

Risk and Prevalence of Self-Perceived Voice Disorders in Male and Female University Professors

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Abstract:

Purpose: The aim of this survey was to explore risk factors and prevalence of voice disorders in male and female university professors in order to determine the need for a gender specific preventative vocal hygiene education program which could improve their occupational performance.

Methods: An online survey was filled out by 102 female and 94 male university professors from 12 universities in Cyprus. The survey obtained information on risk factors that may lead to voice problems related to general health, voice use, lifestyle, and environment, as well as, the self-perceived severity of a participant's voice difficulty. The chi-squared test was applied to investigate the differences in answers for each voice risk factor between male and female professors. The prevalence of self-perceived voice disorders in males and females was also calculated.

Results: The estimated prevalence of self-perceived voice disorders was 43.1% for female and 26.6% for male professors. Female professors were more likely to "frequently" experience respiratory infections, "sometimes" speak over their natural breath cycle, and "always" and "frequently" have stress and anxiety than males. Female faculty were also more likely to have breaks between classes that last less than 30 minutes.

Conclusions: Risk factors for developing voice disorders in female professors are related to health, voice use and lifestyle. Therefore, a preventative gender specific vocal hygiene education program is recommended for female faculty.

Keywords: Risk factors; Voice disorders; Prevalence; Male; Female; University professors; Cyprus

Abbreviations: VDI: Voice Disordered Index; HA: Hyaluronic Acid

Introduction

Studies demonstrate that women, compared to men, may have a higher prevalence of voice disorders regardless of their occupation. Roy, et al., (2005) reported a significantly higher number of females (32.6%) than males (25.7%) in the general population, who had experienced a voice disorder. Behlau, et al (2012) examined the frequency of voice disorders in Brazilian teachers and reported that women teachers had generally a higher incidence of voice disorders across the age span compared to men. In addition, Smith, et al., (1998) explored the relationship between voice problems and coursework in teachers and stated that female teachers more frequently reported a voice problem (38% versus 26%) for every type of course taught than males. Furthermore, Houtte, et al., (2011) reported that women teachers who participated in their study self-reported a significantly higher number of voice problems than male teachers (38% vs 13.2%). Moreover, Korn, et al., (2015) investigated the presence of hoarseness in male and female university professors, a population who may teach under the same circumstances (e.g., teaching for extended periods of time, teaching in noisy environments, etc.) but also dissimilar circumstances (e.g., teaching in large lecture halls and instructing large groups of students) than teachers. Findings indicated that the percentage of hoarseness was higher in female (51.8%) in comparison to male faculty (32.6%).

In contrast to the numerous studies that demonstrate that women in various occupations such as teachers, university professors and others may have a higher prevalence of voice disorders than men, minimal literature showed no significant differences in the prevalence of voice disorders between males and females. Seifpanahi, et al., (2016) looked into the prevalence of voice disorders among teachers and nonteachers in Iran and found no significant differences between mean scores of self-reported voice problems among women and men.

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In addition to the multiple studies exploring the prevalence of voice disorders in females and males, sparse literature exists in investigating the impact of voice disorders on females' and males' occupational performance. Smith et al., (1998) reported that female teachers were more likely to report that voice problems (e.g., a lower voice, weak voice, tired and effortful voice and breathy voice, etc.) reduced their teaching activities than male teachers (44% women vs 34% men). Houtte, et al., (2011) explored voice-related absenteeism from work in male and female teachers and presented that female teachers stayed significantly more often at home because of their voice problems than male teachers (38.9% females vs 26% males).

There is minimal research exploring specific risk factors for voice disorders in females and males. Precisely, Lopez, et al., (2008) investigated occupational risk factors for voice disorders in teachers and found that women teachers had less teaching experience, taught more class hours per week, had younger teachers, smoked less, drank less alcohol and had more coffee and tea than men.

The aim of this study is to complete a further analysis of the existing data from a study by Kyriakou, et al., (2017) to explore the self-reported prevalence and risk factors for voice disorders in male and female university professors in Cyprus in order to determine the need for additional vocal hygiene education specific to their gender which could further improve their occupational performance.

Materials and Methods

Participants

One thousand professors in 12 universities in Cyprus were sent an email that included a link to an online questionnaire. One hundred and ninety six questionnaires were completed, creating a response rate of about 20%. Subjects consisted of 102 (52.04%) female and 94 (47.9%) male university professors who had excellent ($n = 172$) or good ($n = 24$) English proficiency and were 25 - 67 years old. Subjects were categorized into two groups based on their gender, male university professors ($n = 94$) and female university professors ($n = 102$).

Design of the Questionnaire

The questionnaire was posted online via the Survey Monkey website and was set up to not allow multiple completions from the same participant (see Appendix A). It included 36 questions which were written based on the investigators' clinical experience and other questionnaires that exist in the risk factors for voice disorders literature (Helidoni, et al. 2012; Chen, et al. 2010, Korn, et al., 2015). It included two sections. One was the "Risk Factors for Voice Disorders" which entailed questions 1 - 35. Questions 1 - 35 were split into five parts, which were "(1) demographic information such as age, gender, and level of English proficiency, (2) risk factors related to general health such as nasal allergies, gastroesophageal reflex, and upper respiratory infections, (3) risk factors related to voice use such as years of teaching, teaching hours per week, etc., (4) risk factors related to lifestyle such as smoking, alcohol consumption, stress, etc., and (5) risk factors related to the environment such as the physical size of the classroom, etc." (Kyriakou, et al., 2017).

The other section of the online survey was the "Voice Disorder Index" (VDI) which comprised Question 36. The VDI

is a reliable tool that portrays the participant's self-perceived severity of his/her voice difficulty with respect to activities in his/her everyday life (WEVOSYS, 2014). It entails twelve statements that are included in the Voice Handicap Index-30, four of those sentences are incorporated on the Voice Handicap Index-10 as well (WEVOSYS, 2014; Rosen, et al., 2004). Its scores range from 0 to 48. A score of 0-7 designates normal voice where a score of 8 - 48 shows a voice that is slightly (i.e., scores 8 - 14), moderately (i.e., scores 15 - 22) or profoundly disordered (i.e., scores 23 - 48) [lingWAVES, F. Ingolf, personal communication, June 26, 2017].

Procedures

In stage one, one thousand professors in 12 universities in Cyprus received an email that included a link to an online questionnaire. In stage two, each subject was inquired to answer Question 1 that obtained data on his/her level of English competence. Subjects with excellent ($n = 172$) and good ($n = 24$). English competence were allowed to go on with completing the questionnaire whereas subjects with poor English competence were not allowed to continue filling out the survey because poor English competence may have jeopardized the accuracy of their responses. In stage three, each subject was inquired to answer Questions 2 to 35 that obtained data on demographic information and risk factors relevant to general health, voice use, lifestyle, and environment. In stage four, every subject was asked to answer Question 36 which consisted of the VDI. Subjects' responses on Question 36 were then transmitted to the VDI section of the lingWAVES program (lingWAVES) which scored them and provided a self-perceived severity of their voice difficulty (i.e., normal, slightly, moderately or profoundly disordered). In stage five, subjects were divided into two groups, male professors and female professors. In stage six, the prevalence of self-perceived voice disorders in males and females was calculated.

Data Analysis

The chi-squared test of goodness of fit was used to investigate the differences in responses between male and female professors with respect to risk factors related to general health, voice use, lifestyle, and environment. "The significance level was set to 0.05 throughout. An adjusted residual analysis was further utilized to identify categories (i.e., never, infrequently, sometimes, frequently, or always) for each voice risk factor that were responsible for the significant chi-square statistic (Test Omnibus, 2015; Field, 2013). A residual value greater than 1.96 or lower than -1.96 indicated that the category made a significant contribution to the chi-square statistic for a voice risk factor. The Statistical Package for the Social Sciences, Version 22 (SPSS Inc.) was used for all statistical analyses" (Kyriakou et al., 2017). The prevalence of self-perceived voice disorders in male and female professors was obtained by computing the percentage of males and females who received a VDI score of 8 - 48.

Results

The results of the present study show that the estimated prevalence of self-perceived voice disorders in the sample of 196 university professors investigated is 43.1% for females and

26.6% for males. Precisely, 44 females and 25 males out of 196 professors surveyed received a VDI score 8 - 48 which indicates a voice that is self-perceived to be slightly, moderately, or profoundly disordered.

The outcomes of the current study also indicate that risk factors for developing voice problems in male and female university professors are not related to the environment (see Table 1) but are related to general health, voice use and lifestyle. Tables 2, 3 and 4 indicate the significant risk factors concerning general health, voice use and lifestyle and the adjusted residual values for each risk factor category in male and female university professors.

Table 1: Risk factors related to the environment in the Male and Female professor groups showing the percent of those responding to the statements.

Risk factors	Male professors (n = 94)		Female professors (n = 102)		Adjusted residual	p value ¹
	n	%	n	%		
Most frequent classes in daily workday located in a noisy environment						
Not at all noisy	31	33.0	34	33.3	-0.1	.853
Slightly noisy	37	39.4	38	37.3	0.3	
Moderately noisy	23	24.5	27	26.5	-0.3	
Very noisy	3	3.2	2	2.0	0.5	
Extremely noisy	0	0.0	1	1.0	-1.0	
Most frequent classes in daily workday located in a noisy environment in the past						
Not at all noisy	32	34.0	26	25.5	1.3	.504
Slightly noisy	36	38.3	39	38.2	0.0	
Moderately noisy	22	23.4	31	30.4	-1.1	
Very noisy	4	4.3	6	5.9	-0.5	
Extremely noisy	0	0.0	0	0.0	0.0	
Physical size of the most frequent classroom in workday						
Small	11	11.7	12	11.8	0.0	.990
Medium	68	72.3	73	71.6	0.1	
Large	15	16.0	17	16.7	-0.1	
Physical size of the most frequent classroom in workday in the past						
Small	10	10.6	12	11.8	-0.2	.942
Medium	65	69.1	71	69.6	-0.1	
Large	19	20.2	19	18.6	0.3	

¹ Pearson's chi-square test. Significant differences between professors in the Male and Female groups are indicated in bold in the last column

Risk Factors Related to General Health

The significant results of the statistical analysis for the risk factors concerning general health are presented in Table 2.

The female professors group had significantly more participants who had "frequently" (10.8% vs 3.2%, z = -2.1) experienced upper respiratory infections (e.g., pharyngitis and laryngitis) than the male professors group. Furthermore, there were considerably fewer participants in the female group who had "never" (21.6% vs 48.9%, z = 4.0) had respiratory infections

than the male group (χ^2 (4 d.f., N = 196) = 18.87, p < 0.001). There were no significant differences between the male and female groups for the rest of the questions in the general health category (see Table 2).

Table 2: Risk factors related to general health in professors in the Male and Female professor groups showing the percent of those responding to the statements.

Risk factors	Male professors (n = 94)		Female professors (n = 102)		Adjusted residual	p value ¹
	n	%	n	%		
Nasal allergies						
Never	34	36.2	26	25.5	1.6	.117
Infrequently	24	25.5	36	35.3	-1.5	
Sometimes	20	21.3	16	15.7	1.0	
Frequently	13	13.8	23	22.5	-1.6	
Always	3	3.2	1	1.0	1.1	
Gastroesophageal reflux						
Never	50	53.2	47	46.1	1.0	.645
Infrequently	24	25.5	29	28.4	-0.5	
Sometimes	15	16.0	15	14.7	0.2	
Frequently	4	4.3	9	8.8	-1.3	
Always	1	1.1	2	2.0	-0.5	
Upper respiratory infections						
Never	46	48.9	22	21.6	4.0	< 0.001
Infrequently	35	37.2	49	48.0	-1.5	
Sometimes	10	10.6	19	18.6	-1.6	
Frequently	3	3.2	11	10.8	-2.1	
Always	0	0.0	1	1.0	-1.0	

¹Pearson's chi-square test. Significant differences between professors in the Male and Female groups are indicated in bold in the last column.

Risk Factors Related to Voice Use

The significant outcomes of the statistical analysis for the risk factors concerning voice use are displayed in Table 3.

The female group had significantly fewer subjects who had a duration of breaks between classes equal or more than 121 minutes (5.9% vs 22.3%, z = 3.3), and significantly more subjects whose duration of breaks between classes is less than 30 minutes than the male group (74.5% vs 58.5%, z = -2.4) (χ^2 (3 d.f., N = 196) = 13.18, p < .05).

A significantly higher number of subjects in the female category reported to "sometimes" (33.3% vs 14.9%, z = -3.0) and significantly fewer subjects stated to "never" speak over a natural breath cycle (22.5% vs 36.2%, z = 2.1) than the male category (χ^2 (4 d.f., N = 196) = 12.43, p < .05). There were no significant differences between the female and male groups for the other questions in the voice use category (Table 3).

Table 3: Risk factors related to voice use in professors in the Male and Female professor groups showing the percent of those responding to the statements.

Risk factors	Male profes- sors (n = 94)		Female profes- sors (n = 102)		Ad- justed residual	P value ¹
	n	%	n	%		
Teaching years						
≤ 5	24	25.5	32	31.4	-0.9	.623
6-10	25	26.6	26	25.5	0.2	
11 - 20	30	31.9	25	24.5	1.2	
≥ 21	15	16.0	19	18.6	-0.5	
Teaching hours per week						
≤ 3	10	10.6	12	11.8	-0.2	.600
4 - 6	30	31.9	26	25.5	1.0	
7 - 9	24	25.5	23	22.5	0.5	
≥ 10	30	31.9	41	40.2	-1.2	
Teaching hours per week in the past						
≤ 3	9	9.6	7	6.9	0.7	.252
4 - 6	29	30.9	27	26.5	0.7	
7 - 9	23	24.5	18	17.6	1.2	
≥ 10	33	35.1	50	49.0	-2.0	
Duration of most frequent classes						
< 60 min	10	10.6	5	4.9	1.5	.491
60 - 90 min	32	34.0	38	37.3	-0.5	
91 - 120 min	29	30.9	31	30.4	0.1	
> 121 min	23	24.5	28	27.5	-0.5	
Duration of most frequent classes in the past						
< 60 min	14	14.9	9	8.8	1.3	.491
60 - 90 min	36	38.3	39	38.2	0.0	
91 - 120 min	18	19.1	26	25.5	-1.1	
> 121 min	26	27.7	28	27.5	0.0	
Duration of breaks between classes						
< 30 min	55	58.5	76	74.5	-2.4	.004
30 - 60 min	11	11.7	8	7.8	0.9	
61 - 120 min	7	7.4	12	11.8	-1.0	
≥ 121 min	21	22.3	6	5.9	3.3	
Maximum number of students per classroom of the most frequent classes						
≤ 10	6	6.4	12	11.8	-1.3	.514
11 - 30	47	50.0	51	50.0	0.0	
31 - 60	28	29.8	24	23.5	1.0	
≥ 61	13	13.8	15	14.7	-0.2	
Maximum number of students per classroom of the most frequent classes in the past						
≤ 10	7	7.4	9	8.8	-0.4	.362
11 - 30	36	38.3	48	47.1	-1.2	
31 - 60	36	38.3	27	26.5	1.8	
≥ 61	15	16.0	18	17.6	-0.3	
Voice loudness in class						
Not loud	3	3.2	4	3.9	-0.3	.172
Slightly loud	21	22.3	10	9.8	2.4	
Moderately loud	54	57.4	69	67.6	-1.5	
Very loud	14	14.9	18	17.6	-0.5	
Excessively loud	2	2.1	1	1.0	0.7	

Voice loudness at home						
Not loud	21	22.3	22	21.6	0.1	.144
Slightly loud	48	51.1	42	41.2	1.4	
Moderately loud	21	22.3	36	35.3	-2.0	
Very loud	4	4.3	1	1.0	1.5	
Excessively loud	0	0.0	1	1.0	-1.0	
Using microphone when teaching						
Never	82	87.2	84	82.4	0.9	.869
Infrequently	7	7.4	11	10.8	-0.8	
Sometimes	2	2.1	4	3.9	-0.7	
Frequently	1	1.1	1	1.0	0.1	
Always	2	2.1	2	2.0	0.1	
Using microphone when teaching in the past						
Never	71	75.5	77	75.5	0.0	.990
Infrequently	13	13.8	16	15.7	-0.4	
Sometimes	7	7.4	6	5.9	0.4	
Frequently	2	2.1	2	2.0	0.1	
Always	1	1.1	1	1.0	0.1	
Teaching above students talking						
Never	21	22.3	13	12.7	1.8	.046
Infrequently	36	38.3	28	27.5	1.6	
Sometimes	26	27.7	36	35.3	-1.1	
Frequently	8	8.5	17	16.7	-1.7	
Always	3	3.2	8	7.8	-1.4	
Speaking over a natural breath cycle						
Never	34	36.2	23	22.5	2.1	.014
Infrequently	40	42.6	36	35.3	1.0	
Sometimes	14	14.9	34	33.3	-3.0	
Frequently	6	6.4	7	6.9	-0.1	
Always	0	0.0	2	2.0	-1.4	
Coughing during the day						
Never	26	27.7	24	23.5	0.7	.424
Infrequently	45	47.9	40	39.2	1.2	
Sometimes	18	19.1	30	29.4	-1.7	
Frequently	4	4.3	7	6.9	-0.8	
Always	1	1.1	1	1.0	0.1	
Clearing throat during the day						
Never	17	18.1	19	18.6	-0.1	.900
Infrequently	37	39.4	34	33.3	0.9	
Sometimes	26	27.7	30	29.4	-0.3	
Frequently	12	12.8	17	16.7	-0.8	
Always	2	2.1	2	2.0	0.1	
Screaming						
Never	46	48.9	36	35.3	1.9	.128
Infrequently	39	41.5	48	47.1	-0.8	
Sometimes	8	8.5	13	12.7	-1.0	
Frequently	1	1.1	5	4.9	-1.6	

¹Pearson's chi-square test. Significant differences between professors in the Male and Female groups are indicated in bold in the last column.

Risk Factors Related to Lifestyle

The significant risk factors and the adjusted residual values for the risk factors associated to lifestyle are presented in Table 4.

The female professor group had significantly more subjects who “always” (16.7 % vs 5.3%, $z = -2.5$) and “frequently” (44.1% vs 24.5%, $z = -2.9$) and significantly fewer subjects who “sometimes” (21.6% vs 35.1%, $z = 2.1$) and “infrequently” (15.7% vs 30.9%, $z=2.5$) had stress and anxiety than the male group (χ^2 (4 d.f., $N = 196$) = 19.99, $p < .05$; Table 4).

Table 4: Risk factors related to lifestyle in professors in the Male and Female professor groups showing the percent of those responding to the statements.

Risk factors	Male profes- sors (n = 94)		Female profes- sors (n = 102)		Adjusted residual	p value ¹
	n	%	n	%		
Smoking						
Never	63	67.0	66	64.7	0.3	.199
Infrequently	10	10.6	15	14.7	-0.9	
Sometimes	7	7.4	7	6.9	0.2	
Frequently	3	3.2	9	8.8	-1.6	
Always	11	11.7	5	4.9	1.7	
Smoking in the past						
Never	51	54.3	44	43.1	1.6	.076
Infrequently	16	17.0	14	13.7	0.6	
Sometimes	8	8.5	15	14.7	-1.3	
Frequently	9	9.6	22	21.6	-2.3	
Always	10	10.6	7	6.9	0.9	
When did former smoker stopped smoking						
N/A	84	89.4	76	74.5	2.7	.027
1 - 3	1	1.1	5	4.9	-1.6	
3 - 5	0	0.0	4	3.9	-1.9	
> 5	9	9.6	17	16.7	-1.5	
Drinking alcohol						
Never	3	3.2	12	11.8	-2.3	.114
Infrequently	43	45.7	41	40.2	0.8	
Sometimes	38	40.4	35	34.3	0.9	
Frequently	10	10.6	12	11.8	-0.2	
Always	0	0.0	2	2.0	-1.4	
Drinking caffeine						
Never	3	3.2	3	2.9	0.1	.267
Infrequently	10	10.6	10	9.8	0.2	
Sometimes	10	10.6	8	7.8	0.7	
Frequently	27	28.7	45	44.1	-2.2	
Always	44	46.8	36	35.3	1.6	
Taking medications						
Never	28	29.8	19	18.6	1.8	.288
Infrequently	38	40.4	46	45.1	-0.7	
Sometimes	12	12.8	20	19.6	-1.3	
Frequently	6	6.4	9	8.8	-0.6	
Always	10	10.6	8	7.8	0.7	

Drinking water (glasses per day)						
<= 2	14	14.9	15	14.7	0.0	.738
3 - 5	40	42.6	42	41.2	0.2	
6 - 8	22	23.4	30	29.4	-1.0	
> 8	18	19.1	15	14.7	0.8	
Having stress and anxiety						
Never	4	4.3	2	2.0	0.9	.001
Infrequently	29	30.9	16	15.7	2.5	
Sometimes	33	35.1	22	21.6	2.1	
Frequently	23	24.5	45	44.1	-2.9	
Always	5	5.3	17	16.7	-2.5	

¹ Pearson’s chi-square test. Significant differences between professors in the Male and Female groups are indicated in bold in the last column.

Discussion

The present study revealed that the estimated prevalence of self-perceived voice problems in the sample of 196 university professors is higher in females (43.1%) than in males (26.6%). This finding corroborates with past investigations which showed that female university professors have a higher prevalence of voice problems than males. Korn et al. (2015) found that the percentage of hoarseness was higher in female (51.8%) than in male (32.6%) university professors. This outcome also is in sync with previously reported literature which showed that women teachers, a group that has similar but also different teaching conditions than university professors, and women in the general population have higher prevalence of voice disorders across all ages compared with men (Behlau et al., 2012). Roy et al. (2005) found that the percentage of individuals in the general population who reported a voice disorder was significantly greater for females (32.6%) than males (25.7%). Furthermore, Smith et al. (1998) found that female teachers more frequently stated a voice problem compared to male teachers (38% versus 26%). In addition, Nerrière, et al., (2009) reported that one in two female teachers in the French National Education system self-reported a voice disorder (50.0%) compared to one in four male teachers (26.0%).

The higher prevalence of voice disorders in females than males has been ascribed to many gender specific characteristics that make the female voice more vulnerable to vocal health problems. One gender specific characteristic is laryngeal differences in males and females. Females’ vocal cords are thinner than males’ cords and thus females’ vocal folds have less tissue to absorb the vibratory forces than the males’ vocal folds. Also, females’ vocal folds have less hyaluronic acid (HA) in their superficial layer, which plays an important role in wound repair. Therefore females’ vocal folds have a reduced wound healing response compare to males. Another gender specific factor that may predispose women to develop voice disorders compared to men is differences in their nervous system. Specifically, studies indicated that women have a lower pain threshold than men and consequently women may report voice problems more than men. Behavioral differences between males and females may be another factor that may make women more susceptible to voice problems. Particularly, women speak more than men and thus

females use their voice more compared to males. An additional gender specific factor is nonphysiological differences between the two genders. In particular, women have a higher incidence of anxiety and stress which frequently produce whole-body musculoskeletal tension that often extends to the laryngeal muscles and may contribute to voice disorders such as muscle tension dysphonia (Hunter, Tanner, & Smith, 2011).

In contrast to the finding of the survey that corroborates past literature indicating that women have a higher prevalence of voice disorders than men, Seifpanahi et al. (2016) found no significant difference between mean scores of self-reported voice complaints among women and men teachers and nonteachers. This inconsistency may have been ascribed to the small sample size of Seifpanahi's et al. (2016) study which may have resulted in less power to demonstrate statistically significant differences between reported voice problems in males and females.

Another finding in the present research is that more female professors frequently reported upper respiratory infections (e.g., pharyngitis, laryngitis, etc.). Similarly, past studies in the general population found that the frequency of upper respiratory illnesses (e.g., influenza, cold, etc.) is higher among females than males (Monto, 2002; Sydenstricker, 1926). A possible explanation for the differences in the incidence of upper respiratory infections between the two genders may be the fact that women have a lower pain threshold than men and thus may seek health care for respiratory infections more easily than males. Another explanation of the differences in the incidence of upper respiratory infections may be that women traditionally tend to spend more time with their children and expose themselves to upper respiratory infections that are commonly found in children (Monto, 2002). Previous investigations of university professors found that university faculty with self-reported voice disorders were more likely to report respiratory infections than those with no voice disorders (Higgins, 2006; Kyriakou et al., 2017). However, past studies (Higgins, 2006; Kyriakou, et al., 2017) did not explore upper respiratory infections between females and males.

An additional finding of the study is that there were more female professors whose duration of breaks between classes was less than 30 minutes and fewer who had breaks equal or more than 121 minutes than in the male group. Przysiezny and Przysiezny (2015) conducted a literature review on work related voice disorders and found that one occupational risk factor for developing voice disorders in the general population is the lack of breaks and resting periods during the workday. On the other hand, Korn, et al., (2015) stated no statistically significant differences in the percentage of hoarseness in university professors with and without voice disorders with respect to "minutes of break between classes". Nevertheless, these studies did not investigate the duration of breaks between classes in males compared to females.

Another finding of the study is that more professors in the female category reported "sometimes" and fewer noted "never" speaking over their natural breath cycle than males. Past literature by Kyriakou, et al. (2017) showed that university professors with self-perceived voice disorders were more likely to "frequently" and "sometimes" speak over their natural breath cycle compared to professors with no voice disorders. Nonetheless, Kyriakou, et al. (2017) did not look into "speaking over a natural breath cycle" in female compared to male professors.

Another finding that the survey is that there were sig-

nificantly more female professors who "always" and "frequently" and fewer who "sometimes" and "infrequently" had stress and anxiety than males. This outcome is in sync with past literature reporting that anxiety disorders are more prevalent in female than male professional voice users (e.g., university professors, teachers, etc.) who depend on their voice for their work. Specifically, Wilhelm, et al., (2008) followed a group of professional voice users for 30 years and identified that the women professional voice users reported significantly more anxiety disorders than men. Previous studies that investigated voice risk factors in university professors with and without voice disorders revealed that the voice disorder group more frequently experienced anxiety and stress compared to the no voice disorder group. Precisely, Korn, et al. (2015) presented that the percentage of hoarseness is higher among those professors who are very stressed and anxious than those who are calm. Kyriakou, et al. (2017) also revealed that university professors with self-perceived voice problems were more likely to "frequently" or "sometimes" experience stress than professors with no voice disorders. However, Korn, et al. (2015) and Kyriakou, et al. (2017) did not examine stress and anxiety between male and female professors.

Conclusions

The current study is one of the few to examine the prevalence of self-perceived voice problems in male and female university professors. Additionally, the current study is the first investigation to explore risk factors that may lead to voice disorders in male and female university professors. The results of the study indicate that risk factors related to general health (i.e., respiratory infections), voice use (i.e., duration of breaks between classes and speaking over a natural breath cycle) and lifestyle (i.e., stress and anxiety) may play a part in developing voice problems in female university professors in Cyprus. The development and implementation of additional preventative voice hygiene practices to Kyriakou's, et al. (2017) program which was geared towards all university professors is recommended. A voice hygiene program can provide recommendations to current and future female professors to prevent them from developing voice problems and enhance their occupational performance.

A vocal hygiene program for female university professors may include: 1. Encouraging female faculty to rest their voice and use it minimally, as well as, increase fluid intake when they have upper respiratory infections until the vocal fold swelling resolves (Boone, McFarlane, & Von, 2005). 2. Advising female faculty to schedule classes with at least 121 or more minutes of a break between them in order to avoid vocal fatigue that is caused by prolonged periods of voice use which may lead to vocal folds inflammation (Sapienza & Ruddy, 2009).

The research also identified similar goals to Kyriakou's, et al. (2017) vocal hygiene program for female professors that consist of: 1. Obtaining voice therapy training that focus on decreasing talking over a natural breath cycle (e.g., instruct the professors to say as many numbers as possible per breath and discontinue before he/she feels any strain, instruct the professor to read a paragraph marked with phrase markers aloud and breathe in at each marker, etc.) (Stemple, et al., 2010). 2. Instructing relaxation techniques (e.g., differential relaxation, a technique in which the professor focuses on a particular body part and purposefully relaxes and tenses the body part's muscles,

etc.) in order to loosen parts of the vocal tract if her vocal tract is uptight as a result of her reaction to stress (Boone, et al., 2010).

Ethics Approval: The study received bioethics approval from the Cyprus National Bioethics Committee.

Consent for publication: Subjects have given their consent for their inclusion in the study.

Availability of data and materials: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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