PEDAGOGY

The Prevalence and Impact of Voice Problems Among Physical Education Teachers

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Abstract

The focus of this research effort was to examine the prevalence and impact of voice problems among a sample of physical education teachers. The survey was administered to K–12 physical education teachers (n = 199) addressing three aspects of voice issues: consequences, strategies for prevention, and potential risk factors. The results indicated a strong prevalence and impact of voice problems for almost all physical education teachers surveyed regardless of grade level taught, age, or gender. Findings indicate an immediate need for physical education teachers and administrators to determine the most appropriate, cost-effective procedures that can reduce voice problems for those in this at-risk occupation.

Classroom teachers have long known about the vocal challenges and risks presented by their teaching settings (Fritzell, 1996; Munier & Kinsella, 2008). Teachers are among the most frequent occupational groups that seek medical advice for issues associated with voice injury and overuse, which is considered to be one of the major occupational hazards of teaching (Roy, Merrill, Thibeault, Gray, & Smith, 2004; Williams, 2003). Voice problems include difficulties in phonation, physical pain or sensation, and/or deviant voice qualities

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related to voice use (Gotaas & Starr, 1993; Roy, Merrill, Thibeault, Gray, et al., 2004; Roy, Merrill, Thibeault, Parsa, Gray, & Smith, 2004; Sapir, Keidar, & Mathers-Schmidt, 1993). These occupational hazards affect their attendance, job performance, and future career choices (Roy, Merrill, Thibeault, Gray, et al., 2004). Goldberger and Gerney (1990) suggested that for students to learn more they need to be engaged at a high level and successful at an appropriate task for an adequate amount of time to produce learning. Engaging students at a level of success can be very difficult if the teacher's primary mode of communication is absent or strained. Therefore, due to the common occurrence of voice problems in teachers, there should be concern that various types of voice problems may significantly impact teacher effectiveness (Smith, Lemke, Taylor, Kirchner, & Hoffman, 1998).

Feldman Studies have shown that 11% to 89% of teachers have reportedly experienced a variety of vocal symptoms such as dysphonia, vocal fatigue, increased phonation effort, sore throat, tightness, and dry throat (Roy, Merrill, Thibeault, Parsa, et al., 2004; Yiu, 2002). These conditions are due to teachers spending long periods of time talking loudly in loud environments and in challenging situations (Anderson, 2004; Tung, 2000). Smith, Lemke, et al. (1998) found that increased speech output has been shown to lead to voice problems in teachers. The study reported that 20% of the teachers had missed work due to a voice problem and 32% reported sporadic voice fatigue. A similar study of over 1,000 teachers found that almost 21% had a pathological voice condition (Urrutikoetzea, Ispizua, & Matellanes, 1995). The higher incidence of vocal-strain symptoms experienced by teachers (67%) compared with nonteachers (33%), regardless of age, suggests that teachers are at elevated risk for vocal abuse (Smith, Gray, Dove, Kirchner, & Heras, 1997). In addition, the caseload of teachers at voice clinics is significant; in one study they represented 15% of those attending voice clinics (Bufton, 2000). A study in the United Kingdom reported teachers with voice issues make up 34% of the caseloads of speech therapists (Comins, 1995). The majority of teachers had problems arising from persistent abuse and misuse of their voices and stress. Thirty-one percent of the teachers had suffered harm to the vocal folds. Russell, Oates, and Greenwood (1998) found that 20% of teachers reported voice problems during the teaching year, and more recently, Roy, Merrill, Thibeault, Parsa, et al. (2004) found that voice disorders were reported by 57% of teachers studied.

While typical classroom teachers are faced with many voice concerns, gymnasiums with poor acoustics, covered areas, and outdoor teaching environments can be more challenging to the voices of physical education teachers. They often rely on shouting instructions over noises and hope their students will hear and understand. The complexity of the physical education environment (Ryan, 2009a), acoustic issues in physical education settings (Ryan, 2009a; Ryan, Grube, & Mokgwati, 2010; Ryan & Mendel, 2010), classroom management problems (Ryan, 2009b; Ryan, Ormond, Imwold, & Rotunda, 2002; Ryan & Yerg, 2001), and the findings from voice research in classrooms strongly suggest the need to identify specific types of voice problems among physical education teachers.

Despite the evidence that supports the ongoing voice problems found in classroom teachers, to date little research has attempted to focus on voice issues among physical education teachers (Ryan & Mendel, 2010). Information on how to reduce the causes of voice issues or to diminish their effects are commonly considered to be constructive for helping teachers avoid and manage voice problems (Mattiske, Oates, & Greenwood, 1998). Voice data will also provide information to occupational health and safety organizations that will allow them to better address the problem (Russell et al., 1998). Therefore, the focus of this research effort was to examine the prevalence and impact of voice problems among a sample of physical education teachers, to compare these results with findings from previous studies, and to provide suggestions based on this body of work.

Methods

Participants

The participants were 199 K–12 physical education teachers located at public schools from five school districts in south, central, and northwest Florida. Three of the school districts were primarily urban, while two were primarily rural settings. The online survey was made available through Survey Monkey. Participants did not receive any compensation or incentives to participate. Prior to data collection, the Institutional Review Board approved the project and informed consent was obtained from all participants.

Survey Design

The survey used in this investigation consisted of 28 questions that were modified from the Roy, Merrill, Thibeault, Parsa, et al. (2004) voice disorder study. The survey addressed three components of this phenomenon in addition to frequency of occurrence: consequences of voice problems, strategies for prevention of problems, and potential risk factors. Specific voice-related questions were asked to clarify instructional activities that may be associated with an increase in voice problems. If a respondent indicated existing problems, questions were asked about their perception of severity and number of days they were affected, recovery time, number of work days missed, number of days of limited teaching activities, and voice-related health care visits. Gender, age, teaching experience, physical education setting, and pedagogical strategies related to voice issues were also included in the survey. The Pearson chi-square test was used to examine the existence of a statistical association with respect to grade level taught, gender, and age. Specific hypotheses based on these demographics were not posited.

Results

Of the 199 participants who completed the survey, the distribution into age groups is reported in Table 1. Forty-three percent (n = 86) of the subjects were males, while 57% (n = 113) were females. About 50.3% (n = 100) taught in elementary schools while 49.7% (n = 99) taught in middle and high schools. The mean number of years of teaching experience of the sample was 15.5 (*SD* = 10.35).

Potential risk factors. The average number of instruction hours per day reported by these physical education teachers was 5.9, and 48% of the teachers surveyed usually coached a sport after school as well. Secondary teachers were more likely to coach a sport after school than elementary school physical education teachers (x^2 ^2 = 38.73; df = 1; $p < 0.01$). The majority of respondents reported that they most often teach in outside settings (79.4%) compared to the gymnasium (11.1%), covered area (5.5%), or classroom (4.0%). The majority of teachers surveyed (58.8%) ranked the outside teaching setting as very stressful on their voice and the classroom setting as having little stress (50.6%). The frequency of perceived stress on teacher voice by setting can be seen in Table 2. Almost all of the teachers surveyed (94%) reported that they have to project their

Table 1

Demographic Characteristics of Participants (N = 199)

Characteristic	n	%
Age at time of survey (years)		
21-27	16	8.0
28-34	35	17.5
35-41	38	19.0
42-48	45	22.6
49-55	42	21.1
Over 55	23	11.5
Gender		
Males	86	43.0
Female	114	57.0
Grade Taught		
Elementary	99	50.3
Secondary	100	49.7

Table 2

Frequency of Stress on Physical Education Teacher's Voice for Each Teaching Settings

	Very Stressful		Stressful		Little Stress		No stress	
Setting	%	n	%	n	%	n	%	n
Gymnasuim	13.8%	(20)	46.2%	(67)	30.3%	(44)	9.7%	(14)
Covered Area	11.7%	(17)	46.2%	(67)	31.0%	(45)	11.0%	(16)
Outside	53.8%	(105)	28.7%	(56)	14.4%	(28)	3.1%	(6)
Classroom	2.4%	(4)	13.3%	(22)	50.6%	(84)	34.3%	(57)

voice (distal feedback) at great distance to do their job, while 60.3% of the teachers reported that they talk and instruct constantly (see Table 3).

Consequences. Thirty-five percent of the teachers reported that they suffer from a sore throat or voice strain related to their job once or twice annually (see Figure 1), and 38.2% reported that it takes two days to recover from a sore throat or voice strain, while 43% reported that they need three or more days to recover (see Figure 2). Forty-six percent of the teachers surveyed reported they completely lost their voice due to overuse, and over the past 3 years they averaged 12.4 days when their voice was a problem because it did not function as it usually does or as they would like. In addition, elementary physical education teachers are more likely to completely lose their voice through overuse than secondary teachers ($x^2 = 3.98$, $df = 1$; $p < 0.05$). Females were more likely to lose their voice than men ($x^2 = 8.93$; $df = 1$; $p < 0.01$), and teachers had to decrease activities or interactions because of voice problems an average of 11.6 days over the past 3 years.

When asked if they had visited a doctor as a result of a voice issue, 25.3% of the teachers reported doing so while 9.8% were diagnosed with vocal nodules or polyps. Females were also more likely ($x^2 = 7.34$; $df = 1$; $p < 0.05$) to have been diagnosed with vocal cord nodules or polyps than men. Over the past 3 years from January 2007 to January 2010, 82.4% of the teachers had missed school due to a voice-related illness while 83.2% chose to work regardless of a sore throat, vocal strain, or any other voice-related issue. Seventy-seven percent of the teachers chose not to seek medical treatment when suffering from a sore throat, vocal strain, or other voice-related problem. The percentage of teachers that have had a sore throat (not related to a cold) or voice strain related to their job was 81.6%, while 85.8% reported that they have known other physical education teachers that have experienced a sore throat (not related to a cold) or voice strain related to their job. The most common current voice symptoms were hoarseness (34.6%) and voice fatigue or change quality (34.5%), while 89% of the teachers reported trouble speaking in the past (see Table 4). If any of the voice symptoms listed on Table 3 were reported by the teachers, 85.3% of those respondents reported a belief that the symptom(s) occurred as a result of their teaching job.

Table 3

Frequency of Physical Education Voice Behaviors During an Average Teaching Day

	Constantly		Often		Occasionally		Rarely		Never	
Voice Behaviors	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**
Talk	60.3%	(117)	37.6%	(73)	2.1%	(4)	0.0%	(0)	0.0%	(0)
Talk quietly	2.2%	(4)	22.7%	(41)	42.5%	(77)	29.3%	(53)	3.9%	(7)
Talk loudly	28.6%	(54)	57.1%	(108)	13.8%	(26)	0.5%	(1)	0.0%	(0)
Shout, yell, or cheer	19.6%	(38)	47.9%	(93)	27.8%	(54)	4.1%	(8)	0.5%	(1)
Clear your throat	11.3%	(21)	30.1%	(56)	39.8%	(74)	16.1%	(30)	2.7%	(5)
Laugh	13.4%	(26)	57.2%	(111)	27.8%	(54)	1.5%	(3)	0.5%	(1)
Cough	2.7%	(5)	16.8%	(31)	49.2%	(91)	29.7%	(55)	1.6%	(3)

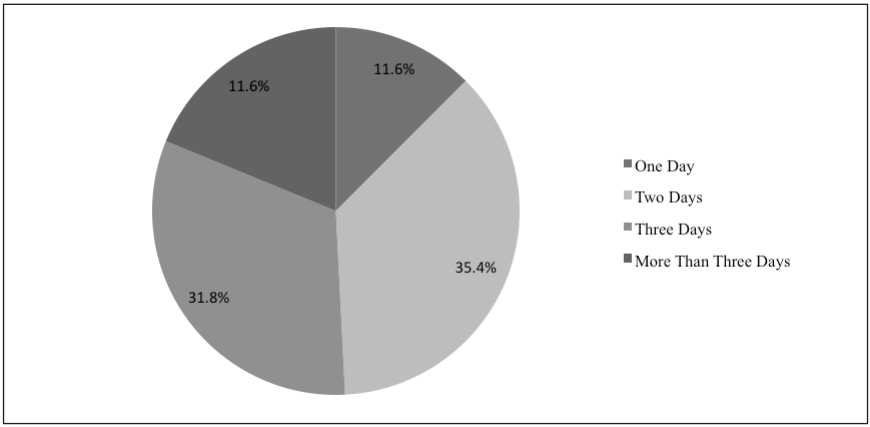

Figure 1. Frequency of Times Annually That Physical Education Teachers Suffer From a Sore Throat or Voice Strain That Is Related to Their Job

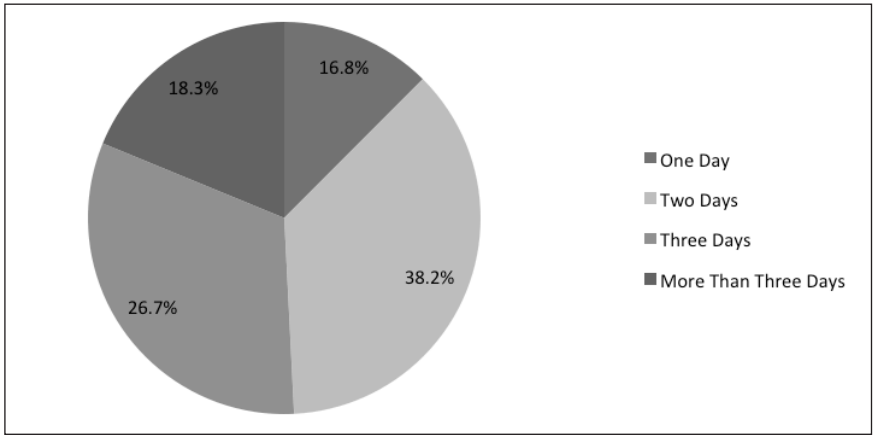

Figure 2. Average Number of Days It Takes Physical Education Teachers to Recover From a Sore Throat or Voice Strain

Strategies for prevention. Almost half of the teachers surveyed (51.8%) reported that they have used a sound amplification device (e.g., public address system) to help them teach, while 64.1% used team teaching as a method for resting their voice. Only 2.0% received any type of voice-related training as part of their teacher training. Elementary teachers were significantly more likely to use a sound field amplification device than secondary physical education

teachers (x^2^2 = 10.56, df = 1; $p < 0.01$). A significant relationship was also found between grade level taught and use of team teaching with elementary physical education teachers more likely to use team teaching as a method of resting their voice than secondary teachers (x^2^2 = 9.318; df = 1; $p < 0.01$).

Table 4

Frequency of Physical Education Teachers That Currently Have or Had Any of the Following Voice Symptoms

Voice Symptom	Current %	Current n	Past %	Past n
Hoarseness	34.8%	(57)	73.8%	(121)
Your voice tires or changes quality after using it for even a short time	34.5%	(51)	69.6%	(103)
Trouble speaking	13.6%	(16)	89.0%	(105)
Difficulty projecting your voice	30.2%	(45)	75.2%	(112)
Discomfort while using your voice	31.8%	(47)	72.3%	(107)

Discussion

The purpose of this study was to examine the prevalence and impact of voice problems in a sample of physical education teachers. The results indicated a high prevalence and negative impacts of voice problems for almost all physical education teachers surveyed regardless of grade level taught, age, or gender. These findings are consistent with classroom research (Roy, Merrill, Thibeault, Parsa, et al., 2004; Russell et al., 1998; Williams, 2003) and several small studies of physical education teachers (Mattiske, 1998; Smith, Lemke, et al., 1998; Verdolini & Ramig, 2001) that also found high levels of voice strain and adverse effects on job performance and attendance. The results suggest that occupational characteristics put these teachers at risk for developing voice problems or disorders. In addition, the possible effects on teacher effectiveness due to teacher voice problems and the likelihood that they may reduce activities as a result of vocal dysfunction (Roy, Merrill, Thibeault, Gray, et

al., 2004) may greatly affect student learning. A simple model of student hearing and understanding indicates that incoming and stored knowledge interact to result in precise speech perception (Crandell, Smaldino & Flexer, 2005). Any alteration of the incoming information or incomplete stored knowledge can weaken a student's ability to learn. Based on this model, any impact on the capability of students to perceive spoken language could negatively affect academic achievement. Morton and Watson (1998) evaluated the effect of disordered voice quality on children's ability to process spoken language and found that they did not score as high on tests when they heard a dysphonic voice compared to a normal voice.

In a study by Ryan et al. (2010), signal-to-noise ratios (SNRs) in physical education teaching settings were found to be significantly lower than national standards and suggest that SNRs in physical education teaching settings are likely detrimental to student learning (Berg, 1993) and possibly stressful on teacher voice.

The findings of this study indicated that the majority of teachers perform in an "outside" teaching setting and rate the setting as *very stressful*. Outdoor areas are often subjected to road traffic, airplanes, area construction, lawn maintenance, school air conditioners, other physical education classes, recess activities, and wind (Ryan & Mendel, 2010), which may further contribute to the development of voice disorders. Physical education settings have been viewed as "hostile listening environments" (Ryan & Mendel, 2010) and have the potential to obscure an already distorted voice signal (Roy, Merrill, Thibeault, Parsa, et al., 2004). Physical education teachers often have to project their voices at great distances (Ryan & Yerg, 2001), which has been shown to cause significant voice problems (Smith, Kirchner, et al., 1998). In addition, teachers negatively affected by poor classroom acoustics have to make vocal adjustments in order to project their voices and maintain classroom control (Ray, 1987). Research studying vocal behavior has also revealed that teachers who speak too long and too loud are prone to voice disorders (Gotass & Starr, 1993; Masuda, Ikeda, Manako, & Komiyama, 1993).

Elementary teachers were more likely to lose their voice to overuse when compared to secondary physical education teachers, which is similar to findings reported by Smith, Kirchner, et al., (1998). Most elementary school physical education classes in Florida are held outside due to a lack of gymnasiums, which is considered to be a more stressful environment compared to indoor

settings. In addition, most elementary physical education teachers are grouped together outside, which may explain why they are more likely to use team teaching as a method of resting their voices. Elementary teachers were also more likely to use a sound field amplification device to help them teach as compared to secondary teachers. Over half of the physical teachers have used a sound field amplification device to help them teach, which is in great contrast to the 3% of classroom teachers who reported using an amplification system (Smith, Lemke, et al., 1998). This finding may be due to the greater challenges facing physical education teachers and their need to adapt to very different instructional conditions. In addition, there is an increasing body of research and information relating to the use and effectiveness of sound amplification in classrooms and in physical education settings (Arnold & Canning, 1999; Crandell, Smaldino, & Flexer, 1995; Flexer, Richards, Buie, & Brandy, 1994; Mendel, Roberts, & Walton, 2003; Ryan et al., 2002). For example, Ryan et al. (2002) found that a PA system used by the teacher in a physical education setting helped to reduce off-task behavior in elementary students and reduced management time at the beginning of class (Ryan, 2009b).

Female teachers in this study were also more likely to report voice problems during their teaching careers than male teachers, which is consistent with prior research (Roy, Merrill, Thibeault, Parsa, et al., 2004; Russell et al., 1998). Female teachers also have been reported to seek out medical treatment for voice disorders at an elevated rate, but this behavior may be attributed to the higher rate of medical care use routinely found among women (Smith, Kirchner, et al., 1998).

The relatively low number of physical education teachers in our sample who sought help with voice-related issues, in spite of the high percentage of teachers reporting voice problems, was consistent with other findings for American and Australian teachers (Roy, Merrill, Thibeault, Parsa, et al., 2004; Russell et al., 1998; Sapir, Keidar, & Mathers-Schmidt, 1993). Russell et al. (1998) stated that teachers view voice problems as occupational hazards and may not be conscious of the help available to them. Roy, Merrill, Thibeault, Parsa, et al. (2004) also suggested that this may be because teachers were cautious about taking time off from work for medical appointments or that they fear physician suggestions that they decrease voice use or change occupations.

Further research is required to understand what factors contribute to these voice problems (e.g., hydration, voice use patterns, class size, class activity) and the effects of vocal training in mitigating harm. The results of this study suggest that physical education teachers' voice problems are a serious health issue that may also affect student learning, making the case for prevention and early intervention programs. Due to lost workdays, use of sick benefits, replacement costs for substitute teachers, and treatment expenses, Verdolini and Ramig (2001) estimated the public costs in the United States alone to be $2.5 billion annually for teachers. Research has identified numerous effective treatment alternatives for teachers with voice disorders, including voice amplification, vocal function exercises, and resonance voice therapy (Roy, Weinrich, Gray, Tanner, Stemple, et al., 2003; Roy, Weinrich, Gray, Tanner, Walker-Toledo, et al., 2002). In addition, vocal training should be instituted as part of teacher education programs. The services of a school speech pathologist could help in decreasing these undesirable vocal outcomes. The results of this study clearly indicate that education, prevention, and treatment programs need to be developed and assessed in order to reduce the occurrence of undesirable voice conditions related to the high-risk profession of teaching physical education.

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