L2 English



Result for EACH learner

Paired samples T-Test

P = 0,005

A significant effect of training on the correct pronunciation of /h/ initial words.



Results

6 questions

1. Did the participants produce fewer intrusive aspirations in #V contexts?
2. Did the participants produce more licit productions in V-V contexts?
3. **Did they elide less in /h/-initial words? YES**
4. Were they aware of what they produced?
5. Does awareness correlate with level?
6. Does the ability to produce correct V-V transitions correlate with level?

4. Were they aware of what they produced?

Learner	Production	Identification
FR1	G	x
FR2	G	x
FR3	H	L
FR4	L	L
FR5	L	L
FR8	G	x
FR10	L	L
FR11	H	L
FR13	L	L
FR15	G	G
FR16	L	x
FR17	L	L
FR18	G	G
FR19	L	x
FR20	G	G
FR21	L	x

50 % YES

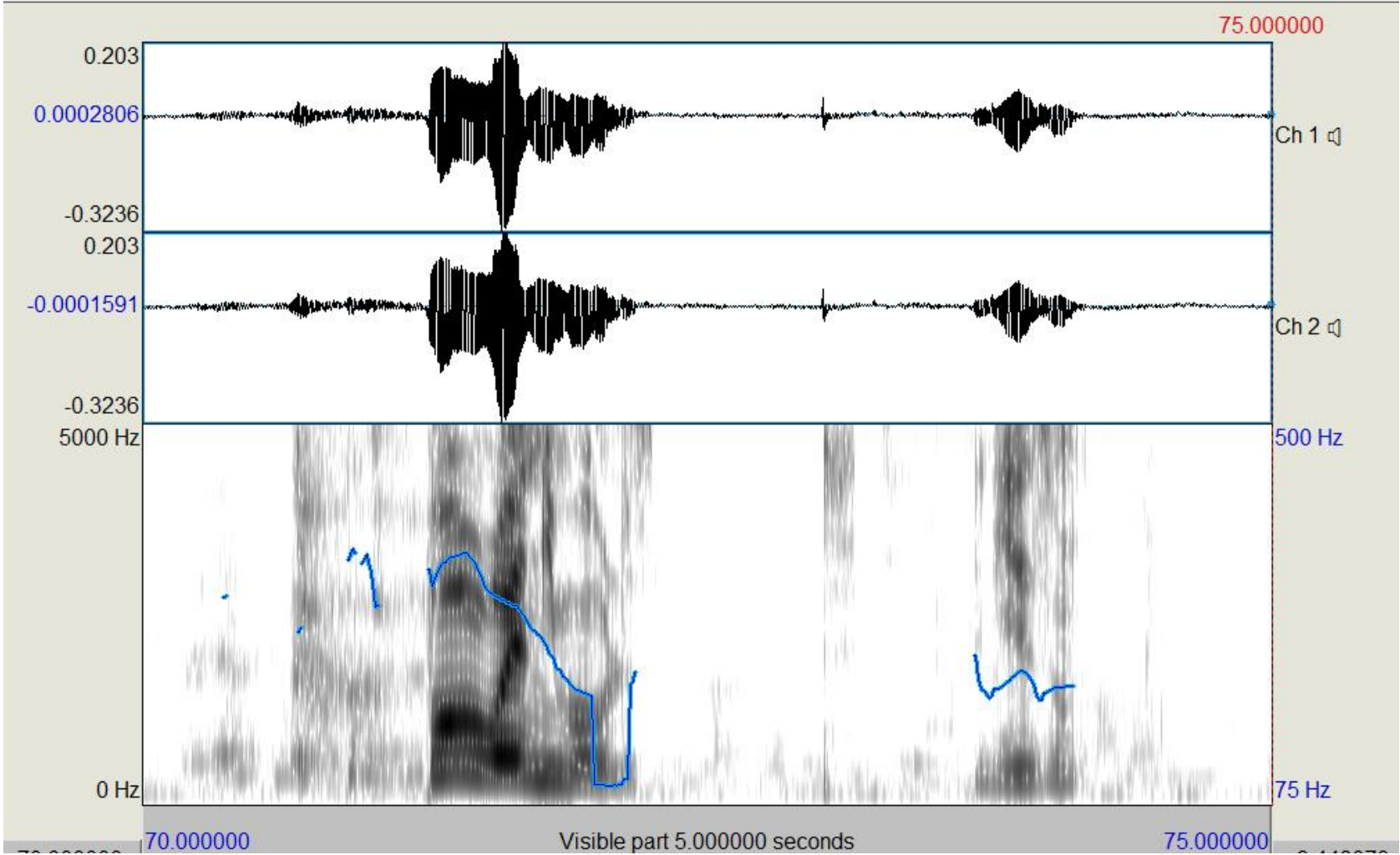
8 students in 16 could name what they produced.

50 % ??

6 students forgot to provide the information. 2 students were wrong while naming the strategy they had just produced.



FR10F- « poor animal » - post-training condition



Results

6 questions

1. Did the participants produce fewer intrusive aspirations in #V contexts?
2. Did the participants produce more licit productions in V-V contexts?
3. Did they elide less in /h/ initial words?
4. **Were they aware of what they produced? Inconclusive**
5. Does awareness correlate with level?
6. Does the ability to produce correct V-V transitions correlate with level?

5. Does awareness correlate with level?

→ hypothesis not supported

Who is able to identify what they produce?

Learner	Production	Identification	Rank / 23 students
FR1	G	x	5
FR2	G	x	14
FR3	H	L	12
FR4	L	L	22
FR5	L	L	18
FR8	G	x	3
FR10	L	L	4
FR11	H	L	17
FR13	L	L	9
FR15	G	G	1
FR16	L	x	7
FR17	L	L	2
FR18	G	G	19
FR19	L	x	13
FR20	G	G	8
FR21	L	x	10

FR5, FR18: poor performers

FR15, FR17, FR10: higher-level students

FR5



FR15



FR15's hiatus resolving strategy

1) Rhotic [ɔ:]

With F3 < 2000Hz

2) break (183 ms)

3) Glottalisation at the onset of ['æ]



Results

6 questions

1. Did the participants produce fewer intrusive aspirations in #V contexts?
2. Did the participants produce more licit productions in V-V contexts?
3. Did they elide less in /h/ initial words?
4. Were they aware of what they produced?
5. Does awareness correlate with level? Probably not...
6. Does the ability to produce correct V-V transitions correlate with level?

6. Does the ability to produce correct V-V transitions correlate with level?

- Pre-training condition paired samples t-test $p = 0,01$
→ The difference between the two groups (rank vs performance) is unlikely to be random.

Rank / 23 students	correct V-V (out of 9 items) - pre-training condition	Learner
5	7	FR1
14	9	FR2
12	6	FR3
22	3	FR4
18	3	FR5
3	4	FR8
4	5	FR10
17	3	FR11
9	7	FR13
1	6	FR15
7	9	FR16
2	6	FR17
19	8	FR18
13	1	FR19
8	6	FR20
10	8	FR21
0,01374128		



Probably, yes...



Results

6 questions

1. Did the participants produce fewer intrusive aspirations in #V contexts?
2. Did the participants produce more licit productions in V-V contexts?
3. Did they elide less in /h/ initial words?
4. Were they aware of what they produced?
5. Does awareness correlate with level?
6. Does the ability to produce correct V-V transitions correlate with level?

Most probably...

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Conclusion

A pilot study : the phonetic realizations of V#V transitions by French learners of English

A 2-hour training session, involving some explicit teaching of three phonetic processes (continuous voicing, vowel glottalisation, word-initial aspiration) **could help students**

- produce fewer intrusive aspirations in #V contexts
- produce more licit productions in V-V contexts?
- elide less in /h/-initial words.

BUT

They were **NOT** aware of what they produced

Their awareness did **NOT** correlate with their level in English

YET

Their ability to produce correct V-V transitions seems to correlate with their level...

Perspectives : what we need

- Clearer acoustic data to explore the issues:
 - How rare is modal voicing in French learner's L2 English ?
 - Is initial vowel glottalisation the default type of onset for vowel-initial words?
 - Does modal voicing correlate with better propensity to linking? (FR10 = modal voice)
- A bigger corpus
 - More training, with real-time spectrogram reading
 - More words and more contexts
- Bigger samples of students
 - Control group
 - Pre & post training
 - Long-term commitment
- Longitudinal experiments to measure
 - Short-term vs long-term efficiency
 - Explore double-loop learning, learning cycles = presenting input items in multiple random orders to favour long-term memorisation

Eg: 1-2-3-4; -> 1-2-1-2-3-2-1-3-4;

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Thank you for your attention.

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