

## Effectiveness of vocal warm-up and cool-down exercises on voice after a vocal loading task: a randomized controlled trial study

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**Introduction:** Due to intensive vocal activities, professional voice users are at higher risk of developing vocal fatigue compared to non-professional users. Vocal warm-ups are widely recommended to enhance efficiency and prevent strain. In contrast, cool-down exercises, which could aid post-use, have received less attention.

**Aim:** This study aims to evaluate the effects of vocal warm-up and cool-down exercises on acoustic parameters and subjective perceptions of vocal fatigue following a period of vocal loading.

**Materials and Methods:** A randomized controlled trial with a pre-test/post-test design was utilized. Thirty-six participants were randomly assigned to three groups: a control group, a vocal warm-up exercises group, and a vocal warm-up and cool-down exercises group. Acoustic analyses were conducted using the MDVP and the ADSV along with Visual Analog Scale evaluations for subjective vocal fatigue, administered in both pre-test and post-test phases. The vocal loading task consisted of 40 minutes of continuous reading at an 80–85 dB sound pressure level. Groups 2 and 3 performed vocal warm-up exercises before loading, while group 3 also included cool-down exercises. Statistical analyses included paired sample t-tests and Wilcoxon tests for within-group comparisons, and two-way ANOVA for between-group comparisons.

**Results:** The study revealed no significant differences in acoustic measurements between groups. However, reported vocal fatigue scores showed significant differences ( $p < 0.05$ ). Participants in the cool-down exercise group reported significantly lower vocal fatigue scores compared to the other groups. While the cool-down group showed observable improvements in post-test acoustic measurements, these changes were not statistically significant.

**Conclusion:** This study suggests that vocal cool-down exercises are more effective in reducing perception of vocal fatigue after intense vocal loading than solely warm-up exercises or no exercises at all. While acoustic improvements for the cool-down group were not statistically significant, the reported reduction in vocal fatigue emphasizes the potential benefits of incorporating cool-down exercises.