

Breathing Against the Conducting Gesture?

The Effect of Congruent and Incongruent Gesture-Task Combinations on Breathing Behavior and Resulting Loudness of Choral Singers

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ABSTRACT

Previous studies have shown that a conductor's preparatory gestures influence choral singers' breathing behavior, loudness, and sound quality. Since these gestures are often paired with instructions on desired breathing techniques, this study investigated whether congruent and incongruent combinations of gestures and breathing instructions affect breathing behavior and vocal loudness.

In a within-subjects design, 18 choristers were asked to respond to four different video stimuli, consisting of two congruent and two incongruent gesture-instruction combinations. Respiratory behavior and vocal production were measured using 3D motion capture to analyze chest wall kinematics, alongside voice recordings. The data were tested for significance using repeated measures ANOVA and Bonferroni-corrected post hoc tests.

The results reveal that the used preparatory gesture has an influence on the predetermined inhalation type. Specifically, the commonly used inward-upward gesture paired with abdominal breathing led to a reduction in chest wall expansion and decreased vocal loudness. These findings align with the stimulus-response compatibility concept, which suggests that incongruent task combinations increase cognitive load, causing delays and poorer performance. In contrast, congruent gesture-task pairings facilitate smoother and faster responses, enhancing performance. Theoretical explanations draw on e.g. the dual-route model of action control. While congruent task pairs activate automatic pathways, leading to fast, efficient performance, incongruent pairs require controlled processing, slowing reaction times.

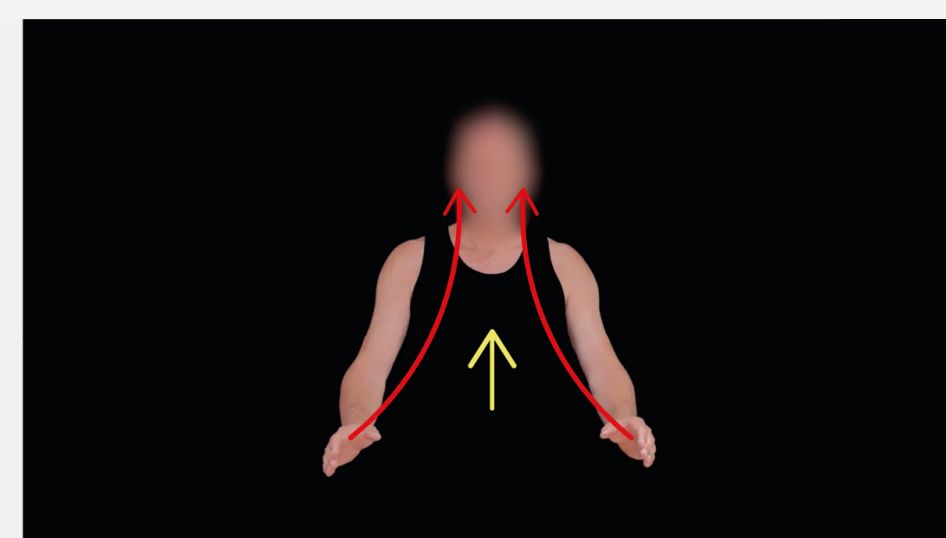
For choral practice, it is essential to consider the significant influence of conducting gestures on breathing behavior and sound production. Conductors should carefully align gestures and verbal instructions to avoid stimulus-response incompatibility effects and optimize breathing efficiency and vocal quality.

METHODS

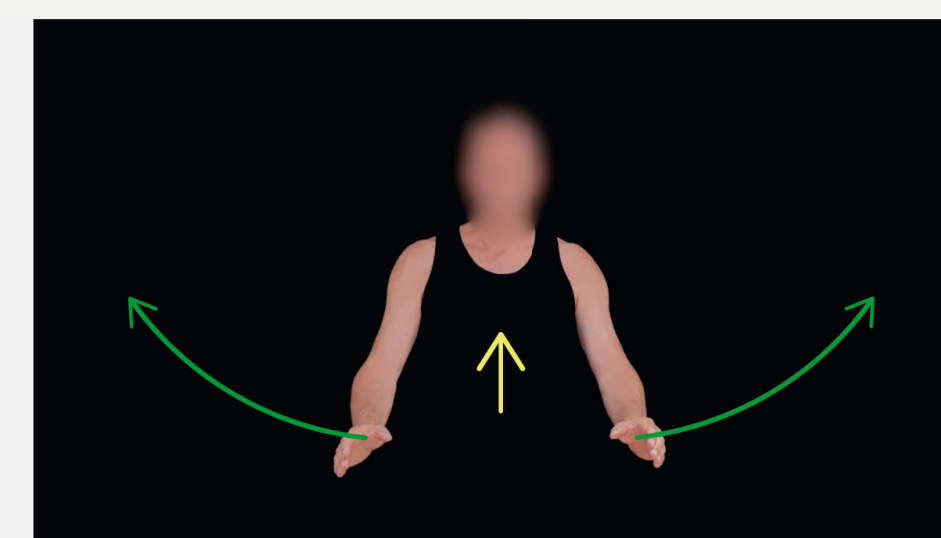
Participants: 18 choral singers (9 female, 9 male), aged 26.7 ± 9.8

Measurements: Chest wall kinematics (3D motion capture) and audio recordings of sung tones.

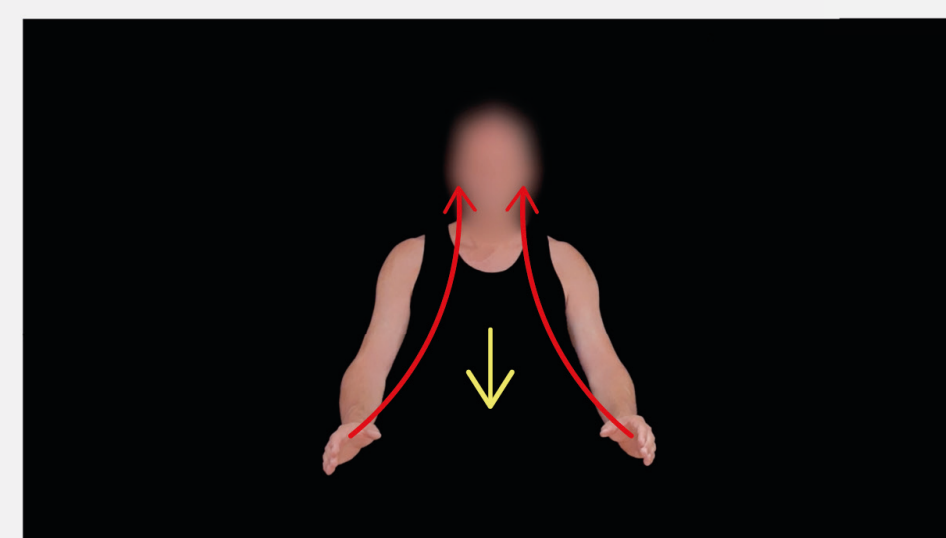
Stimuli: Four video stimuli with two congruent and two incongruent gesture-task combinations:



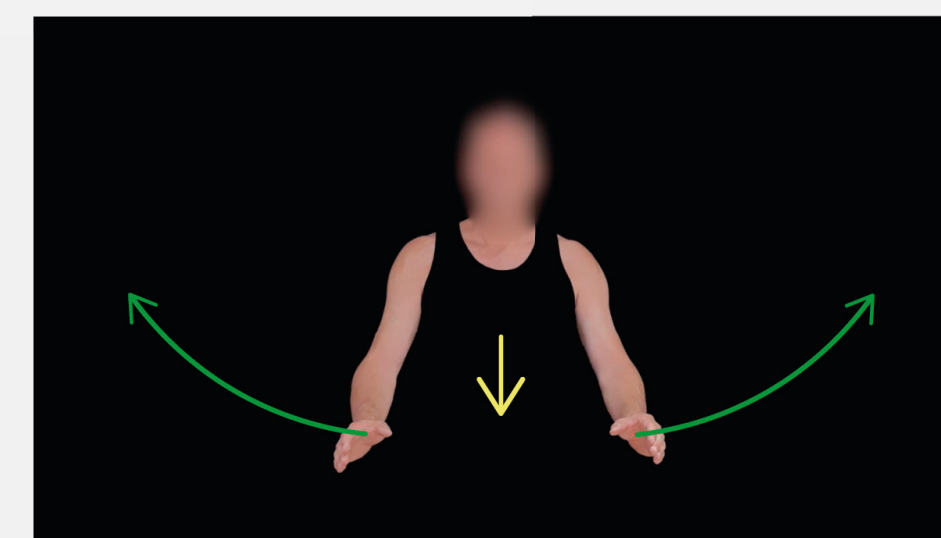
Clavicular Congruent
clavicular breathing + inward-upward gesture



Clavicular Incongruent
clavicular breathing + outward gesture



Abdominal Incongruent
abdominal breathing + inward-upward gesture



Abdominal Congruent
abdominal breathing + outward gesture

DISCUSSION

According to experimental psychology, incongruent task pairs often lead to delayed reactions and weaker outcomes due to stimulus-response compatibility effects. Our study investigated whether similar effects occur with incongruent gesture-task combinations in the context of choral singing with a conductor.

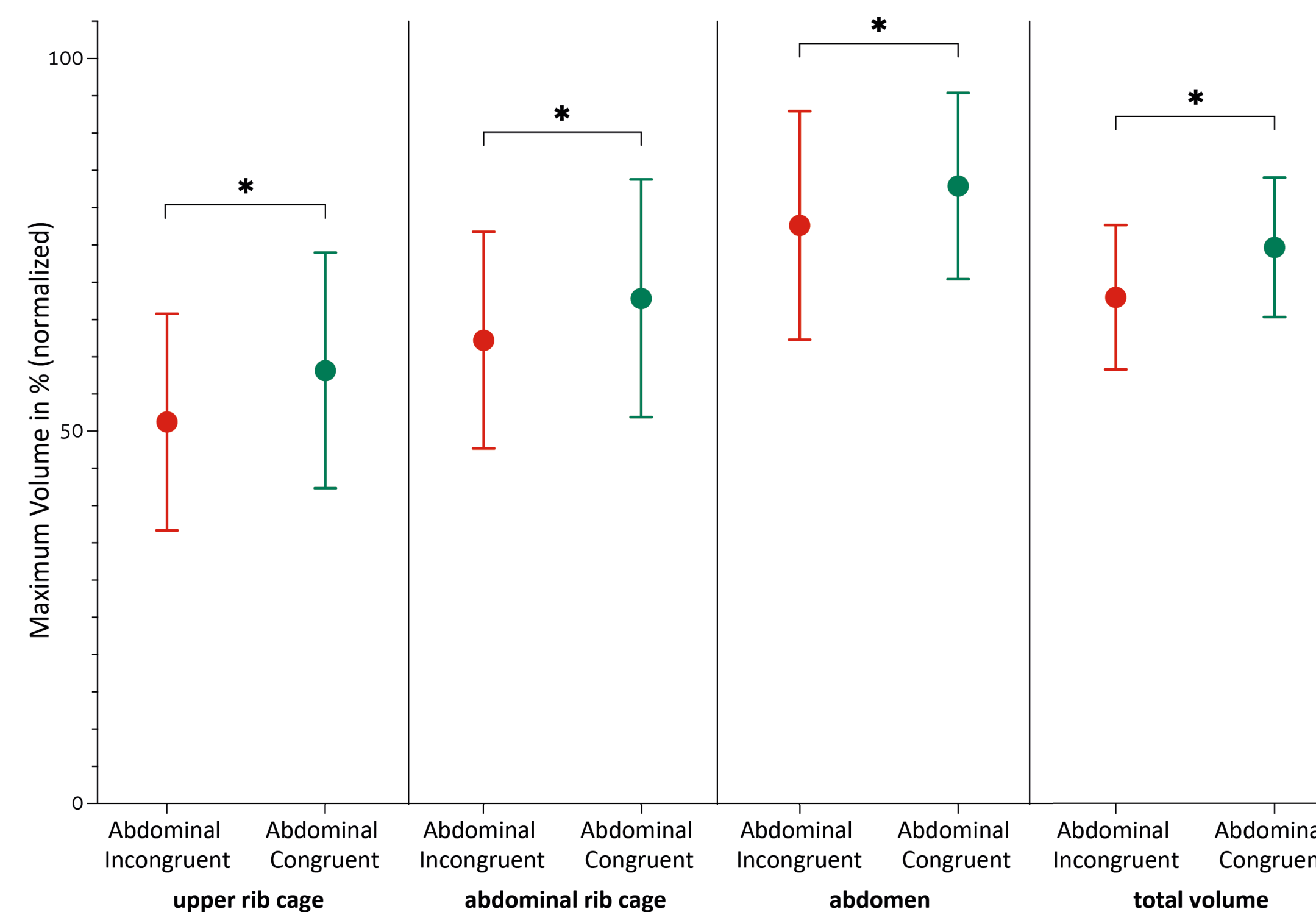
The results demonstrated that the inward-upward gesture, when paired with abdominal breathing, led to a significant reduction in inhalation volume by 6.7% and a 12% decrease in mouth opening compared to the congruent pairing. This resulted in a delayed inhalation and tone onset. In contrast, the outward gesture did not interfere with clavicular breathing tasks and even facilitated thoracic expansion.

These results indicate that the inward-upward gesture may unconsciously signal constriction, impairing abdominal breathing, while the outward gesture appears to promote expansion. The delays observed under the Abdominal Incongruent condition may be explained by dual-route models of action control, incongruent pairs require controlled processing, slowing down execution.

RESULTS

Chest Wall Kinematics

- The Abdominal Incongruent condition (inward-upward gesture + abdominal breathing) resulted in significantly lower chest wall expansion, losing about 6.7% of total volume.
- Clavicular incongruent condition (outward gesture + clavicular breathing) showed no constraint on clavicular breathing.

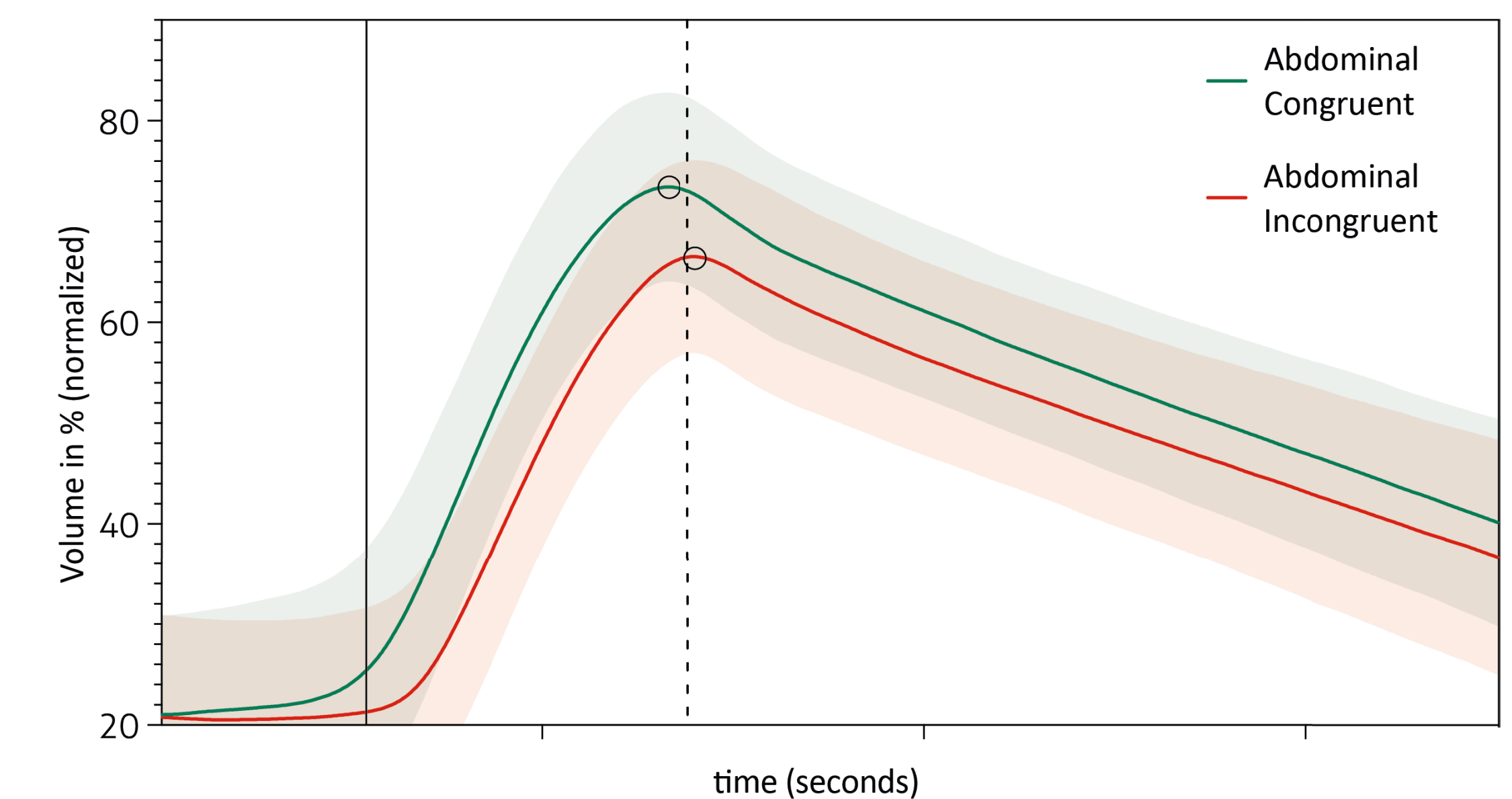


Sound Pressure Levels

- The outward preparatory gesture led to louder tones (mean SPL: +5.5 dB).

Onset Time

- The Abdominal Congruent stimuli showed a quicker onset (20 ms faster) than incongruent one.
- No significant differences in onset were observed in the clavicular conditions.



Mouth Opening

- A 12% smaller mouth opening was observed in the Abdominal Incongruent condition compared to the abdominal congruent condition.

CONCLUSION

Our study demonstrates that preparatory gestures significantly influence singers' inhalation types and resulting loudness. Specifically, the commonly used inward-upward gesture combined with abdominal inhalation leads to reduced chest wall expansion, decreased loudness, and delayed inhalation and onset. While larger inhalations and greater volume are not always desired, it is crucial in choral practice to recognize that the selected gesture affects breathing behavior and sound production. Therefore, gestures should be chosen to align with the desired inhalation type.

REFERENCES

Find the paper with references here:



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