

Voice Symptoms and Wellbeing in School Teachers in England

Emily Sharp, and Robert Cook, *Birmingham, UK*

Summary: Introduction. Negative psychological factors such as depression and other common mental disorders have been found to be associated with voice problems in teachers. However, there is little research with teachers that investigates the relationship between positive psychological factors such as wellbeing and voice problems. Although negative and positive mental states are on a continuum of psychological health, research suggests negative and positive effects are not necessarily inversely correlated and therefore need to be investigated separately.

Objective/Hypothesis. To explore the relationship between voice symptoms and wellbeing in teachers working in primary and secondary schools in England. We hypothesise that as wellbeing increases voice symptoms will decrease.

Design. Cross sectional study using a self-administered web-based questionnaire conducted with primary and secondary school teachers in England.

Methods. The study included 1205 teachers from 608 primary and secondary schools, including state and fee paying, and mainstream and special schools. Voice symptoms were measured using The Voice Symptom Scale and wellbeing was measured using the Warwick Edinburgh Mental Wellbeing Scale. Information was also obtained on health, lifestyle, sociodemographic and environmental factors. Analysis was conducted using a linear multi-level regression model.

Results. A statistically significant relationship between voice symptoms and wellbeing was identified (-0.31 95% CI -0.41, -0.20 $P = < 0.001$). Other factors found to be statistically significantly associated with voice symptoms were age, sex, gastroesophageal reflux, class size, background noise, speaking louder than normal and respiratory infection. Hours teaching per week, deprivation of school, voice training, teaching subject, smoking status and asthma were not associated with voice symptoms.

Conclusions. This study suggests that there is an association between vocal symptoms and wellbeing. Teachers with higher wellbeing had fewer voice symptoms.

Key Words: Wellbeing—Voice symptoms—School teachers—Risk factors—Voice.

INTRODUCTION

Teachers are an occupational group that are particularly affected by voice problems. Studies that have compared the prevalence of voice problems with teachers and non-teachers have found that prevalence is greater in the teaching population.¹⁻⁵ Estimated figures for the prevalence of current or recent voice problems in teachers range from 69.9% to 10.4%^{1-3,5-8} with figures from non-teachers and the general population ranging from 28.2% to 6.2%.^{1-3,5,9} A study conducted in England reported a 12 month prevalence of 30% for teachers compared with 9% for non-teachers.⁵ Therefore, in order to try and lower prevention rates, research with this population is important.

The impact of voice problems in teachers can be significant, including financial implications for schools, negative impacts on student learning and teaching difficulties.^{1,2,4,10-14}

It has been suggested that more than 70,000 teaching days a year are lost in the UK because of voice problems, which are estimated to cost about £15 million a year.¹⁰ In the US the cost may be \$2.5 billion,¹⁵ although this figure is based on research that is 20 years old, so the costs are likely to be even higher. Research which has compared teachers and non-teachers with voice problems identified that teachers were more likely than non-teachers to be absent from work due to their voice, more likely to say that their voice problems prevented them from working effectively, and were more likely to consider changing their occupation in the future due to a voice problem.^{1,4,11,12} Furthermore, voice problems may negatively influence student learning. Studies with teachers have found that primary school children perform more poorly on language comprehension tasks, even with mildly dysphonic voices than when hearing a “normal” voice.^{13,14} Therefore, due to the risk of voice problems in the teaching population and their impact it is important that effective treatment and prevention strategies are in place. Identifying the factors associated with voice symptoms can help in the design of voice care information and vocal training given to teachers as students and throughout their careers.

Wellbeing is a factor that may help reduce voice symptoms and help to prevent them from developing. The importance of good mental health and wellbeing is increasingly

Accepted for publication February 4, 2022.

This study was made possible by funding from the Faculty of Health, Education and Life Sciences at Birmingham City University.

From the Faculty of Health, Education and Life Sciences, Birmingham City University, Birmingham, UK.

Address correspondence and reprint requests to Emily Sharp, c/o HELS Doctoral Research College, Faculty of Health, Education and Life Sciences, Birmingham City University, City South Campus, Ravensbury House, Room 117, Westbourne Road, Birmingham, West Midlands, B15 3TN, UK. E-mail: Emily.sharp2@mail.bcu.ac.uk

Journal of Voice, Vol. ■■■, No. ■■■, pp. ■■■–■■■
0892-1997

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<https://doi.org/10.1016/j.jvoice.2022.02.005>

being recognised as essential for the overall functioning and physical health.¹⁶ According to the World Health Organisation mental health “is a state of wellbeing where the individual realises his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully and is able to make a contribution to his or her community”.¹⁷ Wellbeing is a complex construct and is often used interchangeably in the literature with mental health. There is no consensus around a single definition, although it generally refers to the presence of positive emotions, positive functioning and life satisfaction.¹⁸ Ryan and Deci¹⁹ argue that wellbeing includes two aspects of psychological functioning; hedonic which refers to subjective happiness and eudaimonic which focusses on self-actualisation.

Previous studies have consistently demonstrated that negative psychological states such as depression and anxiety and other common mental disorders, have been found to be associated with voice problems in teachers.^{8,20-24} However there is a paucity of studies examining the relationship between wellbeing and voice. Merrill et al²⁵ found a relationship between history of voice problems and emotional wellbeing in adults over 50. Those who reported having had voice problems over their lifetime experienced lower wellbeing than those who had not reported any voice problems. Nusseck et al²⁶ identified a significant association between voice problems and mental health in German school teachers. Teachers who had not experienced a voice problem during their careers had higher mental health than those who had experienced voice problems. Molina et al²⁷ suggested an association between wellbeing and risk of having a voice problem in elementary school teachers in Southern Brazil. They found that teachers who were “champions of abuse” or at “serious risk for vocal problems” as measured by the Vocal Behavior Profile²⁸ had significantly lower wellbeing than teachers who had little or no risk of a voice problem.

Although these studies suggest that there is a relationship between voice symptoms and wellbeing, more research needs to be undertaken. Although negative and positive psychological states are on the same continuum of psychological health, they are not necessarily inversely correlated and need to be investigated separately. Wellbeing is not merely the absence of mental health problems.²⁹ To highlight this, a study by Huppert and Whittington³⁰ suggested some independence between negative and positive psychological states. They found many participants had low scores on both positive and negative wellbeing scales, and individuals in the top quartile of the positive wellbeing measure reported negative psychological symptoms.

Improving wellbeing may help with the prevention and treatment of voice problems. Research suggests that psychological interventions can help treat voice problems. Deary et al³¹ found that voice measures improved after cognitive behavioral therapy carried out by speech and language therapists. Nguyen-Feng et al³² found that incorporating a

web-based psycho education intervention to increase perceived present control (controlling stressful events) led to a decrease in Voice Handicap Index (VHI)³³ scores. Although no research was identified into psychological interventions helping to prevent voice problems, considering the association between wellbeing and voice symptoms, strategies to improve wellbeing may help to reduce prevalence rates of voice problems.

The primary aim of the study was to determine the association between wellbeing and voice symptoms among school teachers in England working in state, independent, mainstream and special schools. The secondary aim was to identify other risk factors associated with voice symptoms. Other factors that were investigated included those that have been shown in the literature to have a possible relationship with voice problems and may be a confounding factor between wellbeing and voice symptoms: age,³⁴ sex,^{7,35,36} subject taught,^{12,37} gastroesophageal reflux,³⁶⁻³⁸ respiratory infection,^{6,7,39} asthma,⁷ smoking status,⁴⁰ years teaching, deprivation of school, vocal training,⁴¹ class size,⁴² number of hours teaching a week, speaking over background noise and talking louder than normal.^{20,36,43}

METHODS

The study used a cross sectional design with a self-administered web-based survey using the web platform Online Surveys (<https://www.onlinesurveys.ac.uk/>). A census approach was taken so that all schools in England were targeted. This approach was used to ensure participants took part from a wide geographical area within England, to make the results as generalisable as possible. Low response rates were expected so that it was deemed appropriate to try and target all schools. Schools were identified using a database provided by an education marketing company. Schools included mainstream state schools, independent fee-paying schools, special schools and Pupil referral units/alternative provision schools, at primary and secondary level. Emails were sent to schools with a link to the questionnaire and asked to distribute them to their teaching staff.

To be eligible to take part in the study teachers had to have a permanent contract with the school they were working at and could teach students from Reception class, up to and including “A” levels. Teachers that were excluded from the study included Nursery and Early years teachers who taught pre reception age and those who taught in further education. Music instrumental teachers and supply teachers were also not eligible to take part. Supply teachers were not included as they have different working patterns to the national population in permanent jobs.⁴⁴ To ensure that only those who were eligible completed the questionnaire, a question was included on the web survey that screened out ineligible participants.

Data was collected between November 7, 2017 and February 18, 2018. Emails to schools were sent out in November 2017 with a reminder email in December 2017. However, due to a low response using this method a more targeted approach to recruiting participants was devised. This included sending out personalised emails to head teachers in the West Midlands and advertising the study on the social media platforms Facebook and Twitter. Teachers from the West Midlands were targeted as Birmingham City University, where the research took place, had specific links with these schools and were able to provide contact details.

The questionnaire was designed according to research in the literature on voice problems and was also informed by large health questionnaires used in the UK such as Health Survey for England and British Cohort Study.^{45,46} It contained items regarding socio-demographics, the teaching environment, vocal behavior, health and lifestyle and wellbeing. Voice symptoms were measured using the Voice Outcome Scale (VoiSS)⁴⁷ (Appendix 1). This is a 30 item self-administered questionnaire that measures how someone perceives their voice, with scores ranging from 0-120, lower scores indicating fewer voice symptoms. The VoiSS was chosen as it has undergone a rigorous development process with voice patients in the UK and has good validity and reliability.⁴⁷⁻⁵⁰ A minor adaptation to the VoiSS were made to make it more appropriate for a teaching population that included participants that did not consider themselves to have a voice problem. Changes to questions 10, 13, 15, 18, 29 and 30 were made. The word “problem” was taken out of the sentences of these questions. So, for example, question 10 in the original VoiSS questionnaire reads: “Do you feel miserable or depressed because of your voice problem”. This became “Do you feel miserable or depressed because of your voice”. This was done to ensure teachers who did not consider themselves to have a voice problem completed the questionnaire. To make sure the adapted questionnaire was valid, once data collection had been carried out, internal consistency was calculated. Cronbach’s Alpha was 0.94 (95%CI 0.94-0.95) indicating a strong internal consistency.

Wellbeing was measured using the Warwick Edinburgh Mental Wellbeing Scale (WEMWBS)⁵¹ (Appendix 2). This is a validated tool which consists of 14 items. It has a five point frequency scale, “none of the time” (1 point), “rarely” (2 points), “some of the time” (3 points), “often” (4 points), “all of the time” (5 points) with a possible range of scores of 14-70, higher scores indicating higher wellbeing. It is a scale that is widely used in health research in the UK and been shown to have good reliability and validity in the UK general population.⁵¹

VoiSS scores and WEMWBS scores were modelled as continuous data in the analysis. Other factors that were treated as continuous data included gastroesophageal reflux, deprivation of school, age (in years), years

teaching and average number of hours teaching in a week. Gastroesophageal reflux was determined using the GerdQ questionnaire, a tool designed to help clinicians diagnose GERD.⁵² It has a score range of 0-18 with higher scores indicating a higher likelihood of GERD. Deprivation of the school was measured using Pupil Premium. Pupil premium refers to the percentage of disadvantaged children in a school for which the school receives extra funding from the UK government. This information was obtained from the Department of Education⁵³ after data collection had taken place. Variables that were treated categorically were sex, asthma diagnosis, subject taught, respiratory infection in the last 30 days, talking louder than normal in the classroom, talking over background noise, voice information or training, and class size.

As part of the development of the questionnaire, the survey was pretested with a subpopulation of teachers. These included a convenience sample of eight teachers across three schools in the city of Birmingham, two primary schools and one secondary school. The aim of this was to make sure that the questions were easy to understand and applicable to the participants. Participants were given the opportunity to provide comments about the questionnaire and suggest amendments. As a result of the pretest, a few minor amendments were made to the questionnaire.

Data analysis was conducted in R version 3.6.2. *P* values of <0.05 were considered to be statistically significant and were reported alongside 95% confidence intervals. Sampling bias was determined via comparison of the respondents and national baselines using a chi-squared analysis. Age categories, sex, ethnicity, type of school and school region of the study population were compared with national figures from the School Workforce Census 2017 in England.⁵⁴ As parallel tests were being carried out a Bonferroni correction was applied to the data. This resulted in a *P* value of ≤ 0.0083 being considered significant for the chi-squared analysis.

To evaluate the association with VoiSS scores and wellbeing a multilevel analysis was undertaken using a random-effects model. The model takes into account school-level effects, as the clustering of teachers within schools may affect VoiSS score outcomes. A two-level model was fitted with teachers being at the first level and schools at the second level.

Ethical approval for the study was granted by the Faculty of Health, Education and Life Sciences at Birmingham City University.

RESULTS

A total of 1205 teachers took part in the study from 648 schools. It is not possible to establish the true response rate of the study. Emails were sent to 24,313 schools. Out of those 23.95% were opened. However, it is not possible to determine how many of these opened emails were then

TABLE 1.
Characteristics of Participants

Variables	All Participants (n = 1205)
Age in years, mean (sd)	38.98 (10.65)
VoiSS total score, median (interquartile range)	20 (11-29)
Warwick Edinburgh Well Being Scale total score, mean (sd)	42.90 (7.85)
Sex, n (%)	
Female	967 (80.25)
Male	233 (19.34)
Prefer not to say	1 (0.08)
Missing data	4 (0.33)
Ethnicity, n (%)	
White	1120 (92.94)
Other ethnicities	64 (5.32)
Prefer not to say	18 (1.49)
Missing data	3 (0.25)
School level, n (%)	
Primary	627 (52.03)
Secondary	578 (47.97)
Type of school, n (%)	
State funded	1141 (94.69)
Independent fee paying	64 (5.31)
Diagnosed with a voice problem, n (%)	
Yes	117 (9.71)
Under investigation	23 (1.91)
No	1065 (88.38)
Voice training, n (%)	
No	825 (68.46)
Yes – professional development	62 (5.14)
Yes – teacher training	276 (23.00)
Yes – teacher training and professional development	41 (3.40)

TABLE 2.
Percentages of Characteristics in the National Population of Teachers and the Study Population

Characteristic	% National Population	% in Study Population	P values of Chi Squared Analysis
Age in years			0.066
Under 25	6	7	
25-29	18	18	
30-34	17	15	
35-39	15	14	
40-44	13	13	
45-49	13	14	
50-54	10	10	
55-59	6	7	
60 and over	2	2	
School level			0.022
Primary school teachers	49	52	
Secondary school teachers	45	44	
Sex			<0.001
Male	25	19	
Female	75	81	
Ethnicity			<0.001
White	91	93	
Other	8	5	
Refused to say	1	2	
School Region			<0.001
East Midlands	8	8	
East of England	11	10	
London	16	4	
North East	5	1	
North West	13	7	
South East	16	11	
South West	10	9	
West Midlands	11	48	
Yorkshire and Humber	10	2	

forwarded on to teaching staff [Table 1](#), outlines participants' characteristics.

After comparing the proportions of teachers in our study and those of the national population it was found that there were no statistically significant differences in age categories or type of school between our population and national figures. [Table 2](#), shows the percentages of our study population and national statistics. After chi squared analysis, statistically significant biases were found towards female and white participants. There was also a bias in school region with a large percentage of participants coming from the West Midlands when compared to national figures.

There was a statistically significant relationship with voice symptoms and well-being when unadjusted and independent of confounding variables (-0.49 95% CI (-0.60, 0.38)) indicating that as wellbeing increased, scores on the VoiSS decreased.

The multilevel model did not meet the normality assumption. However, we did not transform the data. It has been argued that if sample sizes are sufficient, Schmidt and Finan⁵⁵ suggest 10 observations per variable, then violating the assumption of normality will not impact bias and give valid results.⁵⁵ Indeed, bias can occur when using measurement scales designed for clinical use.⁵⁵ A complete case analysis was carried out, so any incomplete data sets were excluded from the analysis. This resulted in 1099 participants data from 625 schools being included in the final model.

The multilevel linear analysis confirmed a statistically significant relationship between VoiSS scores and WEMWBS scores with a 1-point increase in WEMWBS scores corresponding to a 0.31 (95% CI -0.41, -0.20) decrease in VoiSS scores ($P = < 0.001$). Higher voice symptoms were associated with a higher likelihood of Gerd with a 1-point increase in GerdQ scores corresponding with a 1.29 increase in

TABLE 3.
Results of Multilevel Analysis

Characteristic	Coefficient (95% Confidence Interval)	<i>P</i> value
Warwick Edinburgh Mental Well-being	-0.31 (-0.41, -0.20)	<0.001
Hours teach per week	-0.04 (-0.13, 0.06)	0.474
Age	0.10 (0.02, 0.18)	0.015
GerdQ Questionnaire	1.29 (0.87, 1.70)	<0.001
Pupil premium	0.042 (-0.008, 0.09)	0.100
Voice training		
No	Reference	
Yes	-0.995 (-2.76, 0.77)	0.268
Asthma		
No	Reference	
Yes	0.35 (-1.49, 2.20)	0.708
Smoking status		
Every day	Reference	
Never	-0.44 (-5.11, 4.23)	0.853
Occasionally	0.08 (-6.38, 6.54)	0.981
Used to	-1.32 (-6.19, 3.56)	0.596
Sex		
Female	Reference	
Male	-3.48 (-5.59, -1.37)	0.001
Prefer not to say	-23.79 (-50.34, 2.79)	0.079
Speaking over background noise		
Always	Reference	
Most of the time	-0.79 (-4.74, 3.17)	0.697
Sometimes	-3.46 (-7.13, 0.22)	0.065
Never	-5.39 (-9.18, -1.61)	0.005
Talk louder than normal		
Always	Reference	
Most of time	-2.85 (-5.88, 0.19)	0.066
Sometimes	-8.23 (-11.26, -5.20)	<0.001
Never	-11.35 (-15.73, -6.98)	<0.001
Respiratory infection		
No	Reference	
Yes confirmed by doctor	-4.15 (-5.91, -2.39)	<0.001
Yes not confirmed by doctor	6.26 (3.76, 8.77)	<0.001
Subject		
Arts and humanities	Reference	
Primary classroom	-0.35 (-2.66, 1.96)	0.769
Science and maths	-0.88 (-3.57, 1.80)	0.517
Performing arts	0.45 (-3.26, 4.16)	0.811
Social science	-3.74 (-8.30, 0.83)	0.108
PE	0.67 (-4.91, 6.24)	0.814
Other	2.25 (-3.14, 7.65)	0.412
Class size		
29 and over	Reference	
Under 29	-2.21 (-3.99, -0.43)	0.015

VoiSS scores. The relationship between VoiSS and age was statistically significant, although modestly so, with a 1 year of age increase corresponding to a 0.1-point increase in VoiSS scores ($P = 0.015$).

Factor variables that showed statistically significant results were sex, speaking over background noise, talking louder than normal, respiratory infection and class size. For example, male teachers had significantly lower VoiSS scores than females ($P = 0.001$), scoring on average 3 points lower (-3.48 95% CI (-5.59, -1.37)). Teachers that reported having a respiratory infection not confirmed by a doctor had VoiSS scores on average 6 points higher than teachers who did not have a respiratory infection ($P = < 0.001$), whereas teachers who reported having their respiratory infection confirmed by a doctor had VoiSS scores on average 4 points lower than teachers without a respiratory infection ($P = < 0.001$). The results of the multilevel analysis are shown in [Table 3](#).

DISCUSSION

In this cross-sectional study, a statistically significant association between voice symptoms and wellbeing was demonstrated. As wellbeing increased, voice symptoms decreased. This finding suggests that positive psychological states such as wellbeing are associated with voice problems. These results are supported by findings of other studies in the literature that found that those who had experienced voice problems had lower emotional wellbeing or mental health than those who had not experienced voice problems.^{25,26} It also agrees with research looking at other positive aspects of psychological health such as quality of life. A study by Santos et al⁵⁶ carried out with teachers in Brazil found those without a current voice problem had a higher quality of life. However, this is the first study in the literature that has investigated the relationship between VoiSS scores and WEMWBS. Further studies are required to support these results.

The VoiSS scores of the participants in our study ranged from 0-96 with a median score of 20 and a mean score of 23. It has been proposed by Behlau et al⁵⁷ and Moreti et al⁵⁸ that the cut off point to diagnose voice disorders on the VoiSS is 16. Although these studies assessed the Brazilian Portuguese versions of the VoiSS, they are likely to be similar for the English version. Therefore, we had on average a dysphonic population of teachers, which is line with studies that have suggested a high prevalence of voice problems amongst teachers.^{1-3,12} The mean WEMWBS score for our participants was 43. This was 7 points lower than the UK general population with a reported WEMWBS score of 51.⁵¹ This suggests that the wellbeing in teachers in England is lower than the general population. This is confirmed by another study with teachers in England which also reported WEMWBS scores lower than the national average.⁵⁹ These figures suggest that interventions targeting the voice and the wellbeing of teachers in England is necessary.

A limitation of the study is its cross-sectional design which means no claims of causal direction between wellbeing and voice symptoms can be made. It may be that

higher wellbeing means that someone is more likely to be relaxed and therefore will not have much tension around their throat and larynx. It has been suggested that anxiety may lead to tension in the intrinsic and extrinsic laryngeal muscles⁶⁰ and stress may cause changes in the autonomic nervous system that result in functional voice problems.⁶¹ On the other hand, having a voice problem may cause a reduction in wellbeing if it affects a person's ability to communicate and take part in their usual activities. For example, Martinez and Cassol⁶² found that those who had voice problems had reduced anxiety and depression scores after speech therapy, indicating that improving voice functioning can also enhance psychological health. However, it is likely that the relationship is bidirectional. A qualitative study by Misono et al⁶³ found that participants' voice problems seemed to coincide with stressful events but those with voice problems also reported experiencing lowered self-worth, stress at work, anxiety and feelings of hopelessness due to their voice. Longitudinal studies would help further explain the relationship between wellbeing and voice symptoms.

Although the association between wellbeing and voice symptoms were statistically significant it is necessary to evaluate the clinical significance of the result. Our results suggest that for every 1 point increase on the WEMWBS there was on average a 0.31 decrease in VoiSS scores. This indicates that in order to decrease voice symptoms by 1 point this would require an approximately 3 point increase in wellbeing scores. If someone was to move 10-15 on the WEMWBS it would lead to someone decreasing their VoiSS scores by about 5 points. Therefore, it would need an individual to increase their wellbeing by a significant amount in order to see a practical difference in VoiSS scores. In intervention programmes to increase wellbeing that used the WEMWBS as an outcome measure, an increase in scores from pre to post intervention of anywhere between 3 and 9 points were regarded as significant increases,⁶⁴⁻⁶⁷ which would only equate to a small decrease in voice symptoms. This clearly indicates that if someone has a severe voice problem, then implementing wellbeing strategies is not going to make a practical difference to the voice. However, if voice symptoms are less severe, for example, around the proposed cut off score for a voice disorder, of 16,^{57,58} then implementing wellbeing strategies may help. Additionally, they may help to help prevent voice problems from occurring.

The secondary aim of the study was to see if there were other factors associated with voice symptoms in order to confirm findings from other studies. Our research suggested that independent factors contributing to VoiSS scores were GERD, age, sex, class size, vocal effort and respiratory infections. We found an association between voice symptoms and GERD with higher scores on the VoiSS associated with higher scores on the GerdQ. Reflux is widely considered to be a risk factor for voice problems and is often seen in patients with voice problems.⁶⁸ The result of our study is

also reflected in other studies in the literature. Charn and Mok³⁷ and Sampaio et al³⁶ found a significant association between current voice problems in teachers and reflux, and a study by Devadas et al³⁸ with teachers in India suggested that there was a significant relationship between lifetime voice problems and acid reflux.

The association between age and voice symptoms was not very strong and indeed the result may not be clinically significant. This is reflected in the literature where there is inconclusive evidence of a relationship between age and voice problems in teachers. A study by Smith et al⁶⁹ suggested that the number of voice symptoms in teachers did increase with age, although some studies have found that younger age groups are more at risk.^{8,21} Some studies with teachers, however, have found no association between age and voice problems.^{6,39,70} Biological research has found that age does result in structural changes in the vocal apparatus that may make someone more at risk at having a voice problem.³⁴ Therefore, it may be that teachers with voice problems leave the profession early or those that stay in the profession have adopted techniques to help preserve their voices.

As expected, our study found that female teachers had statistically significantly more voice symptoms than male teachers. This corroborates findings from other studies in the literature where female teachers had significantly greater risk of having a current or recent voice disorder than male teachers.^{7,35,36} In this study, teachers who taught in class sizes of 29 and over had significantly higher VoiSS scores than teachers with fewer students in the classroom. A Brazilian study found that there was a greater prevalence of voice problems in teachers who had more than 28 students in the classroom.⁴² However, the majority of studies have found no association between class size and current voice problems.^{6,20,22} Perhaps in some countries the teaching style and school environment may require less vocal effort for larger class sizes.

In our study respiratory infections were found to be associated with voice symptoms. This has also been found in other risk factor studies with teachers.^{6,7,39} In our study, as expected those with a respiratory infection that had not been confirmed by a doctor had more voice symptoms than those with no respiratory infection. However, a surprising result was that teachers who had had a respiratory infection confirmed by a doctor had fewer vocal symptoms than those who had no respiratory infection. As far as we have identified there are no other studies in the literature that have reported this result. It may be that teachers who go to the doctor may have improved vocal functioning due to the treatment they received, although this would not in itself account for the fact their voice symptoms are significantly less than those without respiratory infections. It may be that the type of people who go to the doctor for their respiratory infection may take better care of their health in general including vocal health.

A significant association was found between voice symptoms and speaking against background noise and

speaking louder than normal. Our finding is in agreement with many studies in the literature which have found an association with voice problems and “talking a lot or excessively”,⁴³ raised voice while teaching,⁶ speaking frequently against background noise⁷ and professional vocal effort of teachers (years worked multiplied by weekly workload).³⁶

We found no association between voice symptoms and voice training, subject taught, asthma, smoking status, hours teaching per week and deprivation of school. This is not evidence that associations do not exist but that they did not occur in this data set. For example, in the case of smoking status and subject taught there may not have been enough participants in our sample to detect a difference. Only 3% of our participants reported smoking every day. Additionally, physical education teachers and performing arts teachers who are considered to be more at risk for voice problems than teachers of other subjects,^{12,37} only accounted for 2% and 6% respectively of our sample.

It is perhaps surprising that voice training was not found to be related to VoiSS scores. Studies that have investigated the voice outcomes of teachers after a course of voice training have found improvements in voice measures compared to teachers who did not receive the training.^{41,71} However our results are in agreement with another cross sectional study.⁵ It may be that teachers in our study did not have the opportunity to carry out recommendations in the school setting. Additionally, there may be selection bias in those that seek voice training. Teachers prone to voice problems may be more likely to undertake voice training than those with healthy voices. These teachers may have a higher baseline score than those with healthy voices who do not undertake training, even if their voices have improved due to the training.

This study has a number of limitations. It was not possible to accurately determine the response rate of our sample as it was not known how many teachers had received the request to take part in the study or read about it on social media. Therefore, our sample may be prone to selection bias that could limit generalisability. For example, there may be differences in the schools that decided to distribute the surveys to their teaching staff and those who did not. There are also particular biases about recruiting on social media which need to be considered. Research suggests that those who respond to social media in particular Twitter are more likely to be white, female and under 45.⁷² Despite this potential bias, using social media allowed us to reach teachers who had not received the questionnaire from their head teachers or administrators. Unfortunately, due to the nature of the research it is not

possible to gather information on the characteristics of non-participating schools and teachers. In order to see if our participants were representative of all teachers in England, we compared characteristics of our population with those of the national teaching population. Representation of the total population was not achieved. Although, school level and age were representative of the population, biases were found for gender, ethnicity and school region. Female participants in our study were proportionally higher than the national population of teachers. This is unsurprising as research suggests that women are more likely to take part in online questionnaires than men.⁷³ However, although there were 19% of men in our study compared to 25% in the national population, there should be enough male participants for the results to be generalisable. Additionally, with ethnicity there was only a 2% difference between national figures and our study. Although there was a bias towards teachers in the region for the West Midlands, percentages between our population and national figures were comparable for the South West, East Midlands and East of England.

CONCLUSION

This is the first study to find an association between the VoiSS and the WEMWBS among primary and secondary school teachers. However more studies investigating the association between wellbeing and voice problems are needed to improve our understanding of this relationship. Although a statistically significant relationship was found between wellbeing and voice problems, the clinical significance is more limited. Using wellbeing strategies may only be helpful for those with mild voice problems or for the prevention of voice problems. Other factors were also found to be associated with voice symptoms including GERD, sex, vocal effort, class size and age. It is hoped that the results from this study will help inform treatment strategies and education policies to help reduce vocal symptoms amongst teachers and identify those most at risk.

DATA STATEMENT

Data is unavailable as it is confidential.

CONFLICT OF INTEREST

None.

Acknowledgments

The authors would like to thank Dr Kate Thomson for providing writing assistance for this article and Christina Easter

APPENDIX 1

Voice Symptom Scale (VoiSS) (adapted version)

Please answer all the following questions as best you can. Even if there is no perfect response, please select the one that applies to you best. When answering these questions think about how your voice has been in all areas of your life over the last 30 days.

	Never	Occasionally	Some of the Time	Most of the time	Always
1. Do you have difficulty attracting attention?	0	1	2	3	4
2. Do you have problems singing?	0	1	2	3	4
3. Is your throat sore?	0	1	2	3	4
4. Is your voice hoarse?	0	1	2	3	4
5. When talking in company do people fail to hear you?	0	1	2	3	4
6. Do you lose your voice?	0	1	2	3	4
7. Do you cough or clear your throat?	0	1	2	3	4
8. Do you have a weak voice?	0	1	2	3	4
9. Do you have problems talking on the telephone?	0	1	2	3	4
10. Do you feel miserable or depressed because of your voice?	0	1	2	3	4
11. Does it feel as if there is something stuck in your throat?	0	1	2	3	4
12. Do you have swollen glands?	0	1	2	3	4
13. Are you embarrassed by your voice?	0	1	2	3	4
14. Do you find the effort of speaking tiring?	0	1	2	3	4
15. Does your voice make you feel stressed and nervous?	0	1	2	3	4
16. Do you have difficulty competing against background noise?	0	1	2	3	4
17. Are you unable to shout or raise your voice?	0	1	2	3	4
18. Does your voice put a strain on your family and friends?	0	1	2	3	4
19. Do you have a lot of phlegm in your throat?	0	1	2	3	4
20. Does the sound of your voice vary throughout the day?	0	1	2	3	4
21. Do people seem irritated by your voice?	0	1	2	3	4
22. Do you have a blocked nose?	0	1	2	3	4
23. Do people ask what is wrong with your voice?	0	1	2	3	4
24. Does your voice sound creaky and dry?	0	1	2	3	4
25. Do you feel you have to strain to produce voice?	0	1	2	3	4
26. How often do you get throat infections?	0	1	2	3	4
27. Does your voice "give out" in the middle of speaking?	0	1	2	3	4
28. Does your voice make you feel incompetent?	0	1	2	3	4
29. Are you ashamed of your voice?	0	1	2	3	4
30. Do you feel lonely because of your voice?	0	1	2	3	4

APPENDIX 2

Warwick Edinburgh Mental Wellbeing Scale (WEMWBS)

Below are some statements about thoughts and feelings. Please mark the box that best describes your experience of each over the last 2 weeks.

Statements	None of the time	Rarely	Some of the time	Often	All of the time
1. I've been feeling optimistic about the future	1	2	3	4	5
2. I've been feeling useful	1	2	3	4	5
3. I've been feeling relaxed	1	2	3	4	5
4. I've been feeling interested in other people	1	2	3	4	5
5. I've had energy to spare	1	2	3	4	5
6. I've been dealing with problems well	1	2	3	4	5
7. I've been thinking clearly	1	2	3	4	5
8. I've been feeling good about myself	1	2	3	4	5
9. I've been feeling close to other people	1	2	3	4	5
10. I've been feeling confident	1	2	3	4	5
11. I've been able to make up my own mind about things	1	2	3	4	5
12. I've been feeling loved	1	2	3	4	5
13. I've been interested in new things	1	2	3	4	5
14. I've been feeling cheerful	1	2	3	4	5

for providing statistical support. Many thanks also to all the participants who agreed to take part in the study.

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