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[Intervention Review]

Singing for children and adults with bronchiectasis

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ABSTRACT

Background

Bronchiectasis is a common respiratory disease, especially in developing countries. Its cause varies from chronic infection to rare immune deficiencies. Bronchiectasis can be present with other respiratory diseases, such as chronic obstructive pulmonary disease (COPD). People with bronchiectasis may suffer from chronic cough, fatigue, shortness of breath, chest pain and coughing up blood. Their lung function may decline with time. These can also have a negative impact on their quality of life. Thus, a holistic management is needed to provide treatment and support. Therapies which include breathing manoeuvres, such as singing, may have health benefits for respiratory function and psychological well being.

Objectives

To evaluate the effects of a singing intervention as a therapy on the quality of life, morbidity, respiratory muscle strength and pulmonary function of children and adults with bronchiectasis.

Search methods

We searched the Cochrane Airways Group (CAG) trials register, the Cochrane Central Register of Controlled Trials, major allied complementary databases, and clinical trials registers. Professional organisations and individuals were also contacted. CAG performed searches in February, and additional searches were carried out in February 2011.

Selection criteria

Randomised controlled trials in which singing (as an intervention) is compared with either a sham intervention or no singing in patients with bronchiectasis.

Data collection and analysis

Two authors independently reviewed the titles, abstracts and citations to assess potential relevance for full review. No eligible trials were identified and thus no data were available for analysis.

Main results

No meta-analysis could be performed.

Authors' conclusions

In the absence of data, we cannot draw any conclusion to support or refute the adoption of singing as an intervention for people with bronchiectasis. Given the simplicity of the potentially beneficial intervention, future randomised controlled trials are required to evaluate singing therapy for people with bronchiectasis.

PLAIN LANGUAGE SUMMARY**The effects of singing for children and adults with bronchiectasis**

People with bronchiectasis (a chronic lung condition) have chest symptoms that include chronic wet cough, fatigue and shortness of breath. Their lung function can also decline with time. Singing may support lung function and enhance quality of life in people with bronchiectasis. The review found no randomised controlled trials that evaluated the benefits of singing in bronchiectasis. As there is no data, we cannot conclude whether or not singing is a beneficial intervention for people with bronchiectasis.

BACKGROUND

Description of the condition

(Please see [Appendix 1](#) for explanations of medical terminology used.)

Bronchiectasis, commonly termed an 'orphan disease' (i.e. very rare), is a major cause of respiratory morbidity especially in developing countries ([Karadag 2005](#); [Karakoc 2001](#)) and in pockets of affluent countries ([Chang 2008](#)). The underlying causes of bronchiectasis varies from post recurrent respiratory infections to rare immune deficiencies. However, bronchiectasis is also a common pathway for a variety of diseases. Thus, bronchiectasis also occurs in common (e.g. chronic obstructive pulmonary disease (COPD) ([O'Brien 2000](#)) and uncommon respiratory diseases (e.g. bronchiolitis obliterans and sarcoidosis) as well as non primary respiratory (e.g. autoimmune) diseases. When bronchiectasis is present with another underlying disorder, it increases the morbidity and mortality of the underlying diseases ([Keistinen 1997](#)). For example, in diseases like COPD the presence of bronchiectasis has been reported in 29-50% of cases ([O'Brien 2000](#)). When present, bronchiectasis increases the severity and frequency of respiratory exacerbations ([Gursel 2006](#)). Thus, management of the symptoms and severity of bronchiectasis has important clinical implications for management of respiratory conditions.

Laenec's definition of bronchiectasis (1819) was originally based on post-mortem histopathology. Later, bronchograms which were first described in 1951, became the gold standard for diagnosis. This method has now largely been replaced by high-resolution computerized tomography (HRCT) scans of the chest. Currently, bronchiectasis is defined by 'irreversible dilatation of peripheral airways' and, is usually diagnostically established radiologically by chest HRCT scans. The key features of bronchiectasis in HRCT scans are dilated bronchi in the periphery of the lung and bronchial wall thickening, and lack of tapering. Clinically, particularly in children, this radiological definition is problematic. It is not known at what stage of the disease process HRCT signs of bronchiectasis occur, and CT definitions are derived from adult populations; moreover, chest HRCT scans performed in different states of health may yield different results ([Chang 2008b](#)).

The dominant symptoms and signs of bronchiectasis are productive (cough with phlegm) or wet sounding cough, dyspnoea on exertion and presence of other respiratory signs (clubbing, chest wall deformity, respiratory noises such as wheezing or crepitations on auscultation) ([Chang 2008b](#)). In the long term, pulmonary decline may occur. As for patients with COPD, children and adults with bronchiectasis also suffer from recurrent acute exacerbations, some of whom require hospitalised treatment ([Chang 2008](#)). Effective management of bronchiectasis aims to improve quality of life (QoL) and reduce the frequency or severity of respiratory exacerbations and/or long term pulmonary decline ([Chang 2008](#)).

Several studies have reported that people who employ diaphragmatic breathing and activate respiratory muscles, such as trained singers, exhibit more efficient pulmonary capacity than non-trained singers ([Collyer 2008](#), [Formby 1987](#)).

In people with respiratory disease, anecdotal evidence suggests that adjunctive therapies that include breathing manoeuvres, such as singing, have significant health benefits for respiratory function

([Stacy 2002](#)) and psychological well being ([Unwin 2002](#)). In a small non-controlled study in adults with emphysema, a singing program improved quality of life and functional outcomes, such as decreased breathlessness, but had no effect on physical health (FEV₁, distance walked) ([Engen 2005](#)).

Description of the intervention

Singing requires well-controlled respiratory manoeuvres due to the greater range of pitch accessed during singing compared with speaking, greater length of musical phrases than spoken language, and the greater dynamic range used in singing songs. To meet these artistic as well as physical challenges, singers employ the diaphragmatic breathing method. The diaphragm as a primary inspiratory muscle generates the necessary subglottic pressure for singing. Louder and higher sounds are associated with higher lung volumes. Respiratory muscles such as the transversus abdominis, external and internal obliques, and the intercostals must also be fully engaged to regulate air flows during singing. Thus, classically trained singers exhibit efficient breath management and greater use of their lung capacity than non-singers ([Leanderson 1988](#), [Thomasson 1999](#), [Collyer 2008](#)).

Respiratory muscles also play an important role in producing an effective cough, which is essential for lung health in patients with bronchiectasis. For an effective cough, high subglottic pressure and strong expiratory force are necessary ([Kang 2006](#)). For increasing one's ability to produce maximal expiratory pressure, it is necessary to employ diaphragmatic breathing because it assists with increased lung volumes and strengthened respiratory muscle capacity ([Sapienza 2002](#)).

Singing can provide not only health benefits but also enjoyment. Studies found that when singing/music was part of a breathing exercise, participants with asthma demonstrated better treatment compliance due to enjoyment, which enhances motivation ([Fukuda 2000](#), [Lipawen 2000](#), [Wiens 1999](#)).

Additionally, a number of anecdotal reports attest to the benefits of singing in enhancing QoL of people with bronchiectasis. Studies investigating the effects of a singing/music program on the lung health and QoL of people with COPD, emphysema and asthma indicated that singing could also be an enjoyable, low-cost and low-risk intervention for people suffering from bronchiectasis, to support their lung health and enhance QoL ([Griggs-Drane 1999](#), [Engen 2005](#), [Wade 2002](#)).

How the intervention might work

Singing as an intervention for respiratory conditions involves, in addition to the vocal folds and laryngeal apparatus, diaphragmatic breathing and activation of the muscles of the entire respiratory system. Diaphragmatic breathing during singing activates respiratory muscles, which support efficient deep inhalation and slow exhalation ([Sundberg 1987](#)). This increases respiratory muscle strength, which increases lung volume and assists effective coughing ([Kang 2006](#)).

Most songs contain musical phrases of greater length than spoken utterances, notes of various pitch, and changing dynamics (soft/loud), which actively engage and work the respiratory muscles.

A singing intervention can be carried out in a one-to-one or group setting in a non-judgmental and supportive environment. The

program needs to be of sufficient length and intensity to allow the participants to master the diaphragmatic breathing technique. This can vary from patient to patient, depending on their age, background, illness severity, past experience with singing and music, and the relationship between the singing facilitator and the patient. A study with emphysema patients (> 60 age) indicated that at least two half-hour sessions are necessary for learning the diaphragmatic breathing method correctly (Engen 2005).

Why it is important to do this review

Although there is some evidence to suggest that singing, as a relatively low-cost adjunct therapy to more conventional regimes, has the potential of improving health outcomes, no systemic review of singing in bronchiectasis has been carried out.

OBJECTIVES

To evaluate the effects of a singing intervention in addition to usual therapy on the quality of life, morbidity, respiratory muscles and pulmonary function of children and adults with bronchiectasis during

(a) stable bronchiectasis and

(b) an exacerbation of bronchiectasis

METHODS

Criteria for considering studies for this review

Types of studies

Randomised controlled trials (RCTs)

Types of participants

Children or adults with bronchiectasis (defined clinically or radiologically) not related to cystic fibrosis. Exclusion criteria: Participants with cystic fibrosis or with other diseases where bronchiectasis is not present.

Types of interventions

All types of singing programs that include diaphragmatic breathing, which are carried out in a group (choir) or one-to-one setting with a singing teacher or instructor for a minimum of two half-hour sessions. Studies comparing singing with a sham group that did not involve activation of the respiratory muscles were not considered. Studies using non face-to-face delivery format, such as using DVD or CD, were not considered, as these formats could not address some important issues, such as how to use the voice in a healthy way while singing, and to obtain immediate feedback on singing practice, the posture and the breathing technique. Further individual or group singing sessions can also be adjusted to the levels of singers, which is hard to be achieved through pre-made media, such as DVD or CD.

Types of outcome measures

Primary outcomes

1. Mean difference in quality of life
2. Mean difference in respiratory function that reflects respiratory muscle function (maximal inspiratory and expiratory flow, cough peak flow)

Secondary outcomes

1. Mean difference in other subjective scores (cough diary, Likert scale, visual analogue scale, level of interference of cough, cough diary, etc)
2. Mean difference in other lung function indices (spirometry, other lung volumes)
3. Proportions experiencing adverse effects of the intervention, (e.g. haemoptysis)
4. Total number of hospitalised days or symptomatic days

For studies in stable state, additional secondary outcomes are

1. Proportions of participants who had respiratory exacerbations and/or hospitalisations
2. Satisfaction with the intervention
3. Treatment adherence
4. Psychological assessments measuring self-efficacy, depression and anxiety

Search methods for identification of studies

Electronic searches

The following topic search strategies were used to identify the relevant randomised controlled trials listed on the electronic databases:

("bronchiectasis" OR "suppurative lung disease" as (text word) or (MeSH)) AND ("singing" OR "songs" OR "sing" OR "music" OR "diaphragm" OR "breathing exercise" OR "voice" OR "voice training" OR "vocalise" OR "choir" as (text word) or (MeSH))

Trials were identified from the following sources:

1. The Cochrane Airways Group Specialised Trials Register (please see the [Airways Group Module](#) for details)
2. The Cochrane Central Register of Controlled Trials (CENTRAL)
3. MEDLINE (1966 to present). Topic search strategy combined with the RCT search filter as outlined in the Airways Group module.
4. OLDMEDLINE (1950 to 1965). Topic search strategy combined with the RCT search filter as outlined in the Airways Group module.
5. EMBASE (1980 to present). Topic search strategy combined with the RCT search filter as outlined in the Airways Group module.
6. CINAHL (1982 to present). Cumulative Index to Nursing and Allied Health Literature.
7. AMED (1985 to present). Allied and Complementary Database
8. NRR (2000 to 2007). National Research Register Archive
9. Clinical Trials Register (www.clinicaltrials.gov)
10. PsycINFO (1872 to present)
11. LILACS (Latin American and Caribbean Health Science Literature)
12. Dissertation Abstracts International (late 1960 to present)
13. INSIDE (<http://www.bl.uk/inside>). British Library Database for journals and conference proceedings

Searching other resources

1. References in relevant publications and conference proceedings

2. Music Therapy Research CD Rom (AMTA 1999), Music Therapy World Info CD Rom (Aldridge 2002)
3. Written communication with the authors of trials included in the review as necessary.

We did not apply any language restrictions. The most recent search was carried out in February 2011. For detailed search strategies, please see [Appendix 2](#)

Data collection and analysis

Selection of studies

Retrieval of studies: From the title, abstract, or descriptors, two review authors (JI, AC) independently reviewed the literature search results to identify potentially relevant trials for full review. 57 abstracts were identified and four papers were retrieved. The same two authors independently assessed the retrieved articles but no studies met the inclusion criteria. It was planned that any disagreement would have been resolved by third party adjudication (DK). The 2011 update search identified nine references, none of which were eligible for inclusion.

Data extraction and management

Trials that satisfied the inclusion criteria were to be reviewed and the following information recorded: study setting, year of study, source of funding, participants' recruitment details (including number of eligible people), inclusion and exclusion criteria, other symptoms, randomisation and allocation concealment method, numbers of participants randomised, blinding (masking) of participants, care providers and outcome assessors, duration of intervention, previous singing training, co-interventions, numbers of patients not followed up, reasons for withdrawals from study protocol (clinical, side-effects, refusal and other), details on side-effects of therapy, and whether intention-to-treat analyses were possible. Data were to be extracted on the outcomes described previously and further information was to be requested from the authors where required.

Assessment of risk of bias in included studies

In order to assess the risk of bias, two review authors would have assessed independently the quality of the studies included in the review using the RevMan 'Risk of Bias' table.

Allocation concealment

We would have assessed whether allocation was adequately concealed, in order to prevent both the participants and the investigators from foreseeing the assignment, for example, when using central allocation, opaque sealed envelopes, etc.

Generation of the allocation sequence

Each study would have been graded for the generation of allocation sequence as follows:

1. Low risk bias, if methods of randomisation included using a random number table, computer-generated lists or similar methods;
2. Uncertain risk of bias, if the trial was described as randomised, but no description of the methods used to allocate participants to treatment group was described;

3. High risk of bias, if methods of randomisation included alternation; the use of case record numbers, dates of birth or day of the week, and any procedure that was entirely transparent before allocation.

Blinding (or masking)

Each study would have been graded for blinding as follows:

1. Blinding of outcome assessor to treatment allocation.

Follow up

Each study would have been graded as to whether numbers of and reasons for dropouts and withdrawals in all intervention groups were described; or if it was specified that there were no dropouts or withdrawals.

Dealing with missing data

We contacted the primary investigators to request further information where required.

Assessment of heterogeneity

Any heterogeneity between the study results was to be examined, described and tested to see if it reached statistical significance using the chi-squared test. We consider heterogeneity to be significant when the P value is less than 0.10 ([Higgins 2008](#)). We also planned to use the I² statistic, where heterogeneity is categorised such that a value of under 25% is considered low, around 50% is considered moderate and over 75% is considered a high degree of heterogeneity ([Higgins 2003](#)).

Assessment of reporting biases

If we were able to combine data and if meta-analysis was possible, we would have assessed publication bias using a funnel plot. We would have tried to identify and report on any selective reporting in the included trials.

Data synthesis

It was planned that for the dichotomous outcome variables of each individual study, odds ratio (OR) would have been calculated using a modified intention-to-treat analysis. An initial qualitative comparison of all the individually analysed studies would have been examined as to whether pooling of results (meta-analysis) was reasonable. This would take into account differences in study populations, inclusion/exclusion criteria, interventions and outcome assessment.

It was planned that the results from studies that met the inclusion criteria, and reported any of the outcomes of interest, were to be included in the subsequent meta-analyses. The summary weighted odds ratio and 95% confidence interval (CI) (fixed-effect model) would have been calculated (Cochrane statistical package, RevMan version 5).

It was planned that numbers needed to treat (NNT) was to be calculated from the pooled OR and its 95% CI applied to a specified baseline risk using an online calculator ([Cates 2003](#)). If studies report outcomes using different measurement scales, the standardised mean difference would have been estimated. Any heterogeneity between the study results was to be described and explored. The 95% CI estimated using a random-effects model was

to be included whenever there were concerns about statistical heterogeneity.

Subgroup analysis and investigation of heterogeneity

The following a priori subgroup analyses were planned:

1. Children (aged 18 years or less) and adults (>18 years)
2. Participant type (bronchiectasis as primary disease versus bronchiectasis as co-existent disease)
3. Type of singing intervention (e.g. short term: less than one month; medium term: 1-6 months; long term > 6 months; type of training)
4. Stable state vs exacerbation phases of bronchiectasis
5. Severity of bronchiectasis (based on FEV1: >80% classified as mild, 50-79% classified as moderate, 30-49% classified as severe, <30% classified as very severe)

Sensitivity analysis

Sensitivity analyses were also planned to assess the impact of the potentially important factors on the overall outcomes:

1. Variation in the inclusion criteria
2. Risk of bias in the included studies, (particularly whether allocation was well concealed)
3. Differences in outcome measures
4. Analysis using random effects model
5. Analysis by "treatment received" or "intention-to-treat"

RESULTS

Description of studies

We found four potential studies but none fulfilled inclusion criteria. Please see Characteristics of excluded study below.

Results of the search

The search identified 64 abstracts in total. We did not identify any suitable trials for inclusion.

Excluded studies

One study ([Manternach 2008](#)) reported case series describing how to teach singing people with emphysema and COPD. The authors provided professional advice on voice care as well as specific approaches that can benefit singers with the diseases. An RCT ([Martinez 2009](#)) evaluated the effects of singing on dyspnoea, QoL and pulmonary function parameters (including maximal inspiratory and expiratory pressures in adults with COPD. For a period of 6 months, participants in the treatment group had weekly one-hour singing sessions, while the control group participated in manual arts practices. The study was completed in December 2007, however, no results are available. A music therapy study (4 weeks) ([Moody 1993](#)) highlighted the effects of a music-accompanied relaxation technique (guided imagery) on QoL, mood, and dyspnoea of 30 adults (but 11 dropped out) with chronic bronchitis and emphysema. Spirometry, maximal inspiratory and expiratory flow were included as assessment methods. There was no significant change in pulmonary functions, but participants' QoL improved ([Moody 1993](#)). Another study involving children with asthma ([Smith 2002](#)) evaluated an 8-week group singing therapy

program to improve their breathing behaviour (deep inhalation) and to provide a supportive environment. Children reported an increased confidence in managing their asthma symptoms, and they also felt happier.

Risk of bias in included studies

No study was included.

Effects of interventions

In the absence of any data, the effect of singing as a therapy for people with bronchiectasis remains unknown.

DISCUSSION

The excluded studies provide the platform for future empirical studies on singing as therapy in the treatment of bronchiectasis. They demonstrated that providing musical approach improved QoL of patients with emphysema, asthma and COPD. However, the evidence of pulmonary function is very weak. An ongoing study identified through searching ([Hopkinson 2009](#)) may provide further clinical evidence on the effects of singing on breathlessness. The benefits of certain breathing exercises for people with pulmonary diseases have been documented ([Holloway 2004](#)). Singing can be regarded as musical breathing exercises in the clinical context. Additionally, singing can bring enjoyment, which may enhance quality of life and improve adherence with other therapies.

AUTHORS' CONCLUSIONS

Implications for practice

There is currently insufficient evidence to advocate singing as a therapy in the management of people with bronchiectasis. In the absence of data, we cannot draw any conclusion to support or refute the adoption of singing as an intervention for people with bronchiectasis.

Implications for research

Previous studies have demonstrated that singing has the therapeutic potential to enhance QoL of patients with chronic respiratory disease, such as emphysema, asthma and COPD. Future studies should consider including people with bronchiectasis. Physiology singing, at least certain types of singing, can strengthen respiratory muscles. The design of future RCTs should include detailed information about the type of singing intervention (vocal exercises, song type, pitch and dynamic range) and delivery format (individual or group), length and frequency of sessions, and prescribed singing practice time. Culturally appropriate musical items should be included, taking care that different songs make similar demands on the respiratory and vocal systems. Dose response effects should be assessed.

ACKNOWLEDGEMENTS

We thank Toby Lasserson, Dr Chris Cates and Elizabeth Arnold from the Airways Group for their advice, supportive role and comments to the protocol and the review. We also thank music therapy professional organisations and the following authors from the following studies for responding to our queries: Brian Fisher ([Smith 2002](#)) and Nicholas Hopkinson ([Hopkinson 2009](#)).

REFERENCES

References to studies excluded from this review

Manternach 2008 {published data only}

Manternach B, Sataloff RT. Teaching Singers with emphysema and other pulmonary diseases. *Journal of Singing* 2008;**64**(3):333-37.

Martinez 2009 {published data only}

Martinez JB. Effects of singing in Chronic Obstructive Pulmonary Disease. *ClinicalTrials.gov* NCT00500526.

Moody 1993 {published data only}

Moody LE, Fraser M, Yarandi H. Effects of guided imagery in patients with chronic bronchitis and emphysema. *Clinical Nursing Research* 1993;**2**(4):478-86.

Smith 2002 {published data only}

Smith S. "Bronchial Boogie: An evaluation of a Health Action Zone funded project" (<http://www.lru.org.uk/>). report 2002.

References to ongoing studies

Hopkinson 2009 {published data only}

Effect of singing lessons on breathlessness in patients with COPD. Ongoing study January 2009.

Additional references

Cates 2003 [Computer program]

Cates C. Visual Rx. Online NNT Calculator. <http://www.nntonline.net/>; Cates C, 2003.

Chang 2008

Chang AB, D Bilton. Non-cystic fibrosis bronchiectasis exacerbations. *Thorax* 2008;**63**:269-76.

Chang 2008b

Chang AB, Redding GJ, Everard ML. State of the Art: Chronic wet cough: protracted bronchitis, chronic suppurative lung disease and bronchiectasis. *Pediatric Pulmonology* 2008;**43**:519-31.

Collyer 2008

Collyer S, Kenny DT, Archer M. The effect of breathing directives on vocal production. *Logopedics, Phoniatrics and Vocology* 2008; Vol. [in press].

Engen 2005

Engen R. The singer's breath: Implications for treatment of persons with emphysema. *Journal of Music Therapy* 2005;**42**(1):20-48.

Formby 1987

Formby C, Thomas R, Brown W J, Halsey JJ. The effects of continuous phonation on 133xenon-inhalation air curves (of the kind used in deriving regional cerebral blood flow). *Brain-Lang* 1987;**31**(2):346-63.

Fukuda 2000

Fukuda Y. Breathing training for asthmatic children using music therapy and a survey on patient preference in the training methods. In: Laufer D, Chesky K, Ellis P editor(s). *Music as a Human Resource: Drafts and Developments. Berichte über die Tagungen des Arbeitskreises der 'International Society for Music Education' (ISME)*. Vol. **4**, Klön: Verlag Dohr, 1994:149-71.

Griggs-Drane 1999

Griggs-Drane. The use of musical wind instruments in the treatment of chronic pulmonary diseases. In: C. Dileo editor(s). *Music Therapy and Medicine: Theoretical and clinical applications*. American Music Therapy Association, 1999:129-37.

Gursel 2006

Gursel G. Does coexistence with bronchiectasis influence intensive care unit outcome in patients with chronic obstructive pulmonary disease?. *Heart & Lung* 2006;**35**(1):58-65.

Higgins 2003

Higgins JPT, Thompson SG, Deeks JJ, Altman DG. Measuring inconsistency in meta-analyses. *BMJ* 2003;**327**:557-60.

Higgins 2008

Higgins JPT, Green S (editors). Available from www.cochrane-handbook.org. Cochrane Handbook for Systematic Reviews of Interventions. The Cochrane Collaboration. 2008; Vol. Version 5.0.0.

Holloway 2004

Holloway EA, Lasserson, TB. Breathing exercises for asthma. *Cochrane Database of Systematic Reviews* 2004, Issue 1. [DOI: [10.1002/14651858.CD001277.pub2](https://doi.org/10.1002/14651858.CD001277.pub2)]

Kang 2006

Kang SW, Shin JC, Park CL, Moon JH, Rha DW, Cho D-H. Relationship between inspiratory muscles strength and cough capacity in cervical spinal cord injured patients. *Spinal Cord* 2006;**44**:242-48.

Karadag 2005

Karadag B, Karakoc F, Ersu R, Kut A, Bakac S, Dagli E. Non-cystic-fibrosis bronchiectasis in children: a persisting problem in developing countries. *Respiration* 2005;**72**(3):233-8.

Karakoc 2001

Karakoc GB, Yilmaz M, Altintas DU, Kendirli SG. Bronchiectasis: still a problem. *Pediatric Pulmonology* 2001;**32**(2):175-8.

Keistinen 1997

Keistinen T, Saynajakangas O, Tuuponen T, Kivela SL. Bronchiectasis: an orphan disease with a poorly-understood prognosis. *European Respiratory Journal* 1997;**10**(12):2784-7.

Leanderson 1988

Leanderson R, Sundberg J. Breathing for singing. *Journal of Voice* 1988;**2**(1):2-12.

Lipawen 2000

Lipawen PJ. The effects of harmonica playing on lung function in asthmatic children. Drexel University unpublished Masters' thesis 2000.

O'Brien 2000

O'Brien C, Guest PJ, Hill SL, Stockley RA. Physiological and radiological characterisation of patients diagnosed with chronic obstructive pulmonary disease in primary care. *Thorax* 2000;**55**(8):635-42.

Sapienza 2002

Sapienza CM, Davenport PW, Martin AD. Expiratory muscle training increases pressure support in high school band students. *Journal of Voice* 2002;**16**(4):495-501.

Stacy 2002

Stacy R, Brittain K, Kerr S. Singing for health: an exploration of the issues. *Health Education* 2002;**102**(4):156-62.

Sundberg 1987

Sundberg J. The science of the singing voice. Illinois: Northern Illinois university Press, 1987.

Thomasson 1999

Thomasson M, Sundberg J. Consistency of phonatory breathing patterns in professional operatic singers. *Journal of Voice* 1999;**13**(4):529-541.

Unwin 2002

Unwin M, Kenny DT, Davis P. The effects of group singing on mood. *Psychology of Music* 2002;**30**:175-85.

Wade 2002

Wade L. A comparison of the effects of vocal exercises/singing versus music assisted relaxation on peak expiratory flow rates of children with asthma. *Music Therapy Perspectives* 2002;**20**:31-7.

Wiens 1999

Wiens, ME, Reimer, MA, Guyn, HL. Music therapy as a treatment method for improving respiratory muscle strength in patients with advanced multiple sclerosis. A pilot study. *Rehabil. Nurs* 1999;**24**(2):74-80.

CHARACTERISTICS OF STUDIES

Characteristics of excluded studies [ordered by study ID]

Study	Reason for exclusion
Manternach 2008	Not RCT. Includes case reports and professional recommendations on vocal care and performance of people with emphysema
Martinez 2009	Study involved patients with COPD, outcome reports not found.
Moody 1993	Not singing, but listening to music and guided imagery used.
Smith 2002	Study involved children with asthma.

Characteristics of ongoing studies [ordered by study ID]

[Hopkinson 2009](#)

Trial name or title	Effect of singing lessons on breathlessness in patients with COPD
Methods	Randomised controlled single blind trial, a 6-week course of singing lessons (1 hour/lesson) twice weekly
Participants	Adults with COPD (N=64)
Interventions	Singing versus no singing with standard care only
Outcomes	Single breath counting, breath hold time, St George's Respiratory Questionnaire (SGRQ), Transition Dyspnoea Index, SF-36® Health Survey, Shuttle walking test (SWT)
Starting date	January 2009

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Hopkinson 2009 (Continued)

Contact information	Lead Investigator Dr Nicholas Hopkinson Royal Brompton and Harefield NHS Trust, U.K.
Notes	Not clear whether participants with COPD have also diagnosed with Bronchiectasis. http://www.controlled-trials.com/ISRCTN17544114/

APPENDICES

Appendix 1. Term used

Term used	Lay Description
Aetiology	Causes of disease
Crepitations	Sounds heard in the chest using a stethoscope
Dyspnoea	Difficulty in breathing
FEV1	Measurement of expiratory flow using a spirometer - detects lung disease related to airway obstruction
Morbidity	illness or disease
Orphan disease	A rare disease in the developed world or one that is poorly researched
HRCT scans	High Resolution CT scan of the chest - a CT technique for evaluation of small airway disease
Haemoptysis	Coughing up blood

Appendix 2. Search Strategies

Airways Register

(#45=BRONCH//) AND (singing or sing or song or songs or voice* or vocal* or choir* or diaphragm or music or "breathing exercis*")

CENTRAL

- #1 MeSH descriptor Bronchiectasis explode all trees
- #2 bronchiect*
- #3 suppurativ* near/3 lung*
- #4 (#1 OR #2 OR #3)
- #5 MeSH descriptor Voice, this term only
- #6 MeSH descriptor Voice Training, this term only
- #7 MeSH descriptor Music, this term only
- #8 MeSH descriptor Diaphragm, this term only
- #9 MeSH descriptor Breathing Exercises, this term only

- #10 sing or singing
- #11 song or songs
- #12 music
- #13 voice*
- #14 vocalise
- #15 choir*
- #16 diaphragm
- #17 breath* near/3 exercis*
- #18 (#5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17)
- #19 (#4 AND #18)

MEDLINE**Topic search**

- 1. exp Bronchiectasis/
- 2. bronchiect\$.mp.
- 3. (suppurativ\$ adj3 lung\$).mp.
- 4. or/1-3
- 5. Voice/
- 6. Voice Training/
- 7. Music/
- 8. Diaphragm/
- 9. Breathing Exercises/
- 10. (sing or singing).mp.
- 11. (song or songs).mp.
- 12. music.mp.
- 13. voice\$.mp.
- 14. vocalise.mp.
- 15. choir\$.mp.
- 16. diaphragm.mp.
- 17. (breath\$ adj3 exercis\$).mp.
- 18. or/5-17
- 19. 4 and 18

RCT Filter

- 1. (clinical trial or controlled clinical trial or randomized controlled trial).pt.
- 2. (randomized or randomised).ab,ti.
- 3. placebo.ab,ti.

4. dt.fs.
5. randomly.ab,ti.
6. trial.ab,ti.
7. groups.ab,ti.
8. or/1-7
9. Animals/
10. Humans/
11. 9 not (9 and 10)
12. 8 not 11

EMBASE**Topic search**

1. exp Bronchiectasis/
2. bronchiect\$.mp.
3. (suppurativ\$ adj3 lung\$).mp.
4. or/1-3
5. voice/
6. music/
7. singing/
8. breathing exercise/
9. exp diaphragm/
10. vocalization/
11. (sing or singing).mp.
12. (song or songs).mp.
13. music.mp.
14. voice\$.mp.
15. (vocalise or vocalize).mp.
16. choir\$.mp.
17. diaphragm.mp.
18. (breath\$ adj3 exercis\$).mp.
19. or/5-18
20. 4 and 19

RCT filter

1. Randomized Controlled Trial/
2. Controlled Study/
3. randomization/

4. Double Blind Procedure/
5. Single Blind Procedure/
6. Clinical Trial/
7. Crossover Procedure/
8. follow up/
9. exp prospective study/
10. or/1-9
11. (clinica\$ adj3 trial\$).mp.
12. ((singl\$ or doubl\$ or trebl\$ or tripl\$) adj5 (mask\$ or blind\$ or method\$)).mp.
13. exp Placebo/
14. placebo\$.mp.
15. random\$.mp.
16. (latin adj3 square\$).mp.
17. exp Comparative Study/
18. ((control\$ or prospectiv\$ or volunteer\$) adj3 (trial\$ or method\$ or stud\$)).mp.
19. (crossover\$ or cross-over\$).mp.
20. or/11-19
21. 10 or 20
22. exp ANIMAL/
23. Nonhuman/
24. Human/
25. 22 or 23
26. 25 not 24
27. 21 not 26

PsychINFO

1. bronchiect\$.mp.
2. (suppurativ\$ adj3 lung\$).mp.
3. 1 or 2
4. singing/
5. voice/
6. vocalization/
7. exp music/
8. (sing or singing).mp.
9. (song or songs).mp.
10. music.mp.

11. voice\$.mp.
12. (vocalise or vocalize).mp.
13. choir\$.mp.
14. diaphragm.mp.
15. (breath\$ adj3 exercis\$).mp.
16. or/4-15
17. 3 and 16

CINAHL

- S19 S4 and S18
- S18 S5 or S6 or S7 or S8 or S9 or S10 or S11 or S12 or S13 or S14 or S15 or S16 or S17
- S17 breath* N3 exercis*
- S16 diaphragm
- S15 choir*
- S14 vocalise or vocalize
- S13 voice*
- S12 music
- S11 song or songs
- S10 sing or singing
- S9 (MH "Singing")
- S8 (MH "Breathing Exercises+")
- S7 (MH "Diaphragm")
- S6 (MH "Music")
- S5 (MH "Voice")
- S4 S1 or S2 or S3
- S3 suppurativ* N3 lung*
- S2 bronchiect*
- S1 (MH "Bronchiectasis")

AMED

- S13 S3 and S12
- S12 S4 or S5 or S6 or S7 or S8 or S9 or S10 or S11
- S11 breath* N3 exercis*
- S10 diaphragm
- S9 choir*

- S8 vocalise or vocalize
- S7 voice*
- S6 music
- S5 song or songs
- S4 sing or singing
- S3 S1 or S2
- S2 suppurativ* N3 lung*
- S1 bronchiect*

LILACS

(bronchiectasis) or "BRONCHIECTASIS/" [Palavras] and (sing or singing or song or songs or voice or vocal or choir or music or choir or diaphragm or) or "SINGING" [Palavras]

WHAT'S NEW

Date	Event	Description
9 March 2011	New search has been performed	Literature search. No new studies included.

HISTORY

Protocol first published: Issue 2, 2009

Review first published: Issue 2, 2010

Date	Event	Description
19 February 2010	Amended	Contact details of contact author updated
11 May 2009	Amended	Contact author name amended

CONTRIBUTIONS OF AUTHORS

All authors wrote the review based on previous protocols. JI is a music therapist, DK has music and psychology expertise and AC has clinical and research expertise in respiratory medicine. All contributed to writing of this review.

DECLARATIONS OF INTEREST

The authors are currently conducting a RCT on the efficacy of a singing program in children and adolescents with cystic fibrosis.

SOURCES OF SUPPORT

Internal sources

- Royal Children's Hospital Foundation, Australia.
- Research support for AC

External sources

- NHMRC, Australia.
Salary support for AC
- Queensland Smart State Funds, Australia.
Support for AC
- Australian Cochrane Airways Group Network Award 2008, Australia.
Scholarship for JI

INDEX TERMS**Medical Subject Headings (MeSH)**

*Breathing Exercises; *Voice Training; Bronchiectasis [*therapy]; Music Therapy [*methods]; Randomized Controlled Trials as Topic

MeSH check words

Adult; Child; Humans