


ORIGINAL RESEARCH

The prevalence and risk factors for perceived voice disorders in public school teachers

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Abstract

Objectives: The aim of this study was to explore the prevalence and risk factors in public kindergarten and elementary school teachers in the Jimei district in Xiamen. We took particular interest in the relationship between work-related factors and voice disorders.

Study Design: A cross-sectional investigation; a General Investigation.

Methods: This study was conducted from September 14 to 18, 2020 at public kindergarten and elementary schools in Xiamen, China. A total of 3140 teachers were separated into a perceived voice disorder group (PVD) and no perceived voice disorder group (NPVD) according to the Voice Handicap Index. The chi-square test was applied to explore the differences between the PVD and NPVD groups. The univariate logistic regression models were used to identify the risk factors in terms of unadjusted odds ratio and 95% confidence interval. Stepwise logistic regression was then used to ascertain independent determinants.

Results: We found that the prevalence of PVD was 47.52%. The results showed that risk factors of PVD included being female (OR = 1.574), middle-rank technical title and higher (OR = 2.199), continuous lecturing for more than 3 classes (OR = 3.034), lectured more than 10 classes a week (OR = 1.436) and taught art or physical education (OR = 1.742).

Conclusions: Teachers' work-related characteristics were associated with PVD. This proves that a preventive voice care program for teachers, administered by the school or education bureau, is urgent. This could include components such as the reasonable arrangement of timetables and recruitment of a sufficient number of kindergarten and elementary school teachers.

Level of evidence: Case-series

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KEYWORDS

risk factors, teachers, voice disorders, voice handicap index, work-related characteristics

1 | INTRODUCTION

As far as we know, the voice is the most important tool of teaching in the group of teachers. As occupational voice users, teachers would speak loudly and use their voices continuously for long periods. It is an ordinary procedure for them to manipulate their voice tone for class discipline. Therefore, they are exposed to much more risk factors and more prone to have a higher prevalence for developing voice disorders than the general population,¹⁻⁶ due to the overuse and misuse of voices. One Byeon's systematic review indicated that the prevalence of voice disorders in teachers ranged from 10% to 70%.⁷ Furthermore, Mattiske's study demonstrated that the voice issues of kindergarten and elementary school teachers were more than that of middle or high school teachers.⁸

Voice disorders may have adverse effects on the quality of life and professional performance of teachers, which would result in a poorer quality of teaching, lower attendance, and even resignation.⁹⁻¹³ The economic burden of teachers' voice disorders is staggering, as it involves lost wages, increased cost for substitute teachers, and the high cost of treatment for voice disorders.¹⁴ Rosow et al.¹⁵ reported that the social cost of US teachers' voice disorders cost roughly \$2.5 billion annually. Meanwhile, Morton et al.¹⁶ showed that the voice disorder combined with voice-related disruptions may impact students' learning. Thus, voice disorders in teachers are an urgent medical condition that should not be overlooked.

The development of voice disorders is multifactorial, including endogenous and exogenous factors. Previous researches have reported that demographic characteristics are the possible risk factors of voice disorders,^{12,17-19} work environment,^{2,19-22} health,^{17,23-25} psychological factors,^{2,26} and voice overuse.^{12,18,22,27,28} However, the muscles of the vocal apparatus that were incorrectly used is one of the most reasons.²⁹ For example, teachers overuse and misuse their voice frequently. In China, the number of students has risen with the full implementation of the second-child policy in 2016, which led to the increasing number of available teachers and unreasonable class schedules, including the daily continuous lecturing by teachers.

Quite a lot of researchers identified related factors that affected teachers' voice disorders in various countries, including work-related factors (e.g., daily hours of teaching)^{12,18}; however, the studies focusing on the continuous lecturing per day are limited. In a qualitative study conducted by Yeung,³⁰ 11 of 19 teachers at a school in Hong Kong complained that vocal problems occurred when they had to teach more than three consecutive lessons in a day.

Therefore, we conducted an epidemiological analysis to investigate the prevalence and risk factors in public kindergarten and elementary school teachers in the Jimei district of Xiamen, China, particularly the relationship between work-related factors and voice disorders, with the aim of providing scientific reference for schools in arranging teaching tasks and protecting the voices of teachers.

2 | MATERIALS AND METHODS

2.1 | Research participants

This is a cross-sectional investigation conducted from September 14 to 18 in 2020 at public kindergarten and elementary schools in Xiamen, China. A total of 80 public schools, including 33 public kindergarten schools and 47 public elementary schools in Jimei district, Xiamen, were selected, and 3246 teachers working in the schools of the district were included in the study. All participants were asked to complete a self-reporting online questionnaire. Finally, a total of 3202 questionnaires were collected of which 3140 questionnaires were filled out correctly, with an effective response rate of 96.73%.

2.2 | Questionnaire and procedures

The online questionnaire was designed based on professional voice disorder literature,^{17,31-34} which consisted of a demographic characteristics section including age and gender, living habits (smoking and drinking), a work-related questionnaire, and the vocal handicap index (VHI). The work-related questionnaire was composed of 11 questions. These queries included school type, technical title, years of teaching, teaching method, classes of continuous lecturing per day, number of classes per week, number of students per class, grade, course, online lectures, and classes of continuous online lecturing per day. The VHI was developed by Jacobson at 1997,³⁴ which was translated into Chinese by Professor Xu in 2008.³⁵ The Chinese version of VHI has proven to be valid and reliable (Cronbach's alpha is 0.86-0.952, coefficient of stability is 0.992).³⁵ VHI was used to assess the voice and its effects on the lives of teachers, which contained three subscales: functional (F), physical (P), and emotional (E). Each subscale consisted of 10 items. The VHI has a 5-point Likert scale, which scores from 0 to 4 for a minimum score of 0 and a maximum score of 120. The higher the score, the more severe the PVD. In order to distinguish teachers with PVD, the cut-off value was settled to be 19 or more points.³⁶ Teachers with VHI scores ≥ 19 were included in PVD group, while the rest ones were included in the NPVD group. As we did not conduct an otolaryngology assessment, it is not clear whether these teachers had preexisting conditions. In this study, we cautiously used PVD to determine vocal injury. Moreover, teachers who have PVD were instructed to seek professional assessment in the follow-up research. The last question of the questionnaire in this study was: are you willing to participate in further voice assessment and voice behavioral treatment if the survey results reveal that you have perceived voice disorder?

We randomly selected one school to conduct our pilot study, in order to check the terminology, validity, and reliability of the

TABLE 1 Demographic characteristics, living habits, work-related characteristics, and chi-square test of the PVD and NPVD groups [n (%)]

Variable	n	NPVD (n = 1648)	PVD (n = 1492)	p
<i>Demographic characteristics</i>				
Gender				
Male	382	227 (59.42)	155 (40.58)	.004*
Female	2758	1421 (51.52)	1337 (48.48)	-
Age				
<30	1654	1005 (60.76)	649 (39.24)	<.001*
~40	994	429 (43.16)	565 (56.84)	-
≥40	492	214 (43.50)	278 (56.50)	-
<i>Living habits</i>				
Smoking				
Yes	110	60 (54.55)	50 (45.45)	.659
No	3030	1588 (52.41)	1442 (47.59)	-
Drinking				
Yes	491	259 (52.75)	232 (47.25)	.898
No	2649	1389 (52.43)	1260 (47.57)	-
<i>Work-related characteristics</i>				
School type				
Kindergarten	751	487 (64.85)	264 (35.15)	<.001*
Elementary	2389	1161 (48.60)	1228 (51.40)	-
Technical title				
No Technical title	1220	801 (65.66)	419 (34.34)	<.001*
Primary technical title	984	472 (47.97)	512 (52.03)	-
Middle-rank technical title and higher	936	375 (40.06)	561 (59.94)	-
Years of teaching				
0-5	1541	957 (62.10)	584 (37.90)	<.001*
6-10	780	350 (44.87)	430 (55.13)	-
>10	819	341 (41.64)	478 (58.36)	-
Teaching method				
Multimedia teaching	667	422 (63.27)	245 (36.73)	<.001*
Blackboard teaching	27	13 (48.15)	14 (51.85)	-
Both multimedia and blackboard teaching	2446	1213 (49.59)	1233 (50.41)	-
Classes of continuous lecturing per day				
No continuous lecturing	503	372 (73.96)	131 (26.04)	<.001*
Continuous lecturing 2 classes	1430	760 (53.15)	670 (46.85)	-
Continuous lecturing 3 or 4 classes	1207	516 (42.75)	691 (57.25)	-
Number of classes per week				
0-10	799	530 (66.33)	269 (33.67)	-
≥10	2341	1118 (47.76)	1223 (52.24)	<.001*
Number of students per class				
≤20	43	28 (65.12)	15 (34.88)	.150
21-59	3073	1605 (52.23)	1468 (47.77)	-
≥60	24	15 (62.50)	9 (37.50)	-
Grade				
Kindergarten	747	484 (64.79)	263 (35.21)	<.001*
Grade 1-3	947	476 (50.26)	471 (49.74)	-
Grade 4-6	979	471 (48.11)	508 (51.89)	-

TABLE 1 (Continued)

Variable	n	NPVD (n = 1648)	PVD (n = 1492)	p
Both Grade 1–3 and Grade 4–6	462	215 (46.54)	247 (53.46)	–
Course				
Kindergarten courses	749	486 (64.89)	263 (35.11)	<.001*
Chinese	716	385 (53.77)	331 (46.23)	–
Math	379	180 (47.49)	199 (52.51)	–
English	118	50 (42.37)	68 (57.63)	–
Arts or Physical education	664	364 (54.82)	300 (45.18)	–
Both Chinese/Math/English and Arts or Physical	514	185 (35.99)	329 (64.51)	–
Online lectures				
No	878	561 (63.90)	317 (36.10)	<.001*
Yes	2262	1087 (48.05)	1175 (51.95)	–
Classes of continuous online lecturing per day (n = 2262)				
No continuous teaching	1330	685 (51.50)	645 (48.50)	<.001*
Continuous teaching 2 classes	808	357 (44.18)	451 (55.82)	–
Continuous teaching 3 or 4 classes	124	45 (36.29)	79 (63.71)	–

Note: * $p < .05$.

questionnaire, so that we may make necessary modifications as needed. This study was approved by the Medical Ethics Committee of The Second Affiliated Hospital of Xiamen Medical College and informed consent of all participants was obtained. The participants remained anonymous and the collected data were used only for investigational research purposes.

2.3 | Data analysis

The Statistics Analysis System (SAS v9.2, SAS Institute Inc., Cary, NC) was applied for data analysis. The chi-square test was used to explore the significant differences between the PVD and NPVD groups with respect to demographic characteristics, work-related characteristics, and living habits. Univariate logistic regression models were used to confirm the risk factors in terms of unadjusted odds ratio (OR) and 95% confidence interval (CI), and a stepwise logistic regression was done to identify independent determinants through estimating OR and 95% CI after adjusting results for potential confounders between the two groups. Variables were entered and dropped from the stepwise model using the 0.10 and 0.15 levels of significance, respectively. The NPVD group was considered the reference for the PVD group. The significance level was set at $p < .05$ for all analyses.

3 | RESULTS

3.1 | Prevalence of PVD

Nearly half of the 3140 public kindergarten and elementary school teachers who completed our questionnaire reported having PVD (47.52%). Furthermore, the mean VHI score was 23.55 ± 23.04 .

3.2 | Demographic characteristics, living habits, and PVD

The chi-square test and univariate logistic regression results showing female teachers had a higher chance to develop PVD than male teachers (OR = 1.378, $p = .004$). And age was a risk factor for PVD (OR = 2.039, $p < .001$; OR = 2.012, $p = .001$). However, no intergroup differences existed regarding the smoking and drinking history ($p > .05$). The specific results of chi-square test and univariate logistic regression are shown in Tables 1 and 2.

3.3 | Work-related characteristics and PVD

Tables 1 and 2 showed the results of chi-square test and univariate logistic regression between work-related characteristics and PVD.

The elementary school teachers had a higher chance of developing PVD than kindergarten school teachers (OR = 1.951, $p < .001$). We found that the technical title and years of teaching were risk factors of PVD (OR = 2.074; OR = 2.860; OR = 2.013, OR = 2.297; all $p < .05$). This study showed that the amount of teaching was a risk factor of PVD; teachers who continuously taught 2 or more classes a day were more likely to have PVD than those who had no continuous lectures (OR = 2.503; OR = 3.803; all $p < .05$) and teachers who lectured ≥ 10 classes a week had a higher chance of developing PVD than those who lectured < 10 classes a week (OR = 2.155, $p < .001$). No significant differences were found in the number of students per class and teaching method between the PVD group and the NPVD group.

The grade was a risk factor for PVD (OR = 1.985; OR = 2.114; all $p < .05$), excluding the grades 1–3 ($p = .126$). The course was also a risk for PVD (OR = 1.589; OR = 1.523; OR = 3.359; all $p < .05$),

TABLE 2 The univariate logistic regression results about the relationship of PVD and NPVD groups among demographic characteristics, living habits and work-related characteristics

Variable	<i>b</i>	<i>S_b</i>	Wald χ^2	<i>p</i>	OR	95% CI
<i>Demographic characteristics</i>						
Gender						
Male*	-	-	-	-	1	-
Female	0.321	0.111	8.350	.004	1.378	1.109-1.713
Age						
<30*	-	-	-	-	1	-
~40	0.242	0.055	19.392	<.001	2.039	1.738-2.393
≥40	0.228	0.066	11.822	.001	2.012	1.641-2.466
<i>Living habits</i>						
Smoking						
Yes*	-	-	-	-	1	-
No	0.076	0.102	0.194	.659	1.018	0.716-1.390
Drinking						
Yes*	-	-	-	-	-	-
No	0.013	0.098	0.016	.898	1.013	0.835-1.228
<i>Work-related characteristics</i>						
School type						
Kindergarten*	-	-	-	-	1	-
Elementary	0.668	0.087	59.430	<.001	1.951	1.646-2.312
Technical title						
No Technical title*	-	-	-	-	1	-
Primary technical title	0.135	0.052	6.825	.009	2.074	1.746-2.463
Middle-rank technical title and higher	0.457	0.053	73.826	<.001	2.860	2.398-3.411
Years of teaching						
0-5*	-	-	-	-	1	-
6-10	0.189	0.056	11.310	.001	2.013	1.691-2.397
>10	0.321	0.056	33.109	<.001	2.297	1.932-2.731
Teaching method						
Multimedia teaching*	-	-	-	-	1	-
Blackboard teaching	0.225	0.259	0.759	.384	1.855	0.858-4.011
Both multimedia and blackboard teaching	0.167	0.134	1.564	.211	1.751	0.968-2.088
Classes of continuous lecturing per day						
No continuous lecturing *	-	-	-	-	1	-
Continuous lecturing 2 classes	0.167	0.053	10.007	.002	2.503	2.000-3.134
Continuous lecturing 3 or 4 classes	0.585	0.054	115.326	<.001	3.803	3.023-4.784
Number of classes per week						
0-10*	-	-	-	-	1	-
≥10	0.768	0.086	80.586	<.001	2.155	1.822-2.548
Number of students per class						
≤20*	-	-	-	-	1	-
21-59	0.319	0.178	3.206	.073	1.707	0.908-3.209
≥60	-0.103	0.301	0.117	.733	1.120	0.397-3.160
Grade						
Kindergarten*	-	-	-	-	1	-
Grade 1-3	0.091	0.060	2.336	.126	1.821	0.926-2.217
Grade 4-6	0.177	0.059	9.027	.003	1.985	1.632-2.414

TABLE 2 (Continued)

Variable	<i>b</i>	<i>S_b</i>	Wald χ^2	<i>p</i>	OR	95% CI
Both Grade 1–3 and Grade 4–6	0.240	0.076	9.988	.002	2.114	1.669–2.678
Course						
Kindergarten courses*	–	–	–	–	1	–
Chinese	0.159	0.076	4.418	.031	1.589	1.288–1.960
Math	0.093	0.095	0.947	.330	1.891	0.914–2.327
English	0.300	0.159	3.564	.068	2.043	0.895–2.827
Arts or Physical education	0.201	0.078	6.710	.009	1.523	1.229–1.887
Both Chinese/Math/English and Arts or Physical	0.590	0.088	45.205	<.001	3.359	2.654–4.250
Online lectures						
No*	–	–	–	–	1	–
Yes	0.324	0.041	62.720	<.001	1.913	1.629–2.246
Classes of continuous Online lecturing per day (<i>n</i> = 2262)						
No continuous teaching*	–	–	–	–	1	–
Continuous teaching 2 classes	–0.012	0.080	0.021	.884	1.342	0.992–1.599
Continuous teaching 3 or 4 classes	0.317	0.128	6.142	.013	1.864	1.273–2.730

Note: *Reference.

TABLE 3 Risk factors of PVD in public kindergarten and Elementary school teachers through Stepwise logistic regression

Variable	<i>b</i>	<i>S_b</i>	Wald χ^2	<i>p</i>	OR [#]	95% CI
Gender						
Male*	0.454	0.135	11.306	.001	1	1.208–2.051
Female					1.574	
Technical title						
No technical title*	–	–	–	–	1	–
Primary technical title	0.068	0.064	1.136	.286	1.642	0.899–2.065
Middle-rank technical title and higher	0.360	0.077	21.912	<.001	2.199	1.676–2.884
Classes of continuous lecturing per day						
No continuous lecturing*	–	–	–	–	–	–
Continuous lecturing 2 classes	0.138	0.078	3.196	.074	2.144	0.953–3.128
Continuous lecturing 3 or 4 classes	0.486	0.084	33.214	<.001	3.034	2.045–4.501
Number of classes per week						
0–10*	–	–	–	–	–	–
≥10	0.362	0.146	6.110	.013	1.436	1.078–1.912
Course						
Kindergarten courses*	–	–	–	–	1	–
Chinese	–0.138	0.090	2.334	.127	0.954	0.634–1.436
Math	0.129	0.111	1.359	.244	1.246	0.801–1.940
English	–0.097	0.177	0.301	.583	0.994	0.572–1.728
Arts or Physical education	0.464	0.103	20.473	<.001	1.742	1.129–2.688
Both Chinese/Math/English and Arts or Physical	–0.267	0.098	3.204	.072	0.838	0.549–1.281

Note: *Reference.

excluding math or English ($p = .330$, $p = .068$, respectively). Due to the outbreak of COVID-19, social isolation was imposed on the teachers and students, and many teachers had to switch to online lecturing in March 2020 which continued through July 2020. In this

study, online lectures was a risk factor for PVD (OR = 1.913, $p < .001$). Among the teachers who switched to online lecturing, continuous lectures was a risk factor for PVD (OR = 1.864, $p = .013$), excluding continuous teaching of 2 classes ($p = .884$).

3.4 | Risk factors of PVD in public kindergarten and elementary school teachers through stepwise logistic regression

Stepwise logistic regression was performed to identify unique risk factors for developing PVD. There were 11 statistically significant variables from the univariate logistic regression that were added into the stepwise logistic regression, including gender, age, school type, technical title, years of teaching, number of continuous lectures per day, number of classes per week, grade, course, online lectures, and number of continuous online lectures per day. The remaining variables met the criterion and those could explain the prevalence of PVD (Table 3). These results show being female (OR = 1.574, $p = .001$), having a middle-rank technical title and higher (OR = 2.199, $p < .001$), continuously lecturing for ≥ 3 classes per day (OR = 3.034, $p < .001$), lecturing > 10 classes a week (OR = 1.436, $p = .013$) and teaching arts or physical education (OR = 1.742, $p < .001$) could be risk factors of PVD.

4 | DISCUSSION

The results from this extensive epidemiological study gave useful insights into the prevalence of PVD and the work-related risk factors. This study is unique in the fact that it focused on investigating work-related characteristics by comparing public kindergarten and elementary school teachers with PVD and those without PVD through general investigation, and we elucidated some risk factors which could potentially contribute to PVD.

4.1 | Prevalence of PVD

In this study, 1492 public kindergarten and elementary school teachers reported to have PVD (47.52%). This is higher than the study from da Rocha et al.,¹³ which reported the incidence of a PVD among elementary and middle school teachers was 17.1%. However, a study conducted by Kyriakou et al.³¹ showed the prevalence of self-perceived voice disorders was 69.9% among the public kindergarten and elementary school teachers in Cyprus. The difference seen in the prevalence of voice disorders may be due to differences in culture, region, and tests conducted to determine the vocal complications of teachers. In addition, because of the outbreak of COVID-19, many teachers had to do online lecturing. The perceived voice disorders may be a result of vocal effort, with difficulties in wearing headphones and speaking while wearing a mask during online lecturing.

4.2 | Demographic characteristics, living habits, and PVD

Female teachers were more prone to have PVD than male teachers in our study, which is in keeping with other studies^{17-19,37,38} that reported that female teachers are more prone to have voice disorders.

This may be owing to the fact that females have a smaller larynx, shorter vocal cords, and higher fundamental voice frequencies than males.³⁹ In addition, females have a lower concentration of hyaluronic acid (HA) in the superficial layer of the lamina propria. And HA plays a notable part in wound repair. Therefore, there is potentially a reduced wound healing response after damaging vocal structures in female teachers.⁴⁰ In this study, age did not significantly influence the onset of PVD, which is consistent with the study of Chen et al.⁴¹ In the aspect of living habits (smoking and drinking habits), these were not significantly related to PVD. Similar results were found by Roy et al.,⁴² Chen et al.,⁴¹ Bolbol et al.,³² and Alva.¹⁷ One presumable possibility is that most of research subjects were female. Because of culture and traditions in China, smoking and drinking are not prevalent among females.

4.3 | Work-related characteristics and PVD

A significant finding of the survey revealed that teachers with a middle-rank technical title and higher had a 2.199-fold higher chance to have PVD than those with no technical title. One possible cause for this is that teachers with a middle-rank technical title and higher undertake more teaching tasks, having richer experience in teaching, as seen by Mattiske et al. who demonstrated that voice disorders exist most often in experienced teachers.⁸ Furthermore, they have more opportunities to act as homeroom teachers or head of pre-prep classes. This means that they have more staff meetings, more communication with parents and counsel more students, leading to vocal overuse. Lee et al. reported that homeroom teachers showed higher voice disorders because they overused their voice by providing student counseling and guidance outside of the classroom.¹²

Our investigation is the first study in Mainland China that showed that teachers who continuously lecture 3 or 4 classes a day had a higher risk of PVD than those who have no continuous lecturing. These results were consistent with the finding of Yeung,³⁰ who showed that teachers in Hong Kong complained of vocal problems occurring when they had to teach more than three consecutive lessons in a day. For kindergarten and elementary school, the duration of a class is 40 min in China. The duration of breaks between classes is 10 min, which is not enough time for the voice to recover. Thus, as the number of continuous classes increases, the time and frequency of voice usage also increase. These long periods of voice usage are due to poor time management. Many schools arrange for teachers to continuously lecture more than three classes a day. Roy et al. assumed that long periods of vocal use has a cumulative effect in developing a voice disorder.⁴² Long periods of vocal use leads to vibration overdose and injury of vocal fold tissue, which leads to the injury of voices.⁴³ Thus, it is not recommended for schools to arrange teachers to continuously lecture more than three classes a day.

It was found that teachers who lectured ≥ 10 classes a week had a 1.436-fold higher chance to have PVD than those who lectured < 10 classes. Similar to previous findings, the study conducted by Lee et al.¹² revealed that teaching more than 20 class hours per week was

positively associated with PVD in secondary school teachers. Domínguez-Alonso et al.¹⁸ showed that total class hours per week significantly affected the disturbance of the voice. The frequency and duration of talking were connected to voice disorders in all these studies, as it leads to microvascular trauma with local edematous remodeling processes and accompanying inflammation.⁴⁴

These results additionally showed that teachers who taught art or physical education had a 1.742-fold higher chance to have PVD than those who taught kindergarten subjects. This corresponds to the results reported by other authors,^{19,45,46} who showed that those who teach music and sports have a higher risk of voice disorders. One possible reason may be that teachers in these courses have to raise their voices more often to make the students hear. The relationship between school type, years of teaching, number of students per class and grade were not found to be significant in our study. This finding is in accordance with the study of Alva,¹⁷ Chen et al.,⁴¹ and Van Houtte et al.⁴⁷ The relationship of online lecturing and continuous online lecturing and PVD had no statistical significance. This result is different from the data reported by Nemr et al.,⁴⁸ which showed that online classes/meetings deteriorated the voices of teachers during the COVID-19 outbreak in Brazil. This may be a result of vocal effort, with difficulties in wearing headphones and speaking while wearing a mask during online classes.

5 | CONCLUSIONS

This study suggested that continuous lecturing ≥ 3 classes per day may be an important risk factor for the development of PVD in public kindergarten and elementary school teachers in Xiamen city. In light of this finding, a preventive voice care program is necessary and should be conducted by the school or education bureau for teachers. The results of the study also concluded that gender, technical title, number of classes taught per week, and course may contribute to the development of PVD. Thus, regular follow-ups of teachers' work-related characteristics and voice disorders are needed. We will focus on the voice behavioral treatment for teachers in the follow-up research.

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CONFLICT OF INTEREST

No author has any conflicts of interest to disclose.

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