MJMR, Vol. 33, No. 1, 2022, pages (19-23).

Open Access
ISSN:2682-4558

Research Article

The effect of sport performance in voice disorders in athletes

Zienab khalaf[1], Effat Zaky[1], Samar Abd El Fatah[1], Wafaa Helmy Abd El-hakeem[1] and Marowa Abd El Wahab[1]

[1]Department of Otolaryngology, Phoniatrics unit, Faculty of Medicine, Minia University, Minia, Egypt.

DOI: 10.21608/mjmr.2022.255598

Abstract

Background: It is well recognized that sports and fitness instructors are at a higher risk of experiencing vocal problems. This study aimed to evaluate the correlation between sport performance and voice disorders in athletes. **Methods:** Case-control study was conducted among ninety four athletes of different games 100 individual as control group collected randomly from members not playing any sport game. The study carried out at Phoniatric Unit clinic at Minia University Hospital between September 2020 and November 2021. **Results:** Highly Statistically significant differences were observed between cases group and control group regarding the presence of dysphonia and dysphonia character, as 71.8% of cases suffered from dysphonia compared to 20% in control group. Among cases with dysphonia it was found that 44.8% were grade I and 6% had grade III. About 88% of control had free endoscopic findings compared to 21.3% of cases. It was found that there were statistical significant differences were between study cases and control regarding the total score of Voice Handicap Index**,** its domains**. Conclusion:** Performance of sports (team sports and individual sports) increases the prevalence of voice disorders in athletes.

Keywords: Voice handicapped index, Auditory Perceptual Assessment, Sport and Fitness Instructors, Harmonic to noise ratio.

Introduction

Change of voice causes changes in vocal quality, pitch, volume, or effort that make it difficult to communicate in social and professional contexts. It can impair social, emotional, physical, and occupational functioning, which can lower quality of life (Schwartz et al, 2009). It is well established that prolonged exposure to short-term, high-intensity activities that cause damage to the vocal folds, such as shouting and screaming, particularly in environments with loud background noise, can lead to voice problems (Et al., Cielo 2015). It is well recognized that sports and fitness instructors (SFIs) are at a higher risk of experiencing vocal problems. SFIs frequently instruct while demonstrating exercises and the combination of their vocal and physical efforts can result in forceful glottic closure According to Koblick (2002) .

Aim of the study:

This study aimed to evaluate the correlation between sport performance and voice disorders in athletes

Methods

Subjects and Study Design:

A case-control study included ninety four athletes of different games (Team sports as football, handball, basketball and volleyball and individual sports as wrestling, boxing, judo, weightlifting, and sport and fitness instructors) and 100 individual as control group collected randomly from members not playing any sport game. The study was conducted at Minia University Hospital's ENT department and phoniatric unit during the period from September, 2020 to November 2021.

All participants of both groups underwent the following evaluation protocols:

1- A full voice evaluation (Kotby, 1995):
The complete voice evaluation protocol in the Phoniatric Unit including patient interview, auditory perceptual assessment (APA) of voice by the clinician, augmentation and documentation of the glottic picture by direct laryngoscope by Telepack X LED, 8.5 mm 70 rigid laryngoscopes (KARL STORZ endoscope).

2-The Voice Handicap Index VHI:
The V.H.I. was administered in Arabic, and it comprises 30 self-administered questions asking patients to describe their voices and quantify the functional, physical, and emotional effects of voice disorders on a patient's quality of life. All patients filled The Voice Handicap Index VHI because they were literate.

3-Acoustic analyses:
Data was collected in a sound-treated room and analyzed using the Multidimensional Voice Program (MDVP) software for measurement of fundamental frequency, jitter, shimmer and harmonic to noise ratio

Ethical consideration:
Ethical approval was granted by the Ethical Committee of the Faculty of Medicine, Minia University. Before data collection, written informed consents were obtained from patients after supplying comprehensive information about the nature of the study.

Statistical analysis:
The collected data were coded, tabulated, and statistically analyzed using SPSS program (Statistical Package for Social Sciences) software version 24. Descriptive statistics were done for parametric quantitative data by mean, standard deviation and by number and percentage for qualitative data. Independent samples T-test was used to compare between the studied cases and the control individuals. The significance of the result was assessed in the form of p value that was differentiated into (Non-significant when p value > 0.05 and Significant when p value ≤ 0.05).

Results:

There were no statistical significant differences between cases and control as regard demographic data. The mean age of cases was 23.55 ± 5.54, while in control was 31.96 ± 10.27. In athlete 58 (61.7%) were males and 36 (38.3%) were females, while in control group 48 (48%) were males and 52 (52%) were females (table 1)

Highly Statistically significant differences were observed between cases group and control group regarding the presence of dysphonia and dysphonia character, as 71.8% of cases suffered from dysphonia compared to 20% in control group. Among cases with dysphonia it was found that 44.8% were grade I and 6% had grade III (table 2).
Highly Statistically significant differences between study group and control group regarding the endoscopic examination, 88% of control had free endoscopic findings compared to 21.3% of cases (table 3).

It was found that there were statistical significant differences were between study cases and control regarding the total score of Voice Handicap Index**,** its domains **(table 4).**

Table 5 showed highly statistically significant differences between both groups regarding frequency and HNR. And statistically significant differences between both groups regarding Jitter % and shimmer dB

Table (1): Demographic data of cases and control

	Cases (No= 94)	**Control** (no=100)	**P value**
Age (years)	23.55±5.54	31.96±10.27	0.296
Sex Males Females	 58 (61.7%) 36 (38.3%)	 48 (48%) 52 (52%)	0.207
Marital status Single Married	 82 (87.2%) 12 (12.8%)	 57 (57%) 43 (43%)	0.581

Table (2): Comparison between the cases and control as regard of the Dysphonia and its character

	Cases	Control	P value
Dysphonia Present Absent	 67 (71.8%) 27(28.7%)	 20 (20%) 80 (80%)	**< 0.001***
Grade of Dysphonia N (%)			
• Grade 1 • Grade 1-2 • Grade 2 • Grade 3	30 (44.8%) 22 (32.8%) 11 (16.4%) 4 (6.0%)	18 (90%) 2 (10%) 0 (0%) 0 (0%)	**< 0.001***
Character (%)			
• Strained • Leaky • Irregular • Strained and leaky • Strained and irregular • Strained, leaky and irregular	27 (40.3%) 0 (0%) 7 (10.4%) 9 (13.4%) 16 (23.9%) 8 (12%)	5 (25%) 10 (50%) 5 (25%) 0 (0%) 0 (0%) 0 (0%)	**< 0.001***

Table (3): Comparison between the cases and control as regard the Endoscopic finding

Endoscopic finding	Cases	Control	**P- value**
Free	20 (21.3%)	88 (88%)	
Hyperfunctional dysphonia	31 (32.9%)	8 (8%)	
Phonasthenia	3 (3.2%)	4 (4%)	
Ventricular dysphonia	8 (8.5%)	0 (0%)	
Vocal fold nodules	12 (12.9%)	0 (0%)	**< 0.001***
Vocal fold polyp	8 (8.5%)	0 (0%)	
Vocal fold cyst	7 (7.4%)	0 (0%)	
Contact granuloma	2 (2.1%)	0 (0%)	
Reinke's Edema	3 (3.2%)	0 (0%)	

Table (4): Comparison between the cases and control as regard of the Voice Handicap Index (VHI) and its three subscales

	Cases (mean±SD)	**Control** (mean±SD)	**P- value**
VHI Functional	4.72 ± 4.86	0.39 ± 1.004	0.01*
VHI Physical	7.45 ± 8.89	0.07 ± 0.25	0.04*
VHI Emotional	2.87 ± 3.45	0.16 ± 0. 44	0.027*
Total VHI	15.04 ± 16.04	0.62 ± 1.61	0.04*

Table (5): Comparison between the cases and control as regard of the average fundamental frequency ,average Jitter, average Shimmer and average harmonic noise ratio HNR

	Cases (mean±SD)	**Control** (mean±SD)	**P- value**
Average Frequency	139.01 ± 35.5	177.86 ± 59.1	< 0.001*
Average Jitter	1.95 ± 0.699	1.194 ± 1.476	0.005 *
Average shimmer	1.22 ± 0.418	0.987 ± 0.744	0.0037 *
Average HNR	13.02 ± 3.88	15.58 ± 2.79	< 0.001*

Discussion

The individual's voice is necessary for communication. Voice is one of the primary means of thought and idea transmission. Even in players or fitness instructors, the voice serves as the primary means of communication for athletes. For effective playing or training, the voice needs to be clear, strong, and flexible ***(Sylvia et al., 2015).*** In order to establish effective communication and an interactive relationship between coaches (Penteado& da Silva, 2014)

Athletes require an establishing voice that is characterized by strong vocalization, low pitch, and precise enunciation; it should also include a neutral or rigid facial expression, vocal strain, and tension in the neck muscles ***(Pedroza, 2010).*** It has been shown that voice abnormalities in fitness instructors are associated with reduced job satisfaction, emotional distress, and social withdrawal. There is a significant frequency of voice complaints, according to previous studies ***(Rumbach et al., 2015).***

Approximately 44% of professionals report acute or chronic voice changes early in their employment, and over 78% report acute voice changes during or right after training. With the goal of early detection and effective management, this study examined and compared voice problems among athletes and non-athletes).

Regarding dysphonia and its characteristics, there was a statistically significant difference between the two groups: 71.3% of athletes had varying grades of dysphonia (mild to severe) and impaired voice quality. This can be explained by the fact that coaches and players' yelling and screaming, particularly during matches, competitions, or training sessions in loud sport halls or outdoors in environments with high background noise, can cause short-term vocal trauma that can result in more severe functional disorders. This outcome aligned with ***Rumbach's (2015)*** findings.

In terms of endoscopic findings, there was a highly statistically significant difference between the two groups: 31 athletes (32.9%) had hyperfunctional dysphonia, 3 athletes (3.2%) had phonasthenia, 8 athletes (8.5%) had ventricular dysphonia, 12 athletes (12.9%) had vocal fold nodules, 7 athletes (7.4%) had vocal fold cysts, 8 athletes (8.5%) had vocal fold polyps, 2 athletes (2.1%) had Contact granuloma, and 3 athletes (3.2%) had Reinke's edema. This explains why the swelling and inflammation of the vocal folds get more noticeable as the dysphonic voice gets worse. If there isn't an obvious decrease in yelling, fluid will start to accumulate between the layers of the vocal folds, leading to the development of vocal nodules, polyps, edema, and granulomas. This was in line with ***Rumbach's (2013)*** findings about laryngeal pathology in sportsmen.

Regarding the overall VHI and its domains, a statistically significant difference between the two groups was found. We would assume that the differences indicated above resulted from voice problems that are thought to have a major influence on everyday activities. Therefore, the most likely reason for changes in VHI domains and overall VHI is voice abuse and misuse among athletes, even during training or competition. This was in contrast to the findings of ***Davis et al. (2015)***, who found no evidence of statistically significant variations in the VHI domain and total VHI scores. However, this was in agreement with ***(Estes C., 2018).***

Significant differences in frequency and HNR , in jitter percentage and shimmer dB between the two groups were observed. We also hypothesize that the athletes' lower fundamental frequency values are related to their reduced breathing support, which lowers their sub glottal pressure. As a result, this may have contributed to the vocal folds' increased mass and decreased tension, which in turn caused their fundamental frequency values to decrease. It may also indicate that the vocal folds are unable to adjust frequency while speaking. Furthermore, the frequency range may have been later decreased as a result of the vocal folds' irregular vibratory patter

The greater breathiness in the voice resulting from decreased subglottic pressure beneath the vocal folds of athletes was a contributing factor to the higher H/N ratio values, which were also associated with a higher presence of noise in the spectrum**.**

We believe that a combination of physiological and structural alterations in the vocal folds is the cause of the elevated jitter and shimmer. The most likely causes of this alteration are thought to be increases in the bulk of the vocal folds and/or decreases in the rigidity of the cover. While shimmer is believed to be connected to the regularity of vocal fold contact, jitter is suggested to represent the stability of vocal fold vibration. Therefore, it's possible that edema affects how well and consistently the vocal fold edges make contact with each other during phonation, which might affect the shimmer values in athletes.

Conclusion

Because athletes' voices are placed under such great tension, our study's findings indicate that they are a high-risk group of professional voice users. In order to prevent chronic vocal problems and the need for clinical intervention, these findings suggest that this group of professionals needs more proper voice care advice and voice training

References

1. Cielo C.A., Ribeiro V. V. and Hoffmann C. F. (2015): Vocal symptoms of future professional voice users. Revista CEFAC: Atualizacao Cientifica em Fonoaudiologia e Educacao, 2015;17(1), 34-43.

2. Davis k.M., Sandage M.J., Plexico L., David D Pascoe. (2015): The Perception of Benefit of Vocalization on Sport Performance When Producing Maximum Effort, Journal of Voice, 1-6.

3. Estes C., Sadoughi B., Coleman R., D'Angelo D. and Sulica L. (2018): Phonotraumatic Injury in Fitness Instructors: Risk Factors, Diagnoses, and Treatment Methods. Journal of Voice. doi:10.1016/j. jvoice.2018.10.001

4. Koblick, H.M. (2002): Effects of simulta-neous exercise and speech tasks on the perception of effort and vocal measures in aerobic instructors (Doctoral dissertation, University of Central Florida, 2002).

5. Kotby M.N. (1995): The accent method of voice therapy: Singular Publishing Group. San Diego. pp. 1-21

6. Penteado R. Z. and Bernardi da Silva N. (2014): Voice and work conditions of soccer coaches and physical trainers. Disturbios da Comunicacao, 26(4), 790-799.

7. Rumbach A. F. (2013): Vocal problems of group fitness instructors: prevalence of self-reported sensory and auditory-perceptual voice symptoms and the need for preven-tative education and training voice. 2013; 27: 524.e11–524.e21.524.e11–524.e21.

8. Rumbach A, Khan A, Brown M (2015): Voice problems in the fitness industry: Factors associated with chronic hoarseness. In the Speech Lang Pathol.2015;17:441–450

9. Schwartz S. R., Cohen S. M., Dailey S. H., Rosenfeld R. M., Deutsch E. S., Gillespie M.B. and Krouse, H. J. (2009): Clinical Practice Guideline: Hoarseness (Dysphonia) Otolaryngology-head and neck surgery, 141(3), S1-S31.

10. Sylvia H. doe, S. Leao., Jennifer M., Oates, Suzanne C., Purdy, David Scott. and Randall P. Morton. (2015): Voice Problems in New Zealand Teachers: A National Survey Journal of Voice, Vol. 29, No. 5, pp. 645.e1-645.e13.

11. Pedroza P.S., Prado A.P.A. and Macedo K.M.F. (2010): A voz de comando na turma de educação física nas series iniciais de uma escola municipal infantil do município de Jataí (GO). In: Anais IV Congresso Centro-Oeste de Ciências do Esporte. UNICEUB, Brasília (DF), 22 a 25/09/2010. Acesso em: 26/03/2014. Disponível

12. Penteado R. Z. & Bernardi da Silva N. (2014): Voice and work conditions of soccer coaches and physical trainers. Disturbios da Comunicacao, 26(4), 790-799