



The impact of music therapy in the rehabilitation of individuals with COPD: systematic review

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ABSTRACT

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Introduction: In the pulmonary rehabilitation of COPD, it is recommended to use non-pharmacological treatment methods with the participation of the individual, as well as pharmacological treatment methods. Music therapy, a non-pharmacological treatment method, is also used in COPD symptom management.

Aim: To clarify the impact of music therapy in the rehabilitation of individuals with COPD.

Method: The research was created under PRISMA-P standards. In this research, Science Direct, Cochrane Library, PUBMED, CINAHL, and Web of Science databases were reviewed. The databases were viewed from the first article to the 25.10.2022 date in English words. Cochrane MeSH's; 'COPD and music', 'COPD and music therapy', 'COPD and acoustic stimulation', 'COPD and auditory stimulation' were written. In total 3070 articles were reached. Duplicate articles are cleared with the Mendeley citation program. Inclusion criteria are defined according to PICOS. Studies included randomized controlled trials. The review was structured by considering the Cochrane Guideline.

Result: From databases, with MeSH terms, a total of 3070 studies were reached. 16 randomized controlled trials were evaluated with reasons for study inclusion and exclusion criteria from 1995 to 2022 years. The studies included in the review were seen using five different music therapy interventions: singing, singing and harmonica playing, harmonica playing, listening, and auditory stimulation.

Conclusion: According to the data obtained from studies, music therapies are effective in the rehabilitation of adult individuals with COPD. However, there is still a need for randomized controlled studies involving different music therapy interventions and a large number of individuals.

Keywords: auditory stimulation, COPD, music, music therapy

1. INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) affects individuals and countries as socio-economically and ranks third among the causes of morbidity (1,2). COPD impairs the respiratory functions and oxygenation of individuals by causing irreversible airway limitation. Airway limitation, which causes dyspnea, cough, sputum, fatigue, and anxiety symptoms, negatively affect the daily life activities of individuals (1,2,3). The symptoms experienced in COPD can be reduced by pulmonary rehabilitation (PR), and it has a positive effect on the respiratory functions and quality of life of the individual (1,2,3,4). In the PR of COPD, as well as

pharmacological treatment methods, it is recommended to use non-pharmacological treatment methods with the participation of the individual. Music therapy, a non-pharmacological treatment method, is also used in COPD symptom management (1,2).

Music therapy is thought to be effective in increasing physiological lung and exercise capacity, self-efficacy, relieving anxiety, and dyspnea, and providing respiratory control (2,3). In the studies conducted in the literature, it is seen that music therapy includes singing, listening, playing a musical instrument, and benefiting from the rhythm feature.

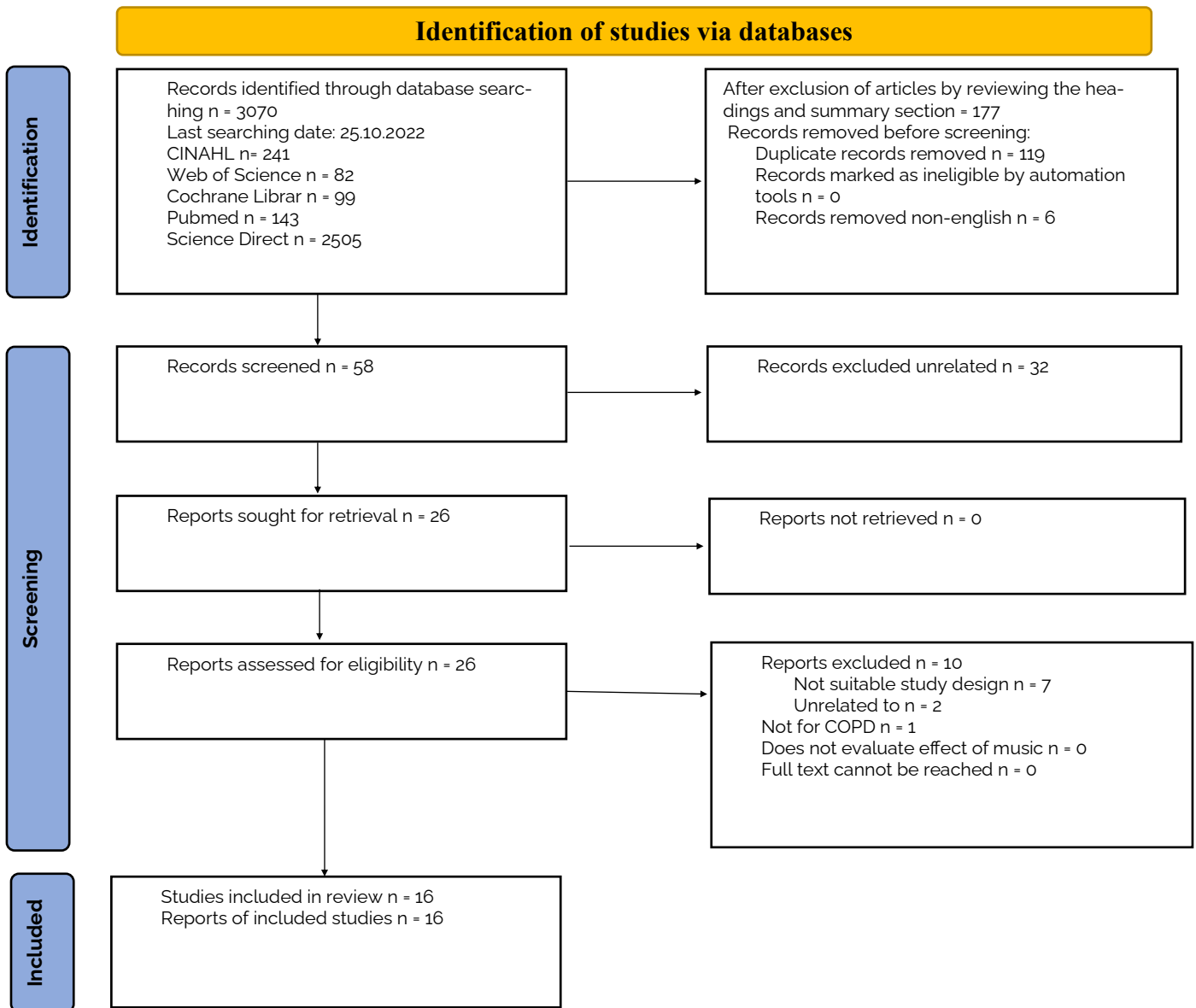


Figure 1: PRISMA flow chart (2020).

These different techniques in music therapy, it is aimed to use the inspiratory muscles effectively, providing deep breathing, and adapting to physical and respiratory exercises by increasing motivation in individuals with COPD. Music therapy is thought to influence the symptoms and quality of life experienced by the individual with COPD (2,3,4,5).

2. METHODS

2.1. Aim

This review aims to clarify the impact of music therapy in the rehabilitation of individuals with COPD. Research questions include:

- What types of music are applied to the PR of individuals with COPD?
- How music therapy was used in PR?

-How long was music therapy applied in the PR of individuals?

-Has music therapy been effective in the PR of individuals with COPD?

2.2. Design This systematic review, to evaluate the effect and characteristics of music therapy in the rehabilitation of individuals with COPD is structured by considering the Cochrane Guideline (6).

2.3. Search Methods

In this research, Science Direct, Cochrane Library, PUBMED, CINAHL, and Web of Science databases were reviewed. The databases were viewed from the first article to the 25.10.2022 date in English words. Cochrane MeSH's; 'COPD and music', 'COPD and music therapy', 'COPD and acoustic stimulation', 'COPD and auditory stimulation' were written. The

research was created under PRISMA-P standards, and criteria are defined by using PICOS (P: Population, I: Interventions, C: Comparisons, O: Outcomes, S: Study designs) (Figure 1) (6,7,8).

-Inclusion Criteria

Population: In this study, regardless of socioeconomic level, gender, or ethnicity, individuals with COPD aged 18 years or older were included. **Interventions:** Studies in which music therapy, acoustic and auditory stimulation were attempted in individuals with COPD.

Comparisons: Articles involving intervention and control groups are compared.

Outcomes: Studies evaluating individuals with COPD who received and did not receive music therapy.

Study designs: Randomized controlled trials

-Exclusion Criteria

Population: Studies with individuals under the age of 18.

Interventions: Studies that do not include music therapy.

Comparisons: Did not include comparisons of groups that received and did not receive music therapy.

Outcomes: Studies that have not been measured or are uncertain outcomes

Study designs: Non-randomized controlled studies

2.4. Search Outcome

In total 3070 articles were reached. Duplicate articles are cleared with the Mendeley citation

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias); Self-reported outcomes	Blinding of outcome assessment (detection bias); Objective measures	Incomplete outcome data (attrition bias): All outcomes	Selective reporting (reporting bias)	Other bias
Alexander et al., 2012	+	+	?	+	+	?	+	?
Bauldoff et al., 2002	?	?	-	?	+	+	+	+
Bauldoff et al., 2005	?	?	-	?	+	+	+	+
Bonilha et al., 2009	+	?	?	?	+	+	+	?
Canga et al., 2015	+	?	?	?	+	+	+	?
Collins et al., 2019	+	?	?	?	+	+	+	?
Ho et al., 2012	+	+	-	+	+	-	+	+
Horuz et al., 2017	?	?	-	?	+	+	+	+
Kaasgaard et al., 2022	+	+	+	?	+	+	+	+
Lee et al., 2017	+	+	+	?	+	+	+	+
Liu et al., 2019	+	+	+	?	+	+	+	+
Lord et al., 2010	+	+	+	?	+	+	+	+
Okamoto et al., 2021	+	?	?	?	+	+	+	?
Reychler et al., 2015	+	?	?	?	+	+	+	?
Singh et al., 2009	+	+	-	+	+	+	+	+
Thornby et al., 1995	+	?	?	?	+	+	+	?

Figure 2: Risk of bias summary (+ low risk, ? unclear risk, - high risk)

Table 1. Features of the articles in this research

Studies	Year	Total number of individuals analyzed (n)	Mean age	Type of intervention	Comparison group	Duration of intervention	Duration of the program	Evaluation items**	Outcomes
Kaasgaard et al (2)	2022	195	68.9 ±7.9	PR and singing, vocal warm-up with rhythm and pitch games	Only PR (included physical and breathing exercises)	40 min, twice weekly	10 weeks	- Spirometry - SGRQ - HADS-D - 6MWT - mMRC - BORG	- Between groups no significant difference - Associated with diverse physiological changes
Okamoto et al (12)	2021	13	72.8 ±12.9	PR and vocal, singing, and breathing exercises using a keyboard harmonica	Only PR (included conditioning, respiratory muscle training, and endurance training)	20 min	8 weeks	- Spirometry - 6MWT - mMRC - Self-rating Depression Scale score - State-Trait Anxiety Inventory - COPD Assessment Test - General Self-Efficacy Scale score - Nagasaki University Respiratory Activities of Daily Living score	- Significant improvement in FEV1 - Did not assess 6MWD changes and viability, with PR improving parameters of pulmonary function
Liu et al (9)	2019	56	63.51 ±4.72	Singing therapy in addition to routine COPD health education	Routine COPD health education	60 min, once a week. Singing at home for 30 min every day	24 weeks	- HADS-D - CCQ	- Reduces depressive symptoms and improves the quality of life
Collins et al (17)	2019	119	66 ±8	Metronome-generated acoustic stimulation during exercise-training	Exercise-training alone	25-45 min, thrice-weekly	12 weeks	- Spirometry - CRDQ - BORG - Incremental-load and constant-load treadmill tests	- Breathing-retraining using metronome-based acoustic feedback did not result in improved exercise endurance or decreased dynamic hyperinflation when compared to exercise-training alone
Lee et al (18)	2017	19	71 ±8	Listening to self-selected music throughout the endurance walk test	Without music the endurance walk test	Twice within one week	1 week	- Spirometry - Heart rate - Percutaneous oxygen saturation - Dyspnea - Rate of perceived exertion	- Less dyspnea, increased tolerance of high-intensity exercise, a modest effect
Horuz et al (15)	2017	96	71.3 ±10.80	Listening music	Without listening music	60 min, four times in two weeks	2 weeks	- BAI - Heart rate - Respiration rate - Systolic and diastolic pressures	- Significant decrease in systolic blood pressure and diastolic blood pressure averages - No significant difference in heart rates and respiration rate
Canga et al (13)	2015	68	70.1	PR and live music visualizations, wind instrument playing inclusive of clinical improvisation, and singing	Only PR	45 min, Once a week	6 weeks	- CRQ-SR - BDI-FS - VAS	- Effective to reduce depression and perceived dyspnea
Reychler et al (19)	2015	41	70.5 ±8.4	PR and distractive auditory stimulus by ambient music	Only PR	In 75 min three sets, three times a week	6 weeks	- Heart rate - Oxygen saturation - VAS - BORG - HADS-A	- Positive effect on anxiety perceived exertion during one PR - Not influenced by ambient music

Alexander et al. (14)	2012	28	69.9 ±1.8	PR and harmonica playing	Only PR	5-20 min, twice a day, five days a week	8-10 weeks	- Heart rate - Oxygen saturation - 6MWT - SOBQ - SF-36 - HAP	- Not support the use of harmonica playing a home-based therapy
Ho et al. (20)	2012	41	74.0 ±10.3	Paced walking to music	Routine walking program	30 min a day, five days a week	12 weeks	- Spirometry - SGRQ - ISWT - BORG RPE-D - BORG RPE-L	- A lower level of exertional dyspnea, leg fatigue, - An improved exercise tolerance - A greater improvement in HRQOL
Lord et al. (10)	2010	28	67.3 ±8.1	Singing, the teaching of posture, relaxation, and vocal exercises	No intervention	60 min, twice a week	6 weeks	- Spirometry - SGRQ - Oxygen saturation - Heart rate - ISWT - SF-36 - HAD - BORG	- Singing lessons improved anxiety - An improved physical component score of the SF36 - Not improve measures of breathing control, functional exercise capacity, or recovery time
Bonilha et al. (11)	2009	30	69.8 ±7.4	Singing Vocalization exercises	Handcraft work	60 min, Once a week	24 weeks	- Spirometry - SGRQ - Oxygen saturation - Arterial blood gases - BDI	- Well tolerated activity - Regular practice of singing may improve QoL
Singh et al. (16)	2009	64	63 ±8	Listening to self-selected music of 60-80 beats per minute and relaxation	progressive muscle relaxation techniques	30 min, in two sessions (morning and afternoon)	1 day	- Heart rate - Respiratory rate - Blood pressure - VADS - STAI	- Listening music is more effective in reducing anxiety and dyspnea
Bauldoff et al. (22)	2005	30	63 ±11	Distractive auditory stimulation during an upper extremity training	only upper extremity training	15 min, three to five times a week	4 weeks	- Spirometry - SGRQ - Oxygen saturation - 6MRPB	- Potential to augment the effectiveness of PR
Bauldoff et al. (21)	2002	24	68.1 ±8	Listening to music with a walking program	Only walking program	20 to 45 min, two to five times a week	8 weeks	- Spirometry - SGRQ - VAS - 6MWT - BORG - UCSD-SOB - CES-D - STAI	- A simple, cost-effective strategy - Has the potential to augment the effectiveness of post-PR maintenance training
Thornby et al. (23)	1995	36	63.0 ±8.8	Listening to music exercise stress test	exercise stress test with grey noise or in silence	10 to 30 min, four times a day	1 day	- Spirometry - Heart rate - EXT - RPE - WT	- Significantly decrease perceived symptoms of respiratory discomfort - Allowing individuals to exercise at a higher intensity - Potentially achieve more effective exercise reconditioning training

**** Evaluation Items:** SGRQ: St. George Quality of Life Score, HADS-D: Hospital Anxiety and Depression Scale Depression Subscale, 6MWT: Six Minute Walk Test, mMRC: Modified Medical Research Council Dyspnea Scale, BORG: a tool for measuring an individual's effort and exertion, breathlessness and fatigue during physical work, CCQ: Clinical COPD Questionnaire, CRDQ: Chronic Respiratory Disease Questionnaire, BAI: Anxiety Scale, CRQ-SR: Chronic Respiratory Questionnaire Self-Reported, BDI-FS: Beck Depression Inventory Scale 2nd edition- Fast Screen, VAS: Dyspnea Visual Analog Scale, HADS-A: Hospital Anxiety and Depression Scale-Anxiety Subscale, SOBQ: San Diego Shortness of Breath Questionnaire, SF-36: Survey Short Form 36, HAP: Human Activity Profile, ISWT: Incremental Shuttle Walking Test, HRQOL: Health-related Quality of Life, BORG RPE-D: the rating of perceived exertion for dyspnea on the Borg category-ratio scale, BORG RPE-L: the rating of perceived exertion for leg fatigue on the Borg category-ratio scale, BDI: Basal Dyspnea Index, VADS: Visual Analogue Dyspnea Scale, STAI: Spielberger's state trait anxiety inventory, 6MRPB: 6-minute peg and ring board, UCSD-SOB: University of California San Diego Shortness of Breath Questionnaire, CES-D: Center for Epidemiologic Studies Depression Questionnaire, EXT: Total exercise time, WT-total external work, RPE: rating of perceived exertion

program. After the articles were examined in detail by the researchers, according to inclusion criteria 16 full-text articles were evaluated (Figure 1).

2.5. Risk of Bias

16 articles included in the study were evaluated in terms of bias according to the Higgins criteria by using the Cochrane Collaboration tool for assessing the risk of bias in randomized controlled trials (Figure 2) (6,8). The risk of bias was evaluated in 3 categories as low, unclear, and high. The assessment headings include:

- Random sequence generation (selection bias)
- Allocation concealment (selection bias)
- Blinding of participants and personnel (performance bias)
- Blinding of outcome assessment (detection bias) (self-reported outcomes)
- Blinding of outcome assessment (detection bias) (objective measures)
- Incomplete outcome data (attrition bias) (all outcomes)
- Selective reporting (reporting bias)
- Other bias

2.6. Analysis of Data

Data was evaluated about music therapy in the rehabilitation of individuals with COPD. A wide variety of measures were used in the studies to evaluate interventions and data, no meta-analysis was performed. The data obtained from the articles are reported in the results.

4. RESULTS

4.1. Features of the studies

In this review, articles were included in a total of 16 randomized controlled trials with reasons for study inclusion and exclusion criteria from 1995 to 2022 years. Features of the articles in this research were seen in Table 1. A total of 888 individuals were included in the studies and the age groups were similar. The application time of the music therapy intervention implemented in the studies ranged from 5-75 min at once and was applied for between 1 day to 24 weeks (Table 2).

Folk, classical, familiar, and happy songs were used in one of the studies, Brazilian folk music was used in the other two, and the musical style and rhythm were not specified in the other two (2,9,10,11). In a

Table 2. Music therapy and music genres used in studies

Studies	Music Therapy Intervention	Music Genres
Liu et al. Bonilha et al.	Singing	Folk, Classical, Familiar, Happy Songs Brazilian Folk
Okamoto et al. Canga et al.	Singing and Playing Harmonica	Japanese Ballads Popular Songs
Alexander et al.	Playing Harmonica	Not Specified
Horuz et al. Singh et al.	Listening	Bach and Farabi's Rast, Saba, and Huseyni compositions of Turkish classical Flute, sitar, mandolin, and mixed instrumentals
Collins et al. Lee et al. Reychler et al. Ho et al. Bauldoff et. al. Thornby et al.	Auditory Stimulation	Metronome Classical (Vivaldi's Four Seasons), Country/ western, Classical, Pop/Motown, Big Band, Folk Songs, Old Songs, Popular Music

study in which singing and playing the harmonica were applied together, Japanese ballads and popular songs that individuals liked were used (12). In the other study, in which singing and playing the harmonica were used together, individuals were allowed to choose the type of music applied according to their own emotions and moods (13). The music genre is not specified in the study, in which only harmonica playing is used (14).

In a study in which listening to music was used in COPD rehabilitation, two different types of music were used: Bach and Farabi's Rast, Saba, and Huseyni compositions of Turkish classical music (15). Another study in which listening is used includes flute, sitar, mandolin, and mixed instrumentals (16).

As an auditory stimulation technique during the exercise test, the metronome was used to regulate the inhalation and exhalation rate in a study (17). In another study, an auditory stimulation technique was used by music tempo and genre selected by the individuals (18). In other studies involving auditory stimulation, it is seen that individuals use classical (Vivaldi's Four Seasons), country/western, classical, pop/Motown, big band, folk songs, old songs, or popular music genres of their choice at a speed of 90-120 beats per minute (19,20,21,22,23) (Table 2).

The risk of bias table of the included 16 articles was seen as high risk in five studies in the blinding of participants and personnel (performance bias) section (15,16,20,21,22). In the sections random sequence generation (selection bias), blinding of outcome assessment (detection bias), and selective reporting (reporting bias), there was a mostly low risk of bias in the articles (Figure 2).

4.2. Outcomes of the studies

Kaasgard et al. (2), Liu et al. (9), Lord et al. (10) and Bonilha et al. (11) studied singing as a part of music therapy in the rehabilitation of COPD. Kaasgard et al. (2) evaluated spirometry, quality of life, anxiety, depression, dyspnea, and fatigue in their study in

which they applied the singing intervention in addition to the PR and found that there were positive physiological changes in spirometry. Liu et al. (9) investigated the effect of singing and routine COPD health education together, it was found that the intervention reduced depression, and improved the quality of life. Lord et al. (10) applied singing, posture education, relaxation, and vocal exercises together versus no intervention. They found that guided singing improves anxiety and the physical score of the SF 36 but not any changes in breathing control, exercise capacity, or recovery. In the other study in which singing and vocalization exercises were used together, the intervention was found as well tolerated activity and was thought that regularly done singing can contribute to the quality of life (11).

In two studies, singing and playing harmonica were applied together (12,13). Okamoto et al. (12) used PR and singing, breathing, and vocal exercises with a keyboard harmonica, and found significant improvement in FEV1, but did not change 6MWD, pulmonary functions were recovering with PR. In the other study, PR and playing wind instruments, live music visualizations, and singing were effective to reduce depression and perceived dyspnea (13).

Alexander et al. (14) tested PR and playing harmonica at home settings in their study, in comparison group applied only PR. They did not support the use of harmonica playing a home-based PR therapy (14).

Horuz et al. (15) and Singh et al. (16) tested the listening on PR. One of the studies found systolic blood pressure and diastolic blood pressure decreased but had no significance in heart and respiration rates (15). In the other study, it was shown that listening to music is more effective in reducing anxiety and dyspnea than progressive muscle relaxation techniques (16).

Auditory stimulation was used while exercising or walking program in the other 7 studies (17,18,19,20,21,22,23). In the study of Collins et al. (17),

using metronome-based acoustic feedback did not affect exercise durability in comparison with the control group. Lee et al. (18) elucidated that by listening music during the endurance walking test individuals had less shortness of breath, increased tolerance to high-intensity exercise, and the intervention was moderately effective. Reychler et al. (19) accounted for auditory stimulation on the perceived effort in the intervention arm individuals' anxiety was reduced but was not affected by ambient music. Ho et al. (20) in their 12 weeks study noticed when the paced walking combined with music in PR, breathlessness and leg fatigue reduced, the durability of exercise and HRQOL improved. In two different studies by Bauldoff et al. (21,22) involving 54 individuals, they thought distractive auditory stimulation related to better outcomes in PR and post-PR follow-up training, besides being a simple, cost-effective strategy Thornby et al. (23) used listening music during the exercise stress test, and they reported that the respiratory symptoms decreased, in this manner, the individuals performed more effective high-intensity exercise.

5. DISCUSSION

According to the data obtained from this systematic review, it was seen that music therapy is effective in the rehabilitation of individuals with COPD. In this systematic review, in the included studies the type, duration, and purpose of the music therapies applied differed; music therapy types and music genres used in COPD rehabilitation were also listed (9,11,15,20).

Considering the types of music therapy in the included studies, it was striking that there were attempts to support the respiratory functions, emotional state, and physical performance of the individual with COPD. Singing and playing the harmonica, in which the individual actively participates, to have the individual do breathing exercises (9,11,12,13,14); passive listening to music for the individual's emotional state to relax and control of breathing (15,16); and to increase the

performance of the individual during exercises aimed at improving the physical capacity of the individual, it was seen that high-tempo music is listened to (17,18,19,20,21,22,23).

In most of the studies, the music genres to be used in music therapy were chosen by individuals. Notes, maqams, and instruments used in musical genres, maybe can have different effects on the individual and may differ from culture to culture (12,15,16,20). In the included studies, there was no comparison to evaluate the effects of different genres of music used in music therapy on individuals. However, regardless of the genres of music used, music therapy seems to have a positive effect on individuals (12,15,16).

Due to the different methods and purposes of applying music therapy in the rehabilitation of individuals with COPD, it was seen that different scales were chosen in studies for the evaluation of pulmonary functions, vital signs, dyspnea, quality of life, anxiety, depression, and fatigue levels (1,9,11,13,15,16). It was thought that the use of very different scales as well as the complex nature of COPD rehabilitation and music therapy make it difficult to evaluate the effectiveness of interventions (9,10,11,12,13,20).

The duration of music therapy used in the studies included in the systematic review varied according to the type of music therapy applied; the interventions of singing and playing the harmonica, in which the individual actively participates, was mostly between 20-60 minutes (2,9,10,11,12,13,14), and in passive music therapies, it was around 60 minutes (17,18,19,20,21,22,23). Since affecting breathing and oxygenation, it was thought that the duration of the singing and harmonica-playing interventions, should be arranged according to the tolerance of the individual (9,11,12,13). In the studies included in the systematic review, no side effects or complications related to the music therapy intervention applied to individuals with COPD were reported.

6. LIMITATIONS

This systematic review is limited to studies in English that meet the inclusion criteria. In general, the duration of the music therapy program was short in the included studies, except for a few studies, the long-term effects of music therapy could not be evaluated.

7. CONCLUSION

This research clarified the impact of music therapy in the rehabilitation of individuals with COPD. The review was formed under the PRISMA-P instructions. PICOS used to define the inclusion criteria. The included studies were evaluated with the Cochrane collaboration tool Higgins criteria for risk of bias. In this review when the content of the articles was examined were seen using five different music therapy interventions to support the respiratory functions, emotional state, and physical performance of the individual with COPD: singing, singing and harmonica playing, harmonica playing, listening, and auditory stimulation. According to the data obtained from studies, music therapies are effective in the rehabilitation of adult individuals with COPD. However, there is still a need for randomized controlled studies involving different music therapy interventions and a large number of individuals.

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