

How do Danish L2 learners produce the distinction between *tai-cai-zai*?

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Danish-Chinese L2 interlanguage

New, but active field of research

Sloos et al (2015): Speech rhythm

Sloos et al (forthc.a): Pitch range

Sloos et al (forthc.b): Tone realization

Thesis being written on production of retroflexes, palatals

Problem

First pointed out by Wang & Sloos (2014)

Danish *t* is not aspirated, but affricated /t^s/

Expected to cause troubles with acquiring *t z c /t^h ts ts^h/*

This problem does not occur with languages that are otherwise similar to Danish.

Problem – Danish *t*

Danish stops: /b̥ d̥ ɡ̊ p^h t^s k^h/

Phonologically /t^s/ is *not* an affricate, but an aspirated stop

- Phonologically has the same position as /t^h/ in Chinese

Most of the aspiration is pronounced with the tongue in close proximity to the alveolar ridge, which acoustically results in affrication

Optionally, affrication is followed by a short burst of regular aspiration

DANISH T

/t^s/

Affrication* (+ Aspiration)

VOT: 93ms

Lenis

Orthography: <t>

Alveolar

*Probably not of cognitive significance to the speaker

CHINESE T

/t^h/

Aspiration

VOT: 86ms

Fortis

Orthography: <t>

Dental

DANISH T

/t^s/

Affrication* (+ Aspiration)

VOT: 93ms

Lenis

Orthography: <t>

Alveolar

*Probably not of cognitive significance to the speaker

CHINESE Z

/ts/

Affrication

VOT: 73ms

Lenis

Orthography: <z>

Dental

DANISH S

/s/

Frication*

Duration: ???

Orthography: <s>

Alveolar

*Acoustically similar to /ts/ frication

CHINESE Z

/ts/

Plosive release* + frication

Duration: 73ms

Orthography: <z>

Dental

*Optionally weak

DANISH T

/t^s/

Affrication* (+ Aspiration)

VOT: 93ms

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Orthography: <t>

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CHINESE C

/ts^h/

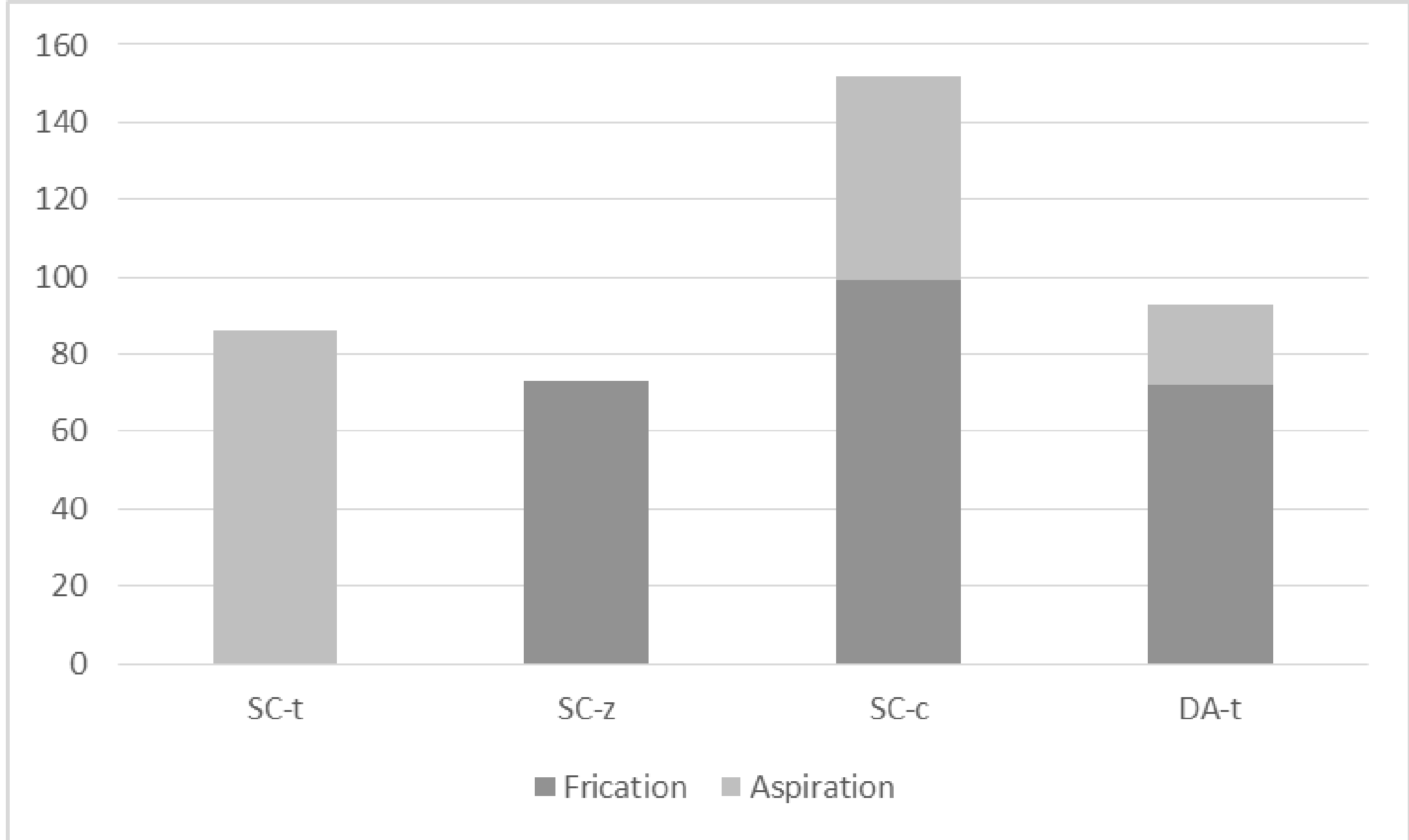
Affrication + Aspiration

VOT: 152ms

Fortis

Orthography: <c>

Dental



Expectations

SC *t c* are probably equidistant to Danish *t*

- May be one phoneme in the early interlanguage

SC *z* is less similar

In production by Danish L1 speakers...

- *t* is expected to retain affrication, at least early on
- *c* is expected to be shorter, aspiration expected to come gradually
- *z* might be confused with *c* early on

Perception

Perception tested by Ne et al (forthc)

- AXB experiment showed near-ceiling perceptive distinction among Danish SC students
- Also found good distinction among Danes with no knowledge of Chinese
- The *c z* pair was hardest to distinguish

Perception

Perception tested by Sloos et al (forthc.c)

- Using aspiration and affrication continua
- Here, *t* and *c* are frequently confused

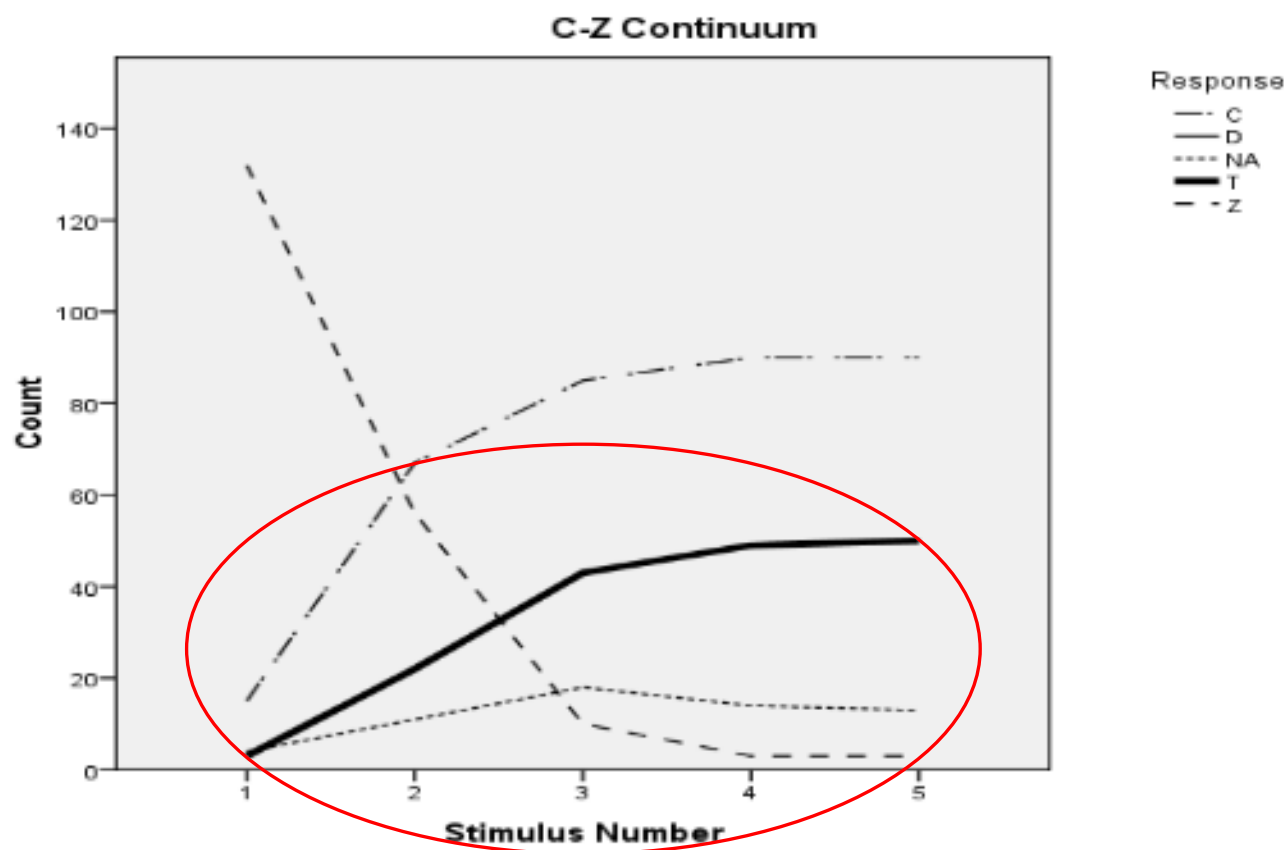
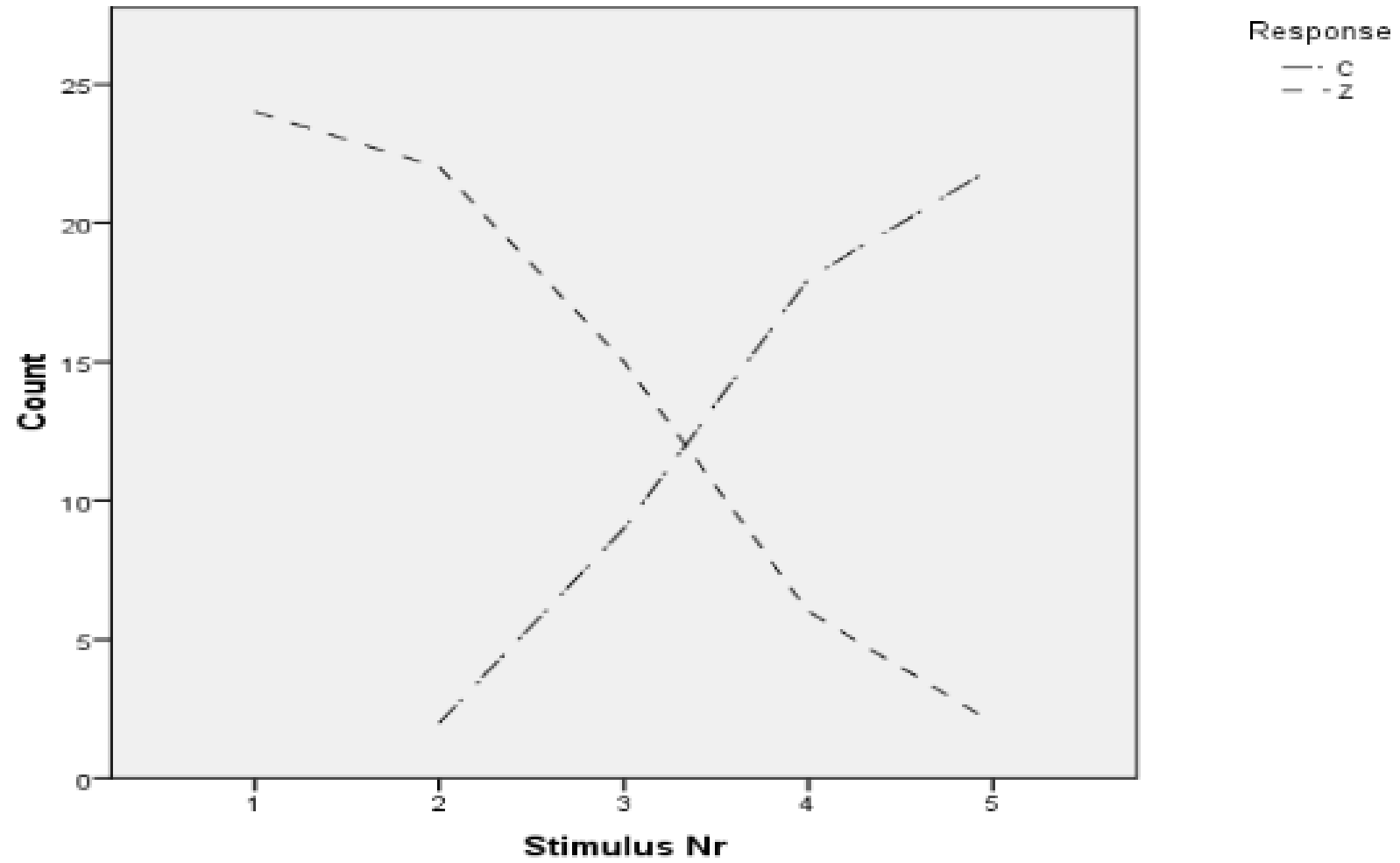


Figure 7. Number of perceived < t d c z > among Danish students of Chinese for five sounds on the < c z > / ts^h ts / continuum (where [ts] = 0 and [ts^h] = 5). It shows categorical perception with the categorical boundary around stimulus 2.

C-Z Continuum (Native)



Design and procedure

Reading task

- 64 sentences
 - 12 Danish, 12 English, 40 Chinese
 - Chinese had both characters and Pinyin
- 6 syllables
- $\frac{3}{4}$ included a target sound, $\frac{1}{4}$ were fillers
 - Randomized
 - Target sounds at different positions before different vowels, tones

Subjects

L1 Danish

- Mostly 20-25 years old
- Mostly from Central Jutland
- Good English, generally good German
- 10 had studied Chinese in high school
- 7 first year students
- 12 second year students
- 6 third year students

Subjects

Native Chinese

- 7 exchange students in Aarhus
- Native Mandarin Chinese speakers

Procedure

Single sentences presented on slides in MS PowerPoint

Chinese sentences presented both in Pinyin and characters

The experiment was self-paced and lasted 3-6 minutes

Recorded at IMC lab at Aarhus University

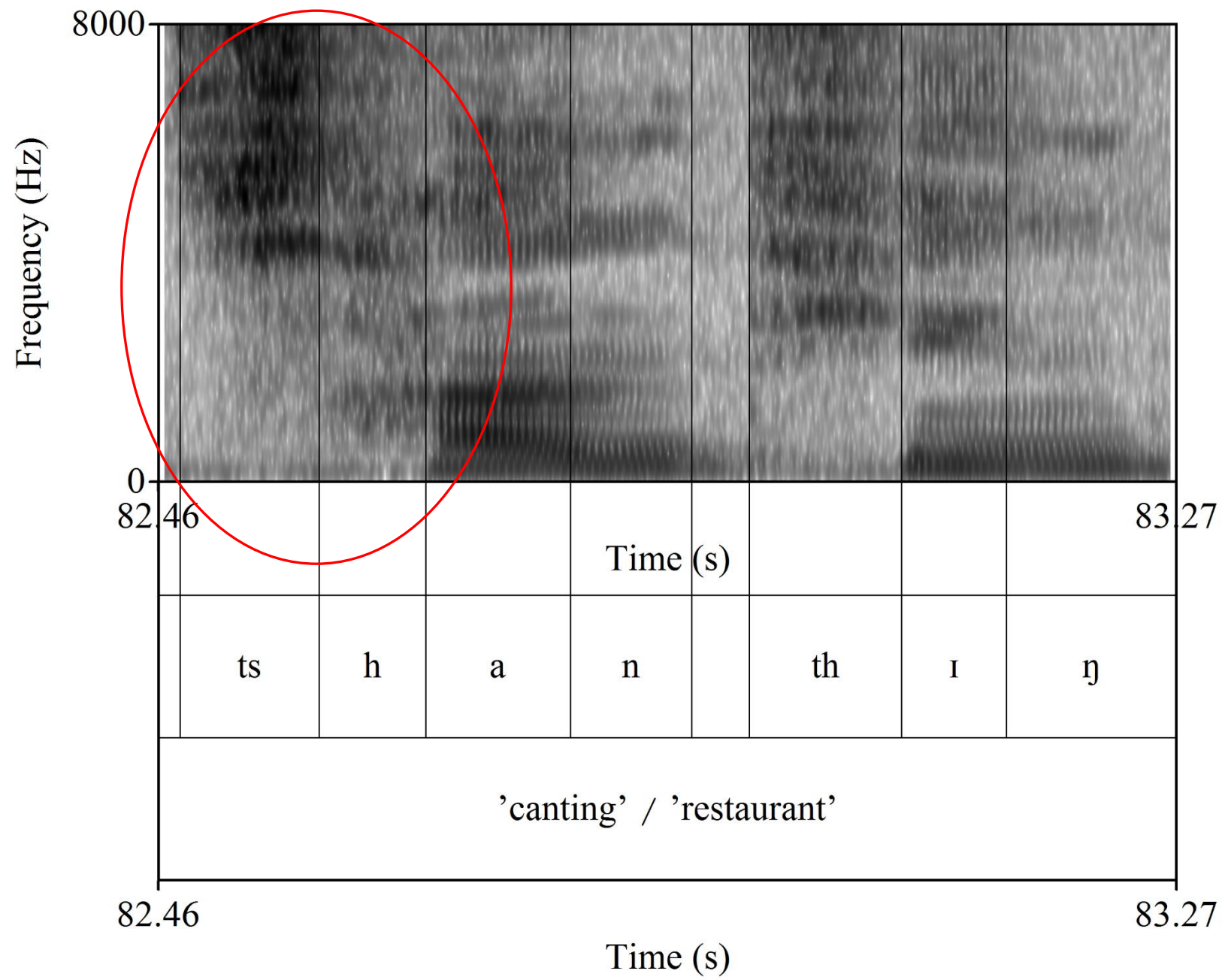
Analysis

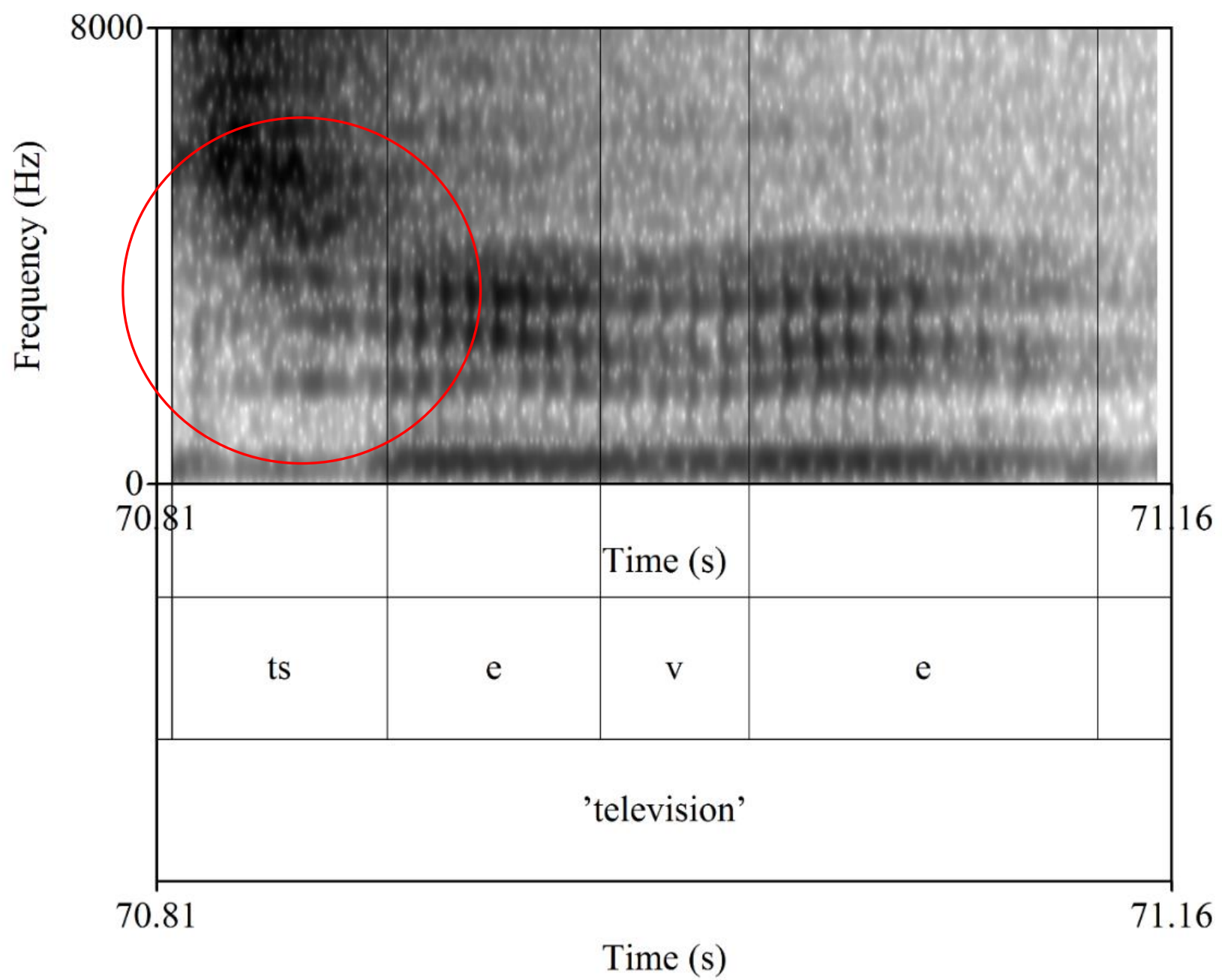
Praat speech processing software used to analyze the release portions of the stops and affricates

Release duration measured for each token

If applicable, VOT split into aspiration and affrication segment

- Individual segments measured in cs
- The normal measure is ms, but Danish change from affrication to aspiration is gradual
- Both auditory and visual judgment used





Results – Chinese *t*

Appeared to become progressively less native-like

Affrication was a tenacious issue

Table 6: <t> VOT

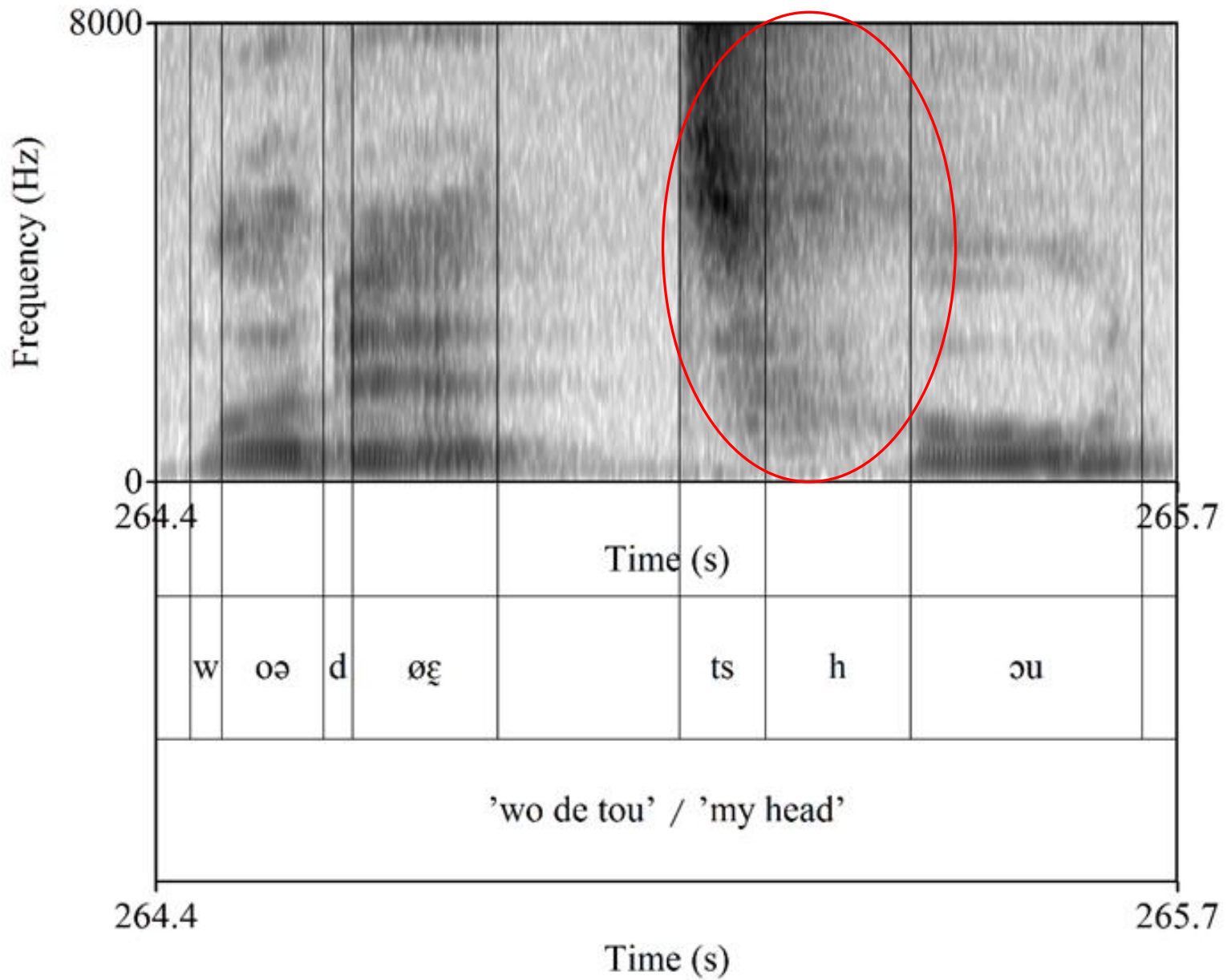
Group	Mean VOT	Mean fr.	Mean asp.	% without fr.	% without asp.	Range (cs)
Y1	92ms	41ms	50ms	35% (n=39)	30% (n=34)	4 - 21
Y2	95ms	24ms	71ms	57% (n=108)	9% (n=18)	3 - 19
Y3	112ms	31ms	81ms	56% (n=53)	11% (n=10)	5 - 29
Native	86ms	0ms	86ms	100% (n=112)	0% (n=0)	3 - 15

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Results – Chinese *t*

Y1: For many students, it is the same category as Danish *t*

- There are also some students who are good at this point

Y2: Affrication has become less prominent

Y3: Much longer duration: Fortis pronunciation developed

- Two strategies:
 - Unproblematic: No affrication, but long
 - Problematic: Affrication and long. Very similar to *c*.

Results – Chinese z

Pronunciation becomes progressively more native-like

Duration was significantly longer than native speakers at all levels

No aspiration – no confusion with *t c*

There was a tendency to leave out plosive release

- Making it simply a fricative

Table 7: <z> VOT

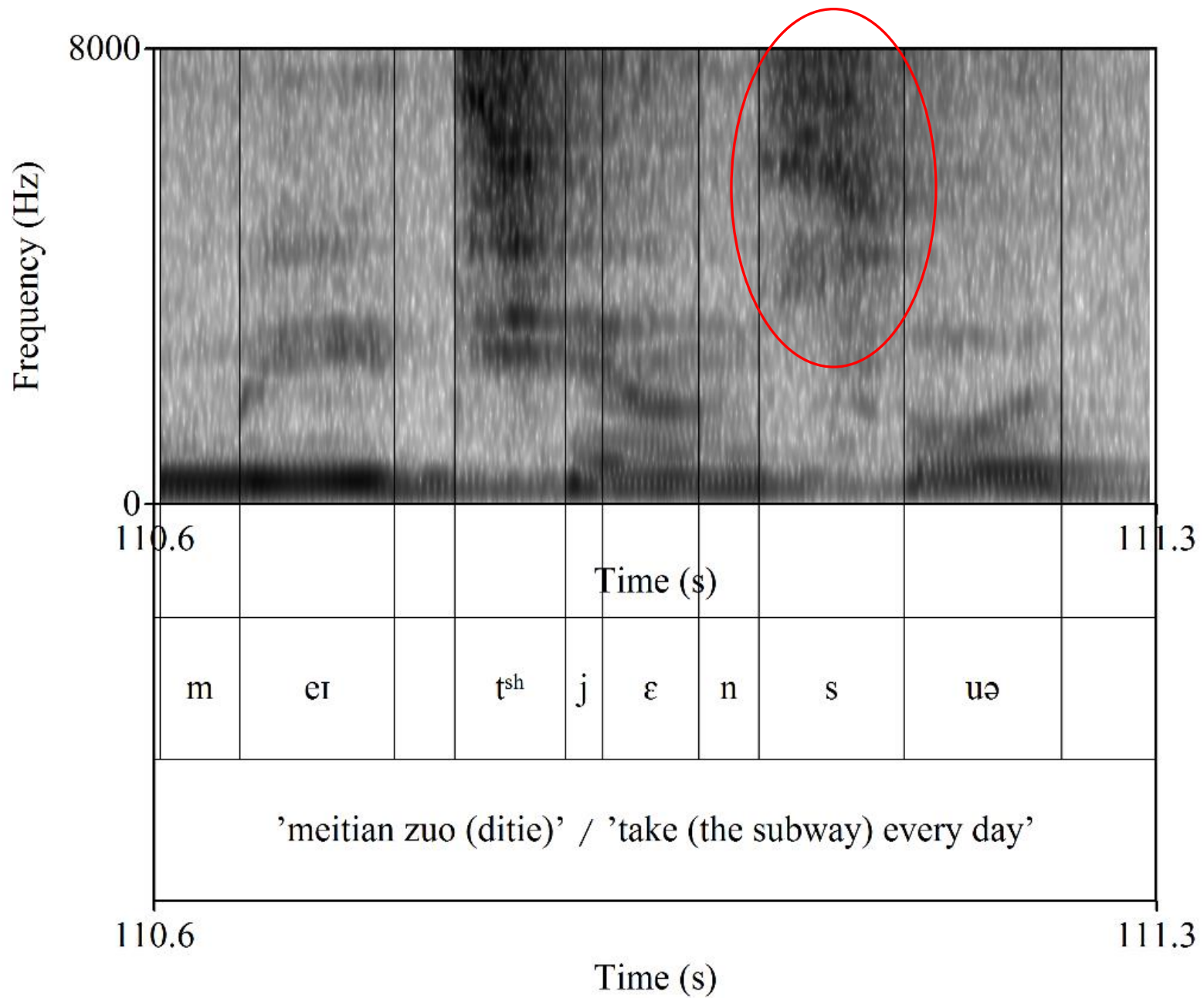
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Y2	119ms	118ms	1ms	1% (n=1)	98% (n=160)	27% (n=45)	5 - 29
Y3	106ms	105ms	1ms	0% (n=0)	99% (n=82)	22% (n=18)	4 - 23
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Results – Chinese z

The biggest problem is lacking plosive release

- Not enough data to properly compare to the pronunciation of s

The duration remains unexplained

- May be due to the duration of s

Results – Chinese *c*

Pronunciation becomes progressively more native-like

Duration was significantly shorter than for native speakers

There was a tendency to leave out affrication

Table 8: <c> VOT

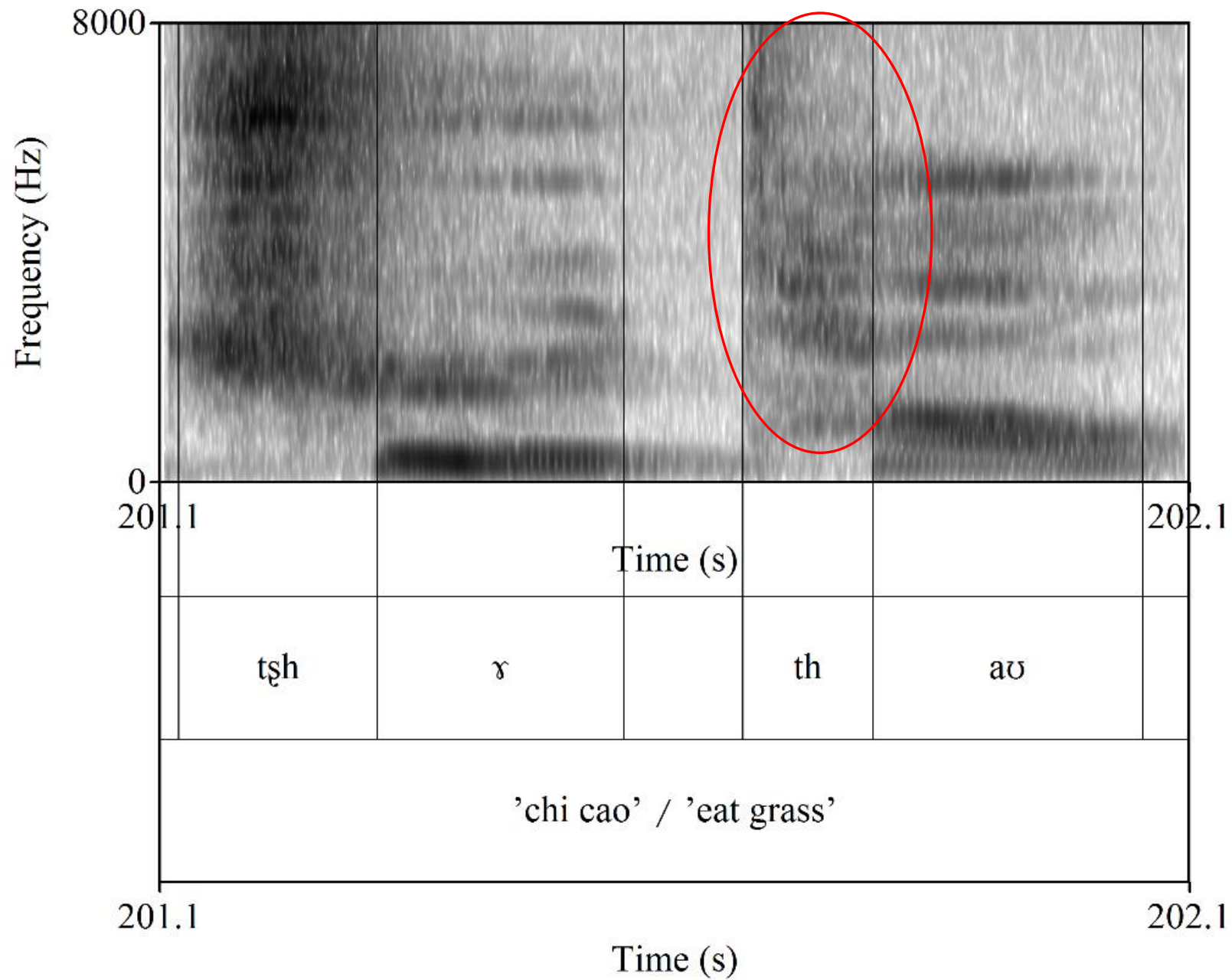
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Y3	125ms	86ms	39ms	3% (n=2)	33% (n=20)	6 - 23
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Results – Chinese *c*

Y1: Very troublesome

- For some students it is identical to Danish *t*
- A significant number without affrication at all
- 14% of tokens excluded due to mispronunciation

Y2: More stabilized

- Fewer tokens excluded (6%)
- Still significant number without affrication

Results – Chinese *c*

Y3: Much more stabilized

- More native-like duration
- Missing affrication no longer a problem
- Missing aspiration still a problem

On a more impressionistic note, transition from affrication to aspiration remains much more gradual for Danish speakers

Categorization - Patterns

Generally speaking, *t c z* are distinct categories early on

- Though the categories are based on different features than for the native speakers

z is most obviously distinct at an early level

- But a more detailed study of its difference from *s* is needed
 - Can *s* for example have a plosive release?

t c are also separate categories

- Though a significant overlap around the edges is expected for speakers who have affrication in *t*

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Categorization – Explanations

Distinguishing feature between *t* and *c* appears to be intensity – not affrication for many Y1 and Y2 speakers

- Chinese *t* is perceived similar to Danish *t*
- Chinese *c* is perceived as a more intense (fortis) version of Danish *t*
- Of course, in Chinese, both *t* and *c* are fortis, but that may be hard for the Danish speaker/listener to perceive

Communicative problems

The considerable overlap between *t c* in the Danish-Chinese interlanguage is expected to be problematic

- But the extent of these problems is unknown
- Testing L1 Chinese speakers' perception of these sounds as uttered by Danes would be very illuminating

Pedagogical implications

Stating the obvious:

Minor phonetic differences between languages can be very important

- Because non-phonemic phonetic features can be very hard for the speaker to perceive
- And because the native speaker is often unaware of them

Pedagogical implications

In this case, a good knowledge of Danish phonology is important to understand why Chinese phonology is different

So teachers are suggested to make Danish students aware that affrication is a prominent feature of Danish

- As this will make it easier to eradicate from their Chinese

Conclusions

Even early in their studies, Danish students make a productive distinction between *t z c*

But this distinction is based on different features than it is for the native speaker

- The *t <-> c* distinction is based more on duration / muscle activity than affrication
- The plosive release is not sufficiently important when producing *z*

Though the difficulty with *t <-> c* was generally overcome for some speakers, it proved to be very tenacious for others, and was actually exacerbated by the development of fortis pronunciation of *t*

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Tak for
opmærksomheden!
谢谢
