Oncology
and Radiotherapy©
18(7) 2024: 001-004 • MINI REVIEW ARTICLE

Playing wind instruments and singing as a form of respiratory rehabilitation in pulmonary and neurological diseases

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ABSTRACT

Singing and playing wind instruments as a form of engaging in musical activities is a no foreign practice in human culture. For quite some time music has also been present in medicine as a form of music therapy. In this paper we discuss the use of singing and playing wind instruments in pulmonary rehabilitation. Because of the fact that singing and playing wind instruments share a prominent amount of similarities, such as sound emission mechanism or the respiratory muscles recruitment, we suggest that those two activities' use in respiratory rehabilitation can be discussed collectively. Singing and wind instruments playing are presumed to be a proper rehabilitation tool in alleviating the symptoms as well as improving the quality of life in conditions such as Chronic Obstructive Pulmonary Disease (COPD), asthma, Interstitial Lung Disease (ILD), Obstructive Sleep Apnoea (OSA), Alzheimer's disease, Parkinson's disease, dementia, and Long Covid. For the reason of low cost and low risk of musical activity as a form of treatment, further research is needed in order to apply singing and playing wind instruments in more diseases' management, especially those where the main focus is weighted on improving patients' quality of life.

Keywords: music, breathing exercises, rehabilitation, quality of life, chronic disease

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Word count: 4379 **Tables:** 00 **Figures:** 00 **References:** 37

Received: 10 April, 2024, Manuscript No. OAR-24-142203
Editor Assigned: 14 April, 2024, Pre-QC No. OAR-24-142203(PQ)
Reviewed: 25 April, 2024, QC No. OAR-24-142203(Q)
Revised: 03 May, 2024, Manuscript No. OAR-24-142203(R)
Published: 05 May, 2024, Invoice No. J-142203

INTRODUCTION

Partaking in musical activities has always been a vast element of human culture [1]. For a long time there have also been known the health benefits and therapeutic potential of music [2]. Music practice has gathered attention in the medical field also recently, which is reflected in projects such as Singing For Lung Health - an intervention aimed to improve the quality of life of patients with respiratory diseases, run by the British Lung Foundation, or the SINFONIA study, ongoing during the time of writing this paper, that evaluates the effectiveness of singing on alleviating dyspnoea and improving quality of life in patients with Chronic Obstructive Pulmonary Disease (COPD) and Interstitial Lung Disease (ILD) [3]. The Singing For Lung Health project has shown that patients partaking in singing activities reported less frequent use of medical system support such as GP visits or hospital admissions, which indicates that use of singing and playing wind instruments as a part of rehabilitation could have not only health but also economic benefits, for it is a low-cost intervention, but also relieves the medical system [4]. In this paper we review the recent reports of the use of singing and playing wind instruments in treatment and rehabilitation of pulmonary and neurological diseases.

What brings singing and playing wind instruments together?

In order to discuss singing and playing wind instruments as connected and possibly interchangeable interventions, it is crucial to understand what brings those two activities together. Playing a wind instrument is an intricate game of creating and controlling air flow of a certain pressure, requiring proficient control of respiratory muscles activity [5, 6]. Singing, similarly, is a form of activity that requires enhanced use of breathing muscles potential [7]. Going further into the mechanics of voice articulation as well as sound generation on wind instruments, there can be established significant common points: in both one could distinguish a valve (vocal folds in vocalization, lips or reed in musical instrument), downstream airflow duct, being respectively vocal tract and instrument's pipe, and upstream airflow duct - trachea for a vocalist and vocal tract for the instrumentalist [8]. Yet another important factor connecting both activities seems to be the enhanced and conscious use of the respiratory muscles, which could even be described as the state of optimized breathing mode [9, 10]. Naming that "optimized breathing" could come from several factors, two of which potentially being the state of

enhanced activation of muscles, respiratory muscles among them, and also the likeness of breathing technique used by musicians to deep diaphragmatic breathing, which requires extensive contraction of the diaphragm with expansion of the abdomen during inhalation, and slow and extensive contraction of the abdominal muscles during exhalation [11]. Given the resemblance of singing and wind instruments playing technique, we will be discussing the use of those practices as a potential beneficial and cost-effective intervention in treatment and rehabilitation.

Effects on respiratory system of musicians

As mentioned above, singing and playing wind instruments is demanding of extensive, as well as precisely controlled breathing pattern and respiratory muscles activity. For this reason, engaging in these activities for a prolonged period of time can significantly affect the respiratory system. In a study conducted on the group of opera singers, vocal soloist and wind instruments players, there was a statistically significant enhancement in spirometry parameters, such as FVC (Forced Vital Capacity), FEV1 (Forced Expiratory Volume in the first second) and PEFR (Peak Expiratory Flow Rate) compared to a group of a healthy, non-smoking individuals [12]. Another study collected parameters from wind instrument musicians, which indicated that wind instrument players presented significantly greater FEV1 and FEF50 (Forced Expiratory Flow at 50% of vital capacity) values. In general, those musicians' lung functions presented higher than expected lung functions. What is more, the enhancement in spirometry parameters was aligned with the length of employment [13]. This finding suggests that the efficiency of human respiratory functions could potentially be susceptible to training, which could be used in rehabilitation and treatment of diseases that impair respiratory functions.

It is also important to mention that intense and prolonged wind instrument playing or singing, which creates significant air pressures within human airways, i.e. in case of professional musicians, do not go without a tool taken on the respiratory system. In wind instrumentalists there have been reported greater risk of hemoptysis, laryngoceles, velopharyngeal insufficiency and pneumoparotitis. Even some speculations about excessive wind instrument playing being the risk factor for lung cancer has been undertaken [6]. Some other, more rare cases that have been reported in musicians consisted of diffused facial, cervical and mediastinal emphysema in a clarinet player, pneumomediastinum described in a trumpet player, and also cases of pneumoparotitis among wind instruments players [14, 15]. It is though relevant to point out that mentioned side effects of singing and playing wind instruments relate mostly to professional musicians and not recreational or rehabilitative engaging in musical activities [16].

Singing and wind instruments playing in pulmonary rehabilitation

Pulmonary rehabilitation is a standard part of comprehensive treatment in respiratory system diseases [17]. Studies show that pulmonary rehabilitation could also be performed in the form of singing or wind instrument playing classes. As long ago as in 1994 playing wind instruments have been shown to improve pulmonary functions as well as emotional wellbeing in asthmatic teenagers [18]. Similarly, playing didgeridoo and singing was revealed to alleviate asthma symptoms in all group ages from children to elderly patients [19]. Playing wind instruments has also been discovered to have a potential to be an alternative Obstructive Sleep Apnoea Syndrome (OSAs) treatment, as the risk of OSA has been reported to be lower in wind musicians than in the population of non-wind musicians [20]. Singing was suggested as a non-inferior alternative to physical exercise training in pulmonary rehabilitation of patients with Chronic Obstructive Pulmonary Disease (COPD) [21]. In a randomized control study music therapy, consisting of among others playing wind instruments and singing, there was a significant improvement of symptoms like dyspnoea and fatigue in patients with COPD and other pulmonary diseases [22]. Another study revealed that singing patients with COPD achieved higher values of Maximal Expiratory Pressure (MEP) [23]. What is more, singing also elevated the quality of life for patients with COPD by alleviating depressive symptoms [24]. Singing in a choir was also revealed to improve respiratory muscle strength and quality of life in patients with structural heart disease, therefore indicating a potential beneficial use of singing and playing wind instruments as cardiological rehabilitation [25].

Singing and wind instruments playing in neurological rehabilitation

Respiratory muscles rehabilitation is also a crucial part of neurodegenerative diseases, as they affect respiratory muscles strength and laryngopharyngeal functions such as speaking or swallowing [26]. Various studies have confirmed that singing, individually or as group classes, has positive effects on communication, swallowing, breathing, and the emotional wellbeing, consequently improving the quality of life of people with Alzheimer's disease [27]. In a systematic review investigating 584 papers, there was seen a tendency to improvement of respiratory functions in patient with long-term neurological conditions after wind instrument playing or singing therapy, conveying a significant difference between experimental and control group in a study on patients with Parkinson's disease [28]. Even in the group of patients suffering from quadriplegia, the projected speech intensity and maximum phonation length were increased significantly in comparison to the control group after the intervention of singing therapy [29]. Singing is also known for supporting cognitive health in elderly patients, which indicates its use as a part of multifactorial rehabilitation of dementia patients [30].

Breathing rehabilitation during COVID-19 pandemic

Playing wind instruments and singing gathered a lot of attention during COVID-19 pandemic, for there was an ongoing discussion about the extent of the risk of transmitting Coronavirus through the aerosol emission [31, 32]. Another important aspect of music practice regarding COVID-19 pandemic that we are focusing on is reported use and success of singing in post-infection rehabilitation. It have been noticed that some patients still experienced symptoms like cough, fatigue and shortness of breath several months, even up to a year after recovering from SARS-CoV-2 infection [33]. Physical rehabilitation, including inspiratory muscle training, was effective in reducing post-COVID dyspnea and fatigue [34]. Singing techniques for breathing rehabilitation were used in a study where patients experiencing symptoms like breathlessness after SARS-CoV-2 infection took part in classes with English National Opera singers. As a result, those patients experienced significantly less shortness of breath in comparison to the control group [35]. Another rehabilitative intervention called SingStrong, consisting

of breathing and vocal exercises, mindfulness and singing showed great improvement in symptoms such as breathlessness, fatigue and voice quality in patients suffering from Long Covid [36]. It is also valid to mention that online group singing during COVID pandemic played an appreciable role in decreasing factors like loneliness and stress and increasing participants' feeling of life satisfaction, social self-efficacy and social participation, therefore alleviating the tool that social distancing took on mental wellbeing [37].

CONCLUSIONS

As we discussed prior, singing and playing wind instruments have been proven to be an effective tool for pulmonary rehabilitation in conditions such as COPD, asthma, Interstitial Lung Disease (ILD), Obstructive Sleep Apnoea (OSA), Alzheimer's disease, Parkinson's disease, dementia, and Long Covid. The potential of singing and wind instrument playing to be an element of efficient rehabilitation in other conditions needs to be further investigated, given the low cost and low risk of the intervention of musical practice. To conclude, partaking in singing and other musical activities brings not only physical aspects of therapeutic value, but also psychological aspect of improving chronic patients' quality of life.

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