Vocal Problems in Sports and Fitness Instructors: A Study of Prevalence, Risk Factors, and Need for Prevention in France

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Summary: Objectives. Sports and fitness instructors (SFIs) are known for being a high-risk population for voice difficulties (VD). However, past studies have encountered various methodological difficulties in determining prevalence and risk factors for VD in SFIs, such as limited population, gender and selection biases, or poor statistical power, because VD were studied as a binary variable. The present research work addresses these issues and aims at studying the prevalence of vocal problems and risk factors in French SFIs, a population in which no such study was conducted yet. Another objective is to survey the French SFIs' habits and expectations regarding vocal prevention and care.
Study design. This is a cross-sectional study.
Methods. Three hundred and twenty SFIs answered a questionnaire, whether in an online (n = 267) or a paper (n = 53) version. The questionnaire consisted of 31 items addressing self-reported vocal difficulties, supposed risk factors, and personal health-care history, followed by the Voice Handicap Index assessment.
Results. Prevalence of self-reported vocal difficulties is 55%. The Voice Handicap Index is significantly associated with gender, age, and variables related to work environment (noise and music) and habits (shouting, frequency of classes), as well as with daily sleeping time. Results also indicate that a minority of the SFIs (37%) received information on vocal difficulties, whereas a majority (80%) declares being interested in participating in prevention programs.
Conclusions. This work confirms that SFIs are a high-risk population for VD, underlines the need for specific information programs in France, and provides relevant data for driving such preventive actions.
Key Words: sports and fitness instructors–prevalence of vocal problems–risk factors–Voice Handicap Index–professional voice use.

INTRODUCTION

The demand for sports and fitness training has largely increased in western countries since the beginning of the 21st century. More than 260,000 instructors were reported by the United States Department of Labor in 2012. European countries have experienced the same trend: in France, 10,000 fitness centers were accounted for in 2013 by the Ministry of Youth Affairs and Sports.

Several studies suggested that sports and fitness instructors (SFIs) are more likely than the general population to experience voice difficulties (VD).[1–5] More specifically, it is hypothesized that these difficulties are caused by a complex conglomerate of physiological, psychological, and environmental factors.[5] The heavy vocal loading required to give instructions to class participants and to stimulate them lays on top of these factors. Nevertheless, in comparison with other professionals who also cope with a high level of vocal loading such as school teachers, SFIs may experience additional risk factors related to their work environment. SFIs often give instructions while performing exercises for demonstration purposes, and this combination of vocal and physical efforts can lead to forceful glottic closure.[6]

Also, SFIs frequently deal with poor acoustic conditions by teaching in reverberating rooms or with the presence of loud music or other competing noises such as participants' voices and noise induced by fitness machines. This may increase their vocal effort, as explained by the Lombard effect.[7] Finally, other elements into SFIs' environment might increase their vocal risks, such as the use of air-conditioning or the presence of chlorine when working in aquatic environments.[8,9]

These numerous factors related to SFIs' professional practice need to be added to the list of other known variables influencing the occurrence of VD, such as demographic, health, and vocal hygiene factors. Given the number of variables at stake, the earliest studies about prevalence of VD in SFIs and associated professional risk factors dealt with rather limited populations, with up to 63 SFIs.[1–4] Moreover, these studies often showed a strong gender bias toward female participants, which is known to be an important risk factor for VD.[10]

To address these limitations, Rumbach conducted a study in 361 group fitness instructors and identified several risk factors directly linked to their profession.[5] However, as the author stated, because the study was done using a self-reporting questionnaire distributed through social networks, a selection bias might have occurred. Instructors with voice disorders may indeed be more likely to answer a questionnaire addressing this specific issue, which would lead to an overestimation of the prevalence of voice problems.

Also, to the best of our knowledge, no study has yet been conducted using a precise quantitative index such as the Voice Handicap Index (VHI)[11] to address voice problems in SFIs. On a statistical point of view, a continuous dependent variable such

as the VHI would allow for a more precise analysis of the effects of each risk factor.

The present research work aims at studying the prevalence of voice problems—as reported by a questionnaire including the VHI assessment—and the influence of associated risk factors in French SFIs, a population in which no such study was conducted yet. The need for research in France is all the more important because to date there is not any French national health program designed to raise awareness of vocal risks among SFIs. To better understand what is at stake, a last objective of the present study is to survey the SFIs' habits and expectations regarding vocal prevention and care.

METHODS

Participants

Three hundred and twenty SFIs (140 men and 180 women) participated in this study. Their age ranged from 18 years old to 65 years old (mean = 31; SD = 7.7). All of them were working as SFI in France and benefited from 6 months up to 35 years of teaching experience.

Data collection

Two hundred and sixty-seven participants were recruited *via* social networks or *via* emails. As the number of SFIs who were contacted by these means is likely to be larger than the actual number of SFIs who answered the questionnaire, a selection bias could have occurred. To address this issue, 53 additional participants were directly recruited in sports and fitness centers; in this last case, all the SFIs working in the centers were asked to answer the questionnaire. Participants' recruitment took place during February and March 2015. The 267 participants contacted by electronic means filled in a questionnaire online, whereas the 53 additional participants completed a paper version of the same questionnaire.

The questionnaire consisted of 31 questions for which an English translation is given in the Appendix, followed by the 30 questions of the VHI in its French translation.[11,12] The first 31 questions were grouped in six different sections, among which five sections were related to the study of vocal risk factors, and the last one related to vocal health prevention and care history:

- demographics
- teaching experience and habits
- teaching environment
- vocal habits
- lifestyle and vocal hygiene
- history with vocal difficulties and related health care.

RESULTS

Preliminary analysis: Selection bias

The first analysis consisted in determining if there was a significant difference between VHI obtained by the SFIs contacted *via* electronic means and VHI obtained by SFIs who were directly contacted in sports and fitness centers.

To this end, a Mann-Whitney *U* test was conducted, with the selection group as the independent variable and VHI as the de-
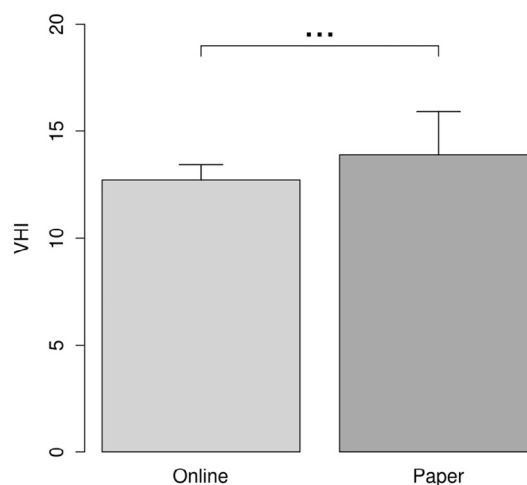

FIGURE 1. Mean VHI for SFIs who completed the questionnaire in its online or paper version. Error bars represent standard errors of the means. ··· means the difference is not significant.

pendent variable. Results indicated that VHI was not significantly different between SFIs recruited by electronic means (Mdn = 158.6) and SFIs directly recruited in sports and fitness centers (Mdn = 170.1, U = 6564, P = .405). As a consequence, data for both groups were combined for subsequent statistical analyses (Figure 1).

Prevalence of VD in French SFI

One hundred and seventy-five SFIs (54.7%) reported experiencing VD such as sore throat or vocal losses without any connection to Ear, Nose and Throat (ENT) illnesses. Mean VHI for all SFIs was 12.9 (Min = 0; Max = 80; SD = 13.7). Mean VHI for male SFIs (mean = 10.3; SD = 11.9) was found to be lower than for female SFIs (mean = 14.9; SD = 14.7).

Survey of risk factors

As the present study involves a large number of variables, a principal component analysis (PCA)[13] was first performed to provide a global overview of the data. Then, the relationship between each potential risk factor and VHI was analyzed. In the PCA (Figure 2), VHI was considered as a supplementary variable. In such a graphical representation, the nature of the correlation between two variables can be visualized through the angles between two vectors: if the angle is sharp, the correlation is positive; if the angle is obtuse, the correlation is negative; and if the angle is right, the correlation is null.

So, one can observe a rather obvious positive correlation between *Exp.* (years of teaching experience) and *Age*, and a negative correlation between *Spks_norm.* (Speaks normally*)* and *Shouts.* For a better readability, an interactive three-dimensional graphic representing the variable positions in the three first dimensions resulting from the PCA is available on the following website: https://www.irit.fr/recherches/SAMOVA/FONTAN/pca3D.html

The relationships between VHI (dependent variable) and the variables associated with supposed risk factors are assessed differently depending on the nature of each independent variable