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An Investigation into the Prevalence of Voice Strain in Chinese University Teachers

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Vocal disorders are very common occupation-related disease in teachers, though it has never been given enough attention in China. As a result, the occupational health care of professional voice users is surprisingly undeveloped compared to the attention given to occupational hearing disorders or many other occupational symptoms. The aim of the present study was to assess the prevalence of voice problems in the general population of Chinese university teachers, and explore whether their voice problems affected their daily life, their social life and their work. A voice strain and voice handicap index questionnaire was administered to university instructors of English (N = 156) in six Chinese universities. Results indicated that voice strain is prevalent among Chinese university instructors. The respondents' self-perceptions revealed that voice strain was significantly correlated with their job and their daily activities.

Keywords: voice strain, vocal disorder, factor analysis, multiple regression, MANOA

1 Introduction

Vocal disorders are very common occupation-related disease in teachers, though it has never been given enough attention in China. According to Sonnenberg (2005), teachers represent the largest group of professional voice users, and are among those individuals at greatest risk for developing vocal problems. Orr, Jong, and Cranen (2002) stated that, "One of the problems confronted in the teaching profession is the maintenance of a healthy voice. This basic pedagogical tool is subjected to extensive use, and frequently suffers from overload, with some teachers having to give up their profession altogether" (p. 106). However, the occupational health care of professional voice users is surprisingly undeveloped compared to the attention given to occupational hearing disorders or many other occupational symptoms (Rantala, Vilkman, & Bloligu, 2002).

Teachers are considered an at risk population for vocal problems. This risk has been attributed to those factors such as vocal abuse and misuse due to the vocal demands of teaching, the poor acoustic environments in which

teachers work, environmental conditions of school facilities, the lack of vocal education and training, length of career, types of teaching, and even factors related to the individual's emotional state such as stress and anxiety (Mattiske, Oates, & Greenswood, 1998). Sapir, Keidar, and Mathers-Schmidt (1993) also argued that several factors contribute to this risk: the professional demands placed on the voice, unsuitable acoustic working environments, lack of voice training, individual voice characteristics and psychological factors such as stress and anxiety. Vocal misuse refers to voicing behaviors that contribute to the development of laryngeal pathologies, such as nodules, cysts, and polyps (Stemple, Glaze, & Klaben, 2000). Often vocal misuse behaviors become vocally abusive, resulting in a greater likelihood of trauma to the laryngeal mucosa (Colton & Casper, 1996). Some examples of vocally abusive behaviors are: shouting, loud talking, screaming, persistent coughing and throat clearing, etc. (Stemple et al., 2000).

Unfortunately, vocal education and training are not a standard part of most curricula in normal universities or teacher-training programs. Teachers often enter the workforce and begin their careers with limited knowledge of the vocal mechanism, vocal hygiene, and effective voice use. According to Smith, Gray, Dove, Kirchner, and Heras (1997), teachers are continually exposed to upper respiratory infections, putting them at great risk for developing illnesses that adversely affect their vocal mechanism. Here the development of laryngeal pathologies includes those illnesses like nodules, cysts and polyps (Sonnenberg, 2005). The need to develop a more extensive understanding of voice strain among university instructors during loading (talking at work), and the need to develop occupational voice care among teachers have motivated this study. Thus, the aim of this study will address the following questions as research questions: (1) How closely is voice strain associated with teachers' social life and their job? (2) Is the years of teaching associated with voice strain? (3) Do gender and different age cohorts affect teachers' self-perceptions of voice problems? (4) Does the quality of sleeping among teachers affect their voice?

2 Method

2.1 Participants

Teachers from six research universities in China (They are: Dalian University of Technology, Dalian Maritime University, Dongbei University of Finance and Economics, Dalian Medical University, Dalian Nationalities University and Changchun University of Technology) participated in the study. The participants (N = 156) were all instructors of English, who were recruited based on the fact that university instructors of English are assumed to be taking up heavy loadings of teaching responsibility, and they have to teach all years round. Therefore, they are representative of university instructors in

China. Among the 156 instructors, 35 were males, and 120 were females (with one data missing). The average age was 35.81 (N = 155 with one data missing, SD = 7.819), the youngest was 24 years and the eldest was 56 years. In addition, the average year of teaching was 12.21 (N = 156, SD = 8.458), the shortest was one year of teaching, and the longest was 43 years of teaching. The average teaching hour per week (N = 147 with nine data missing, SD = 3.722) was 13.84, the minimum was four teaching hours per week, and the maximum was 24 teaching hours per week. Finally, 19% (N = 30) of the respondents (N = 156) reported that they had received voice training, and 20% (N = 31) of the respondents (N = 155 with one data missing) reported that they had received voice therapy.

2.2 Procedure

Babbie (1995) observes that questionnaires need to be carefully developed, tested, and debugged before they are administered on a larger scale. Initially, therefore, a pilot study was carried out among 10 university instructors of English from Dalian University of Technology. This was principally to determine the reliability of the questionnaire and to reveal any difficulties or ambiguities in question wording. The reliability test showed that Cronbach's coefficient alpha on Voice Strain scale was 0.67 (N = 10), which was judged adequate. Based on Hinton's criteria (Hinton, Brownlow, McMurray, & Cozens, 2004), it was regarded as internally moderately reliable for the purpose of this research. The Voice Handicap Index scale consists of thirty items. Cronbach's coefficient alphas on the scale were 0.93 (N = 10), which was regarded as internally highly reliable for the purpose of this research.

Thus, each scale of the questionnaire has a very good internal reliability and consistency. The findings indicate that the internal reliability of each of the scales is acceptable, and the items that finally make up each scale are internally consistent, which shows that the items measure the two dimensions.

2.3 Measures

The participants were given the structured self-completion questionnaire (See Appendix: Voice Strain and Voice Handicap Index Questionnaire: VSVHIQ), which consisted of two scales. In Voice Strain Scale, the researcher designed all the 13 items. In Voice Handicap Index Scale, 30 items were drawn from Jacobson et al.'s (1997) VHI Scale. Respondents were asked to circle one number to correspond with each statement, indication how frequently they have the same experience in a 7-point Likert-type format (1 = "Never", 7 = "Always").

After the questionnaire was administered on a large scale, the reliability test was conducted again. The reliability test showed that Cronbach's coefficient alphas on Voice Strain scale were 0.85 (N = 147 valid), which was judged internally highly reliable for the purpose of this research according to Hinton's criteria (2004). The Voice Handicap Index scale consists of thirty items. Cronbach's coefficient alphas on the scale were 0.96 (N = 151 valid), which was regarded as internally highly reliable for the purpose of this research. Therefore, the items that finally make up each scale are internally consistent, which shows that the items measure the two scales.

3 Results

In order to summarize and analyse the data collected, some specific statistical techniques were employed (using SPSS 14.0). Factor analysis was conducted first to organize the variables on each of the two scales by determining which variables were related and which were not, so that the variables that are related are regrouped together, under a factor. Thus, the variables were reduced to a number of factors representing underlying dimensions of the two scales. Simple Regression analysis was run in order to work out how closely voice strain was associated teachers' social life and their job. Finally, MANOVA was carried out in order to find out any characteristic differences between the two groups' (group 1: males; group 2: females) self-perceptions of the variables on each of the two scales (Voice Strain and Voice Handicap Index).

3.1 Summarizing Data

A principal components factor analysis with varimax rotation method to reduce and summarize the scales, especially to determine which of the items, was most useful in measuring each of voice strain scale and voice handicap index scale. The factor analysis conducted on each of the two scales resulted in three-factor solution based on visual inspection of eigenvalues with the scree test (Cattell, 1966). The factor analysis that was run on voice strain scale with factors rotated to orthogonal structure, had produced three factors, and scree test (Cattell, 1966) clearly indicated the presence of three factors in the matrix as well. As can be seen from Appendix I, three factors were indicated as an overall summary of the results across the sample (N = 156), relating to perceptions of the voice strain dimension. Factor 1, "Voice Strain", explained 38.90% of the variance (eigenvalue = 5.05) and was composed of items indicating "voice strain". Factor 2, "Job Impact", explained 12.05% of the variance (eigenvalue = 1.56) and was composed of items indicating "job impact". Factor 3, "Strain Reduction", explained 7.86% of the variance (eigenvalue = 1.02) and was composed of items indicating "strain reduction". Items loading > 0.45 are listed under their tentative factor labels.

The factor analysis that was run on voice handicap index scale was a three-factor solution as well, because the original scale was composed of three factors (Jacobson et al., 1997). The first factor, "Functional Issues" measuring the impact of the respondent's voice disorder on daily activities, explained 50.97% of the variance (eigenvalue =15.29). The second factor, "Physical Issues" measuring self-perceptions of laryngeal discomfort and voice output characteristics, explained 8.24% of the variance (eigenvalue = 2.47), and the third factor, "Emotional Issues" measuring the respondent's affective responses to the voice disorder, explained 4.13% of the variance (eigenvalue = 1.24). Items loading > 0.45 are listed under their tentative factor labels.

3.2 Multiple Correlation Analysis on Perceptions of Voice Strain and Voice Handicap

In answering Research Questions 1 and 2 (How closely is voice strain associated with teachers' social life and their job? Is the years of teaching associated with voice strain?), a multiple regression analysis was run. Summary statistics from the stepwise multiple-regression analysis on the sample are presented in Tables 1 and 2. Results from the regression using Voice Strain (labeled as Voicestrain) and Job Impact (labeled as Jobimpact), and Strain Reduction (labeled as Strainreduction) on Voice Strain scale, Physical Issues (labeled as Newhandicap2) and Emotional Issues (labeled as Newhandicap3) on Voice Handicap Index scale as the independent variables, and Functional Issues (labeled as Newhandicap1) as the dependent variable (see Table 1), indicated that in Model 3 Newhandicap3, Voicestrain, and Newhandicap 2 explained 71% of the variance in the teachers' self-perceptions of Newhandicap1 (functional issues) (see Table 1). The results of the ANOVA (see Table 2) showed that the regression model 3 explained a significant amount of the variance in the dependent variable Newhandicap1 with $F(3, 135) = 112.366$, $p < 0.005$ (R-Square = 0.71). Thus, in Model 3 Newhandicap3 (emotional issues), Voicestrain (voice strain) and Newhandicap 2 (physical issues) ($p < 0.005$) were found to be significant predictors of Newhandicap1 (functional issues), which made statistically positive contributions to explaining the dependent variable.

Table 1. Summary Statistics from the Stepwise Multiple-Regression Analysis on the Sample: Model Summary

Model Summary [d]				
Model	*R*	*R*-square	Adjusted *R*-square	Std. Error of the Estimate
1	0.830[a]	0.689	0.687	0.572
2	0.837[b]	0.700	0.696	0.564
3	0.845[c]	0.714	0.708	0.553

Notes. [a] Predictors: (Constant), newhandicap3; [b] Predictors: (Constant), newhandicap3, voicestrain; [c] Predictors: (Constant), newhandicap3, voicestrain, newhandicap 2; [d] Dependent variable: newhandicap1.

Table 2. Summary Statistics from the Stepwise Multiple-Regression Analysis on the Sample: ANOVA

ANOVA [d]					
Model	Sum of squares	*df*	Mean square	*F*	Sig.
1 Regression	99.433	1	99.433	303.613	0.000[a]
Residual	44.867	137	0.327		
Total	144.300	138			
2 Regression	100.998	2	50.499	158.603	0.000[b]
Residual	43.302	136	0.318		
Total	144.300	138			
3 Regression	103.036	3	34.345	112.366	0.000[c]
Residual	41.264	135	0.306		
Total	144.300	138			

Notes. [a] Predictors: (Constant), newhandicap3; [b] Predictors: (Constant), newhandicap3, voicestrain; [c] Predictors: (Constant), newhandicap3, voicestrain, newhandicap 2; [d] Dependent variable: newhandicap1.

Tables 3 and 4 illustrate the descriptive statistics and the correlation coefficients for the seven variables entering the equation (1 DV and 6 IDs). The results of the Correlation Matrix also indicated (see Table 4) that voicestrain was significantly correlated with strainreduction (drinking water during lectures, or taking breaks more than an hour) ($r = 0.43$, $p < 0.005$), newhandicap 2 (physical issues) ($r = 0.51$, $p < 0.005$) and newhandicap3 (emotional issues) ($r = 0.40$, $p < 0.005$), and jobimpact (impact of voice strain on job) ($r = 0.55$, $p < 0.005$). In addition, an examination of the mean scores across the sample (see Tale 3) revealed that the respondents scored high on voicestrain ($M = 4.08$, $SD = 1.405$) and strainreduction ($M = 4.77$, $SD = 1.257$), which means that voice strain is prevalent among Chinese university instructors, and they tended to believe that drinking water during lectures and taking breaks more than an hour between lectures help reduce their voice strain.

Table 3. Means and Standard Deviations for Rated Frequency of Voice Strain and Voice Handicap Index

Descriptive Statistics			
	Mean	Std. Deviation	*N*
Newhandicap1	1.90	1.023	139
Voicestrain	4.08	1.405	139
Strainreduction	4.77	1.257	139
Newhandicap2	2.38	1.106	139
Newhandicap3	1.82	1.073	139
Jobimpact	2.30	1.333	139

Table 4. Correlation Coefficients Matrix

Correlations							
		Newhandicap1	Voicestrain	Strainreduction	Newhandicap2	Newhandicap3	Jobimpact
Pearson correlation	Newhandicap1	1.000	0.245	-0.069	0.643	0.830	0.588
	Voicestrain	0.245	1.000	0.436	0.511	0.409	0.553
	Strainreduction	-0.069	0.436	1.000	0.218	0.024	0.180
	Newhandicap2	0.643	0.511	0.218	1.000	0.710	0.593
	Newhandicap3	0.830	0.409	0.024	0.710	1.000	0.676
	Jobimpact	0.588	0.553	0.180	0.593	0.676	1.000
Sig. (1-tailed)	Newhandicap1	-	0.002	0.209	0.000	0.000	0.000
	Voicestrain	0.002	-	0.000	0.000	0.000	0.000
	Strainreduction	0.209	0.000	-	0.005	0.388	0.017
	Newhandicap2	0.000	0.000	0.005	-	0.000	0.000
	Newhandicap3	0.000	0.000	0.388	0.000	-	0.000
	Jobimpact	0.000	0.000	0.017	0.000	0.000	-
N	Newhandicap1	139	139	139	139	139	139
	Voicestrain	139	139	139	139	139	139
	Strainreduction	139	139	139	139	139	139
	Newhandicap2	139	139	139	139	139	139
	Newhandicap3	139	139	139	139	139	139
	Jobimpact	139	139	139	139	139	139

3.3 Gender and Age Effects on Perceptions of Voice Strain and Voice Handicap

To investigate research questions 3 and 4 (Do gender and different age cohorts affect teachers' self-perceptions of voice problems? Does the quality of sleeping among teachers affect their voice?), a two-way MANOVA analysis was calculated. The MANOVA was a 2 × 4 factorial design comprising the independent variables of gender (males versus females) × age group (group 1: 20-29; group 2: 30-39; group 3: 40-49; group 4: 50-59). The gender group and the age group were both between-subjects factors. It was intended to assess the effects of the two independent variables, one at a time, on the six dependent variables: Voicestrain, Jobimpact, Strainreduction, and Functional, Physical and Emotional Issues. The overall differences were studied first. Results are illustrated in Appendix II. Of interest to this analysis are the results for gender and age group, and gender X age group interaction. The accepted benchmark for significance assessing claims in is Wilks' Lambda with eta being a measure of how strong the effects are. Results revealed that there were no significant differences in the dependent variables across the gender groups (males: N = 35; females: N = 120), and age groups (group 1: N = 42; group 2: N = 65; group 3: N = 36; group 4: N = 12), with Wilks' Lambda (6, 126) = 0.985, $p > 0.05$, and with Wilks' Lambda (18, 356) = 0.892, $p > 0.05$, respectively. Thus, significant multivariate effects for gender and age group were not obtained (i.e. a significant $F > 0.05$). As indicated in the table, according to the generally accepted criteria (Cohen, 1988), Eta for gender and age group indicate that these are not strong or large effects with Partial Eta Squared = 0.015 and with Partial Eta Squared = 0.038, which explained either 1.5% or 3.8% of the variances in the dependent variables scores explained by gender and age group. Moreover, the overall analysis showed that there was no interaction effect (Wilks' lambda (18, 356) = 0.840, $p > 0.05$). Therefore, these effects will not be discussed any further in the following study, since no significant multivariate effects were found for gender and age group.

4 Discussion and Conclusions

The aim of the present study was to assess the prevalence of voice problems in the general population of Chinese university instructors, and explore whether their voice problems affected their daily life, their social life and their work, and how closely they were correlated with each other. Results of the multiple-regression analysis on the sample revealed that the university instructors' self-perceptions of Newhandicap3 (emotional issues), Voicestrain (voice strain) and Newhandicap2 (physical issues) dimensions were significantly positively correlated with their self-perceptions of Newhandicap1 (functional issues) dimension. It was found that emotional issues (the respondent's affective responses to the voice disorder), voice strain and physical issues (self-perceptions of laryngeal discomfort and voice output characteristics) were the best and useful predictors of the functional

issues (the impact of the respondent's voice disorder on daily activities), which means that the more often a teacher experiences emotional issues, voice strain and physical issues, the more often he/she experiences functional issues. The findings also revealed that voice strain is prevalent among Chinese university instructors, and they believe that they have to drink water when they lecture, and that taking breaks during lectures more than an hour helps reduce their voice strain. Moreover, the findings showed that voice strain was significantly correlated with job impact, which means that the more often a teacher experienced voice strain, the more impact it exerted on his/her job. These findings are significant because they seem to have provided evidence for answering the first research question.

In answering research question 2, we found that there were no significant main effects for gender factor (males vs. females) and age factor (age group 1, age group 2, age group 3, and age group 4). In other words, both gender and age cohorts made no any significant differences in self-perceived voice strain, strain reduction, job impact, and functional, physical and emotional issues based on the scores gained in the respondents. Interestingly, the statistical analyses and results revealed no differences between the four age groups' self-perceptions of voice strain and job impact, which has been one of the research focuses in the present study.

Although the sample's scores were not satisfactory (e.g., in this study, years of teaching had been assumed effective on voice strain and physical issues in teachers), some findings were significant. For instance, the respondents reported that they often experienced voice strain during/after lectures, which suggested a need for preventive voice programs (such as voice care/hygiene, and voice training) within teacher-training students or in-service teachers training programs, which may help increase (future) teachers' vocal endurance and ability in such a challenging profession. In addition, 20% of the respondents (N = 31) reported that they had had previous voice therapy, which further supported the finding that voice strain in university instructors is prevalent. In short, it may be inferred that voice strain in teachers does affect their jobs and daily activities based on the respondents' self-perceptions. Thus, the research has reached its proposed research purpose.

However, several limitations of the present study should be noted and addressed in future research. For example, all constructs in this study were assessed with paper-and-pencil measures. Although this is defensible in the early phases of a research program, future studies should seek the use of a therapy approach for teachers that includes treatment techniques to improve vocal hygiene habits. Moreover, the sample size should seek to concentrate on the respondents' sample scope, thus it will be more representative of the whole population of Chinese university instructors. In addition, the study mainly deals with English teachers, whom are assumed to be representative of teachers of other fields/disciplines. However, it would be worth comparing

both the perception of teachers of different subjects/fields, and the learners' perception of their teachers' voice in future research.

Furthermore, this study strongly suggests that teachers may benefit from vocal educational training and prevention programs to raise their awareness of potential voice problems and to promote vocal health, so that the qualities of their teaching and social life may be improved.

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