2017

# Does Using Music Therapy Improve Levels of Perceived Dyspnea in Patients with Chronic Obstructive Pulmonary Disease (COPD)?

Jessica Duong
*Philadelphia College of Osteopathic Medicine*

# Does using music therapy improve levels of perceived dyspnea in patients with chronic obstructive pulmonary disease (COPD)?

Jessica Duong, PA-S

A SELECTIVE EVIDENCE BASED MEDICINE REVIEW

In Partial Fulfillment of the Requirements For

The Degree of Master of Science

In

Health Sciences – Physician Assistant

Department of Physician Assistant Studies
Philadelphia College of Osteopathic Medicine
Philadelphia, Pennsylvania

December 16, 2016

## ABSTRACT

OBJECTIVE: The objective of this selective systematic review is to determine whether or not "Does using music therapy improve levels of perceived dyspnea in patients with chronic obstructive pulmonary disease (COPD)?"

STUDY DESIGN: Review of three studies published in English between 2003 to 2009. Studies included two randomized controlled trials and one controlled crossover design trial.

DATA SOURCES: Three trials analyzing the utilization of music therapy and the effects on dyspnea in COPD were found via PubMed.

OUTCOME(S) MEASURED: The outcome measured was level of perceived dyspnea via Visual Analogue Dyspnea Scales (VADS), Basal Dyspnea Index, and Modified Borg Scale.

RESULTS: Two studies concluded no statistically significant data. The study conducted on the comparison of the use of listening to music versus listening to progressive muscle relaxation techniques showed a statistically significant reduction in dyspnea in the music group.

CONCLUSIONS: The results of this systematic review were inconclusive on whether music therapy is effective in reducing levels of perceived dyspnea. Further studies should be conducted on listening to music during relaxation.



KEY WORDS: COPD, Dyspnea, Music

## INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is defined as chronic airflow limitation that is not fully reversible.[1] This includes two conditions: emphysema, characterized by enlargement and loss of elasticity of the alveoli, and chronic bronchitis, characterized by a chronic cough and increased sputum production. Both lead to frequent exacerbations and pulmonary infections.[2] This paper evaluates two randomized controlled trials and one controlled crossover design study comparing the effects of utilizing music therapy, such as singing and listening, for the reduction of perceived dyspnea in patients with COPD.

The prevalence of COPD is estimated to rise from the sixth to the third leading cause of death worldwide by 2020.[1] It currently affects more than 15 million people in the United States.[3] According to a study published by The American College of CHEST Physicians, the national medical cost attributed to COPD and its consequences totaled $32.1 billion in 2010.[3] They also projected this cost would rise to $49 billion by 2020.[3] As COPD progresses, dyspnea and recurrent pulmonary infections cause limitations to the daily activities patients can partake in such as working, social activities and activities of daily living that can lead to decreased quality of life and depression.[4] Complications such as pulmonary hypertension, cor pulmonale and chronic respiratory failure cause high healthcare costs and can lead to death.[2]

Although the correlation of COPD with cigarette smoking has not been absolutely proven, the Surgeon General of the US has issued a statement in 1964 concluding that smoking cigarettes is a major risk factor for mortality from chronic bronchitis and emphysema.[2] Common findings in COPD include decreased forced expiratory flow rates and increased residual volume leading to hyperinflation and disordered gas exchange.

Although COPD is not fully reversible, treatments and lifestyle modifications are

recommended in order to reduce the number and severity of exacerbations and increase patient comfort. This includes smoking cessation and pulmonary rehabilitation. Medications prescribed are inhaled bronchodilators, including long and short acting beta-2 agonists, inhaled and systemic corticosteroids and theophylline. Lung transplant and reduction surgery is recommended for end stage COPD.

Exacerbations of COPD often lead to anxiety and reducing them requires regimented medication schedules. Methods such as singing and listening to music to reduce perceived dyspnea and induce relaxation can be done anywhere and at any time and could potentially benefit quality of life.

**OBJECTIVE**

The objective of this systematic review is to determine whether or not "Does using music therapy improve levels of perceived dyspnea in patients with chronic obstructive pulmonary disease (COPD)?"

**METHODS**

The key words used in searches through PubMed in 2016 included "COPD", "dyspnea" and "music." All articles were published in English in peer reviewed journals. The articles were selected based on their clinical relevance and inclusion of the patient oriented evidence that matters (POEM) to the selected population. Criteria for searches were limited to controlled trials published in the year 2000 or later, studied on patients diagnosed with COPD considered in stable condition and the utilization of a form of music therapy. (See Table 1) Articles excluded were those studying unstable patients. Statistics reported were ANOVA F-score, P-value and patient's change from baseline.

The criteria for selection of studies was based on the patient's clinical diagnosis of COPD and the severity of their symptoms at the time that the study was conducted. Patients in each study were considered stable at the time the trial was conducted. In the Brooks et al. study, the intervention used was taking a walk for 10 minutes at the patient's own pace while listening to music. The comparison group in that study walked the same distance and time without music. This was a randomized crossover design trial so each participant was exposed to both interventions. Each participant walked for 6 minutes to induce dyspnea before being tested under each condition. In the Singh et al. study, the intervention included a music group that listened to classical instrumental pieces while seated. The comparison group in that study listened to pre-recorded tapes instructing them on progressive muscle relaxation techniques. In the Bonilha et al. study, participants were labeled into two groups and attended weekly, hour long classes for 24 weeks. Patients in the intervention group were labeled "singing group" and were taught singing related respiratory exercises and singing training. The comparison group was labeled "control group" and were taught handcrafted art work techniques including paper folding, drawing and collages. Both these groups were instructed to practice these tasks at home. The types of studies included two randomized control trials and one cross-over design trial.

**Table 1: Demographics & Characteristics of included studies**

| Study | Type | # pts | Avg. Age (yrs) | Inclusion criteria | Exclusion criteria | W/D | Intervention |
|---|---|---|---|---|---|---|---|
| Brooks[5] (2003) | Cross over design | 30 | 70 ± 10 | • Clinical diagnosis of COPD in pulmonary rehab<br>• ambulate independently<br>• self reported dyspnea at least once/week | • N/A | 0 | Walked for 10 minutes at their own pace while listening to selected music with a moderate tempo. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bonilha[6] (2009) | RCT | 43 | Singing : 69.8 ±7.4 Control: 73.6 ±7.5 | • Clinical diagnosis of COPD<br>• Former smokers<br>• Stable condition for at least 2 months before study | • Patients with severe co-morbidities<br>• Current smokers<br>• Patients using oxygen therapy | 13 | Weekly singing related respiratory exercises for 10 minutes, vocalization exercises for 15 minutes and singing training for 30 minutes. |
| Singh[7] (2009) | RCT | 72 | 63 ± 8 | • Clinical diagnosis of COPD<br>• Self reported dyspnea at rest<br>• Stable condition, no exacerbations for at least 7 days. | • Patients on TCAs or antipsychotic drugs<br>• Aversion to music, deaf, cognitive impairment<br>• Uncontrolled hyper/hypotension, organ failure and inability to cooperate. | 8 | Listened to selected music through headphones using a portable CD player for 30 minutes in two sessions while sitting and resting comfortably |

**OUTCOMES MEASURED**

The outcomes measured were the levels of perceived dyspnea using three different scales. In the Brooks et al. study, Modified Borg Scale for Dyspnea was used to quantify dyspnea. This is an interval scale ranging from 0 to 10 and supplemented with verbal expressions.[5] In the Bonilha et al. study, dyspnea was evaluated using the basal dyspnea index (BDI). In the Music vs. Progressive Muscle Relaxation (PMR) study (Singh et al.), Visual analogue dyspnea scale (VADS) was used to measure levels of perceived dyspnea. This score consists of a 100 mm vertical scale with anchors of shortness of breath with worst at the top and no dyspnea at the bottom.[7]

**RESULTS**

In the study conducted by Brooks et al. (2003), 30 participants were selected. Data were analyzed using repeated-measures analysis of variance (ANOVA) on dyspnea, and patients were assessed at baseline, pre-test and post-test. The change in each outcome from pretest to posttest was examined between the control and experimental conditions.[5] A p-value of less than 0.05 was considered statistically significant.[5] In the control group, levels of dyspnea changed between baseline, pre and post test ($F(2,58)= 75.5$, $p<0.01$). In the music group, dyspnea also increased significantly from baseline to pre-test ($p <0.01$). Both these results were expected. Post-test mean scores for dyspnea between the control and experimental groups were not significantly different ($p >0.05$).[5] Tolerance for physical activity and distances walked were similar between both groups interventions. Averages of perceived dyspnea are provided in table 2.

**Table 2: Mean dyspnea scores**

| | Baseline | Pre-test | Post- test |
|---|---|---|---|
| With music | 1.4 | 4.3 | 5.0 |
| Without music | 1.1 | 4.3 | 5.2 |

In the study conducted by Bonilha et al. (2009), the aim was to see the effects of weekly singing classes on pulmonary function and quality of life in patients with COPD.[6] The groups were randomized into a singing group and a control group. The BDI score was measured at baseline, then again at the end of 24 weeks prior to the final intervention, at 2 minutes in and 30 minutes in, and post intervention. The results of this study were expressed as means and standard deviations. The results of the initial assessment are shown as the absolute value while the results of the second evaluation are shown as final values minus the initial one.[6] ($\Delta_{(final-initial)}$) P-values considered statistically significant were $\leq 0.05$. At baseline, there was no significant difference in BDI scores between the two groups. After 24 weeks, the differences between the singing group

(0.7±1.2) and control group (0.3 ± 1.7) were not considered clinically significant (P=0.47). As far as acute physiological responses, patient BDI levels were measured during 2 minutes and 30 minutes after the intervention. There was a statistically significant difference in the singing group 2 minutes after (0.5 ±0.7, P=0.02) but that did not last up to 30 minutes later. No adverse events were reported in conjunction with the intervention. Tables 3-5 were provided by Bonilha et al.

**Table 3: Initial clinical features of the groups**

| | Singing group | Control group |
|---|---|---|
| BDI | 6.9 ± 1.9 | 6.1 ± 1.8 |

**Table 4: Physiological responses under basal conditions after 24 weeks**

| | Singing group $\Delta_{(final-initial)}$ [b] | Control group $\Delta_{(final-initial)}$ | p-values | Power of the test (%) |
|---|---|---|---|---|
| BDI | 0.7±1.2 | 0.3 ± 1.7 | 0.47 | 14.9 |

**Table 5: Acute physiological response on dyspnea during and after a singing exercise**

| | Singing group | Control group | p-values | Power of the test |
|---|---|---|---|---|
| $\Delta_{during}$ | 0.1 ±0.4 | -0.3 ±0.6 | 0.14 | 93.1 |
| $\Delta_{2minafter}$ | 0.5 ±0.7 | -0.3 ±0.6 | 0.02 | 99.9 |
| $\Delta_{30minafter}$ | 0.1 ±0.5 | -0.5 ±0.9 | 0.07 | 95.2 |

Δ: Change from baseline

In the study conducted by Singh et al., a randomized controlled trial was performed on 72 participants and data analysis was blinded. ANOVA with repeated measures was used to analyze the changes in outcome variables from pre to post in both sessions and between the groups.[7] There was a significant change in dyspnea between the two sessions (F=122.227, p = 0.000) and the interaction effect was 10.659, p= 0.000.[7] The mean difference in dyspnea reduction in the music group was 23.1 and 12.9 for the PMR group. Table 6 provides mean outcome variables on dyspnea between the two interventions, pre and post for two sessions.

**Table 6: Mean changes in dyspnea in music and PMR groups**

| | Music | PMR |
|---|---|---|
| First session (pre) | 49.06±17.1 | 45.99±13.0 |
| First session (post) | 34.69 ±14.3 | 38.38±14.6 |
| Second session (Pre) | 47.03±16.2 | 45.44±11.3 |

| | | |
|---|---|---|
| Second session (Post) | 23.91 ±10.2 | 32.47±14.4 |

**DISCUSSION**

In the study conducted by Brooks et al., there was an expected increase in the levels of perceived dyspnea from baseline to post- test after walking for ten minutes. According to the study, some patients did report either no change in dyspnea or a decrease in dyspnea even though the reports were not clinically significant. These results implied that some patients reacted positively to listening to moderate- tempo music while walking and listening to music did not seem to have an affect on anxiety or the patient's tolerance for physical activity. Given that listening to music is non invasive and relatively accessible to most patients, listening to music could still be an approach for decreasing the perception of breathlessness during exercise that is affordable.[5] Some limitations were a small sample size and that patient preference for song selection was not taken into account.

In the Bonilha et al. study of the effectiveness of singing classes, there was not a significant difference between the number of missed classes, or those missed for exacerbations, between the two groups. The vocalization and singing exercises did not produce any complaints of severe dyspnea, chest pain, regurgitation or dizziness. There was a significant amount of sputum expectoration and coughing which may suggest a bronchial hygiene property that was not directly studied.[6] A limitation to this study is the amount of singing and vocalization exercise that occurred outside of the designated weekly meeting may have varied greatly between patients. Although there was not a clinically significant change in levels of perceived dyspnea over 24 weeks, there was a statistically significant difference in levels measured two minutes after the initiation of the intervention. Further study may be beneficial in the use of singing during acute exacerbations of COPD.

The study conducted by Singh et al. showed a significant reduction in dyspnea utilizing music therapy as well as with progressive muscle relaxation. The mean difference in dyspnea reduction in the music group was 23.1 and it was 12.0 for PMR group.[7] It was speculated in the study that music was more motivating for relaxation because it is passive and does not require any activity from the participant, while PMR requires an increase in muscle tension.[7] One mechanism hypothesized for the reduction of dyspnea is that sensory stimuli like dyspnea are processed at preconscious level.[7] If the preconscious level is flooded with music, than dyspnea-genic elements can not reach the conscious level.[7]

## CONCLUSIONS

The results of this systematic review were inconclusive on whether music therapy is effective on reducing levels of perceived dyspnea in patients with COPD. Given that the interventions of each study was different, further studies should be conducted on the effects of music utilization for relaxation rather than during activity. For further studies, consideration of the patient's musical preference should be taken into account to see what genres and styles of music the participant finds more relaxing.

References


1. Chronic obstructive pulmonary disease. In: Kasper D, Hauser S, Jameson LJ, Fauci A, Longo D, Loscalzo J, eds. *Harrison's principles of internal medicine.* Vol 2. 19th ed. United States of America: McGraw- Hill Education; 2015:1700.
2. Chronic obstructive pulmonary disease. In: Papadakis M, McPhee S, Rabow M, eds. *Current medical diagnosis & treatment.* Fifty- Fifth ed. United States of America: McGraw- Hill Education; 2016:258. Accessed October 6, 2016.
3. Ford E, Murphy L, Khavjou O, Giles W, Holt J, Croft J. Total and state-specific medical and absenteeism costs of copd among adults aged ≥ 18 years in the united states for 2010 and projections through 2020. *CHEST* [CHEST]. 2015(145):31-45.
4. Yohannes A, Alexopoulos G. Depression and anxiety in patients with COPD . *European Respiratory Review*. 2014;23(133):345-349.
5. Brooks D, Sidani S, Graydon J, McBride S, Hall L, Weinacht K. Evaluating the effects of music on dyspnea during exercise in individuals with chronic obstructive pulmonary disease: A pilot study. *Rehabil Nurs*. 2003;28(6):192-196.
6. Bonilha AG, Onofre F, Vieira ML, Prado MY, Martinez JA. Effects of singing classes on pulmonary function and quality of life of COPD patients. *Int J Chron Obstruct Pulmon Dis*. 2009;4:1-8.
7. Singh VP, Rao V, V P, R CS, K KP. Comparison of the effectiveness of music and progressive muscle relaxation for anxiety in COPD--A randomized controlled pilot study. *Chron Respir Dis*. 2009;6(4):209-216. doi: 10.1177/1479972309346754 [doi].