

CLASSROOM VOICE AMPLIFICATION SYSTEMS USAGE AND OTHER WORK-RELATED FACTORS IN TEACHERS' VOCAL HEALTH

Eric J. Hunter^{1,2*} Lady Cantor Cutiva^{1,2} Russell E. Banks³
Brian E. Anderson⁴ Pamela Hallam⁵

¹ Department of Communicative Sciences and Disorders, Michigan State University, East Lansing, Michigan, USA

² Department of Communication Sciences and Disorders, University of Iowa, Iowa City, Iowa, USA

³ Linus Health, Boston, Massachusetts, USA

⁴ Department of Physics and Astronomy, Brigham Young University, Provo, Utah, USA

⁵ Department of Educational Leadership and Foundations, Brigham Young University, Provo, Utah, USA

ABSTRACT

Teachers frequently experience voice problems that can impact their ability to teach and hinder student learning. A common preventative response is providing voice amplification systems. This aim of this study was to: (1) investigate the relationship between teacher vocal symptoms and classroom amplification use; and (2) identify factors influencing amplification usage. Teachers in the U.S. responded to questions designed to explore amplification system use. As might be expected, results indicated that those with higher levels of voice complaints were the ones most likely to use amplification systems if they had access to reduce pre-existing voice issues. Further, teachers were also more likely to use them if they had specific behavioral risk factors like smoking occasionally or drinking frequently, both of which may be modifiable behaviors. Finally, work-related factors such as teaching in younger grade levels and teaching in larger capacity classrooms were associated with increased amplification use; these factors may be adjusted by school administrators

to reduce the occurrence of teacher voice problems. Ongoing studies reviewing the available amplification equipment and use from a school administrator's perspective will be discussed.

Keywords: *Teacher, Vocal Health, Classroom, Voice Amplification*

1. INTRODUCTION

Several decades of studies have shown that schoolteachers have a significant risk of voice problems. These risks stem from multiple factors such as occupational physical space, work administration, outside work activities, individual physiology and behaviors, and previous training.

Voice amplification systems in the classrooms are a commonly used response to a teacher's voice problems. Such systems may reduce actual and perceived vocal load, vocal effort, and self-perceived vocal fatigue [1-3]. Further, children in amplified classrooms appear to show increased listening, comprehension, and learning skills [4,5].

In the current study, data were collected via survey from a sample of U.S. teachers. Responses were analyzed to examine the accessibility and use of classroom amplification systems, and related factors.

*Corresponding author: ejhunter@msu.edu.

Copyright: ©2023 Eric Hunter et al. This is an open-access article distributed under the terms of the Creative Commons Attribution 3.0 Unported License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

2. METHODS:

The study collected data from teachers across the United States through paper and online surveys. The questionnaire included the 19 questions from the Vocal Fatigue Index [7], along with several other questions aimed at capturing factors related to teachers' vocal health problems including voice amplification access and use, voice function, lifestyle habits potentially affecting vocal performance, work conditions related to voice, and other comorbid health related issues which may affect vocal performance. Teachers who had access to amplification systems were asked to provide more information about their use of such systems. Linear regression was used to analyze the relationship between availability and use of amplification systems, Vocal Fatigue Index scores, and other factors. Previous results from this survey have been published elsewhere [8-12] including a more in-depth look at amplification impacts. These results, along with a new collection from qualitative interviews with school administrators, were analyzed and collated together.

3. RESULTS:

From our invitations, 740 teachers provided information about amplification use, voice symptoms, and work-related conditions. Overall, fewer than 40% of the responding teachers had access to a classroom voice amplification system of any kind, with teachers in lower grades reportedly having the least access. Regardless of grade levels or measured factors, schoolteachers who reported using amplification systems were also more likely to report higher levels of vocal fatigue. Female teachers (sex as a biological factor) who used voice amplification systems or taught in kindergarten through 8th grade were more likely to report higher levels of vocal fatigue. Teachers who had access to amplification systems were also more likely to use them if they smoked occasionally, drank alcohol frequently, and/or taught in larger capacity classrooms.

For those who had access to amplification systems, several follow-up questions were used to better understand the specific reasons for a teacher's decision to use or not use the systems. Many teachers reported that amplification systems decreased their speaking effort (27%), helped students hear them (21%), and improved student behavior and focus (13%). A few teachers said that it helped them not feel as tired at the end of the day (6%) and helped improve student learning (2%).

Overall, teachers reported being generally more satisfied than not with amplification systems (72%). However, some teachers still did not to use the system. Those who did not use a classroom amplification system gave reasons such as it conflicted with their teaching style (38%), it was not comfortable (60%), it was distracting to the class (22%), technology was not supported (9%), and it produced noise and feedback (23%).

4. CONCLUSION:

The aim of this study was to investigate the factors associated with self-reported use by teachers of classroom amplification systems. The results suggest that it is important to have well-adapted and appropriate amplification systems in classrooms to support teachers' vocal production. Poor-quality systems or introducing amplification in a poorly acoustically conditioned classroom may worsen teachers' vocal performance. In addition, certain work-related factors such as grade level and classroom capacity were associated with the use of amplification systems. As school administrators work to create supportive classrooms, it is crucial that they consider vocal health risk factors and the impact/use of school amplification systems to make informed decisions.

While potentially helpful, amplification systems may not be able to completely alleviate teachers' voice problems. For example, call center workers have significant voice problems even though they use a similar system (i.e., phone headsets with close microphone support) [6]. Nevertheless, as school administrators work to create supportive classrooms, information about vocal health risk factors and the impact of school amplification systems is critical to making informed decisions.

5. ACKNOWLEDGMENTS

The authors would like to thank the many teachers who were willing to give of their time to this work. Also, thanks to the many students who helped with teacher emails and testing. This research was in part supported by the NIDCD of the NIH under Award Number R01DC012315. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

6. REFERENCES

- [1] Bovo, R., Galceran, M., Petruccelli, J., & Hatzopoulos, S. (2007). "Vocal Problems Among Teachers: Evaluation of a Preventive Voice Program," *J of Voice*, 21, 705–722.
- [2] Morrow, S. L., & Connor, N. P. (2011). "Voice Amplification as a Means of Reducing Vocal Load for Elementary Music Teachers," *J of Voice*, 25, 441–446.
- [3] Hunter, E. J., Cantor-Cutiva, L. C., van Leer, E., van Mersbergen, M., Nanjundeswaran, C. D., Bottalico, P., Sandage, M. J., et al. (2020). "Toward a Consensus Description of Vocal Effort, Vocal Load, Vocal Loading, and Vocal Fatigue," *J Speech Lang Hear Res*, 63, 509–532.
- [4] da Cruz, A. D., Alves Silvério, K. C., Da Costa, A. R. A., Moret, A. L. M., Lauris, J. R. P., and de Souza Jacob, R. T. (2016). "Evaluating effectiveness of dynamic soundfield system in the classroom," *Noise Health*, 18, 42–49.
- [5] Dockrell, J. E., & Shield, B. (2012). "The Impact of Sound-Field Systems on Learning and Attention in Elementary School Classrooms," *J Speech Lang Hear Res*, 55, 1163.
- [6] Lehto, L., Laaksonen, L., Vilkmán, E., & Alku, P. (2008). "Changes in Objective Acoustic Measurements and Subjective Voice Complaints in Call Center Customer-Service Advisors During One Working Day," *J of Voice*, 22, 164–177.
- [7] Nanjundeswaran, C., Jacobson, B. H., Gartner-Schmidt, J., & Verdolini Abbott, K. (2015). "Vocal Fatigue Index (VFI): Development and Validation," *J of Voice*, 29, 433–440.
- [8] Banks, R. E., Bottalico, P., & Hunter, E. J. (2017). "The Effect of Classroom Capacity on Vocal Fatigue as Quantified by the Vocal Fatigue Index," *Folia Phoniatrica et Logopedica*, 69, 85–93.
- [9] Cantor-Cutiva, L. C., Banks, R. E., & Hunter, E. J. (2022). "The Effect of Upper Airway Ailments on Teachers' Experience of Vocal Fatigue," *J of Voice*, 36, 226–231.
- [10] Hunter, E. J., & Banks, R. E. (2017). "Gender Differences in the Reporting of Vocal Fatigue in Teachers as Quantified by the Vocal Fatigue Index," *Ann Otol Rhinol Laryngol*, 126, 813–818.
- [11] Nanjundeswaran, C., van Mersbergen, M., Banks, R., & Hunter, E. (epub-2022). "Vocal Fatigue Index in Teachers Using Mokken Analysis," *J of Voice*.
- [12] Banks, R. E., Cantor-Cutiva, L. C., & Hunter, E. (epub-2022). "Factors Influencing Teachers' Experience of Vocal Fatigue and Classroom Voice Amplification," *J of Voice*.