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PREVALENCE AND RISK FACTORS OF VOICE DISORDER SYMPTOMS IN UNIVERSITY PROFESSORS: A PILOT STUDY IN NEBRASKA

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Although many studies note positive correlations between teaching professionals and voice disorder development, much of what is known is based on reports of elementary and secondary educators, not university professors. Few studies have sought to determine voice disorder prevalence and risk for university professors even though, as professional voice users, they are likely at high risk for voice disorder development. In the present study, 408 university professors responded to questions regarding general health, voice symptomology, and engagement in behaviors associated with voice quality and health. Almost 18% of respondents reported at least 1 consistent voice disorder symptom. Of these, hoarseness was the most commonly-reported symptom. Statistically significant differences between those reporting consistent symptomology and those who did not included feelings of stress/anxiety, medicine intake, and self-reported overall general health. Findings indicate the need for expanded study of this at-risk population and investigation into their access to voice-education and intervention resources.

Prevalence and Definition of Voice Disorders

Many depend on their voice to perform occupational activities. In the U.S. alone, an estimated one quarter of those employed use their voice as a critical aspect of their work (Titze et al., 1997; National Center for Voice and Speech [NCVS], n.d.). Some professions inherently put individuals at higher risk (e.g., teachers, salespeople, clergy, singers) than others to develop voice disorders due to their profession's heavy vocal load (Cantor-Cutiva, 2018; Titze et al., 1997; NCVS, n.d.; Verdolini & Ramig, 2001).

A voice disorder is characterized by changes in voice quality, pitch, and loudness that are inappropriate for an individual's age, gender, cultural background, or geographic location (Bradley, 2010; American Speech-Language-Hearing Association [ASHA], n.d), and can be caused by a variety of factors including occupational hazard (Bradley, 2010). Roy and colleagues (2005) defined voice disorder as "any time the voice does not work, perform, or sound as it normally should, or interferes with communication" [6, p. 1989]. Auditory-perceptual symptoms, often referred to as "dysphonia," can encompass alterations in vocal quality, pitch, loudness, and/or effort (Stemple et al., 2014).

A wide range of methodologies have been used to determine the prevalence of voice disorders among adults of working age in the U.S. Roy and colleagues (2005) conducted a cross-sectional phone survey with 1,326 adults and found a voice disorder prevalence of 6.6% within a 12-month period and 29.9% across the lifespan. A retrospective database analysis by Cohen and colleagues (2012) showed a prevalence rate of 0.98% in a treatment-seeking population, indicating that few individuals with voice problems actually sought treatment. Using a cross-sectional analysis of a national health survey, Bhattacharyya (2014) found 1 in 13 adults (7.7%) experienced voice disorders annually. Studies have also shown a higher prevalence rate of voice disorder in females (Cohen et al., 2012; Roy et al., 2005) and the elderly (Cohen et al., 2012).

Prevalence and Symptomatology of Voice Disorders in Professional Voice Users

For individuals whose occupations put them at high risk for voice disorder, voice problems were usually related to excessive phonotrauma at work (e.g., loud talking, yelling, hard glottal attacks) leading to symptoms of soreness, hoarseness, voice fatigue, sore throat, and aphonia (Williams, 2003). These symptoms can be employment threatening.

Two large studies to date from Sweden and the U.S. have investigated the frequency of individuals from high-risk occupations who seek voice treatment and compared them with the general population (Titze et al., 1997; Fritzell, 1996). The results of the two studies revealed singers have the highest risk for developing voice disorders, followed by counselors/social workers, teachers, lawyers, and healthcare workers (Verdolini & Ramig, 2001). However, when looking at those occupations which employ large numbers of workers, teachers were the most at-risk occupation for developing voice problems and four times more commonly-represented clinically than the general population (Titze et al., 1997; Fritzell, 1996; Verdolini & Ramig, 2001). Although teachers only represented only about 2.7% of the U.S. workforce (U.S. Department of Education, Institute of Education Sciences: National Center for Statistics, 2005) they accounted for nearly 20% of voice clinic clientele (Titze et al., 1997)

Teachers

Several findings indicate a high incidence of voice problems among teachers in comparison with nonteachers (Cantor-Cutiva, 2018; Roy et al., 2004; Roy et al., 2005; Behlau et al., 2012). The estimated prevalence of vocal dysfunction was found to be higher in teachers (11.0%) compared to nonteachers (6.2%; Roy et al., 2004). A systematic review of voice disorders in teachers (Cantor Cutiva et al., 2013) showed a voice disorder prevalence of 9% to 37% with 15% to 80% reporting some sort of voice problem in the past 12 months. This high prevalence of voice disorders in teachers has been attributed to intense and prolonged occupational voice use, speaking in noisy environments, and using inefficient phonation techniques (Van Houtte et al., 2011). Voice disorders in teachers results in lost work days and treatment expenses of about \$1.5 billion annually (Verdolini & Ramig, 2001). In a treatment-seeking population with teachers as a main subgroup, the three primary vocal pathologies associated with occupational voice were functional voice disorders (41%), followed by vocal fold nodules/hypertrophy (15%), and reflux/laryngitis/inflammation (11%) (Van Houtte et al., 2009). Another study showed hoarseness, difficulty projecting, discomfort, and loss of vocal range were common symptoms in teachers (Roy et al., 2004).

University Professors

Contrary to the plethora of information related to voice disorders among teachers, very few studies have examined voice problems among university professors. To date, only three peer-reviewed studies, two of them outside the United States, have been published investigating risk factors for voice disorders in university professors, an occupational group working under similar conditions to teachers (e.g., talking for long periods of time with increased volume, speaking above background noise).

Korn and colleagues (2015) investigated the correlation between hoarseness and risk factors for voice disorders in university professors in Brazil. Results indicated the percentage of those reporting hoarseness was lower when the time of teaching was shorter or equal to one year, when the workload was one to three class hours per day, when the maximum number of students per classroom is less than 30, and when professors worked in an otherwise silent environment. Kyriakou and colleagues (2017) used an online questionnaire to investigate risk factors for voice pathologies in 196 professors from 12 universities in Cyprus. Results indicated a voice disorder prevalence of 35.2%. Their findings also revealed health, voice use, lifestyle, and environmental factors may contribute to the development of voice disorders for this population.

Higgins and Smith (2012) conducted an in-person/by-telephone interview survey to study the prevalence of voice disorders as well as the demographic and behavioral variables likened to voice disorders in U.S. university faculty. Of the 100 participants involved, 45 self-reported having a voice disorder (Higgins & Smith, 2012). Among those, the most common voice symptoms were hoarseness, vocal discomfort, increased vocal effort, decreased loudness, and pitch changes. Also, they found little effect when comparing the prevalence of voice disorders and demographic or behavioral data, suggesting teaching demands were the factors most likely to underlie voice disorder for their participants.

Canton-Cutiva and colleagues (2020), conducted voice acoustic analysis in university professors with and without vocal fatigue. Both men and women participants with vocal fatigue demonstrated a significantly decreased standard deviation of vocal sound pressure level (8.7 dB vs 10.2 dB) and an increase of mean fundamental

frequency (138.2Hz vs 122.3Hz for males; and 228.7Hz vs 188.9Hz for females) compared to participants without vocal fatigue. These variables were found to be good indicators to identify and monitor speakers with vocal fatigue in university professors.

Taking into consideration the existing data on prevalence of voice disorders in teachers and the impact that voice problems can have on a teacher's quality of life, it is of interest to further investigate risk factors of voice disorder in university professors. More information about U.S. university professors' use of voice and presence of voice disorder symptomatology must be gathered beyond a single survey of 100 participants.

The purpose of the present study was to add to the scant existing knowledge base regarding voice disorder prevalence for university professors and identify self-reported risk factors associated with voice disorder symptoms for this population in the U.S.. The overall objective of this line of research is to determine the need for preventative vocal hygiene educational programming aimed at improving healthy use of voice for university professors.

In the present pilot study, the researchers addressed the following questions based on a small sample of university professors from the U.S. with the intent to conduct further inquiry with larger samples: (1) What are the self-reported prevalence and risk factors for voice disorders symptoms among university professors? (2) Of these, what are most commonly self-reported? (3) Do university professors self-report engagement in behavioral risk factors negatively associated with vocal use? (4) Do university professors self-report engagement in behaviors associated with healthy vocal hygiene habits? (5) Are there common factors across university professors associated with voice disorder symptomatology (e.g., years teaching, age)?

Method

Participant recruitment, research materials (e.g., online questionnaire), and project procedures were conducted in accordance with the ethical standards of the authors' institutional review board and approved by this governing body prior to the initiation of data collection.

Participants

A link to an online Qualtrics questionnaire comprised of 64 questions (see appendix) was emailed to 2,200 randomly-selected university professors whose email addresses were publicly available through the campus websites of a multi-campus university system in Nebraska. This university system included three independent campuses offering four-year post-secondary degree completion. Potential participant emails were randomly selected for all three campuses. For this study, university professors were defined as individuals teaching at a four-year post-secondary university in a tenure-track or non-tenure track position, part-time, or full-time.

The survey was active for 3-weeks and 458 professors responded, corresponding to a return rate of 21% which, for web-based surveys, was within the recommended response rate of 20-24% (Sax et al., 2003) and aligned with the 20% response rate noted by Kyriakou and colleagues (2017). To be eligible for analysis, responders had to satisfy three inclusionary criteria: (a) meet the researchers' definition of a university instructor, (b) self-report teaching in-person coursework the majority of the time or indicate that the teaching load was equally divided between online and in-person coursework, and (c) self-report that they taught at least one in-person course per semester. Exclusion criteria were also threefold: (a) a respondent was not a university instructor (e.g., elementary/secondary teacher, collegiate staff not considered faculty), (b) self-reported that they primarily taught online coursework, or (c) did not teach at least one in-person course per semester. If individuals met any one of the three exclusion criteria, their survey responses were not part of the study's analysis corpus.

Of the 454 respondents, 408 met the eligibility criteria for inclusion in the study, 46 did not meet the criteria because the respondent did not indicate teaching format (n=35) or reported teaching mainly online course (n=11). Eligible respondents included 206 males, 195 females, 1 transgender individual, and 6 individuals who preferred not to report gender. Ages ranging from 20 - 60+ years. Additional demographic information for survey respondents is noted in Table 1.

Materials

The online questionnaire was developed by the first two authors using a variety of existing questionnaires for teachers targeting factors related to voice use and voice disorder characteristics including those related to occupation. The present study questionnaire (see Appendix) consisted of four distinct domains: demographic information (n=21 questions), general health information (n=11 questions), voice symptomatology (n=12 questions), and lifestyle factors (n=20 questions). The demographic information questions were based on those used by

Kyriakou and colleagues (2017) and Roy and colleagues (2004). It related to participant inclusion/exclusion criteria as well as characteristics of their most frequently taught class (e.g., duration, number of students, typical loudness level) and questions regarding gender, age, race/ethnicity and highest degree held. The general health questions were derived primarily from those utilized by Kyriakou and colleagues (2017). These consisted of questions about respondents' experiences with more general health issues that may relate to vocal quality and use (e.g., experiences with reflux, heartburn, asthma, colds, and allergies).

The 12 voice symptomatology questions were those of the *Screening Index for Voice Disorders* (SIVD; Ghirardi et al., 2013). The SIVD is a screening tool developed to quantify self-perceived voice problem severity of teachers (Ghirardi et al., 2013). Ghirardi and colleagues (2013) found it had an internal consistency of 0.82, a sensitivity of 94%, and a strong correlation with the Voice Handicap Index (VHI; Jacobson et al., 1997) translated to Brazilian Portuguese (Behlau et al., 2012). The SIVD includes twelve symptoms with ordinal response categories (i.e., never, sometimes, almost always, always) regarding how often the symptom was noted to be present by the responder. To score, one (1) point is indicated for any symptom noted as "almost always" or "always" present and no points (0) are awarded for "never" and "sometimes" responses. A total score is then obtained by adding up the number of points for all twelve symptoms represented. According to Ghirardi and colleagues (2013), a score of 5 or higher indicates the likely presence of a voice disorder and is accompanied by a strong suggestion to consult with a voice specialist for a full assessment.

The creators surmised that the SIVD was an efficient tool for screening teachers for the presence of voice disorder that could contribute to the identification and public policy surrounding occupational voice disorders (Ghirardi et al., 2013). Francis and colleagues (2017) included the SIVD in a thorough review of 32 patient-reported outcome measures for voice disorders. They found the screening tool included both a conceptual model and adequate information for measurement properties (e.g., reliability and construct validity) (Francis et al., 2017). Further, they indicated the SIVD included an adequate plan for scoring, could be completed in a reasonable length of time, and was specific to teachers (Francis et al., 2017). Based on this information, the SIVD was used for the present study questionnaire.

The final questionnaire domain, lifestyle factors, was based on behavioral risk factors associated with the presence of voice disorder explored by Kyriakou and colleagues (2017) as well as behaviors generally associated with healthy vocal hygiene habits explored by Bolbol and colleagues (2017). These questions included historical and present engagement in smoking, drinking, and medication use in addition to having stress and anxiety. Behaviors generally associated with healthy vocal hygiene habits included in this domain featured questions related to water consumption, vocal rest, exercise, and sleep.

Procedures

Potential participants were sent an email that included a brief introduction to the study and its purpose, an overview of participant criteria, and a link to the questionnaire. Two follow-up emails were sent, during the second and third weeks the questionnaire was available. The link was available for three weeks. After following the link to the questionnaire, participants were presented with a narrative consent statement. Potential participants clicked "next" after reading the narrative to agree to participate before they could access the questionnaire.

Following the three-week timeframe of availability, the authors conducted descriptive and inferential analyses of participant responses to address the study's research questions. Descriptive statistics (including means and standard deviations) were compiled using Microsoft Office Excel software, version 16.16.15. Inferential analyses were conducted using the Statistical Package for Social Sciences (SPSS) software (IBM Corporation, 2016).

Descriptive and inferential statistics along with effect size calculations were used to answer the research questions posed. To answer the first question and determine the self-reported prevalence and risk factors for voice symptoms among university professors, descriptive analysis of participants' responses to the 12 voice symptomatology survey questions comprising the SIVD (Ghirardi et al., 2013) were conducted. Descriptive statistics for SIVD responses were also used to answer the second question about identifying the most commonly self-reported voice symptoms of university professors. The third research question focused on self-reported engagement in behaviors that were risk factors widely considered to be negatively associated with voice. The analyzed responses were derived from a subset of survey questions regarding lifestyle factors. The authors used descriptive and inferential statistics as well as effect size calculations to determine findings associated with this inquiry.

For the fourth question about self-reported engagement in behaviors generally associated with healthy vocal hygiene habits, responses derived from a subset of lifestyle factors were analyzed using descriptive and inferential statistics as well as effect size calculations. The fifth and final question related to potential factors

associated with voice symptoms and vocal use habits involved statistical analysis of the SIVD questions, demographic survey questions, and those questions that related to general health. Participant responses were compared to assess the relationship between participants' SIVD score and key environmental and personal factors.

Results

Self-reported Prevalence and Risk Factors

Of the 408 responders, 72 (17.6%) self-reported at least 1 consistent symptom of voice disorder by indicating “almost always” or “always” to at least 1 of the 12 SIVD questions (see Table 2). Only 1 of the 408 participants indicated at least 5 symptoms (0.25%). For this lone participant according to SIVD guidelines (Ghirardi et al., 2013), there would be a strong suggestion to consult with a voice specialist.

Most Commonly Reported Voice Disorder Symptoms

To address this research question, the authors looked to the self-reported SIVD responses of those participants indicating at least 1 consistent symptom and the SIVD responses of those participants who did not indicate at least 1 consistent symptom (Table 3). For the participants with at least 1 consistent symptom ($n=72$ of survey respondents), the most commonly-reported symptom was hoarseness with 68 participants (91.67%) reporting its presence at least “sometimes.” This group also noted the presence of phlegm (62 participants, 86.11% of the group), and cough with secretion (60, 83.33%).

Of the participants who did not report at least 1 consistent symptom ($n=336$), the most commonly-reported symptom was dry cough with 227 participants (67.56%) reporting its presence “sometimes.” This was followed by phlegm (217 participants, 64.58% of the group) and cough with secretion (204, 60.71%).

Engagement in Behaviors Negatively Associated with Voice Health

To determine participants' self-reported engagement in behaviors widely considered to be negatively associated with voice health, the researchers first summarized using descriptive statistics participants' responses to the question prompt: How often have you engaged in any of the following behaviors? As applied to the following: Drinking caffeine, taking medications, having stress and anxiety, etc. (see Table 4). Then, the researchers conducted significant testing to determine if responses between the two groups were significantly different. To do this, the researchers used nonparametric statistical procedures due to the differential group sizes in this pilot study data. A Mann-Whitney U test was conducted for each of the groups' highest reported risk factors for voice disorder (i.e., caffeine drinking, medicine intake, and stress and anxiety). Self-reported caffeine intake for professors who did not report at least 1 consistent symptom (mean rank = 197.68) and those who did (mean rank = 219.02) were not statistically significantly different, $U = 10618.5$, $z = -1.486$, $p = 0.137$.

A Mann-Whitney U test was conducted to determine differences in medication use frequency between the university professors. Self-reported medicine intake for professors who did not report at least 1 consistent symptom (mean rank = 197.69) were statistically significantly lower than those who did (mean rank = 230.47), $U = 10082.5$, $z = -2.201$, $p = 0.028$. A Mann-Whitney U test was then conducted for self-reported stress and anxiety frequency. Self-reported stress and anxiety for professors who did not report at least 1 consistent symptom (mean rank = 192.40) were statistically significantly lower than those who did (mean rank = 257.96), $U = 8175$, $z = -4.498$, $p \leq 0.001$.

Effect sizes, expressions of relative clinical magnitude between group mean differences regardless of sample size, were calculated using Cohen's d (1988) for the two significant findings related to this research question to determine their clinical importance. The effect size of the medication intake was of small, negligible clinical importance ($d = 0.16$) according to operational definitions provided by Cohen (1988). However, using Cohen's (1988) definitions, the effect size for stress and anxiety was of moderate clinical and practical importance ($d = 0.39$).

Engagement in Behaviors Generally Associated with Healthy Vocal Hygiene Habits

To ascertain participants' self-reported engagement in behaviors generally associated with healthy vocal hygiene habits, the researchers used descriptive statistics to summarize participants' responses to the question prompt: How often have you engaged in any of the following behaviors? As applied to the following: Sleeping well, exercising, drinking water throughout the day, etc. (see Table 5). Then, the researchers conducted significance testing using Mann-Whitney U tests to determine if responses between the two groups were significantly different. Although the most reported behaviors were engaging in exercise, drinking water throughout the day, and consuming

healthy foods, there were no statistically significant differences between the two groups for these behaviors. Effect size calculations ranged from $d = 0.04$ (vocal rest during the day) to $d = 0.23$ (engaging in exercise), all of which represented minimal practical importance.

Potential Factors Associated with Voice Symptoms and Use

To determine potential factors associated with voice symptoms, the researchers compared factors related to professional voice use and demographic and general health information with the participants' SIVD scores. Because of the exploratory nature of the present pilot study, multiplicity was not accounted for using experiment wise-adjusted alpha procedures (for an extended explanation supporting this decision see Cohen, 1990). Therefore, the acceptable significance value for all comparisons was ≤ 0.05 . A series of Spearman's rank-order correlations were conducted to assess the relationship between SIVD score and several key environmental (number of years teaching, number of hours teaching per week, number students per classroom, duration of the class) and personal factors (gender, age, general health) selected by the researchers for inferential analysis. There were no statistically significant correlations between the professors' SIVD scores and most of the factors examined (Table 6). However, the correlation between participants' self-reported general health and SIVD score was statistically significant, $r_s(405) = -0.105$, $p = 0.034$. To determine the relationship between gender and SIVD score, a point-biserial correlation was conducted. No significant association was present between gender and SIVD score, $r_{pb}(405) = 0.001$, $p = 0.988$. Correlational coefficients serve as their own effect sizes estimations and those noted here indicated minimal clinical importance.

Discussion

This study investigated the prevalence and risk factors of voice disorders symptoms in U.S. university professors in four distinctive domains: demographic information, general health information, voice symptomatology, and lifestyle factors. Study results indicated 17.6% of the university professors reported at least 1 consistent symptom of voice disorder by indicating "almost always" or "always" to at least 1 of the 12 SIVD questions (Ghirardi et al., 2013). Although the present study corroborates with previous studies reporting the presence of voice disorders among university professors, it found a much lower percentage compared to the studies by Higgins and Smith (2012) and Kyriakou et al. (2017) which, respectively, reported the presence of voice disorder in 45% and 35.2% of university professors surveyed. The inconsistency in the results might be related to the fact that the current study and the studies by Higgins and Smith (2012) and Kyriakou et al. (2017) used different criteria to determine the prevalence of voice disorder in university professors. More specifically, Higgins and Smith (2012) established the prevalence of voice disorders based on participant's self-response "yes" to 2 voice disorders related questions and Kyriakou et al. (2017) used a Voice Disorders Index (VDI) score of 8-48 in which participants were classified with a voice that was slightly, moderately, or profoundly disordered. In the present study, the SIVD questionnaire was used (Ghirardi et al., 2013). Since no one protocol for determining self-reported voice disorder symptomatology has been used, disparity in estimated prevalence results. This highlights the need for coordinated research efforts to best determine prevalence and risk for this important group of professional voice users.

Among university professors who reported consistent voice disorder symptomatology, the most common symptoms were phlegm, secretion/phlegm in the throat, and dry cough. This group also self-reported a high percentage of voice disorder symptoms noted at least "sometimes," including hoarseness, phlegm, and cough with secretion. Many of these symptoms have been reported in other studies of voice disorders in teachers and university professors (Roy et al., 2004; Higgins & Smith, 2012; Korn et al., 2015). An interesting finding in the current study was the relatively high frequency of phlegm, secretion/phlegm in the throat, and dry cough reported by university professors. According to Ghirardi et al. (2013), these symptoms are commonly reported by teachers and possibly related to allergic conditions and to the occurrence of laryngeal-pharyngeal reflux. This may also be related to higher reports of medicine intake by those reporting consistent symptomatology in the present study.

Another key finding of this study revealed university professors who reported at least 1 consistent voice disorder symptom also reported a higher incidence of the use of medications and levels of stress and anxiety compared to those who reported no consistent voice disorder symptoms. Spiegel and colleagues (2000) noted certain types of medication (i.e., antihistamines, diuretics, sleeping pills, antidepressants) can adversely affect the voice by drying upper respiratory tract secretions. Reducing and thickening the protective vocal fold mucosal layer secretion reduces lubrication and generates dry cough (Sataloff et al., 2017). Levels of stress and anxiety at work has also been considered a risk factor for the development of voice disorders in teachers. In fact, Vertanen-Greis et al.

(2018), found stress as the most significant explanatory variable in teachers reporting voice disorders. The results of the present study corroborate with two previous studies also analyzing the stress and anxiety variable in university professors. Korn et al. (2015) found that tense and anxious professors demonstrated a higher percentage of hoarseness. Kyriakou et al. (2017), reported a higher frequency of stress and anxiety in professors who showed symptoms of voice disorders (VDI >5) compared to the professor without or only a few voice disorders symptoms (VDI ≤5).

The analysis of engagement in behaviors generally associated with healthy vocal hygiene habits suggested no statistically significant differences between university professors with consistent voice disorders symptoms and the ones without self-reported consistent voice symptoms. One possible interpretation of this result could be that the occurrence of voice disorders symptoms in university professors may be more related to the task of teaching itself rather than healthy vocal hygiene habits (e.g., sleeping well, engaging in exercises, drinking water throughout the day). Likewise, engaging in healthy vocal hygiene habits could be supportive in treatment once symptoms of voice disorders are present in this population.

With regard to the potential factors associated with voice symptoms and use, we observed that there was a correlation between general health and SIVS score. We can infer that professors who exhibit voice disorders related symptoms are more likely to seek related general health medical care or medications. However, in the study by Roy et al. (2004), the percentage of teachers with vocal complaint seeking for medical advice was only 14.3%. Other variables that had been suggested as risk factors for developing voice disorders in previous studies (e.g., gender, age, and number of hours teaching per week) were not shown to be significant.

Limitations and Future Directions

A limitation of the current study may be that findings represent a small size in one geographic region. Future replication with large and more diverse samples is warranted. The results of the present study were also analyzed on a low end of the recommended response rate for online survey. A follow-up study investigating risk factors and prevalence in university professors with a greater response rate is also warranted. Further, investigation into university professors' access to voice-education and intervention resources is needed. Additionally, although present study findings indicated medication intake as significantly related to voice disorder symptomology, type of medication (e.g., reflux, cardiac, diabetes medications) was not specified in the survey. Given this significant finding, future studies regarding specific medication type would be beneficial.

Conclusion

In summary, a few studies using different methodologies have pointed to the fact that university professors are also at risk of developing voice disorders. The results of this study indicated that a small percentage of university professors reported voice symptoms associated with professional voice usage. The most frequent voice symptoms were phlegm, secretion/phlegm in the throat, and dry cough. The outcomes of the current study indicate that stress, anxiety, and the use of medications are also more common in university professors reporting symptoms of voice disorders.

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Table 1. Survey participant demographic information

Demographic variable	Response variables	n (%)
Gender	Male	206 (51)
	Female	195 (48)
	Transgender/ Other	1 (<1)
	Prefer not to answer	6 (1)
Age	20-29	3 (<1)
	30-39	104 (26)
	40-49	106 (26)
	50-59	102 (25)
	60+	92 (23)
Primary race/ ethnicity	White/non-Hispanic	345 (86)
	Hispanic	15 (4)
	African-American	8 (2)
	Other	34 (8)
Primary area of discipline	Business	44 (11)
	Humanities	82 (20)
	Natural and Applied Sciences	90 (22)
	Social Sciences	124 (30)
	Other	67 (16)
Highest degree held	Bachelor's	6 (1)
	Master's	68 (17)
	Ph.D.	304 (75)
	Ed.D.	9 (2)
Years teaching at the university level	Other	21 (5)
	< or = to 5 years	86 (21)
	6-10 years	92 (23)
	11-20 years	118 (29)
	21+ years	112 (27)
Typical voice loudness level in the class	Not loud	35 (9)
	Slightly loud	117 (29)
	Moderately loud	234 (57)
	Very loud	21 (5)
Amount of days in the past year your voice was a problem because it did not function as you would like it to or as it usually does	0	182 (45)
	1-2	136 (33)
	3-4	56 (14)
	5+	33 (8)
Amount of days in the past year you reduced activity or interaction because of your voice	0	258 (63)
	1-2	92 (23)
	3-4	38 (9)
	5+	20 (5)
Description of general health	Very bad	2 (<1)
	Rather bad	6 (1)
	Rather good	140 (34)
	Very good	181 (44)
	Excellent	79 (19)

Ever attended a voice training or voice care program in your lifetime	Yes	38 (9)
	No	368 (90)
	Not sure	2 (<1)
Ever consulted with an Ear, Nose, and Throat (ENT) physician due to a voice problem in your lifetime	Yes	25 (6)
	No	382 (93)
	Not sure	1 (<1)
Have a family history of voice problems	Yes	12 (3)
	No	385 (94)
	Not sure	11 (3)

Table 2. SIVD results for all participants (n=408) of self-reported voice symptoms marked as “almost always” or “always” present

Self-reported consistent voice symptoms	n (% of sample)
1 symptom	72 (17.60%)
2 symptoms	38 (9.31%)
3 symptoms	15 (3.68%)
4 symptoms	7 (1.72%)
5 symptoms*	1 (0.25%)

*Individuals indicating at least 5 consistent symptoms are encouraged to consult with a voice specialist for a comprehensive evaluation as this score is likely associated with a voice disorder.

Table 3. Frequency of self-reported voice symptoms from survey participants

SIVD Response Item	Those with at least 1 consistent voice disorder symptom (n=72 of survey respondents): Responding at least “sometimes” n (%)	Those with at least 1 consistent voice disorder symptom (n=72 of survey respondents): Responding at least “almost always” n (%)	Those without consistent voice disorder symptom (n=336 of survey respondents): Responding at least “sometimes” n (%)
Hoarseness	68 (91.67%)	8 (11.11%)	201 (59.82%)
Voice loss	40 (55.56%)	2 (2.78%)	84 (25.00%)
Breaking voice	55 (76.38%)	7 (9.72%)	118 (35.12%)
Low-pitched voice	41 (56.94%)	11 (15.27%)	89 (26.49%)
Phlegm	62 (86.11%)	34 (47.22%)	217 (64.58%)
Dry cough	59 (81.94%)	16 (22.22%)	227 (67.56%)
Cough with secretion	60 (83.33%)	7 (9.72%)	204 (60.71%)
Pain when speaking	20 (27.78%)	3 (4.17%)	49 (14.58%)
Pain when swallowing	37 (51.38%)	4 (5.56%)	105 (31.25%)
Secretion/phlegm in throat	59 (81.94%)	22 (30.56%)	184 (54.76%)
Dry throat	48 (66.67%)	13 (18.06%)	194 (57.74%)
Strained speech	40 (55.56%)	4 (5.56%)	82 (24.40%)

Table 4. Participant responses to questions regarding engagement in behaviors

Response items related to behaviors <i>negatively</i> associated with voice health: How often have you engaged in any of the following behaviors?*	Participants <i>with</i> at least one self-reported consistent symptom (n=72) <i>Mean (SD)</i>	Participants <i>without</i> at least one self-reported consistent symptom (n=336) <i>Mean (SD)</i>
Drinking caffeine	3.78 (1.20)	3.65 (1.23)
Taking medications	3.34 (1.49)	3.11 (1.37)
Having stress and anxiety	3.46 (0.98)	3.07 (1.02)
Throat clearing during the day	3.08 (1.08)	2.37 (1.00)
Eating spicy foods	2.94 (0.88)	2.80 (0.99)
Coughing during the day	2.65 (1.00)	2.22 (0.81)
Drinking alcohol	2.60 (1.08)	2.52 (0.98)
Teaching above students talking	2.59 (1.01)	2.31 (0.87)
Teaching in a noisy environment	2.55 (1.02)	2.26 (0.94)
Speaking over a natural breath cycle	2.48 (1.04)	1.99 (1.05)
Smoking in the past	1.68 (1.09)	1.47 (0.92)
Screaming	1.55 (0.75)	1.39 (0.59)
Smoking currently	1.06 (0.41)	1.08 (0.41)
Response items related to behaviors <i>positively</i> associated with voice health: How often have you engaged in any of the following behaviors?*		
Using a microphone when teaching	1.41 (0.91)	1.53 (0.99)
Taking breaks from talking throughout the day (voice rest)	2.95 (1.27)	3.00 (1.25)
Sleeping well	3.17 (1.01)	3.36 (0.93)
Engaging in exercise	3.41 (1.11)	3.62 (0.93)
Drinking water throughout the day	3.56 (1.16)	3.80 (1.02)
Consuming healthy foods	3.70 (0.94)	3.84 (0.79)

*Presented in ascending order of reported frequency by respondents with at least one consistent symptom of voice disorder, such that the behavior they report engaging in the least is presented first.

NOTE: Response options were as follows: Never (coded as "1"), infrequently ("2"), sometimes ("3"), frequently ("4"), and always ("5").

Table 5. Participant responses to questions regarding engagement in behaviors generally associated with healthy vocal hygiene habits

Response Items: How often have you engaged in any of the following behaviors?*	Participants <i>with</i> at least one self-reported consistent symptom (n=72) <i>Mean (SD)</i>	Participants <i>without</i> at least one self-reported consistent symptom (n=336) <i>Mean (SD)</i>
Using a microphone when teaching	1.41 (0.91)	1.53 (0.99)
Taking breaks from talking throughout the day (voice rest)	2.95 (1.27)	3.00 (1.25)
Sleeping well	3.17 (1.01)	3.36 (0.93)
Engaging in exercise	3.41 (1.11)	3.62 (0.93)
Drinking water throughout the day	3.56 (1.16)	3.80 (1.02)
Consuming healthy foods	3.70 (0.94)	3.84 (0.79)

*Presented in ascending order of reported frequency by respondents with at least one consistent symptom of voice disorder, such that the behavior they report engaging in the least is presented first.

NOTE: Response options were as follows: Never (coded as “1”), infrequently (“2”), sometimes (“3”), frequently (“4”), and always (“5”).

Table 6. Correlation coefficients of participants' environmental and personal factors and SIVD scores

Environmental and personal factors investigated	Correlation coefficient	Number of paired observations per comparison	Significance level*
Number of years teaching	$r_s = 0.022$	406	$p = 0.661$
Number of hours teaching per week	$r_s = 0.051$	406	$p = 0.300$
Number students per classroom	$r_s = 0.060$	406	$p = 0.225$
Duration of the class (current)	$r_s = 0.060$	405	$p = 0.231$
Age	$r_s = 0.035$	405	$p = 0.479$
Gender	$r_{pb} = 0.001$	405	$p = 0.988$
General health	$r_s = -0.105$	405	$p = 0.034^*$

*Denotes significant findings ($p \leq 0.05$)

Appendix

Voice Disorder Survey Summary

I. Demographic Information; 21 questions related to:

1. University Instructor Status
2. Amount of Face-to-Face Courses
3. Length of Teaching at the University Level
4. Amount of Time Teaching Currently Each Week
5. Amount of Time Teaching Each Week in the Past
6. Duration of their Most Frequently Taught Class
7. Duration of their Most Frequently Taught Class in the Past
8. Duration of their Breaks Between Classes
9. Maximum Number of Students in Each Class
10. Typical Voice Loudness
11. Attendance of a Voice Training
12. Consultation with an ENT Physician
13. Familial History of Voice Disorders
14. Amount of Days in the Past Year where they Experienced Voice Problems
15. Amount of Days in the Past Year where Voice Problems Reduced Their Activity Level
16. Description of General Health
17. Primary Area of Discipline
18. Highest Degree Held
19. Gender
20. Age
21. Race/ Ethnicity

II. General Health Information; 11 questions related to frequency of respondent experiences:

Please indicate your experiences with any of the following:

1. Laryngopharyngeal Reflux (LPR)
2. Gastroesophageal Reflux (GERD)
3. Heartburn
4. Morning Hoarseness
5. Asthma
6. Respiratory Allergies
7. Chronic Rhinitis
8. Sinus Infection
9. Laryngitis
10. Pharyngitis
11. Colds

III. Voice Symptomatology; 12 questions from the SIVD (Ghirardi et al., 2013):

How frequently do you experience the following symptoms:

1. Hoarseness
2. Voice Loss
3. Breaking Voice
4. Low-Pitched Voice
5. Phlegm
6. Dry Cough
7. Cough with Secretion
8. Pain when Speaking
9. Pain when Swallowing
10. Secretion/ Phlegm in Throat
11. Dry Throat
12. Strained Speech

IV. Lifestyle Factors; 20 questions related to engagement in behaviors generally associated with voice quality and health, including both positive and negative associations:

How often have you engaged in any of the following behaviors:

1. Smoking Currently
2. Smoking in the Past
3. Drinking Alcohol
4. Drinking Caffeine
5. Taking Medications
6. Having Stress and Anxiety
7. Teaching Above Students Talking
8. Teaching in a Noisy Environment
9. Speaking Over a Natural Breath Cycle
10. Throat Clearing
11. Coughing
12. Screaming
13. Eating Spicy Foods
14. Drinking Beverages that are Too Hot or Too Cold
15. Using a Microphone
16. Drinking Water
17. Taking Breaks from Talking
18. Consuming Healthy Foods
19. Engaging in Exercise
20. Sleeping Well