



HHS Public Access

Author manuscript

Logoped Phoniatr Vocol. Author manuscript; available in PMC 2017 November 09.

Published in final edited form as:

Logoped Phoniatr Vocol. 2012 October ; 37(3): 133–135. doi:10.3109/14015439.2012.664657.

Teacher Response to Ambulatory Monitoring of Voice

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Abstract

Voice accumulation and dosimetry devices are used for unobtrusive monitoring of voice use. While numerous studies have used these devices to examine how individuals use their voices, little attention has been paid to how subjects respond to them. Therefore, the purpose of this short communication is to begin to explore two questions: (1) How do voice monitoring devices affect daily communication? and (2) How do participants feel about the physical design and function of these types of voice monitoring devices? One key finding is that most of the subjects remain aware of the dosimeter while wearing it, which may impact the data collected. Further, most subjects have difficulty with the accelerometer and/or the data storage device.

Introduction

Voice accumulation and voice dosimetry devices have been developed for ambulatory monitoring of voice use (e.g., 1;2;3;4;5). Current devices use an accelerometer attached to the neck to capture basic voice data (i.e., loudness and frequency), thus removing the interference of external noises (4;5) and avoiding privacy concerns because the subject's actual speech is not recorded. Voice data are processed and stored in an external, portable device that is usually worn on the waist.

While numerous studies have employed these devices to examine how individuals use their voices, little attention has been paid to how subjects respond to these type devices. Because previous studies suggest that other ambulatory devices impact the behaviors of the wearer (e.g., 6), it would be valuable to investigate if a similar impact occurs with voice monitoring devices. Therefore, the purpose of this short communication is to begin to explore two questions: [1] How do voice monitoring devices affect daily communication? and [2] How do participants feel about the physical design and function of these type of voice monitoring devices?

Methods

The National Center for Voice and Speech (NCVS) voice dosimeter (e.g., 5) was developed nearly 10 years ago as a research device to monitor multi-day voice use in teachers. During

the study period, teachers were recruited to wear the device during all waking hours and activities for two weeks. During the study, teachers completed vocal tasks, self-ratings, and daily log sheets. Fifty-seven public school teachers completed the study for 2-week increments, with a variety of published studies from the results (7–10). This study was approved by the Colorado Multiple Institutional Review Board.

A short post-study questionnaire, completed by the first fourteen teachers who participated in the 2-week study, was the data source for the current study. This questionnaire consisted of 16 questions grouped around 2 general themes: (1) impact of the dosimeter on general communication; and (2) dosimeter function and design. Ten of the questions were yes/no with the ability to leave comments; the remaining six were short answer.

Results

All fourteen participants provided responses to all 16 questions in the questionnaire. In general, the teachers were divided on whether the dosimeter affected their voice use, with seven reporting that it did not, and seven reporting that it did to some degree. When the teachers were asked if they ever reached the point that they become unaware of the device, nine responded yes and five responded no. Finally, all of the teachers reported that other people noticed and/or commented on the dosimetry equipment; further, nine of the fourteen respondents commented that people noticed the accelerometer specifically at least some of the time. One respondent noted that communication partners expressed concern that their voice was going to be recorded or interfere with the participant's recordings.

Part Two of the survey asked more functional questions about the device. More than a third of the teachers (n=5) had difficulty applying the accelerometer, but noted that the application became easier as the study progressed. Only two of the teachers had difficulty with the accelerometer staying in place, which was attributed to method of application. Eleven of the twelve teachers experienced at least mild skin irritation from the adhesive, and one participant actually dropped out of the study because the irritation was so severe. The device itself also received negative feedback. Eleven of the teachers complained of difficulties carrying the dosimeter. Objections included the heaviness and bulk of the device (the batteries being the heaviest component). The vast majority suggested having a smaller device with fewer wires that could be better concealed and more easily worn. The small waist bag used to carry the device was also mentioned as a negative, both because it was inconvenient and noticeable.

In spite of the negatives mentioned, all of the participants reported an overall positive experience. Further, all but one would encourage their friends or colleagues to participate in the study.

Conclusions

Voice accumulation and voice dosimetry devices are common tools used to unobtrusively monitor occupational vocal users. However, little research has been conducted to examine how subjects respond to the device itself. The current paper investigates the impact of voice monitoring devices on daily communication and the participants' perceptions of the physical

design and function of these types of voice monitoring devices. While the impact of only one device (the National Center for Voice and Speech voice dosimeter) is explored, this research-only device is similar to commercial devices available. An obvious weakness of this preliminary investigation is the limited number of subjects. However, it is an important first step. Most subjects were cognizant of the dosimeter throughout the study. This finding is supported by previous studies which showed that subjects were aware of other ambulatory devices and behavior was effected (e.g., 6). Therefore, it is crucial to further explore how this awareness might impact the data collected in a study.

Another key finding in the study is the subjects' dissatisfaction with key aspects of most voice monitoring devices. First, skin irritation may be caused by attaching the accelerometer. While protocols that do not call for self-application of the accelerometer would avert the skin irritation, this would hinder multi-day observations. Nevertheless, there are new devices, such as the VoxLog (<http://www.sonvox.com/>) that uses a slip on collar without adhesive, which may mitigate accelerometer application issues. Second, the size and inconvenience of the external pack used to process and store the data collected was a major complaint. This is a issue which should be addressed in future iterations of ambulatory devices (e.g., KayPentax's ABM (<http://www.kaypentax.com/>) is smaller than the original and approximately the same size as the NCVS dosimeter).

Acknowledgments

The author would like to thank Sydney Fredrickson for some initial discussion and analysis of the subjects' responses. In addition, acknowledgements to the NCVS Voice Dosimeter research team (both past and present) is necessary with many supporting roles (Jan Svec, Peter Popolo, Karen Rogge-Miller, Andrew Starr, Albert Worley, Kate Emerich, Jennifer Spielman, Angela Halpern). Thanks Laura M. Hunter for the technical edits.

DECLARATION OF INTERESTS: This work was supported by National Institute on Deafness and Other Communication Disorders at the National Institutes of Health (grant number R01DC04224), Ingo R. Titze as the Principal Investigator.

Reference List

1. Ohlsson AC, Brink O, Lofqvist A. A voice accumulation-validation and application. *J Speech Hear Res.* 1989 Jun; 32(2):451-7. [PubMed: 2739395]
2. Buekers R, Bierens E, Kingma H, Marres EH. Vocal load as measured by the voice accumulator. *Folia Phoniatr Logop.* 1995; 47(5):252-61. [PubMed: 8563777]
3. Szabo A, Hammarberg B, Hakansson A, Sodersten M. A voice accumulator device: evaluation based on studio and field recordings. *Logoped Phoniatr Vocol.* 2001; 26(3):102-17. [PubMed: 11824498]
4. Cheyne HA, Hanson HM, Genreux RP, Stevens KN, Hillman RE. Development and testing of a portable vocal accumulator. *J Speech Lang Hear Res.* 2003 Dec; 46(6):1457-67. [PubMed: 14700368]
5. Popolo PS, Svec JG, Titze IR. Adaptation of a Pocket PC for use as a wearable voice dosimeter. *J Speech Lang Hear Res.* 2005 Aug; 48(4):780-91. [PubMed: 16378473]
6. Hermida RC, Calvo C, Ayala DE, Fernandez JR, Ruilope LM, Lopez JE. Evaluation of the extent and duration of the "ABPM effect" in hypertensive patients. *J Am Coll Cardiol.* 2002 Aug; 40(4): 21. 710-7.
7. Carroll T, Nix J, Hunter E, Emerich K, Titze I, Abaza M. Objective measurement of vocal fatigue in classical singers: A vocal dosimetry pilot study. *Otolaryngol Head Neck Surg.* 2006 Oct; 135(4): 595-602. [PubMed: 17011424]

8. Titze IR, Hunter EJ, Svec JG. Voicing and silence periods in daily and weekly vocalizations of teachers. *J Acoust Soc Am*. 2007 Jan; 121(1):469–78. [PubMed: 17297801]
9. Halpern AE, Spielman JL, Hunter EJ, Titze IR. The inability to produce soft voice (IPSV): A tool to detect vocal change in school-teachers. *Logoped Phoniatr Vocol*. 2009 Jun.34:28. 117–27.
10. Hunter EJ, Titze IR. Variations in intensity, fundamental frequency, and voicing for teachers in occupational versus nonoccupational settings. *J Speech Lang Hear Res*. 2010 Aug; 53(4):862–75. [PubMed: 20689046]