Melodic perception skills predict Catalan speakers' speech imitation abilities of unfamiliar languages

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Introduction

Music aptitude and working memory affect L2 speech production [1].

Mixed results in previous studies

- Which subcomponent(s) of musical abilities affects L2 speech production?
- Is there a confounding role of working memory?

Aim

The predictive role of four main subcomponents of **musical perception skills** (accent, melody, pitch, and rhythm) and **working memory** on **L2 speech imitation abilities**.

Methods

Participants:
- 61 Catalan speakers from UPF.
- Don't know the target languages.

PROMS-S [2]:
- Four subsets: Accent, Melody, Pitch, Rhythm.
- Discrimination task.

Forward digit span [3]:
- 3–14-digit series
- Correct recall → one digit more
- Two incorrect → one digit less
- Score = N of correctly recalled digits at the 14th trial.

Speech imitation:
- 6 languages × 2 sentences
- Unfamiliar to the participants
- 3 raters per each language.
- 9-point Likert scale (1 = very bad; 9 = very good).
- ICC: 0.72-0.93, acceptable

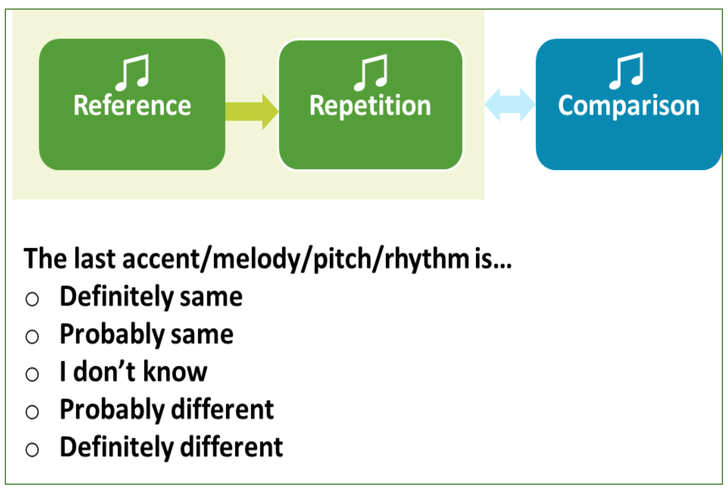

Figure 1. PROMS-S

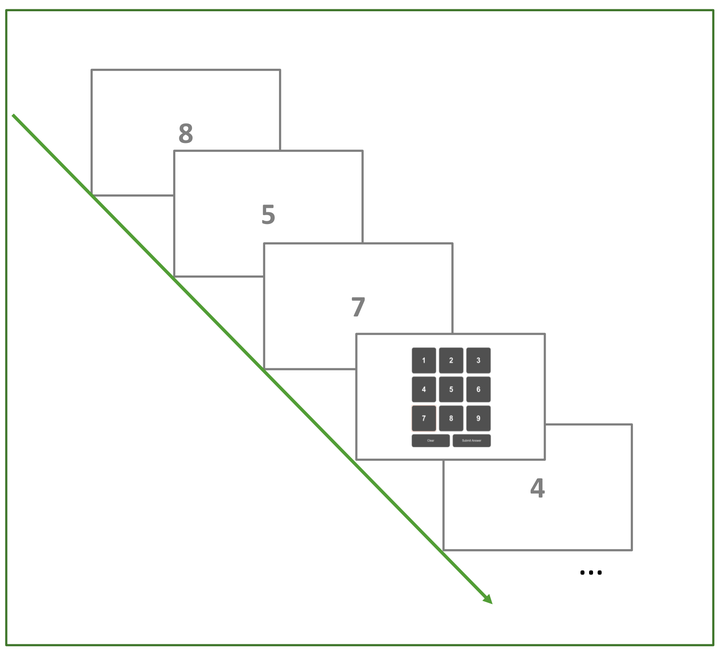

Figure 2. Forward digit span

Results

Linear mixed model

Speech imitation score
- Accent score
- **Melody score (p = .007)**
- Pitch score
- Rhythm score
- Working memory score

Random effects:
- By subject: working memory score
- By item: working memory score

Table 1. *Means (M), standard deviations (SD), minimum (Min), and maximum values (Max) of the scores of musical perception tests (accent, melody, pitch, and rhythm), working memory, and speech imitation*

Measure	*M*	*SD*	*Min*	*Max*
Accent	4.76	1.67	2.00	9.50
Melody	4.80	1.75	1.50	8.50
Pitch	3.12	1.29	1.00	6.50
Rhythm	4.89	1.47	1.50	7.50
Working memory	7.01	1.36	4.77	11.17
Speech imitation	**4.28**	**2.01**	**1.00**	**8.33**

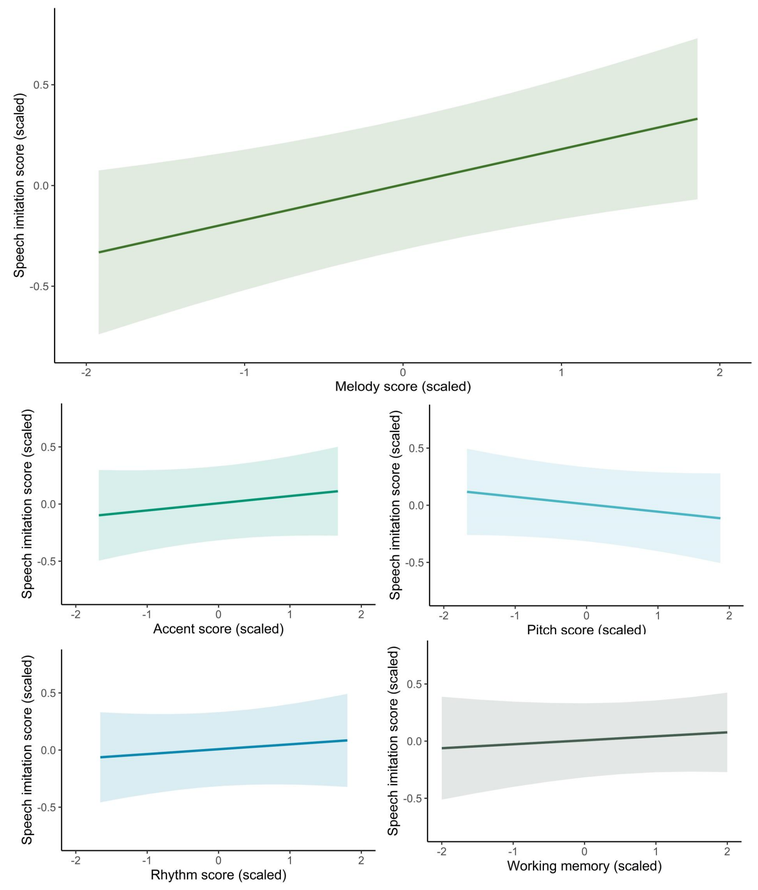

Figure 3. Linear regression plots

Discussion

- **Melodic** perception skills were the only significant predictor of imitation.
  - Good melody → good suprasegmental accuracy.
  - Good suprasegmental accuracy → less accented [4].
- **Working memory** was not a significant predictor of speech imitation abilities.
  - Sentences ($M_{\text{syllable count}}$ = 8.50) are short. So, WM may not be as relevant as to long sentences.
  - Forward digit span may not be sensitive enough for adults.
- Individual differences in musicality might be a crucial factor in L2 pronunciation training design.

References

[1] R. Milovanov and M. Tervaniemi, "The interplay between musical and linguistic aptitudes: A review," *Front. Psychol.*, vol. 2, no. NOV, pp. 1–6, 2011, doi: 10.3389/fpsyg.2011.00321.
[2] M. Zentner and H. Strauss, "Assessing musical ability quickly and objectively: development and validation of the ShortPROMS and the Mini-PROMS," *Ann. N. Y. Acad. Sci.*, vol. 1400,no. 1, pp. 33–45, 2017, doi: 10.1111/nyas.13410.
[3] D. L. Woods *et al.*, "Improving digit span assessment of short-term verbal memory," *J. Clin. Exp. Neuropsychol.*, vol. 33, no. 1, pp. 101–111, 2011, doi: 10.1080/13803395.2010.493149.
[4] K. Saito, P. Trofimovich, and T. Isaacs, "Second language speech production: Investigating linguistic correlates of comprehensibility and accentedness for learners at different ability levels," *Appl. Psycholinguist.*, vol. 37, no. 2, pp. 217–240, 2016, doi: 10.1017/S0142716414000502.

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