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Introduction

- Cleft palate leads to speech disorders [1] and can be associated with physiological impairments such as **velopharyngeal insufficiency**
- Velopharyngeal insufficiency → a loss of intraoral pressure [2]
- Speakers with a cleft palate compensate for the loss intraoral pressure by using **higher pulmonary volumes** [3][4]

⇒ Can disruptions in speech breathing patterns of children with a cleft palate affect speech timing ?

- Aim**
To investigate speech breathing patterns in children with a cleft palate by :
- Examining compensatory strategies deployed at the thoracic and abdominal levels
 - Exploring their effects on the temporal organisation of speech

Method

	Control speakers	Cleft palate		
		Adequate (CP-A)	Slight insufficiency (CP-sVI)	Several insufficiency (CP-SVI)
Number	17	3	4	5
Mean age (sd)	9.71 (0.772)	9.33 (1.15)	9.25 (1.71)	9.8 (1.78)

Acquisition system

- Kinematic data (Respiratory Inductive Plethysmography) and acoustic data
- Synchronized respiratory and speech signals → thoracic-abdominal perimeter variation during phonation

Data processing

- Respiratory signal = 1Tho+1 Abd [5]
- Amplitude of respiratory movement reported according to maximum displacement (%MD) [6]

Corpus - experiment 1

- Carrier sentences : short sentences with target VCV sequences

Corpus - experiment 2

- Reading : the tale *la bise et le soleil*
- Spontaneous speech

Measurements

- Amplitudes of inspiration and expiration (%MD)
- Breath group durations in reading and spontaneous speech

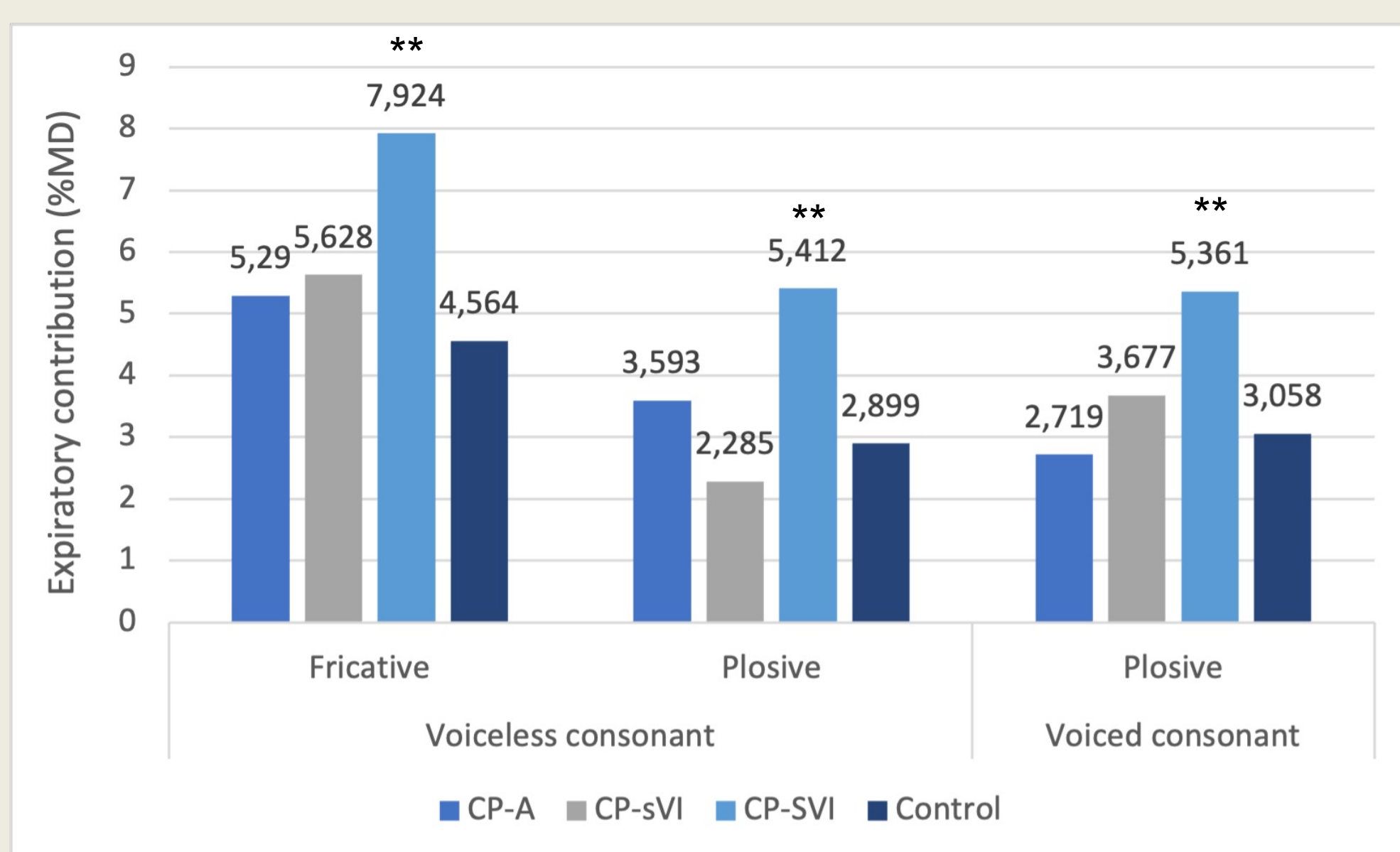
Statistical analyses

- Mixed measures ANOVA
- Inter-subject factor (groups of speakers)
 - Intra-subject factors (target consonants, speech tasks)
- Pearson's correlation coefficient

Results

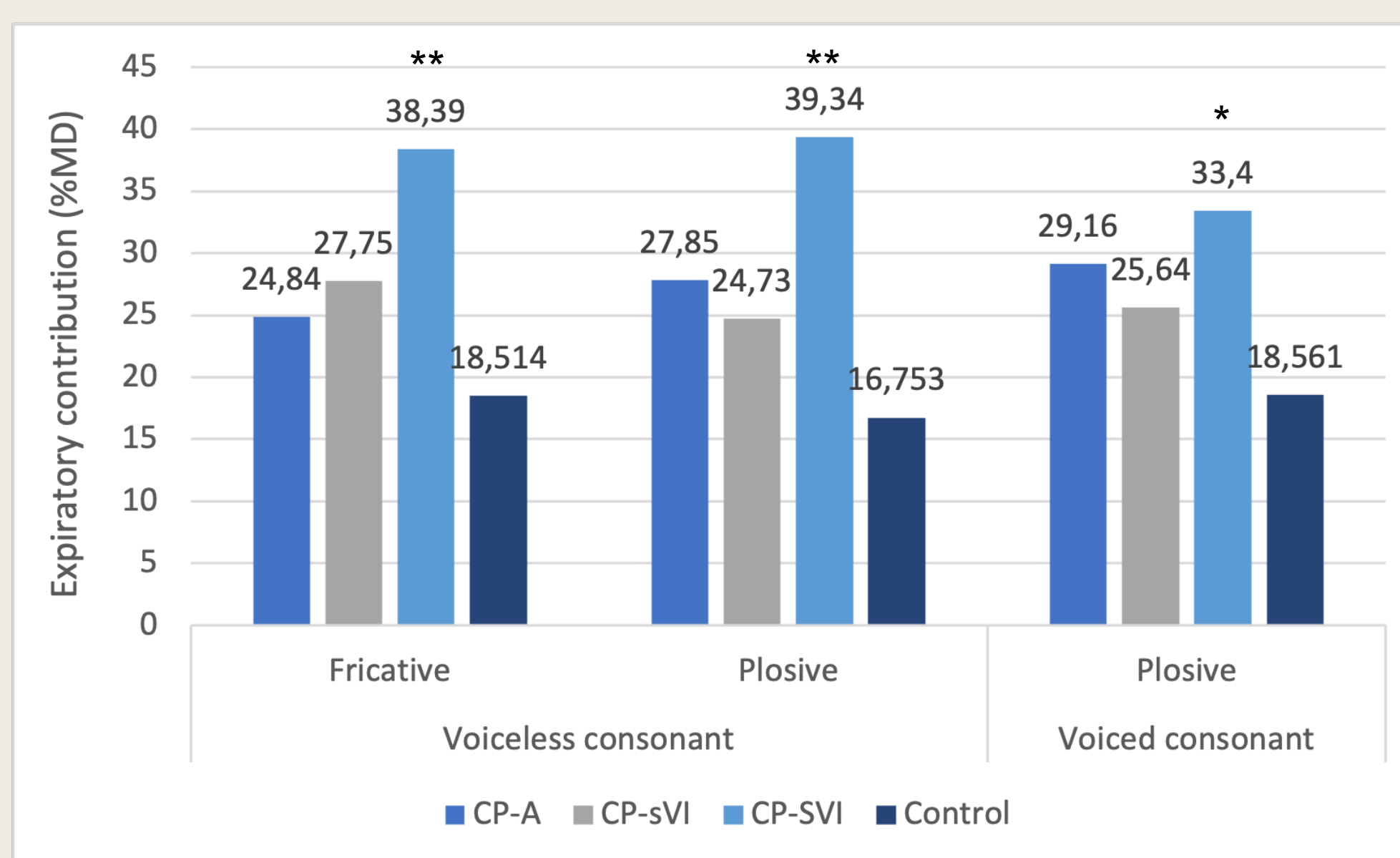
1. Carrier sentences

a) Expiratory contribution per consonantal cycle



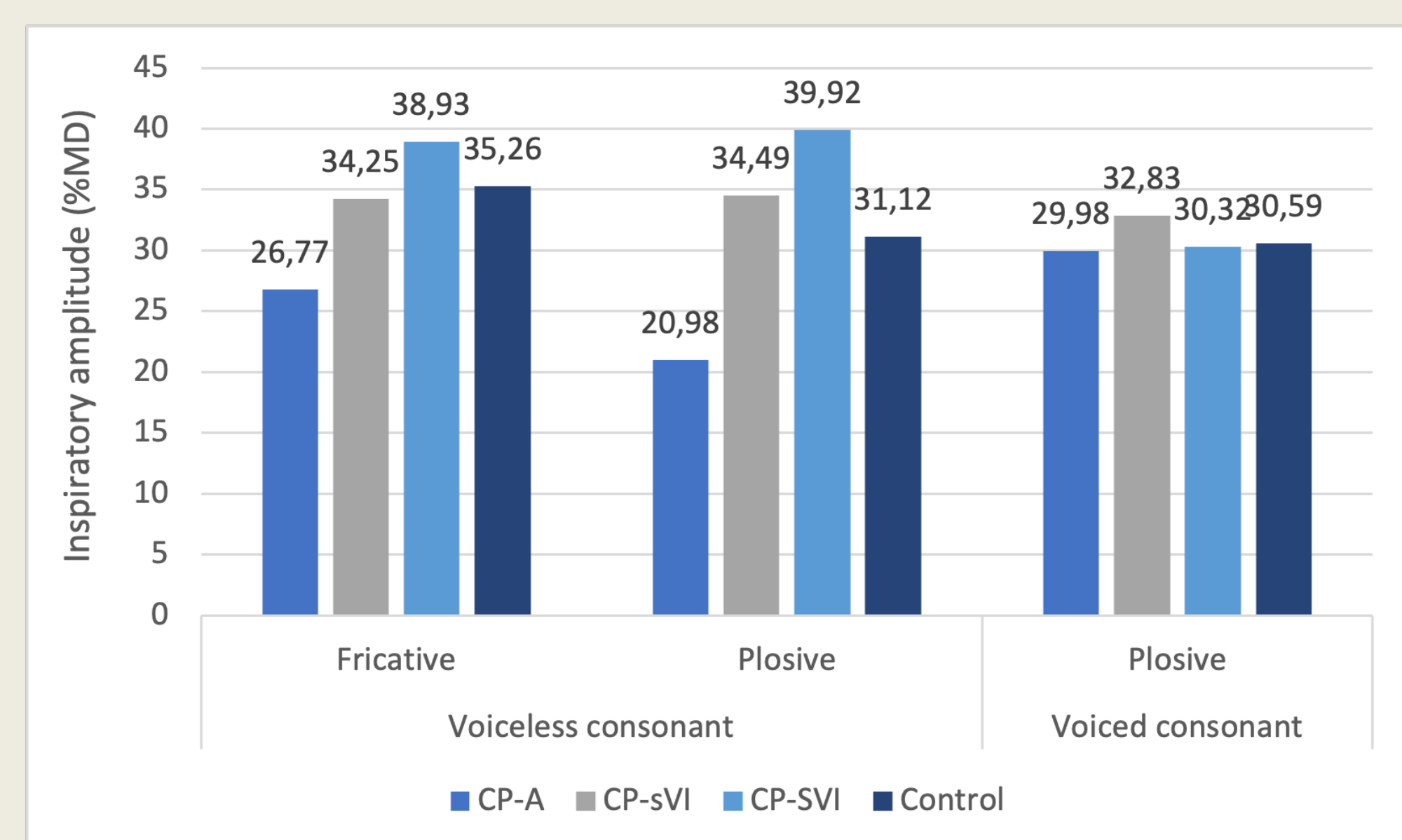
- CP-SVI > other groups*
- Fricative voiceless cycles > plosive cycles*

b) Expiratory contribution during breath group



- Children with cleft palate > control speakers *
- CP-SVI > other groups *

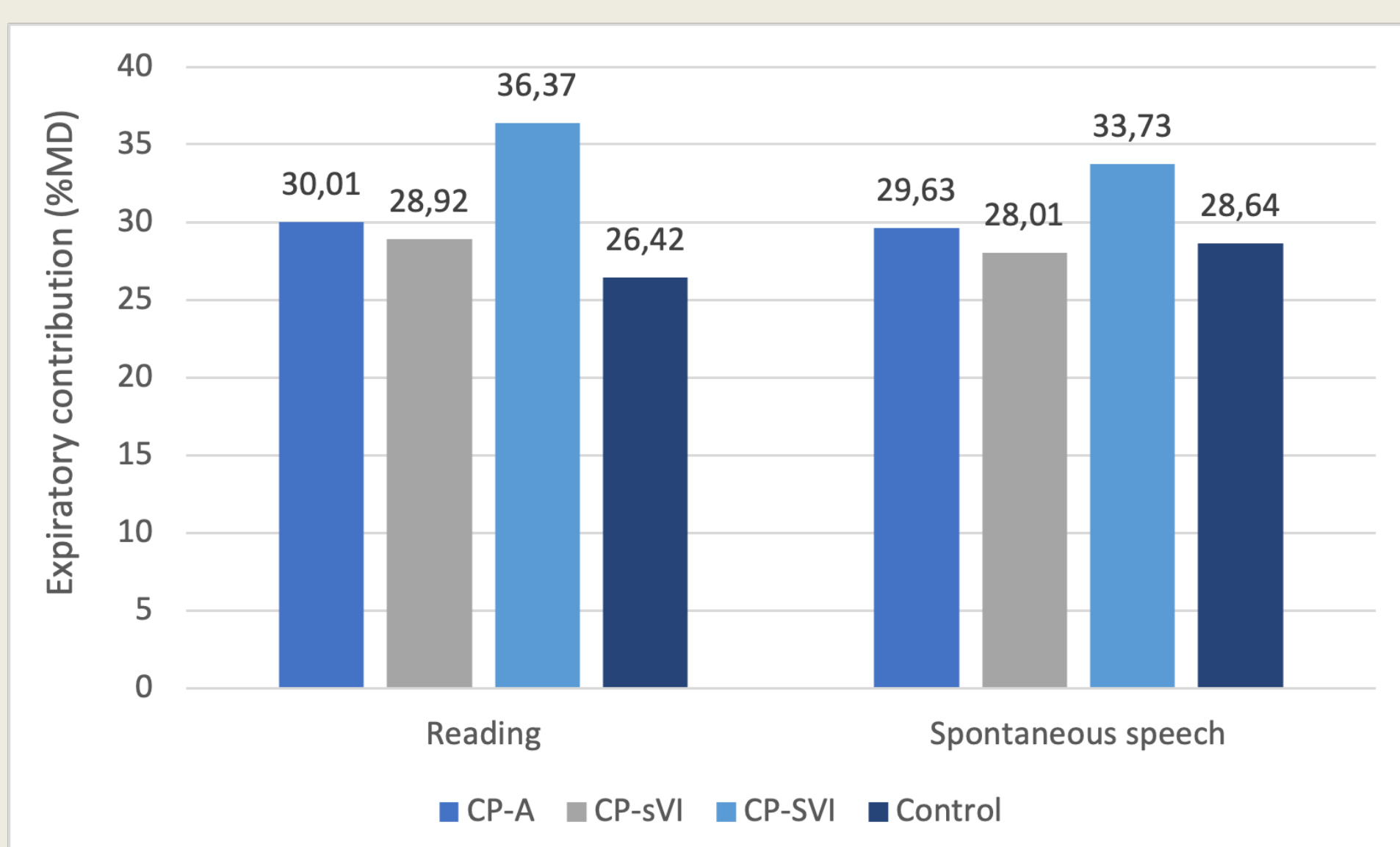
c) Inspiratory contribution



- CP-SVI tends to be greater than others

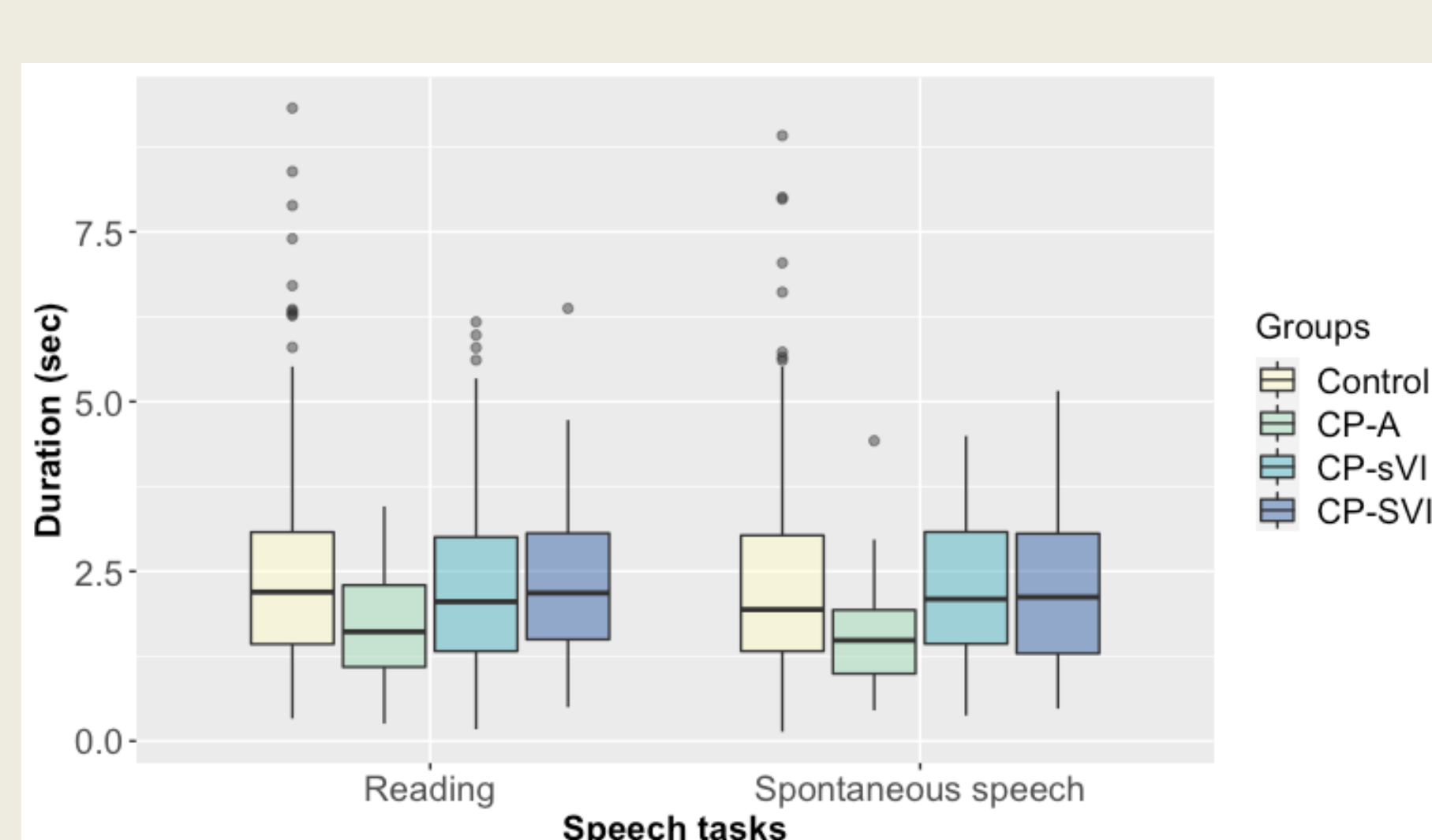
2. Speech breathing during read and spontaneous speech

a) Expiratory contribution per breath group in read and spontaneous speech



- Expiratory movements tend to be greater in children with cleft palate
- Chest compression in children CP-SVI > control speakers *

b) Temporal organisation of speech : breath group durations



- Breath group durations are similar for 3 groups
- Breath group durations in children CP-A < others
- Partial correlation between the duration of BG and the expiratory contribution ($r = 0.567$; $p < 0.05$)

Discussion

Children with a cleft palate deploy mainly compensatory respiratory strategies during **expiration** :

- The **severity of velopharyngeal dysfunction** influences the implementation of this strategies
- The loss of significance in results for experiment 2 → effect of other factors ?
- Sporadically, increased aerodynamic needs are anticipated during inspiration

Respiratory strategies don't have a major impact on speech organisation

This study is primarily descriptive :

- A better understanding of respiratory control at the thoracic and abdominal levels in children with a cleft palate
- Are these strategies effective for optimal sound production and speech intelligibility ?

Conclusion

- This study reveals compensatory strategies deployed by children with a cleft palate and their effects, to a lesser extent
- Addressing breathing during speech therapy is important to optimize speech production → to investigate the effects of these strategies on sound and speech intelligibility
- Increasing the data should help understand why some strategies are preferred in speech and thus adopted at thoracic and abdominal levels

References

- [1] Harding, A., Grunwell, P. 1996. Characteristics of cleft palate speech. *International Journal of Language & Communication Disorders*. 31, 331-357. [2] Warren, D. W. (1987). Nasal emission of air and velopharyngeal function. *Cleft Palate J.* 4, 148-155. [3] Laine, T., Warren, D. W., Dalston, R. M., Hairfield, W. M., Morr, K. E. 1989. Intraoral pressure, nasale pressure and airflow rate in cleft palate speech. *Journal of Speech, Language, and Hearing Research*. 31, 432-437. [4] Warren, D. W., Drake, A. F., Davis, J. U. 1992. Nasal airflow in breathing and speech. *The Cleft Palate-Craniofacial Journal*. 29, 511-519. [5] Boliek, C. A., Hixon, T. J., Watson P. J., Jones, P. B. 2009. Refinement of Speech Breathing in Healthy 4- to 6-Year-Old Children. *Journal of Speech, Language, and Hearing Research*. 52(4), 990-1007. [6] Rochet-Capellan, A., Fuchs, S. 2013. Changes in breathing while listening to read speech: the effect of reader and speech mode. *Frontiers in Psychology*. 4, 906.