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Embodied pronunciation instruction: empirical evidence and recent findings

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Do you use your hands in the classroom?

To what purpose?

What kind of movement?

Answer in the chat !



Human communication is **multimodal**



It involves a dynamic interaction between the **verbal content**, **gestural** and **prosodic features**

What do we mean by: **embodied** pronunciation instruction?



Gestures

What do we mean by:
embodied pronunciation instruction?



Gestures

**Kinaesthetic
movements**

What do we mean by: **embodied** pronunciation instruction?

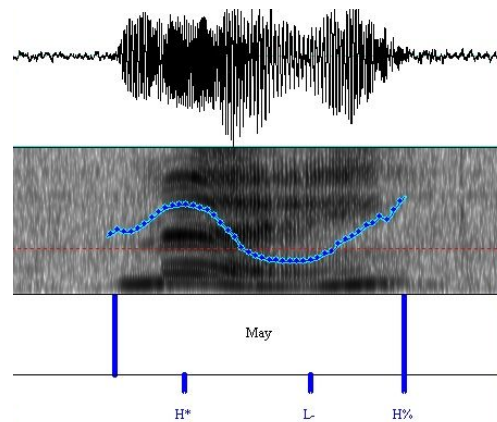
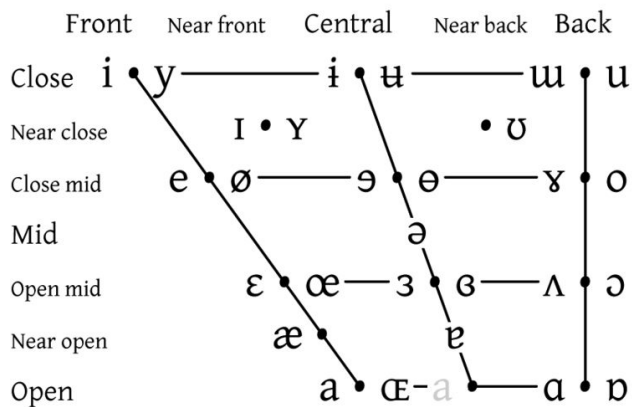
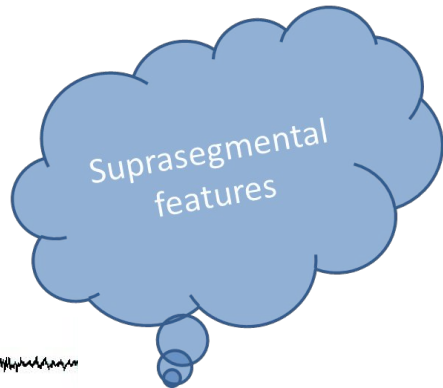
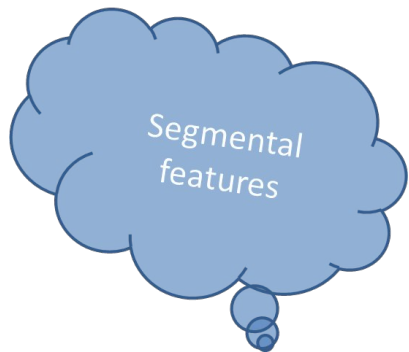


Gestures

Kinaesthetic
movements

**Whole-body
movements**

What does embodied pronunciation instruction deal with?



Road Map

1. What are the mechanisms behind embodied learning ? (the theory)

- **Embodied cognition paradigm**
- **Speech-gesture alignment**

2. What are the gestures and the movements that have been tested ? (the practice)

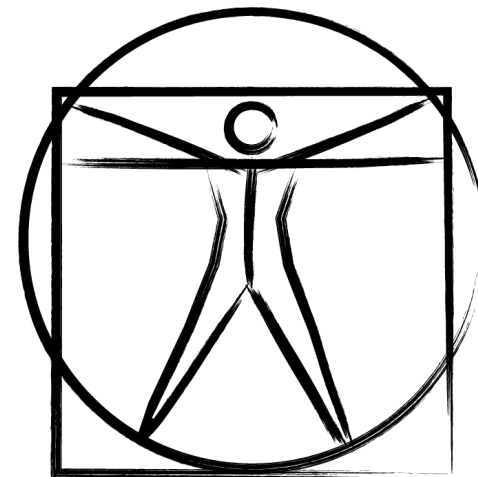
- Segments : **hand articulatory gestures**
- Rhythm : **beat gestures, hand clapping**
- Prosody : **prosodic gestures, embodied music**

8 STUDIES

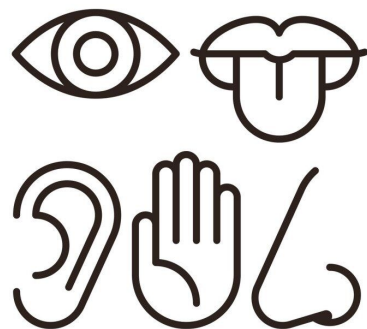
Example



FLE Philippe Mijon <http://www.fle-philippemijon.com/>



EMBODIED COGNITION



Barsalou 2008
Kiefer & Trumpp 2012

Embodied cognition

Grounding by interaction hypothesis

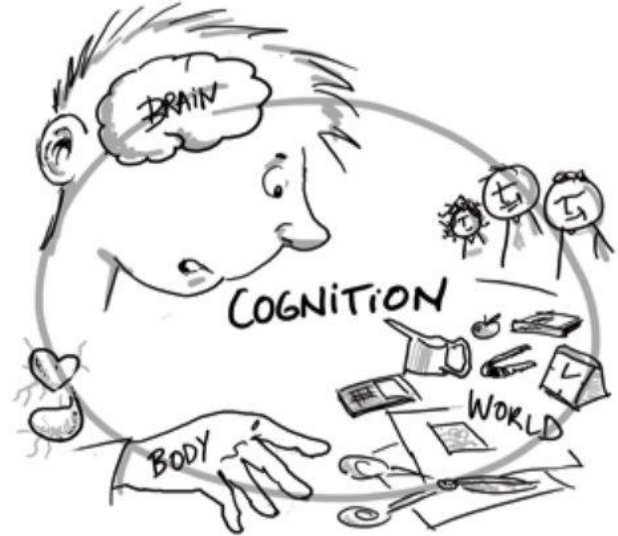
Sensory and motor information provide a **enhanced, richer** version of conceptual representations

Mahon & Caramazza 2008

Reenactment / Simulation of action

- 1) Perception and memorization of an experience / action
- 2) Offline cognitive process involving the activation of the experience / action

Engel et al. 2013



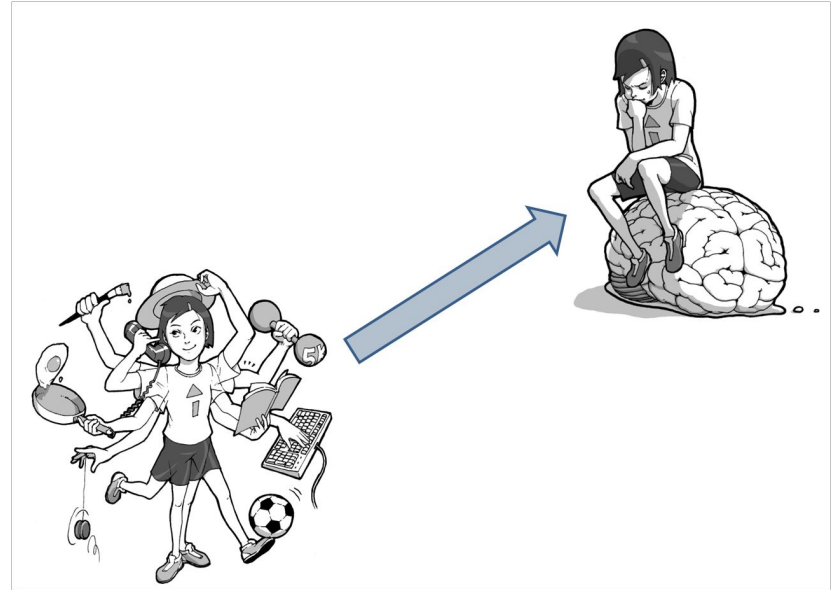
© Jelle van Dijk EMBODIED COGNITION: THREE FLAVORS

Embodied cognition

Mimesis

Imitation of verbal and non-verbal behaviors

Pardo et al. 2017
Coles-Harris 2017



by S. Iwasawa from Pfeifer & Bongard:
How the body shapes the way we think,
2007

Spatiotemporal coupling between speech and manual motor actions

Gestures are tightly intertwined with speech in **time** and **semantic** function.
(McNeill 1992, “Hand and mind: What gestures reveal about thought”)

Gestures are **anchored to prosodic structure**

The most prominent part of gestures tends to occur with the most prominent parts of speech (e.g., Birdwhistell, 1952; 1970; Kendon, 1972; 1980, Loehr 2012, among many others).

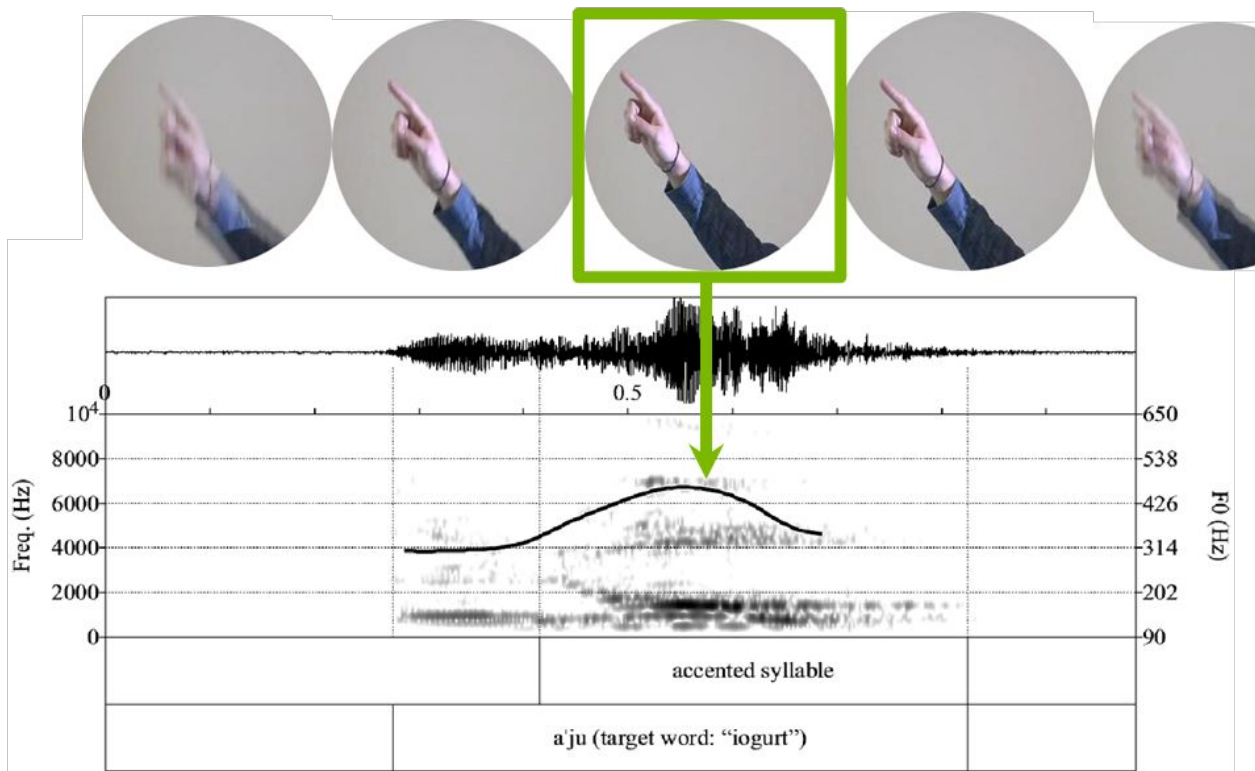
Gestures start and end with beginnings and ends of prosodic phrases (e.g. Esteve-Gibert & Prieto, 2013; Krivocapic’s work).

Pointing-corrective focus task



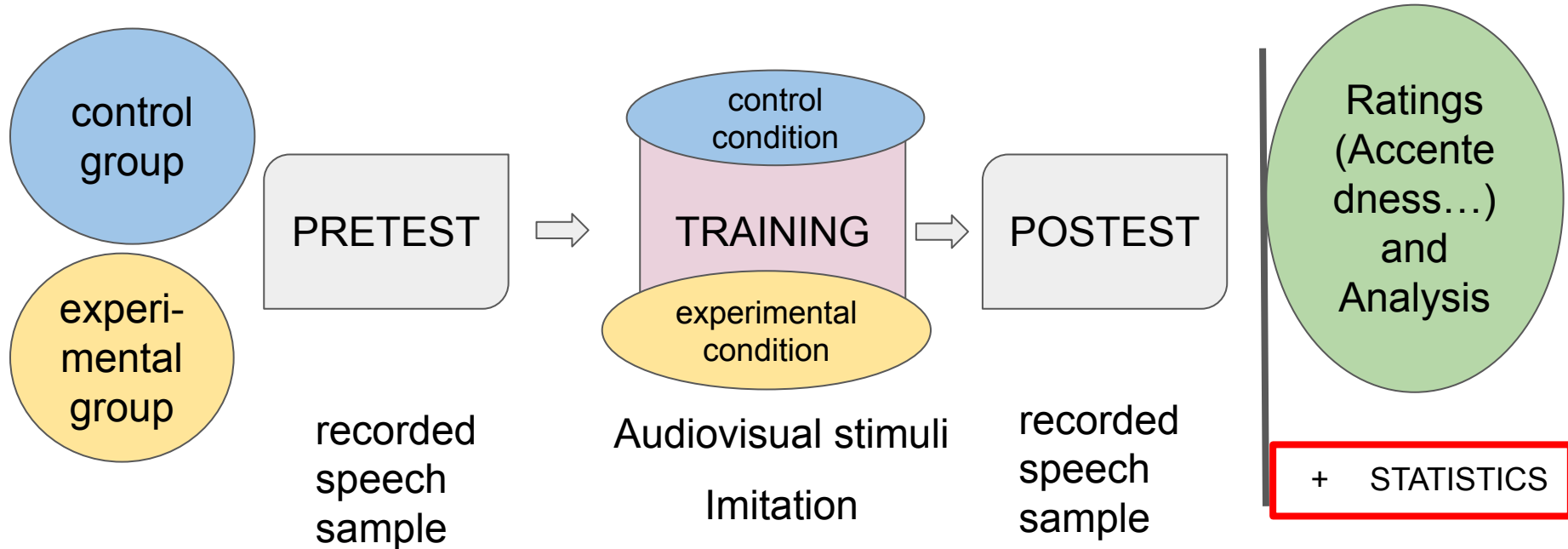
Esteve-Gibert, N., & Prieto, P. (2013). "Prosodic structure shapes the temporal realization of intonation and manual gesture movements". *Journal of Speech, Language, and Hearing Research* 56(3), pp. 850-864.

apex of the pointing gesture

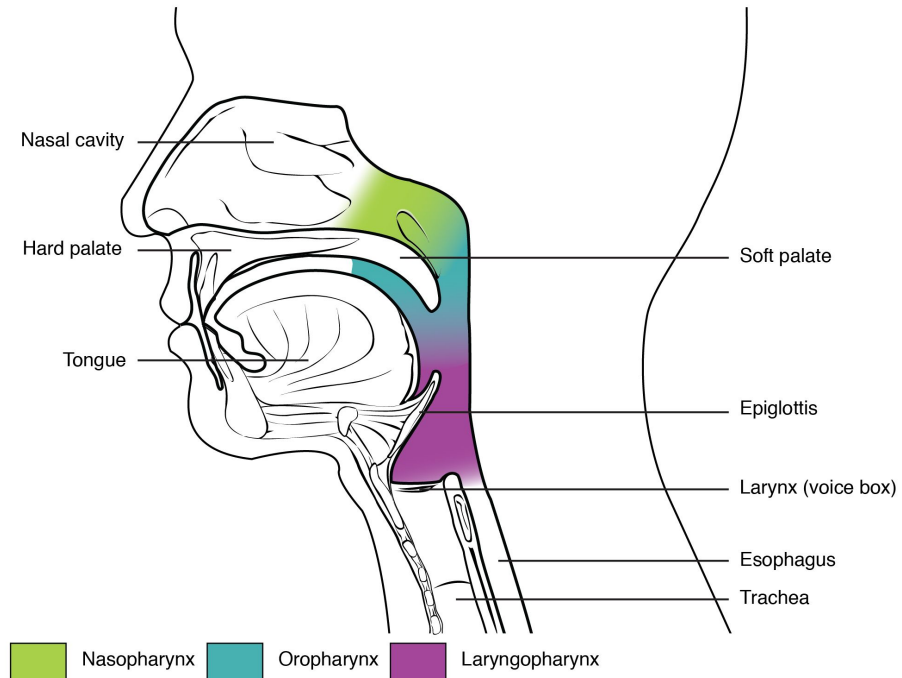


Testing the effect of embodied pronunciation training Methodology

Controlled design, Between-subject experiments



Hand articulatory gestures



Study 1: Producing hand articulatory gestures

Li, P., Xi, X., Bails, F. & Prieto, P. (2021). “Training non-native aspirated plosives with hand gestures: Learners' gesture performance matters”. *Language Cognition and Neuroscience*, 36(10): 1313-1328.

50 Catalan naive learners of Chinese

Short training (5 minutes)

Imitation task

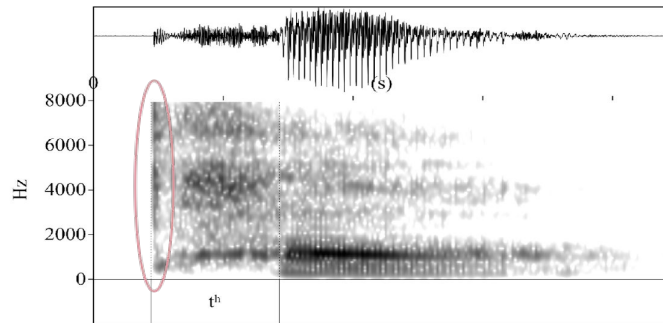
- aspirated plosives
- aspirated fricatives



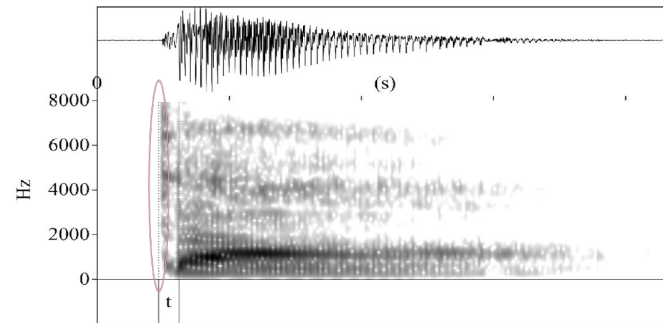


Target sounds

strength
of air
burst

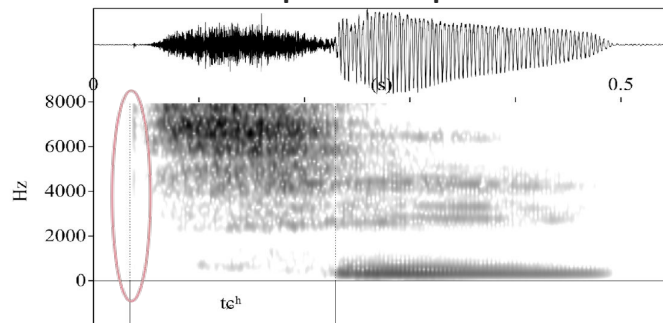


aspirated plosive

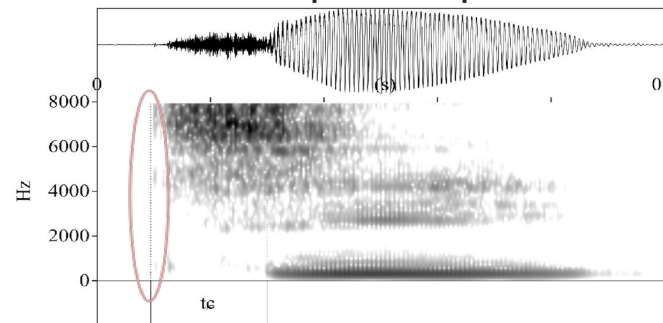


unaspirated plosive

duration
of
frication



aspirated affricate



unaspirated affricate

Gesture vs No gesture

pi yan p^hi yan

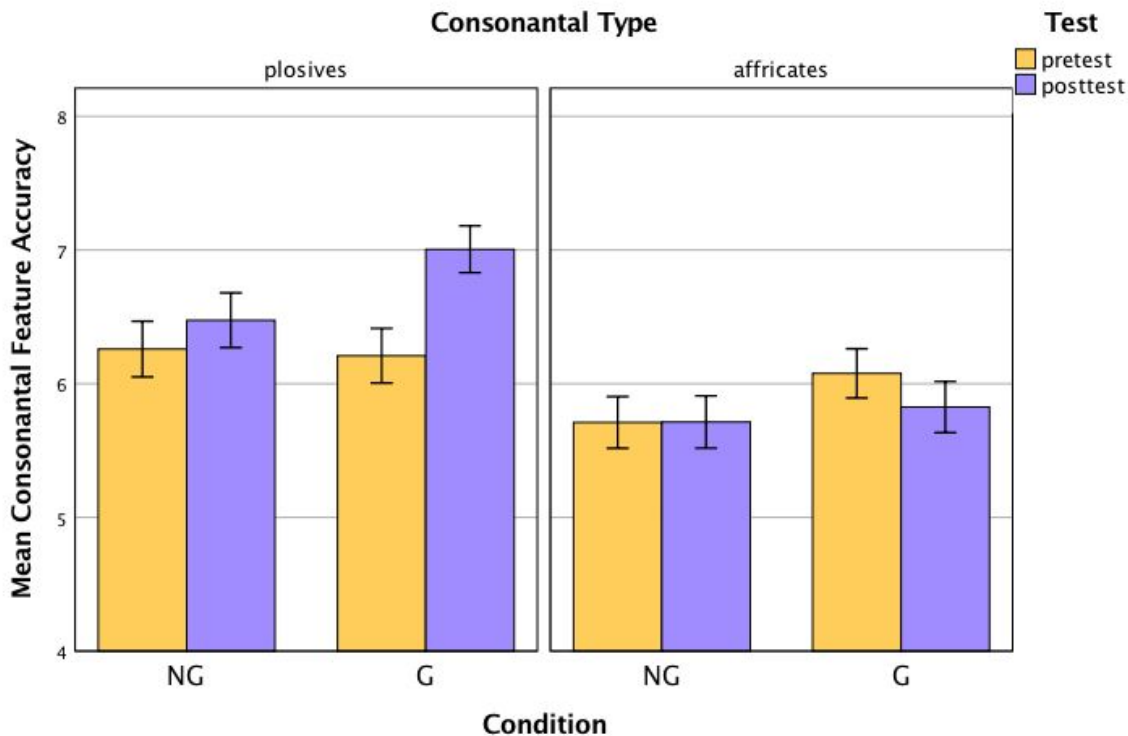
pi yan p^hi yan

ACOUSTIC ANALYSIS (VOT)

aspirated
plosives



Ex. **phuo**



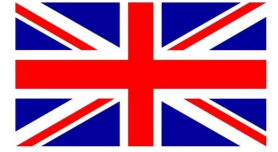
aspirated
affricates



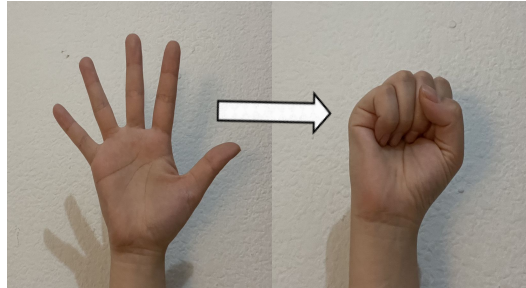
Ex. **tchhan**



Other studies: Amand & Touhami, 2016

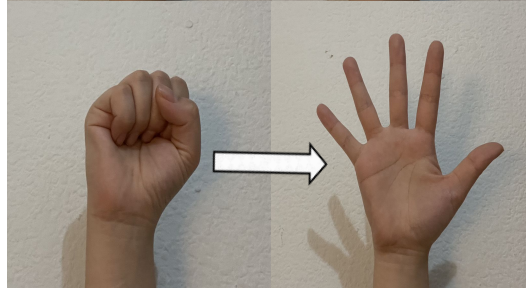


Ex. black pan



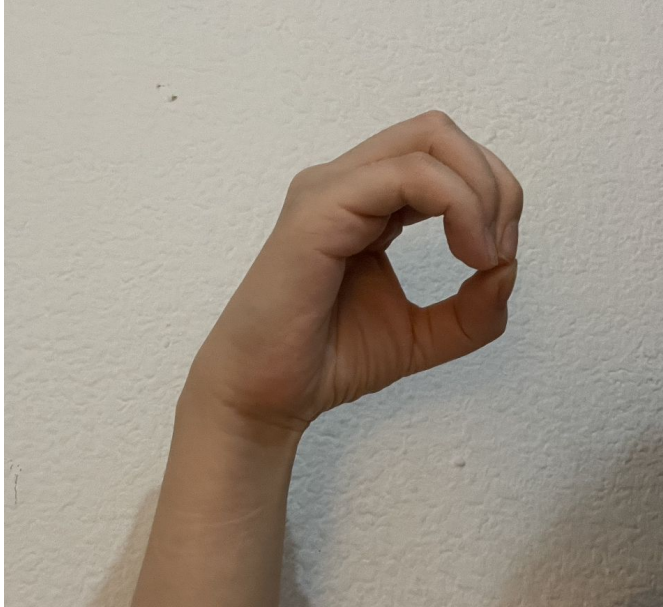
unreleased stop

Ex. to speak



released stops

Other studies: Hoetjes & van Maastricht, 2020



Spanish /u/

Ex. la nube



Spanish /θ/ ❌

Ex. la zeta

Hand articulatory gestures

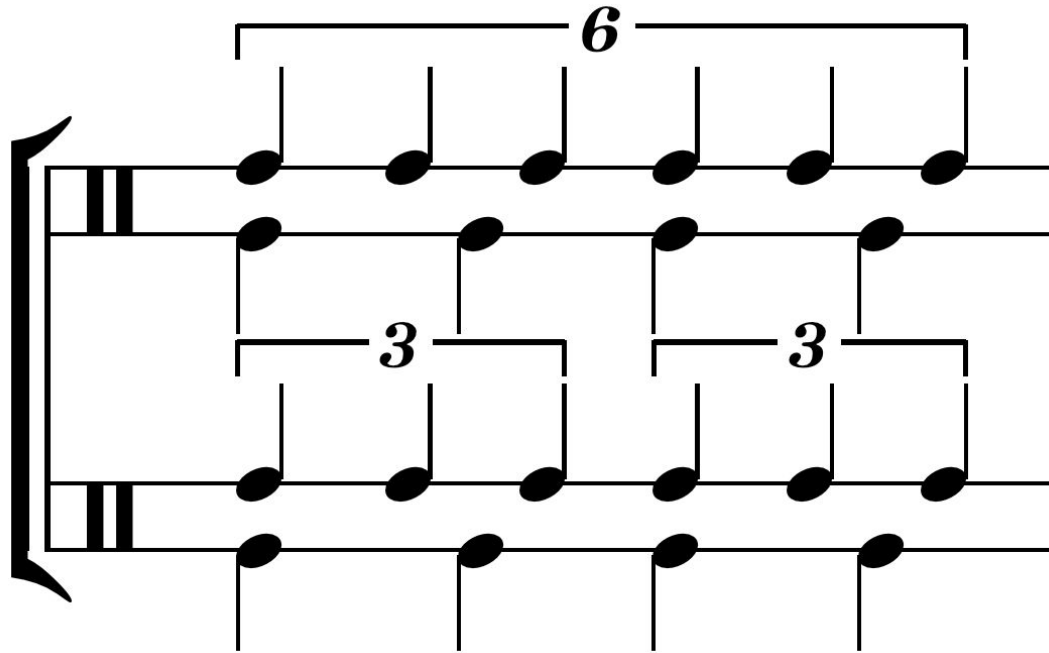
Gestures representing a particular property of the sound

→ Useful when the sound is particularly difficult to produce

→ Importance to imitate correctly the gesture

→ The metaphor of the gesture must be clear (for ex. rounding of the lips)

Highlighting rhythm



Highlighting rhythm

Studies 2 & 3:
beat gestures

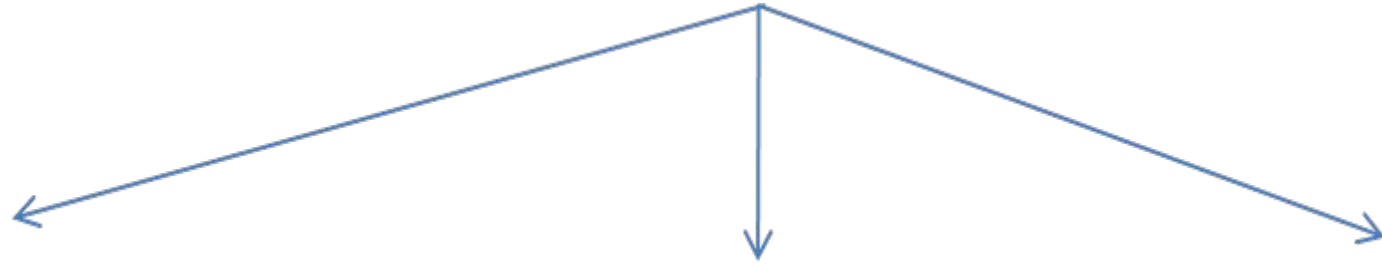


Study 4 & 5:
hand clapping

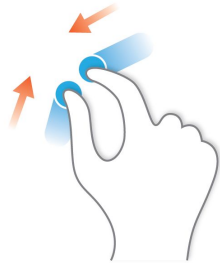


Types of co-speech gestures

Goldin-Meadow, 2013; Kelly & Church, 1997;
Holler et al. 2009; Morsella & Krauss, 2004;
Beilock & Goldin-Meadow, 2010



Iconic / metaphoric



“Pinch”

Deictic



Beat



Beat gestures

- Spontaneously produced biphasic movements of the hand
- Most frequently used
- Closely temporally aligned to the prosodic characteristics of the speech signal
- Typically occurring on stressed syllables

→ Typically associated with **rhythmic marking**, but also with **focus marking** and **discourse structure marking**.

Study 2 & 3: Producing beat gestures in discourse

Gluhareva, D. & Prieto, P. (2017). “Training with rhythmic beat gestures benefits L2 pronunciation in discourse-demanding situations”, *Language Teaching Research*, 21 (5): 609–631.

Kushch, O. (2018). The role of beat gesture production in L2 pronunciation training. *Chapter 3, PhD Thesis*.



18 Catalan learners of English

→ difference in the realisation of phrasal prominence (stress-timed vs syllable-timed)



Examples of pre- and posttest prompts



You are in a lecture at the university. You didn't hear what the professor just said and would like to ask your friend to repeat it for you.

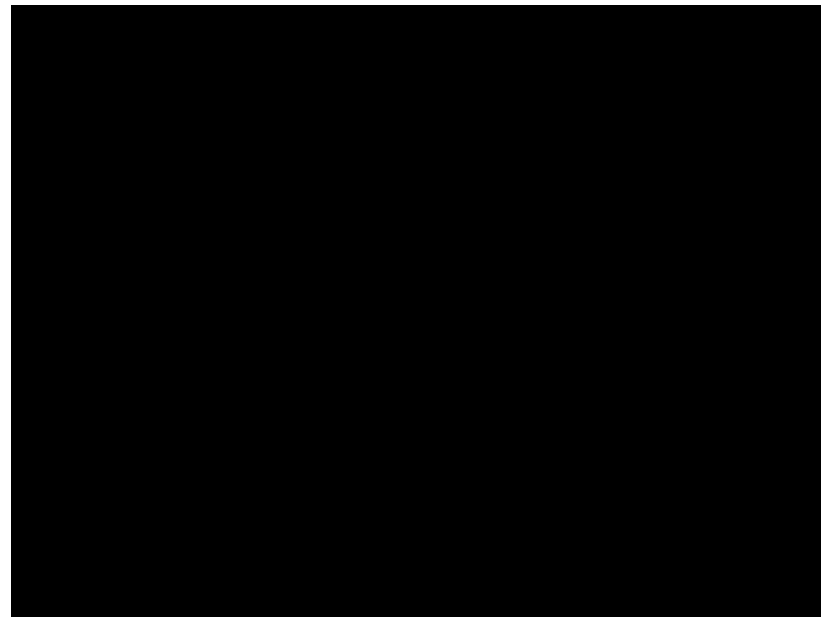
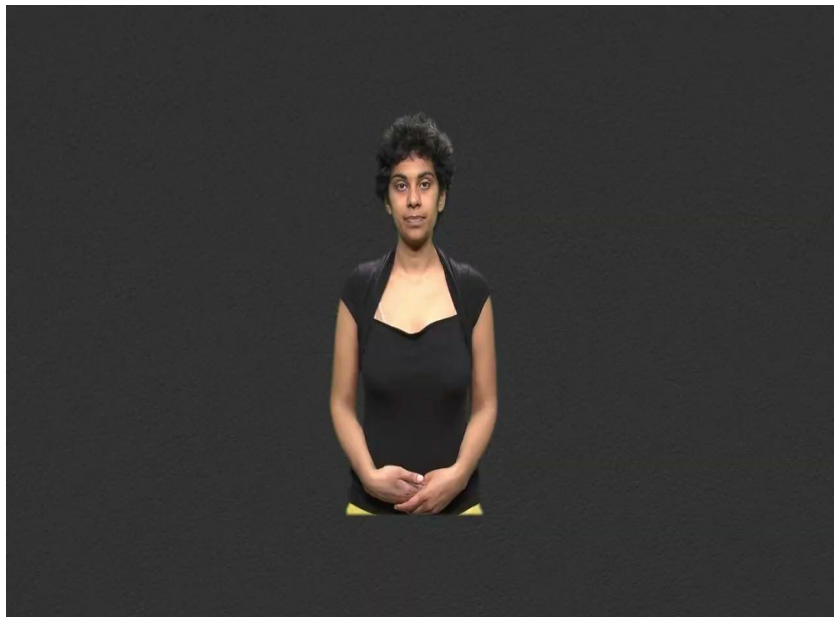


Now, please record your response.

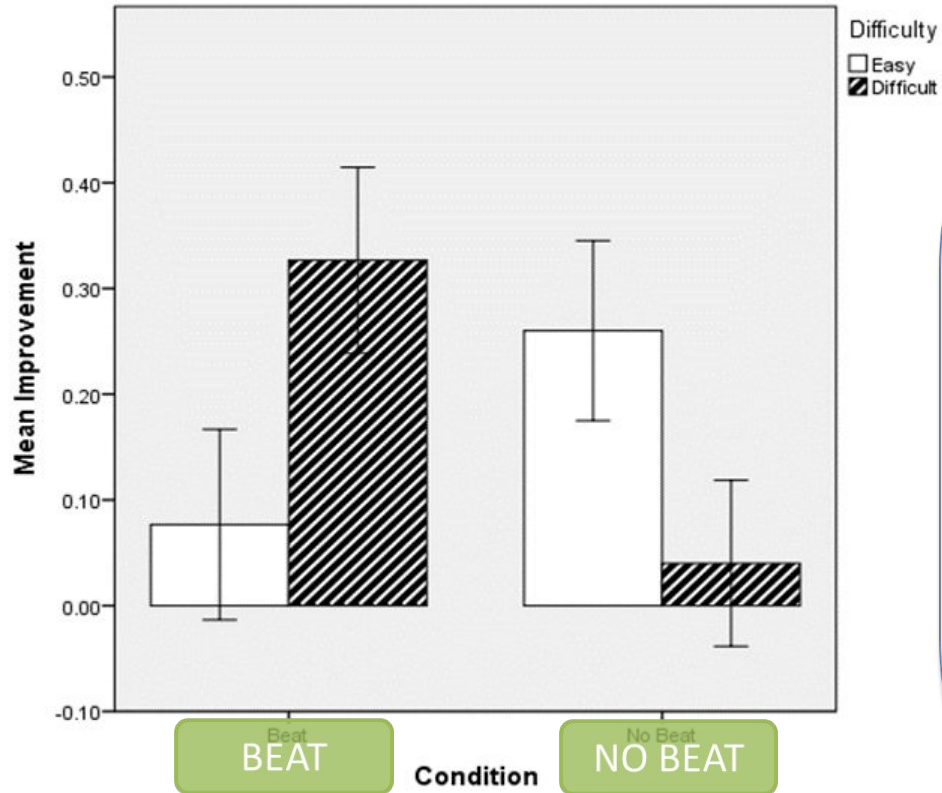
Easy vs. Difficult items

Training design

1. Beat gesture **observe** vs. no beat gesture
2. Bear gesture **observe** vs. beat gesture **produce**

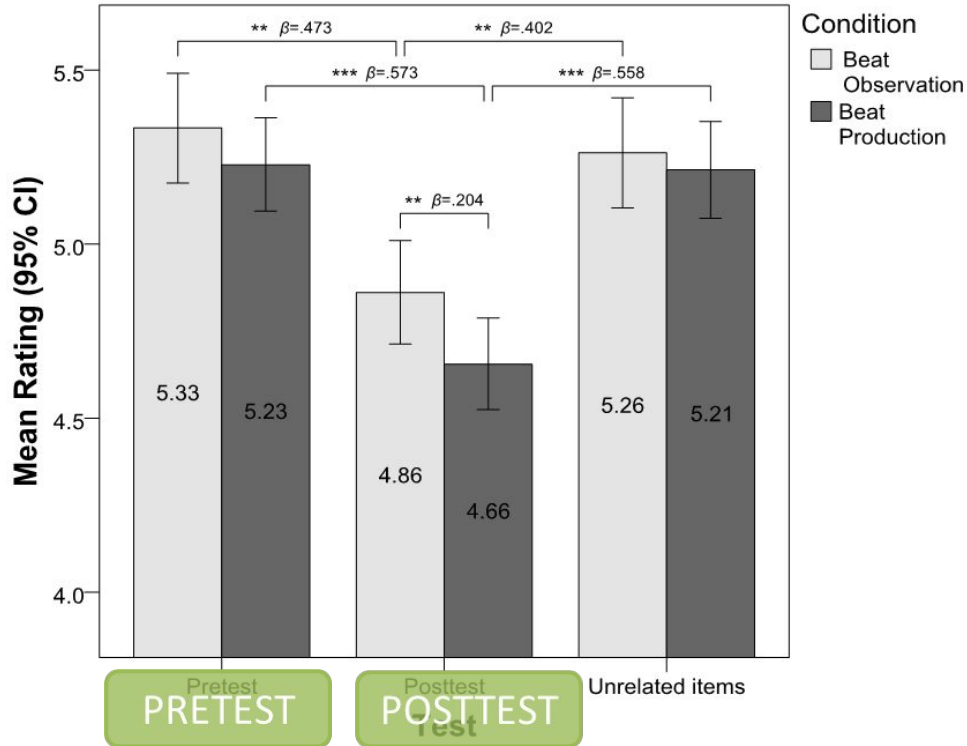


Results 1 (beats vs no beat): Improved accentedness



Observing beat gestures significantly improved participants' accentedness ratings on the set of **difficult** (more discourse-demanding) items

Results 2 (observe vs. produce): Improved accentedness



Producing beat gestures improved participants' accentedness significantly more than observing them.

Kinaesthetic movement : hand-clapping

- Specific **embodied activity** focused on rhythm
- Easily adaptable for children
- Triggers positive emotions



Studies 4 and 5 Does hand-clapping to the rhythm of newly learned words improve L2 pronunciation in children and adolescents?

Baills, F. & Prieto, P. (2022). "Embodying rhythmic properties of a foreign language through hand-clapping helps children to better pronounce words." *Language Teaching Research*. Online first.

Zhang, Y., Baills, F., & Prieto, P. (2020). "Hand-clapping to the rhythm of newly learned words improves L2 pronunciation: Evidence from training Chinese adolescents with French words". *Language Teaching Research*, 24, 666-689.



Participants

EXPERIMENT 4

CATALAN CHILDREN

Participants

28 children (7-8 y.o.)

From a primary school in
Girona, Catalonia.

Catalan as first language

**Cognate
target words**

EXPERIMENT 5

CHINESE ADOLESCENTS

Participants

50 adolescents (13-14 y.o.)

From a middle school in the
Shandong Province, China

Chinese as first language

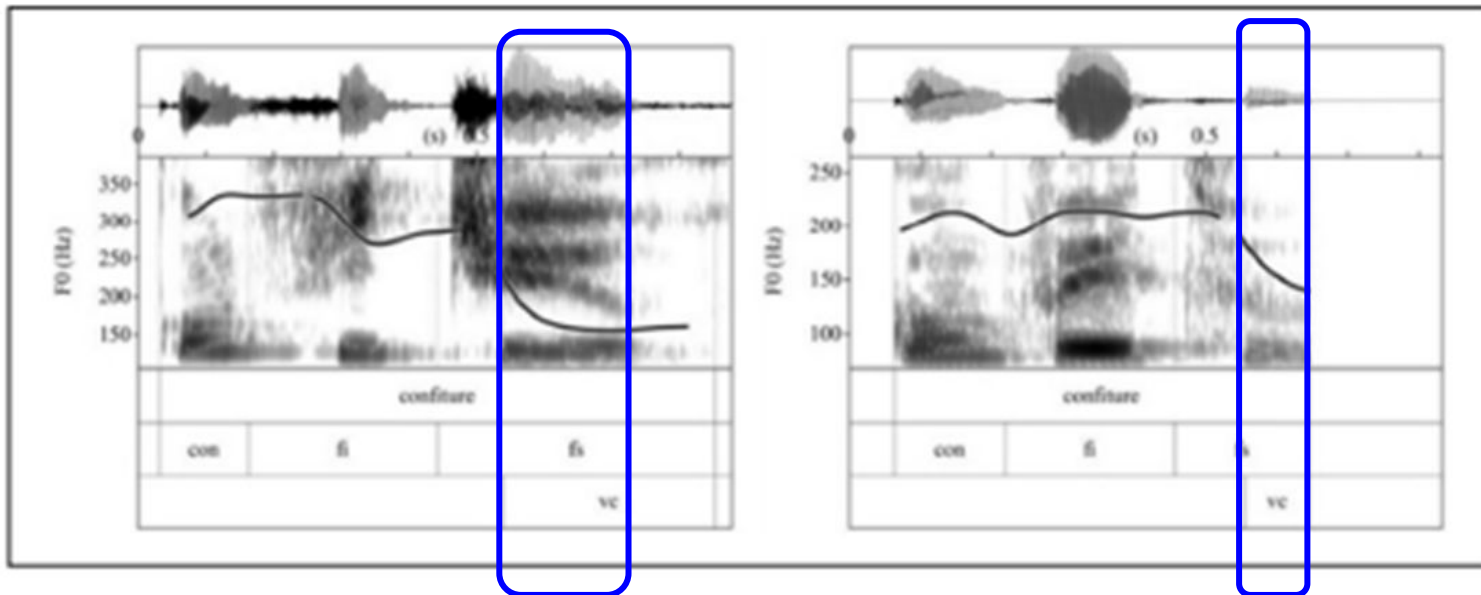
**Non-cognate
target words**

Stimuli and Tasks: 20 words



<u>bisyllabiques</u>	<u>trisyllabiques</u>	<u>plus de 3 syllabes</u>
<u>balcon</u>	<u>ambulance</u>	<u>télévision</u>
<u>tambour</u>	<u>crocodile</u>	<u>ordinateur</u>
<u>musique</u>	<u>biberon</u>	<u>hélicoptère</u>
<u>purée</u>	<u>céréales</u>	<u>aspirateur</u>
<u>oreille</u>	<u>confiture</u>	
<u>pizza</u>	<u>spaguettis</u>	
<u>avion</u>	<u>éléphant</u>	
<u>famille</u>	<u>mandarine</u>	

In French, **primary stress** is word-final and is realized by **lengthening**



“confiture”

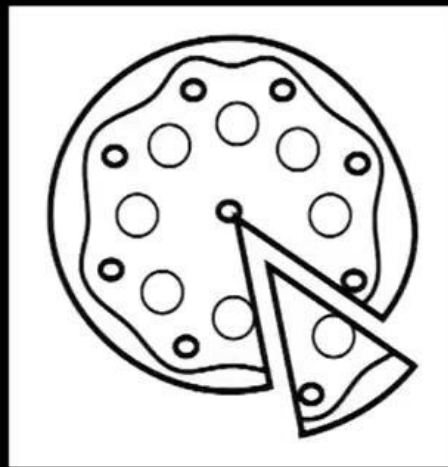
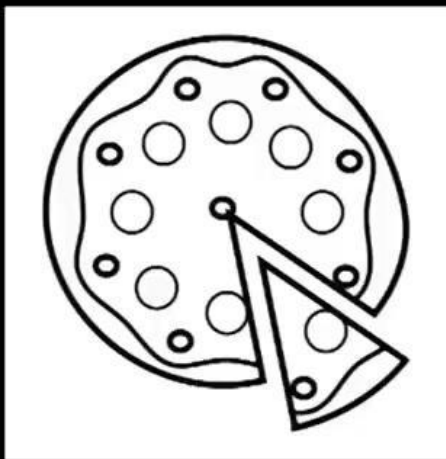
spoken by a native French speaker

“confiture”

imitated by a Chinese speaker

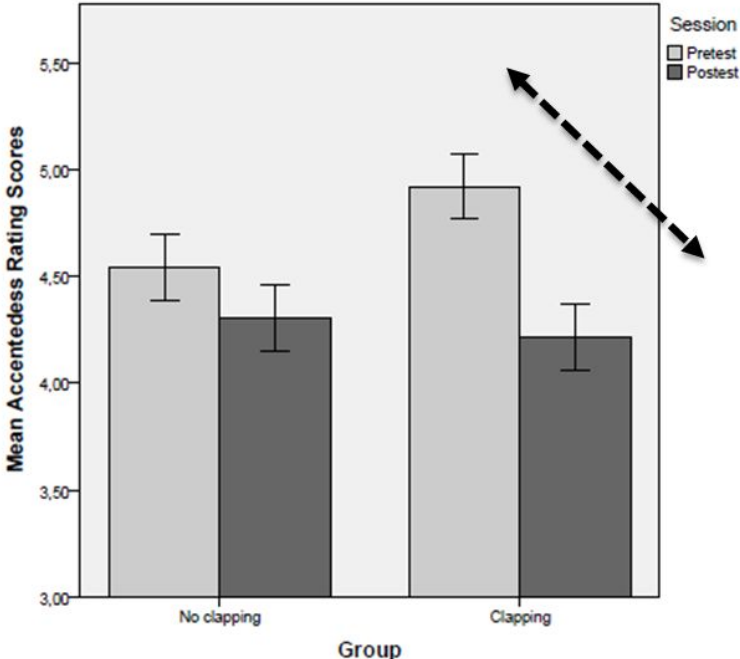
Training design

Hand-clapping vs. no hand-clapping



Results: Accentedness

Experiment 4

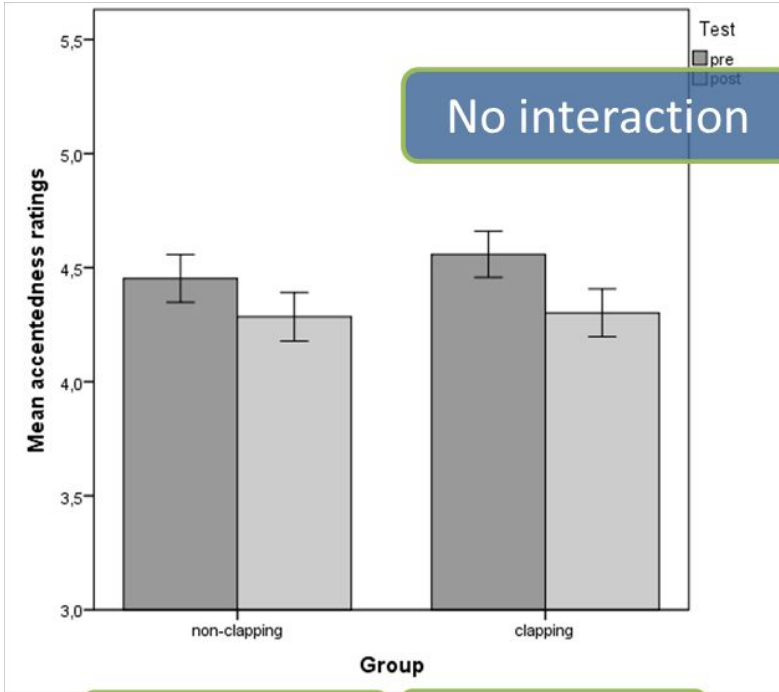


No clapping

Clapping

Barra de error: 95% CI

Experiment 5



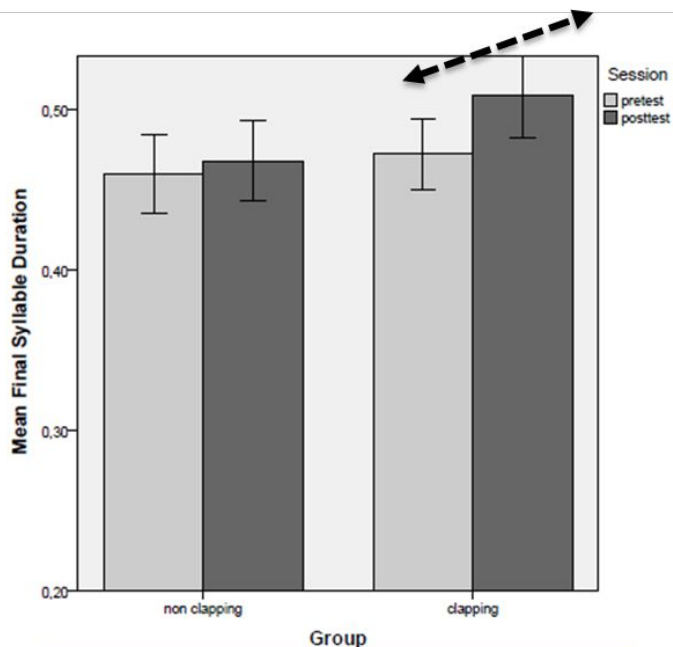
No Clapping

Clapping

No interaction

Results: final lengthening

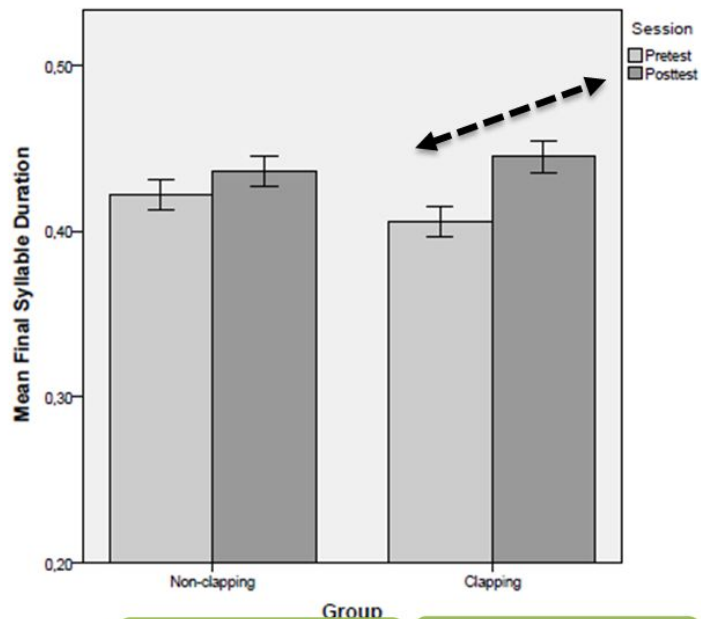
Experiment 4



No clapping

Clapping

Experiment 5



No Clapping

Clapping

So far...

Beat gestures and **hand-clapping** highlight **the rhythmic structure** of the target language and help improve L2 pronunciation.

Relatively short embodied rhythmic trainings seem to be effective tools to **support L2 pronunciation** at **different levels of proficiency**.

What about the effects of **training**
sentence-level prosodic features?

Highlighting prosody

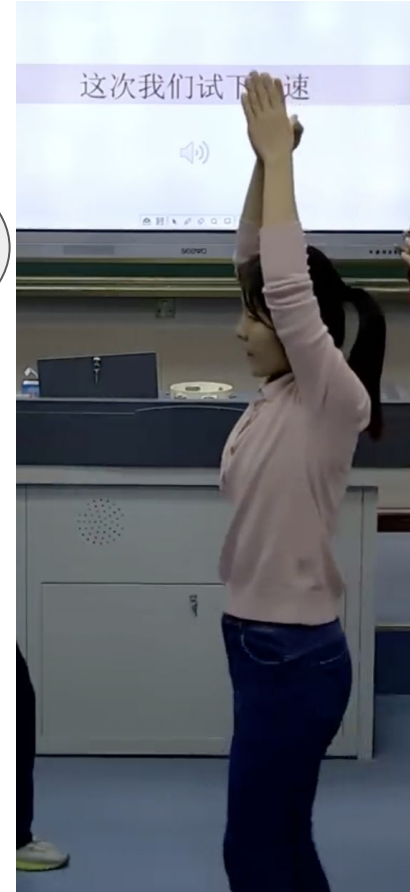


Highlighting prosody

Studies 6 & 7:
prosodic
gestures



Study 8:
embodied
music



Experiments 6 and 7 Do melodic embodied training improve L2 pronunciation?

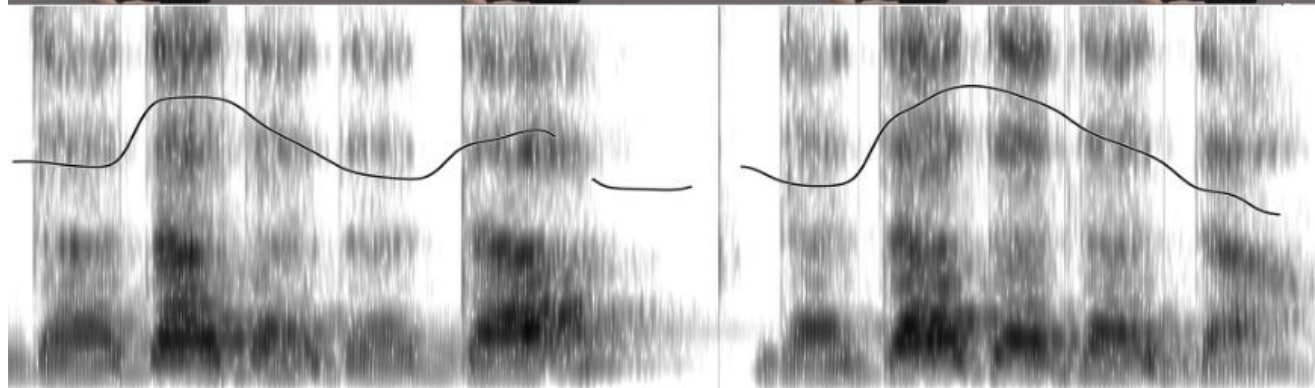
Baills, F., Alazard, Ch. & Prieto, P. (2022). "Embodied prosodic training enhances L2 read speech pronunciation." *Applied Linguistics* 43, 776–804.



Li, P., Baills, F., Baqué, L., & Prieto, P. (in press). "Embodied prosodic training helps improve not only accentedness but also vowel accuracy". *Second Language Research*.



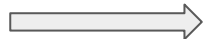
Melodic gestures



LOGATOME



SENTENCE



da

da

da

da

da

da

da

da

da

da

je

suis

dé

so

lée

votr(e) lett(e) n'est pas

là

Participants

Catalan learners of French, university students
30-minutes tasks integrated into the programme

STUDY 6

EMBODIED LOGATOMES

75 Participants

3 training sessions **onsite** in
interpretation booths

Focus on **suprasegmental
features**

STUDY 7

EMBODIED SPEECH

57 Participants

3 training sessions **online**

Focus on **suprasegmental
and segmental** features →
more difficult target
sounds (vowels)

Tasks and stimuli : Oral reading

Dialogue C3 - Sortie

Caroline: Papa, je peux aller au cinéma avec Sylvie ce soir?

Le père: Je regrette mais tu as cours demain. Je ne veux pas que tu te couche tard.

Caroline: Mais Sylvie a eu la permission.

Le père: Pas question! Sylvie, c'est Sylvie. Toi, c'est toi.

Caroline: Mais papa...

Le père: Ça suffit. Ne discute pas. C'est comme ça.

Caroline: Y en a marre. C'est toujours la même chose.

Le père: J'ai dit non et c'est non. Et parle-moi autrement.

Going out

Caroline: Dad, can I go to the cinema with Sylvie tonight?

Dad: I'm sorry, but you have class tomorrow. I don't want you to go to sleep too late.

Caroline: But Sylvie has permission to go

Dad: It's out of the question. What goes for Sylvie does not go for you.

Caroline: but Dad...

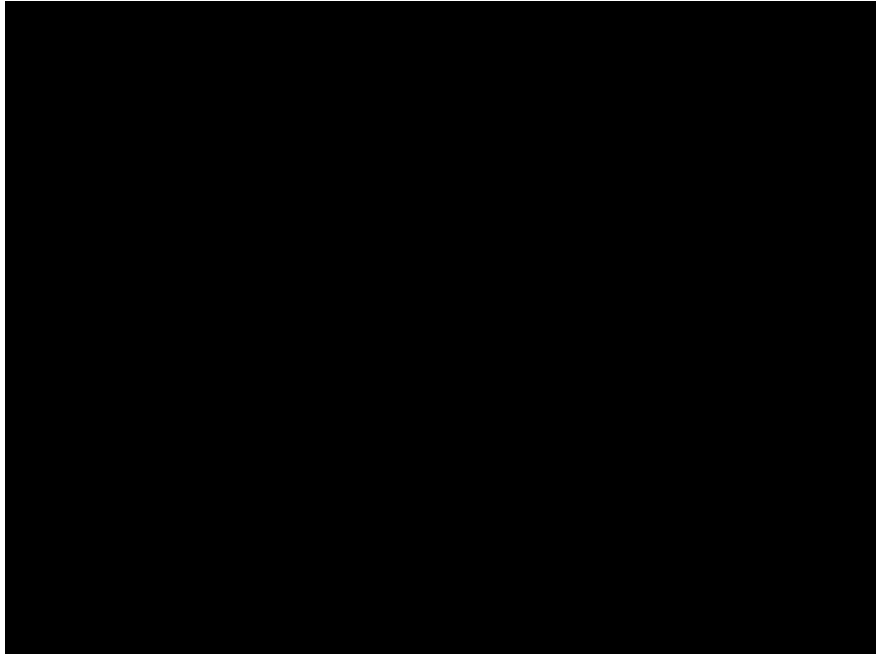
Dad: That's it, don't fight it. That's how it is.

Caroline: How lame, you never let me do anything.

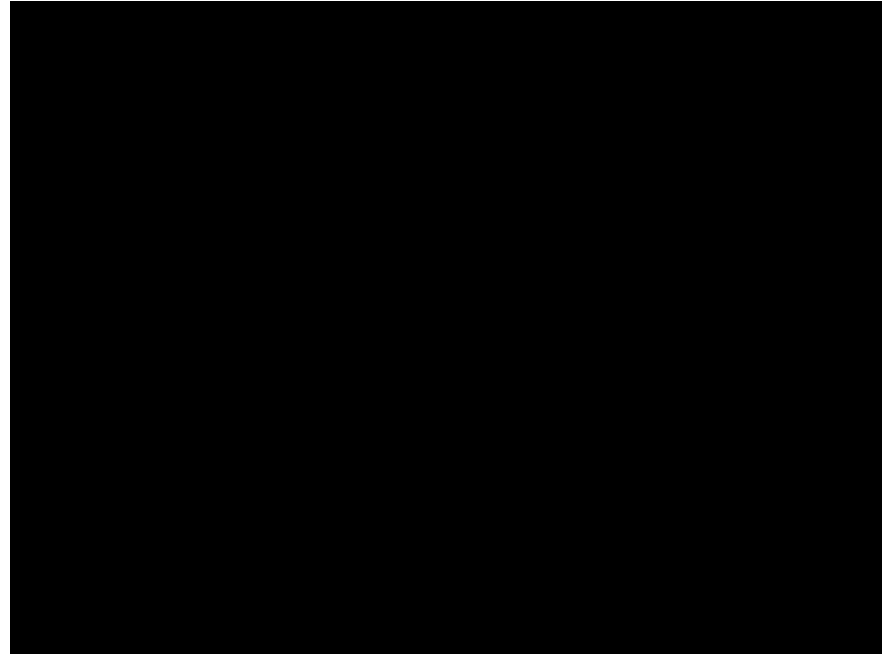
Dad: I said no and that's final. And don't talk to me like that.

Prosodic gestures vs. No gesture

Example with logatomes (Study 6)



Example with speech (Study 7)

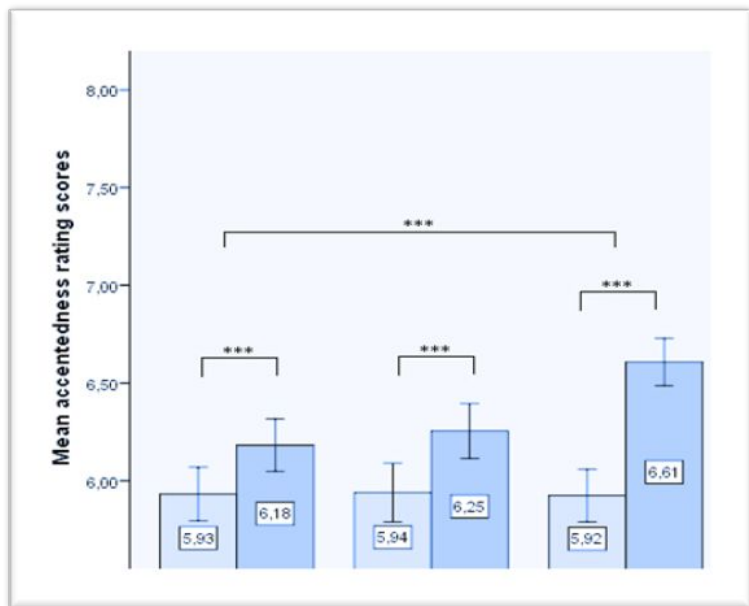


Wrap-up interpretation



Results study 6 (embodied logatome vs. logatome vs. speech only)

ACCENTEDNESS

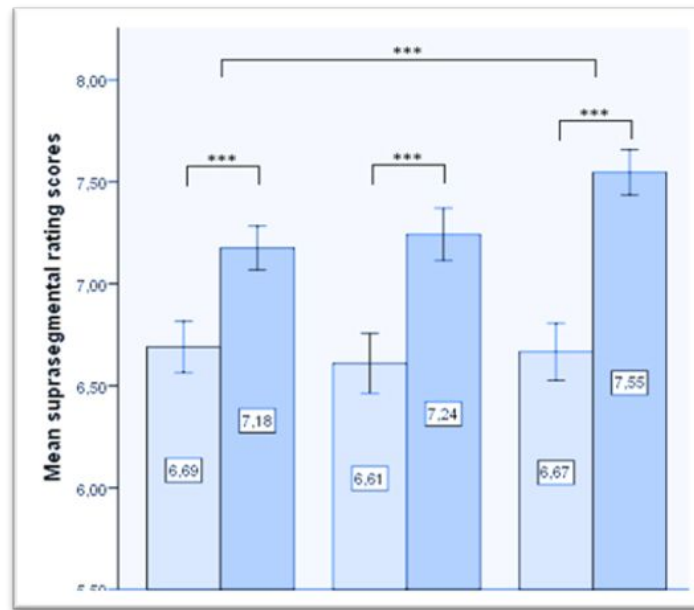


speech only

non-embodied logatomes

embodied logatomes

SUPRASEGMENTAL FEATURES



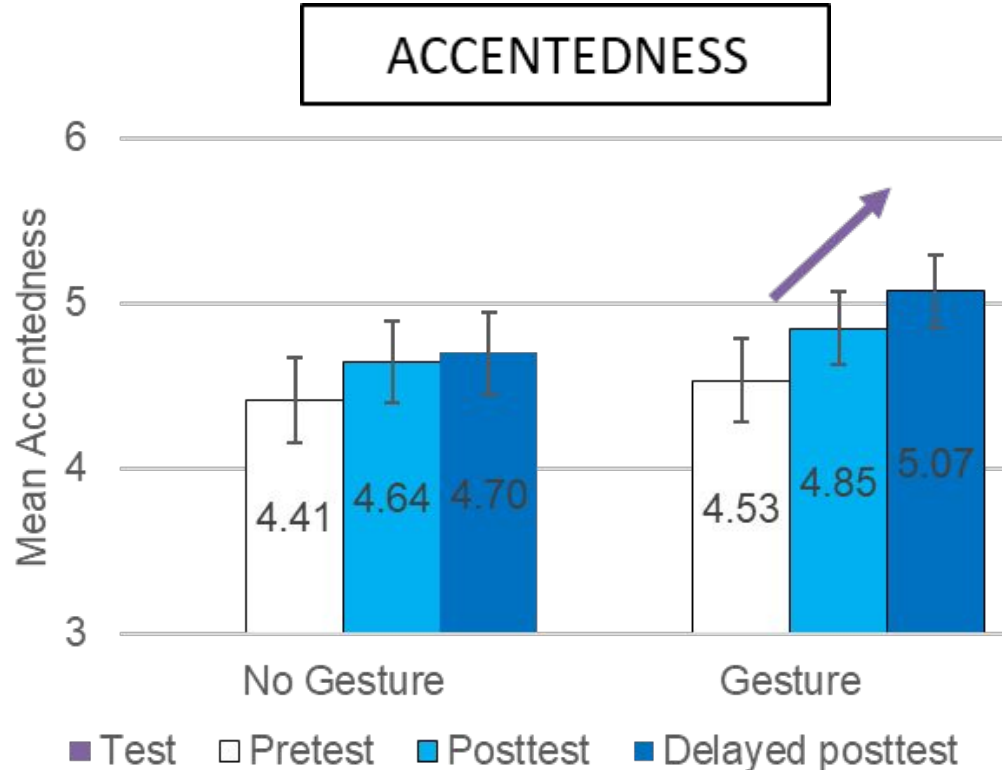
speech only

non-embodied logatomes

embodied logatomes

pretest
posttest

Results study 7: embodied speech vs. speech only

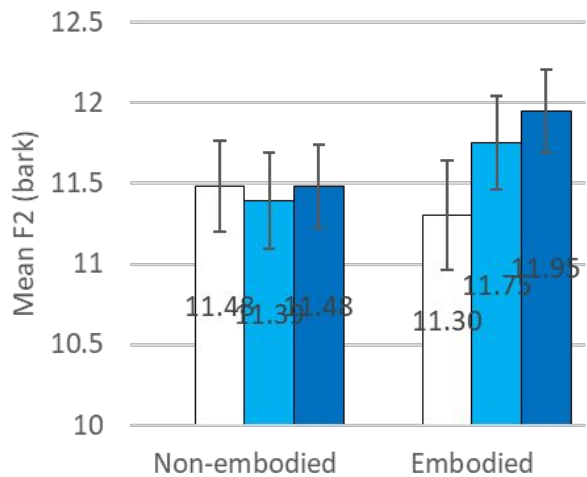


Results study 7

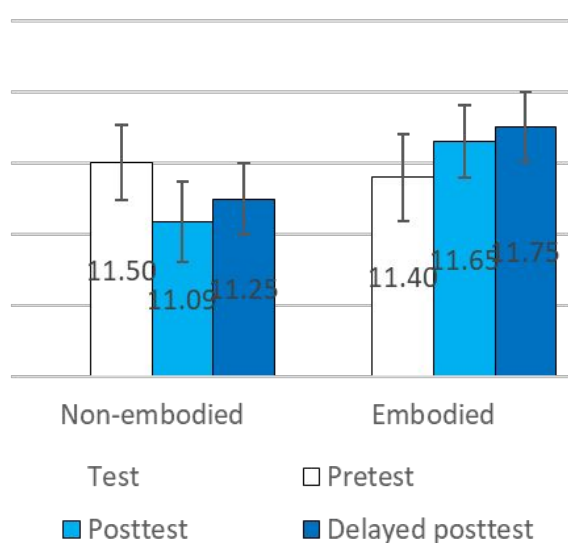
Acoustic analysis of front rounded vowels

More fronted vowels → Higher F2 values

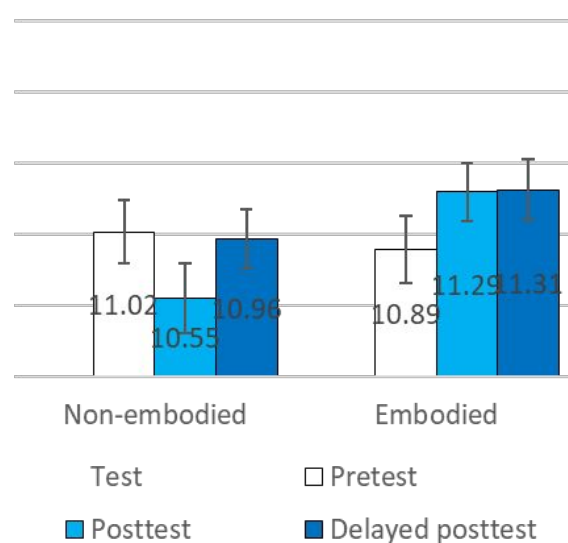
VOWEL /y/



VOWEL /ø/



VOWEL /œ/



Test □ Pretest ■ Posttest ■ Delayed posttest

Test □ Pretest ■ Posttest ■ Delayed posttest

Test □ Pretest ■ Posttest ■ Delayed posttest

Getting there...

The training sessions have been carried out during classes

Both studies showed a significant improvement in oral reading accentedness and suprasegmental features in the embodied conditions

yet NOT on comprehensibility and fluency

Positive effect of prosodic embodied training on the pronunciation of vowels and maintained effects at delayed posttest.

→ **A scaffolding mechanism for L2 speech production**

EMBODIED MUSIC TRAINING

Importance of increasing learners' prosodic awareness through the body

MELODY

RHYTHM

ACCENT



<https://dalcrozeusa.org/about-dalcroze/what-is-dalcroze/>

EMBODIED MUSIC TRAINING

Body movements lead to stronger improvements in rhythmic abilities

(O'Dell, 2007; Overy 2012; Repp 2006; Deli et al. 2006; Zachopoulou et al., 2003)

Promotes positive emotions and experience.

Working in groups also increases social bonding, crucial for motivation & willingness to participate and learning (Juntunen, 2020)

Study 8: effect of embodied music training (no speech) on oral reading and imitation pronunciation

Zhang, Y., Bails, F., & Prieto, P. (submitted). "Does using exclusively embodied musical activities improve foreign language pronunciation? A classroom study with Mandarin-speaking adolescents".



Participants and procedure

50 Chinese adolescents (13-14 years-old)

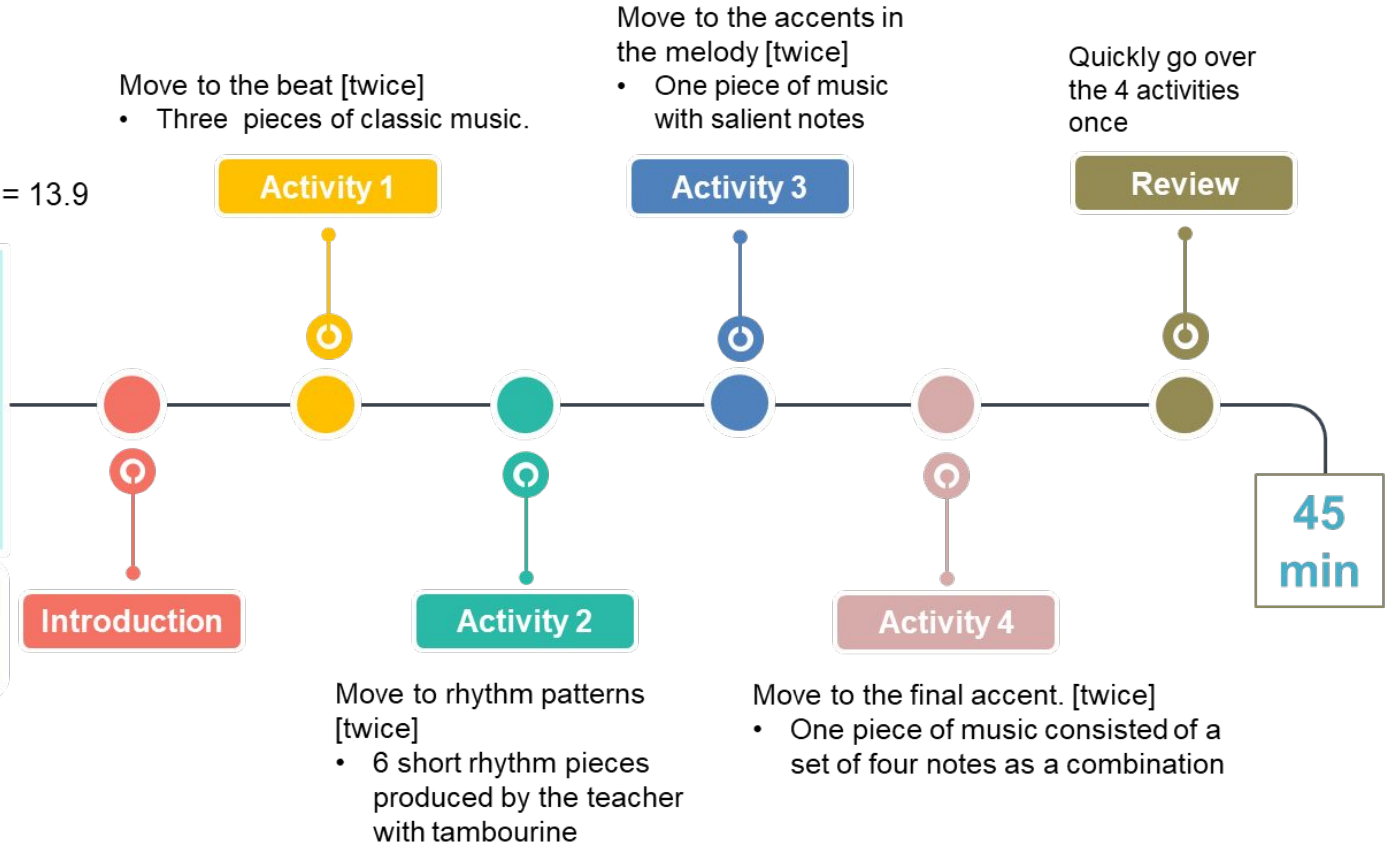
Three 45-minutes sessions after school (but at school with the music teachers)

Embodied music training based on rhythmic and melodic activities vs. Traditional music classes (theory, culture)

25 adolescents, $M_{age} = 13.9$



Followed sample videos or teacher instructions



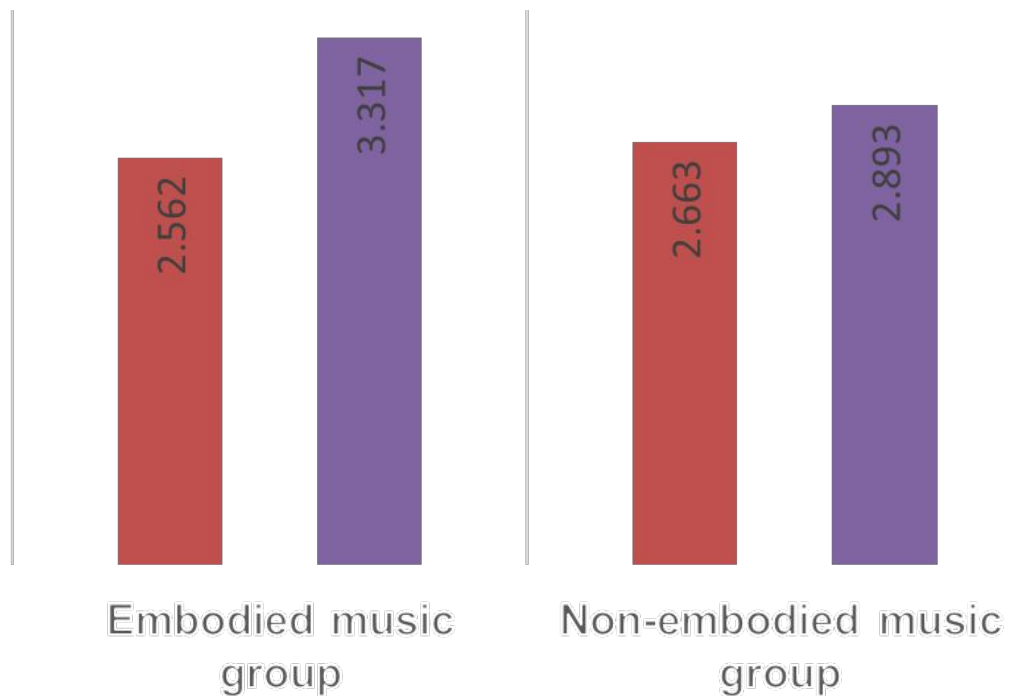




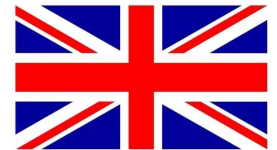
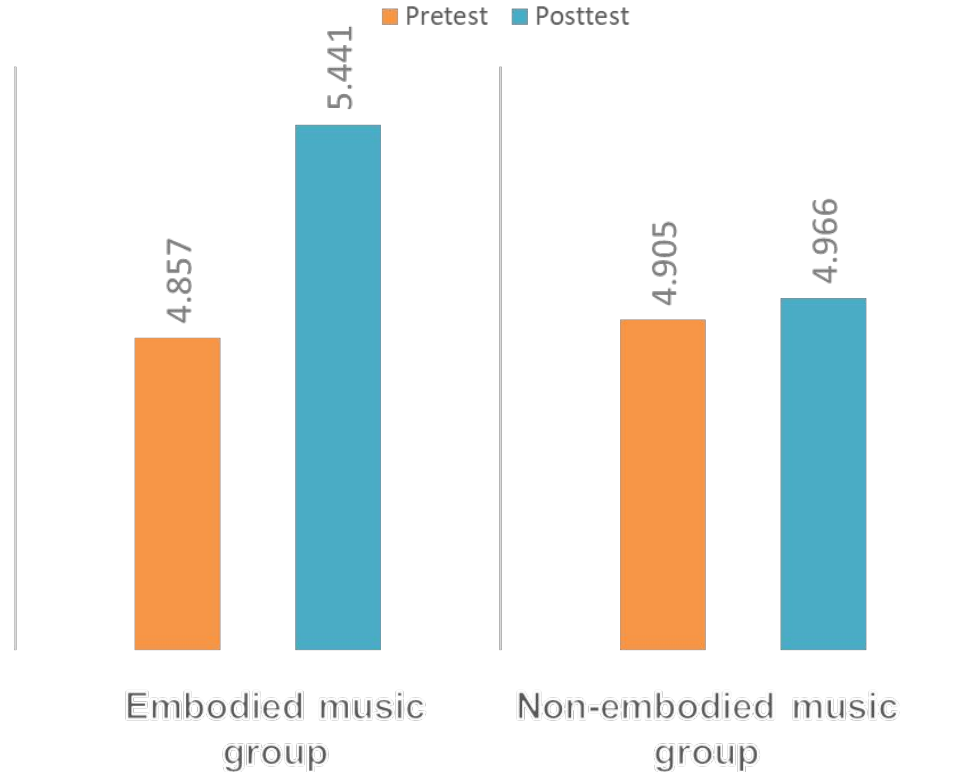
學生也被要求必須隨著即興伴奏音樂的強弱調整打球的動作大小。

<https://www.youtube.com/watch?v=e0lWhNtqTS8>

Results: accentedness in a multi-language imitation task



Results: Accentedness in a sentence reading task in L2 English



Conclusions

Experimental studies looking at the effect of embodied pronunciation training

Many embodied tools to teach pronunciation

hand articulatory gestures

beat gestures

hand clapping

prosodic gestures

embodied music ...

**NATURAL / PEDAGOGICAL
GESTURES AND MOVEMENT**

Conclusions

How to use the gestures and movements?

→ “On the spot”

Am I using the right gesture ??

→ Organizing pronunciation training sessions

Where to find experimentally-tested materials?



Tools for the second language research and teaching

Mora-Plaza, I., Saito, K., Suzukida, Y., Dewaele, J-M., & Tierney, A. (2022). Tools for second language speech research and teaching. <http://sla-speech-tools.com>.
<http://doi.org/10.17616/R31NJNAX>

<http://sla-speech-tools.com/>

THANK YOU FOR LISTENING !

