

1 INTRODUCTION

- Using computer-assisted reading to train fluency in reading aloud, with a specific focus on phrasing, linked to pauses and breath planning [1]
- Reading aloud requires a specific control of breathing to coordinate the breath needs with the discourse structure [2] [3]
- Children novice reader produce more breath and ungrammatical pauses [4] [5]
- Development of speech-breathing coordination in children gradually refine with age [6] and grade level [5]

Aims

- Identifying the respiratory features that could be considered as the hallmark of fluency improvement;
- Quantifying the impact of specific training on speech-breathing coordination through computer-assisted reading.

2 METHOD

1. Computer-assisted reading

- RAKE application (Reading Assistance by KaraokeE)
- Audio-visual assistance of reading → read-while-listening [7]
- Based on *close-shadowing* reading [8] and repeated reading [9]
- Two levels of highlighting: words vs. Breath groups/word/pause highlighting

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Illustration of word highlighting

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Illustration of breath groups, word and pause highlighting

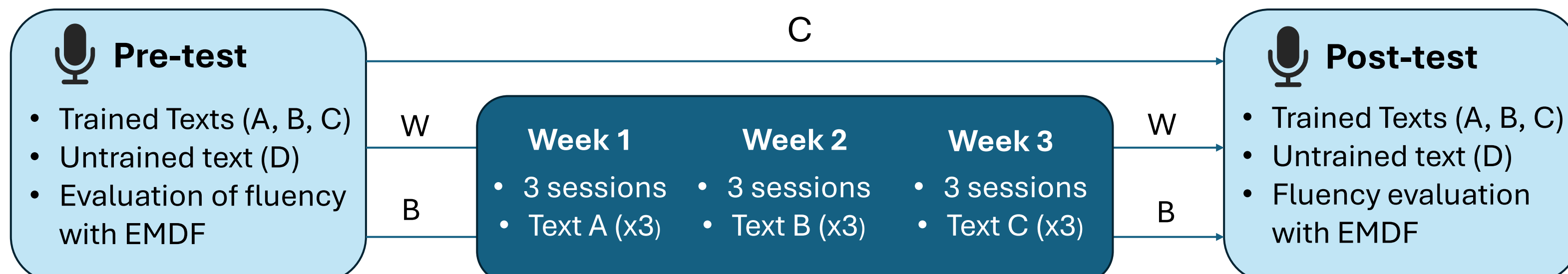
2. Experimental protocol

Participants

- 97 children (3rd-5th grades)
- Fluency was evaluated using the multidimensional fluency scale [10], adapted to French (EMDF) [11]

66 children selected (9 y.o. 3±17 months):

- C : control
- W : word highlighting
- B : Breath group + word + pause highlighting



3. Background

Subjective evaluation of fluency [1]

- Using EMDF [11]
- Improvement in the total score of fluency for text A & D, for groups B* & W*
- Improvement in phrasing for text A & D, for groups B* & W*

Objective markers of phrasing

- Phonation rate
- Ratio of ungrammatical pauses
- Inhalation-to-phonation Delay (IPD) mean and sd

Statistical analysis

- Multiple analysis of variance & Tukey-Kramer test (Multicompare on Matlab)

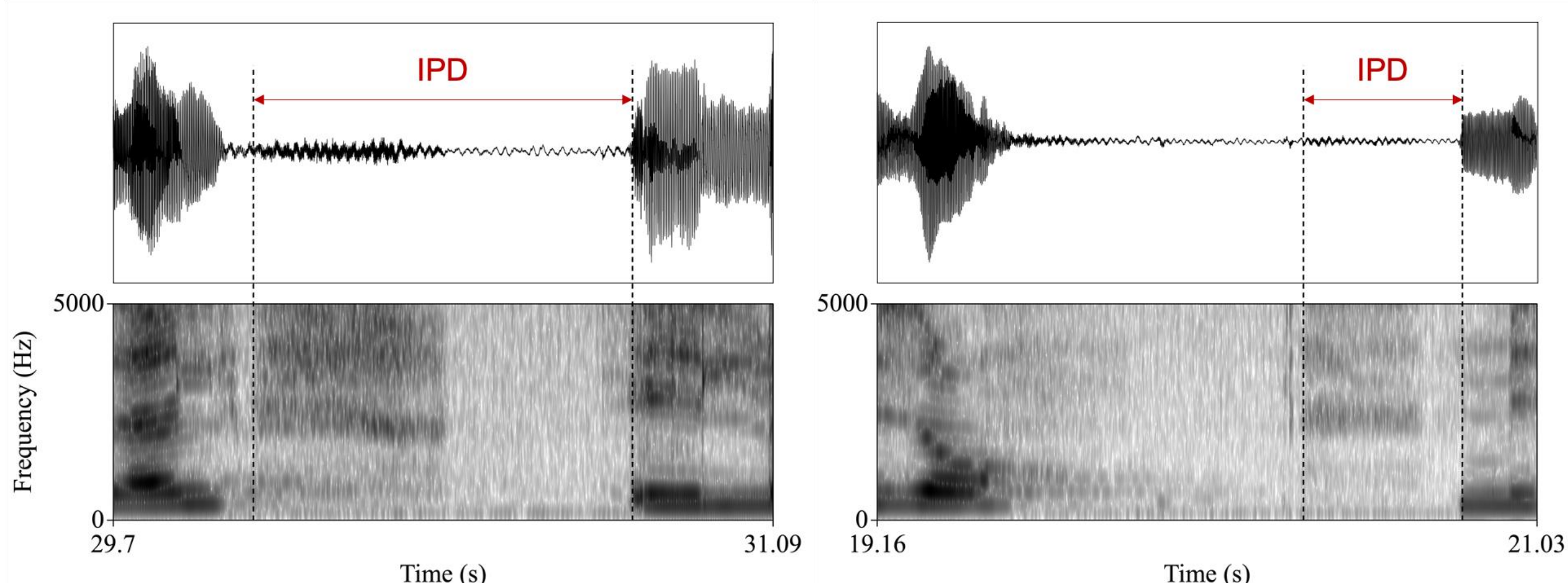


Figure 1. Illustrations of a typical IPD of a novice reader (left) vs. an IPD of a fluent pupil (right)

3 RESULTS

1. Phonation rate

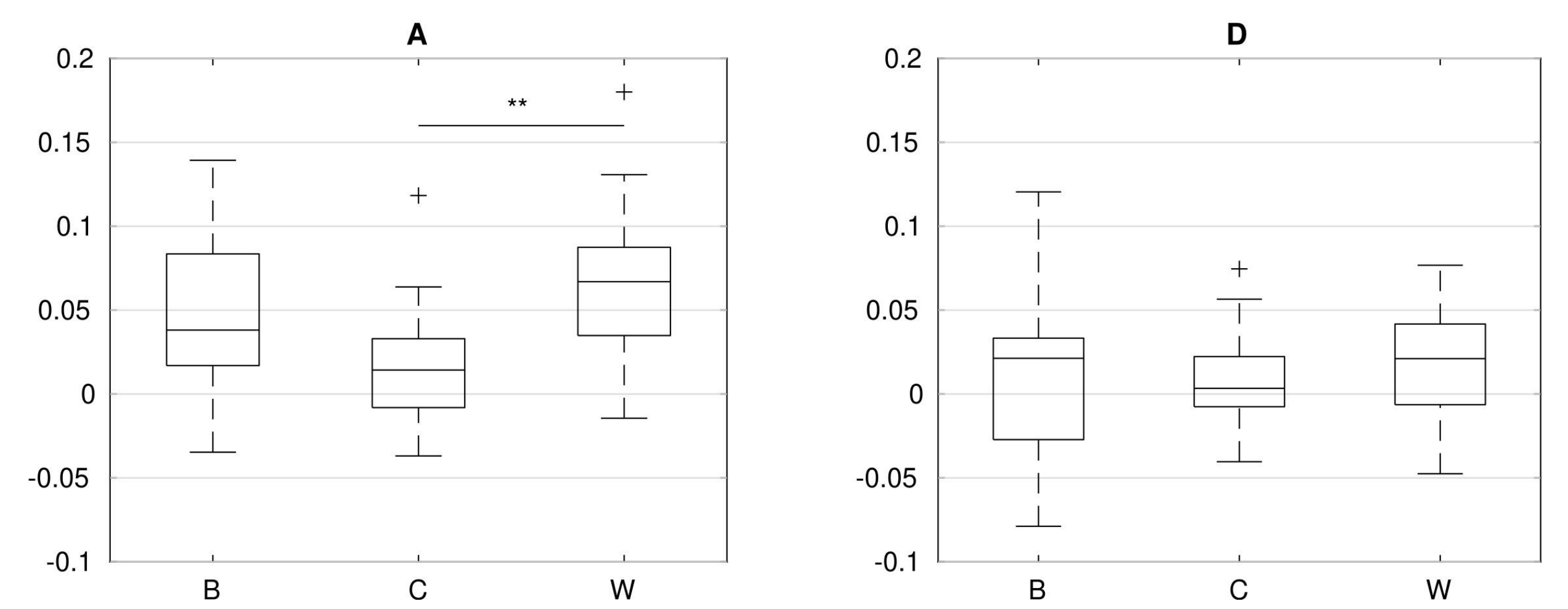


Figure 2. Variation in phonation rate between pre- and post-test for texts A and D

2. Ungrammatical pauses ratio

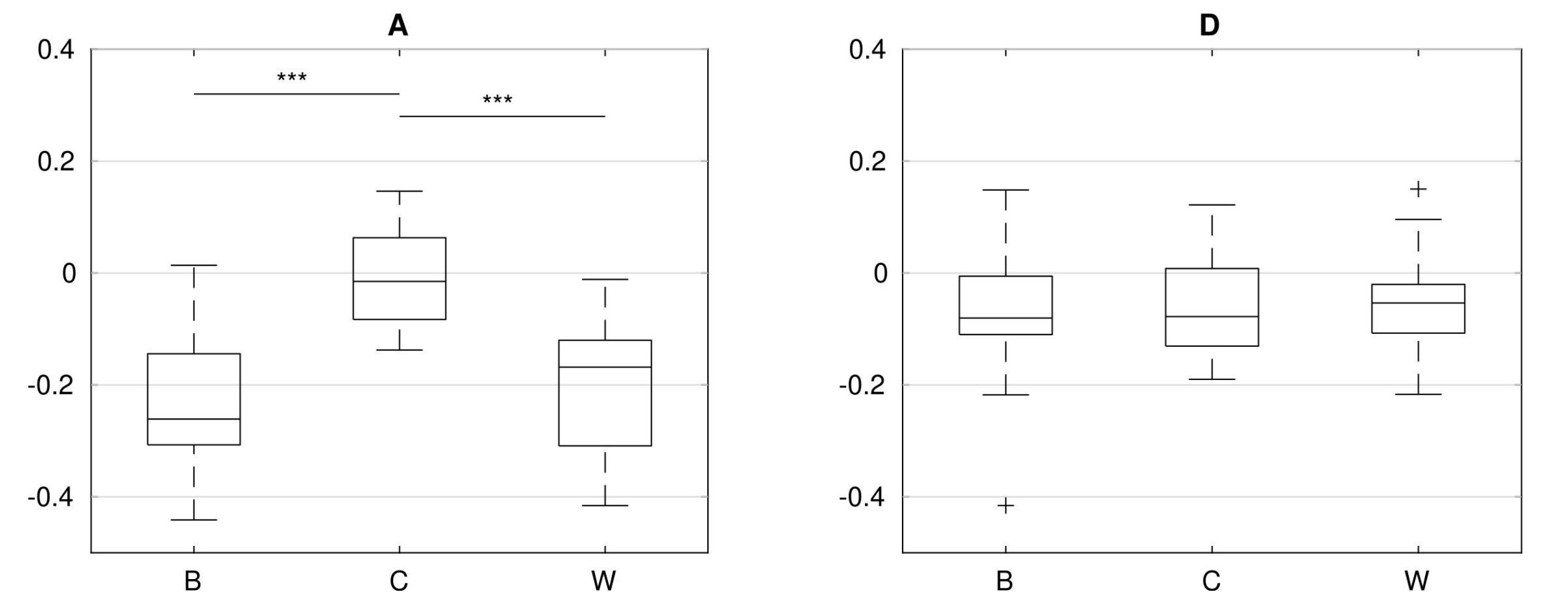


Figure 3. Variation in percentage of ungrammatical pauses between pre- and post-test for texts A and D

3. Inhalation-to-Phonation Delay

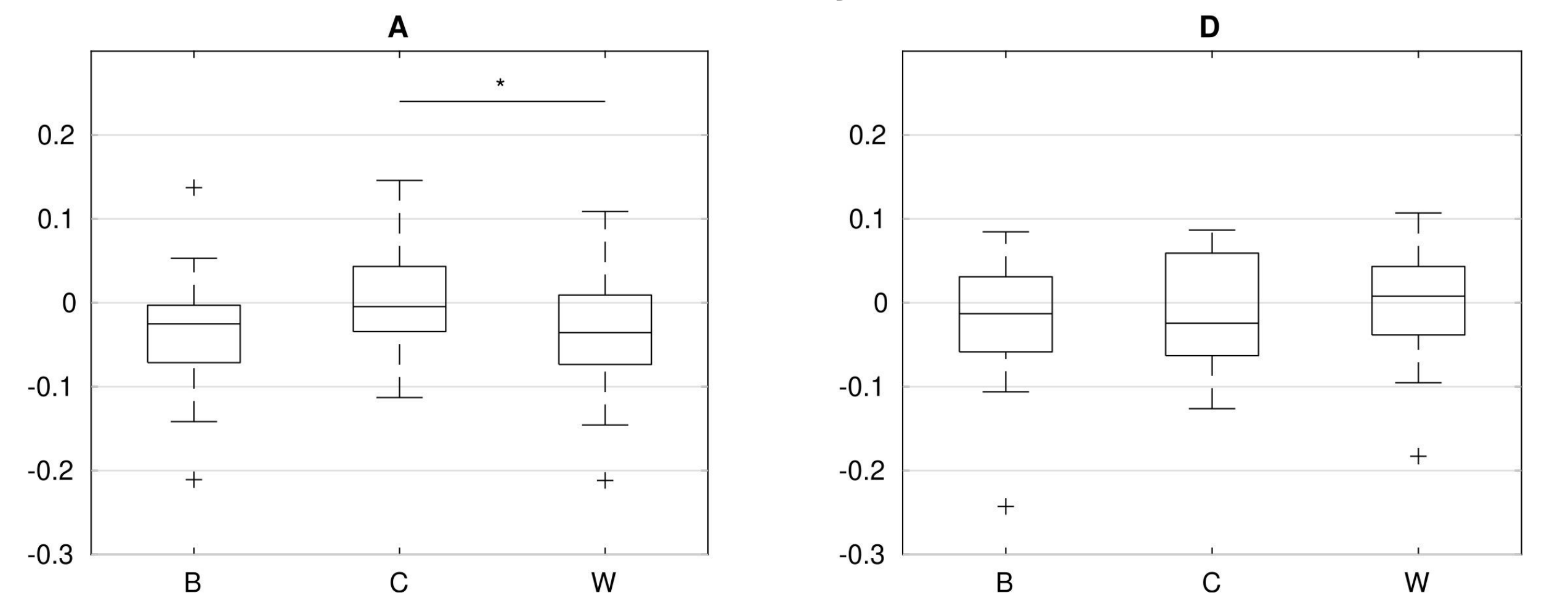


Figure 4. Variation in mean IPD between pre- and post-test for texts A and D

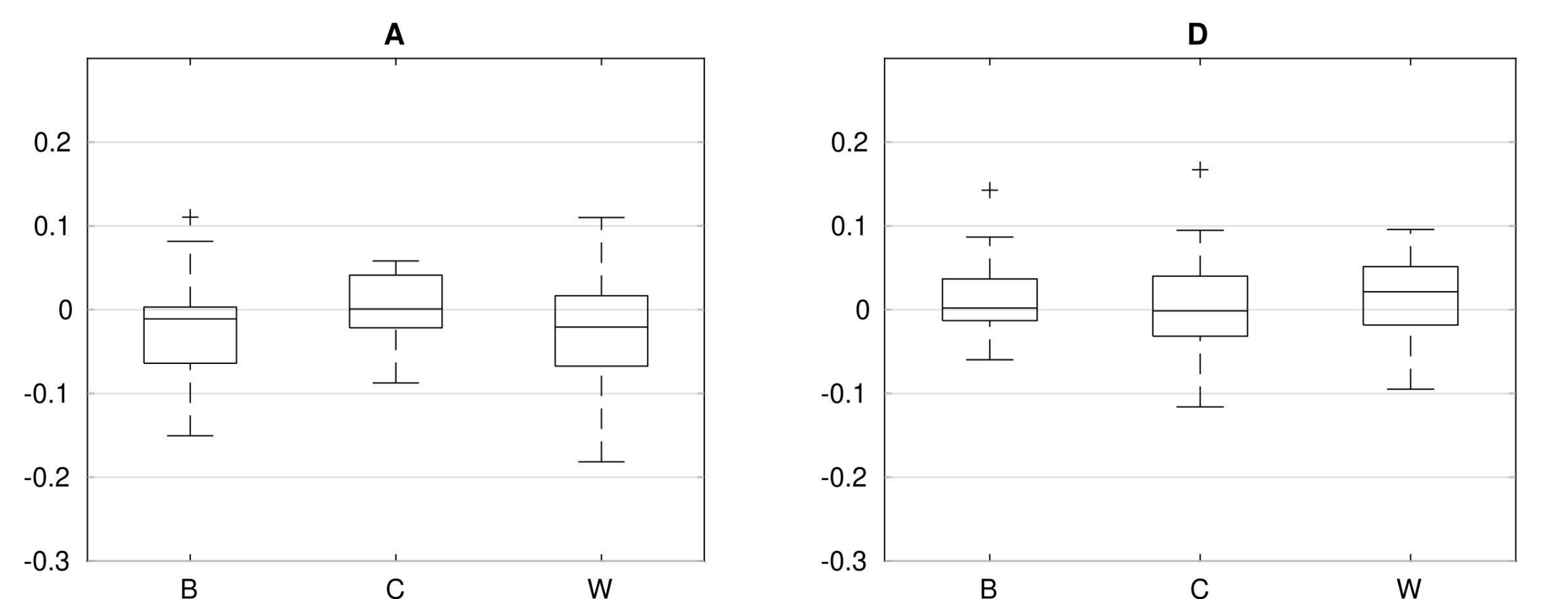


Figure 5. Variation in standard deviation of IPD between pre- and post-test for texts A and D

4 DISCUSSION

- Positive effects of computer-assisted reading on speech breathing coordination during reading of a trained text A, specifically on pause management
- IPD also appears to be a marker of fluency, but our results suggest that other may influence the position of inhalation within pauses
- Word highlighting mode is stronger than breath group/word/pause highlighting: surplus of information? Competition between the smooth progression of reading and the programmed fixation of 2 breath groups? Saliency of pauses?
- No transfer of improvements in speech-breathing coordination on untrained text D: larger complexity of this text?
- Difference in significance with subjective evaluation [1]: analysis duration? Phrasing perception cues?
- Future works:** extend this study to a larger panel of pupils (≈ 1000), over a period of 10 weeks, and across a greater number of texts

References

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