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SINGING FOR BETTER BREATHING

Findings from the Lambeth and Southwark Singing and COPD Project



Stephen Clift, Ann Skingley, Sonia Page, Lizzi Stephens, Sadie Hurley, John Dickinson, Steve Meadows, Irisz Levai, Anna Jackson, Roisin Sullivan, Natalie Wren, Dave McDaid, A-la Park, Saleem Azhar, Noel Baxter, Guillermo Rozenhuler and Shilpa Shah

In association with:



Funded by:



Dedication

With fond memories of Maria Simmons, 1946-2017. An enthusiastic member of the Rotherhithe group.



“*The actual thing of singing, I've always loved singing... I do that at home yeah. I hum and sing. And in the car I put tapes in, I've got CDs, and my husband said: 'You've started singing much more different things now.' Because if I hear them here I look for them on CD and do them. I really think it has made a difference to my breathing.*

The atmosphere has been so welcoming. Everybody helps everybody else, you know? And nobody is... top or bottom, and... I suppose that I've noticed people do small things for me that I'm not meant to notice, but I also do small things for other people here. Like a group of friends. Because any time I see them shopping they go: 'Oh hello, see you Tuesday!' And when you get to seventy, it's amazing to make even one new friend. But from this group I would say if it finished I would take away maybe two or three really good friends from it anyway.”

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Summary

Introduction

Over the last eight years there has been a growth of interest in the potential value of participation in singing groups for people with chronic obstructive pulmonary disease (COPD) and other respiratory illnesses. This is shown by the increasing number of singing for breathing groups established across the UK over this period. The British Lung Foundation have taken a leading role in promoting this activity through their 'Singing for Lung Health' programme.

A limited number of small-scale research studies have assessed the benefits of singing for people with COPD and other lung conditions. These include three randomised controlled trials, one in Brazil, and two conducted at the Royal Brompton Hospital in London. Further studies have been carried out in Canada, New Zealand, the UK and the USA. There is limited evidence that singing improves lung function and exercise capacity, but qualitative feedback from participants has been highly positive. Testimonies point to singing having substantial subjective benefits for physical, psychological and social wellbeing, and in enabling people with COPD to better manage their lung condition.

The current study in Lambeth and Southwark, South London, was based on earlier research conducted in East Kent, UK. Morrison et al. (2013) established and evaluated a network of six community singing groups for people with COPD which ran over the course of ten months. Seventy-two people with COPD were followed up over this time and assessed using validated questionnaires, with St. George's Respiratory Questionnaire (SGRQ) as the primary outcome measure. Spirometry was also used to assess lung function. Significant improvements were found on the total and impact scores from the SGRQ, and participants also improved in their lung function.

Project and evaluation

The aim of the current study was to further test the feasibility of setting up a network of community singing groups for people with COPD to run over the course of ten months from end of September 2015 to end of July 2016. Recruitment took place over the period April-September 2015. The study involved two cohorts, assessed in September 2015 and January 2016. The two groups were comparable on all baseline measures, and were combined for the purpose of the evaluation. A total of 60 participants with breathing difficulties were recruited into the study.

Assessment included a battery of validated questionnaires, with the SGRQ as the primary outcome measure. Questions were also included on use of health and social care services and medication, including the use of inhalers. Participants underwent a comprehensive assessment to measure lung function. The principal measures were the amount of air expelled forcibly from the lungs in one second (FEV₁); the total volume of air forcibly expelled from the lungs (FVC), and distance walked in six minutes – the Six-Minute Walk Test (6MWT).

Singing groups met weekly over the course of the project in four venues, led by two experienced and skilled facilitators. Three groups started in late September/early October 2015 and ran for 38-40 sessions and a fourth group, commenced in January 2016, and ran for 25 sessions.

At follow-up, 44 participants completed the questionnaires again and 42 completed the lung and exercise assessments (attrition rate 27-30% due to health issues and family commitments). In addition, 37 participants took part in a structured interview in April/May 2016 to gather feedback on their experiences of the singing groups and their perceptions of any benefits gained. Average level of attendance was 26 sessions, with approximately 82% participants attending at least 20 sessions. Filming and photography was also used throughout to provide a documentary record of the project, and the final film giving an account of the whole project is included with this report.

Among the participants followed-up, 31 were shown to have COPD from the lung function tests at baseline ($FEV_1/FVC < 0.7$) - six mild, 15 moderate, nine severe, and one very severe. Findings for the total sample and for those with COPD are presented, but particular attention is given to the changes seen for participants with COPD.

Findings

The principal quantitative findings for the COPD group were as follows:

- A significant improvement on the SGRQ symptom scale
- Participants with COPD reported 'fewer bad days' and 'more good days'
- No change on FEV_1
- A small but statistically significant decline in FVC
- A small but statistically significant increase in FEV_1/FVC
- No change in distance walked on the 6MWT
- No change in breathlessness after the 6MWT
- No change in reported health service use

The accounts provided in the interviews were consistently and highly positive. Participants claimed that regular singing helped them in managing their respiratory symptoms, and reported improvements in mental wellbeing, attributing this to the singing group. Social benefits were also described, extending to participants meeting outside of the singing sessions, and group members providing each other with support and advice.

Reflections

Our study shows that COPD patients who took part in singing groups experienced a reduction in symptoms, as measured by the St. George's Respiratory Questionnaire. Detailed structured interviews also revealed a wide range of physical, psychological and social benefits, which together substantially improved the wellbeing of participants. In addition, lung function and functional exercise capacity was maintained throughout the course of the 6 – 10 month singing intervention.

The findings add to the previous body of research in supporting the value of regular singing for people with COPD, and other respiratory conditions. We agree with the conclusions reached in a recent systematic review (Lewis, et al., 2016) that further, larger-scale controlled trials are needed to establish benefits and address a range of outstanding questions on effective delivery.

Confounding factors of weather and background air pollution may have had some impact on the participants in this study. Such factors can only be controlled for through multi-centre trials in which an intervention is run over a wide geographical area including inner-city and rural locations.

Our experience of difficulties with recruitment indicates the need for greater resources, time and effort to ensure sufficient numbers for any future studies on singing for people with lung disease.

Introduction

Chronic obstructive pulmonary disease (COPD) is an umbrella term for a number of specific airway conditions including bronchitis and emphysema. Diagnosis relies on a combination of history, physical examination and spirometry (GOLD, 2017). Post-bronchodilator spirometry $FEV_1/FVC < 0.70$ confirms the presence of persistent airflow limitation and thus a diagnosis of COPD with four grades of severity. GOLD (2017) gives cut off points for mild, moderate, severe and very severe COPD as follows: Mild – $FEV_1 \geq 80\%$ predicted; moderate – $50\% \leq FEV_1 < 80\%$ predicted; severe – $30\% \leq FEV_1 < 50\%$; very severe – $FEV_1 < 30\%$ predicted.

Dyspnoea (breathlessness) is a central symptom and major cause of disability and anxiety associated with the disease (GOLD, 2017). COPD is associated with other serious health conditions including cardiovascular disease, osteoporosis and depression (Fletcher et al 2010). As Jones (2009) notes, COPD is characterised by 'a spiral of decline': 'As COPD progresses, patients fail to exercise, feel depressed, and experience low self-esteem.'

Smoking tobacco is the main risk factor for COPD, but other environmental factors, such as exposure to smoke or dust in different occupations and atmospheric pollution may be important determinants. Genetic and developmental factors may also raise the risk of individuals developing COPD. Generally COPD is progressive over time, especially if individuals continue to smoke or continue to be affected by environmental factors, but individuals may periodically experience episodes of acute worsening of respiratory symptoms or exacerbations, commonly due to infections, or periods of stress.

COPD is a widely prevalent chronic illness throughout the world, and represents a major public health challenge internationally. GOLD (2017) states that COPD is currently the fourth leading cause of death in the world but is expected to be the third leading cause of death by 2020. In 2012, at least three million people are estimated to have died of COPD, and the COPD burden internationally will increase in the coming decades due to continued exposure to COPD risk factors and increased life expectancy.

Currently, in the UK, 1.2 million people are estimated to have a diagnosis of COPD (BLF, 2016) which makes COPD the second most common lung disease after asthma. Approximately two percent of the British population is living with COPD and prevalence increased by nine percent between 2008 and 2012. Under-diagnosis of COPD is a problem, and it has been estimated that up to two-thirds of people COPD have not been diagnosed. Currently, 115,000 people are newly diagnosed annually.

COPD is the second biggest cause of death in the UK, with approximately 30,000 deaths due to the condition every year (BLF, 2016).

COPD makes a big impact on hospital services, and accounts annually for over 140,000 hospital admissions and over a million bed days across the UK. This is 1.7% of all hospital admissions and bed days. Exacerbation of COPD is the second most common cause of emergency admissions to hospitals in the UK and one of the most expensive conditions treated by the NHS (BLF 2007). The direct cost of COPD to the UK National Health Service has been estimated at £810-930 million per year and these costs are expected to rise (DH, 2010). Although COPD mainly affects people beyond retirement age, it is estimated that 24 million working days are lost each year in the UK due to COPD (BTS, 2002).

Since smoking remains the primary cause of COPD, smoking cessation is the intervention with the greatest capacity to influence the natural history of the disease (GOLD, 2017). COPD is not curable, however progress may be slowed down and symptoms reduced through pharmacological management using a stepped approach to inhaled therapies (bronchodilators, steroids and combination therapies), based on the severity of the disease (DH, 2010). In addition, pulmonary rehabilitation can significantly improve exercise capacity, dyspnoea and psychological wellbeing and a minimum of 12 supervised sessions is recommended with patients being encouraged to continue exercise beyond the programme (BTS 2013).

New, innovative initiatives are also needed to help people with COPD engage in physical and social activity in order to support independence and quality of life. Recently, there has been some interest in the value of singing in promoting wellbeing, including its ability to improve breathing. Currently this is an under-researched, though growing field, and has mixed findings. Although surveys have shown that choral singers believe that singing improves their breathing and enhances lung function (Clift and Hancox, 2001; Clift et al, 2009), direct assessment



Dulwich group having fun, 2015

of lung function in professional singers compared with wind and percussion players, has failed to show differences in spirometric parameters (Clift et al, 2009). Recent reviews, published after the planning of the Lambeth and Southwark project, discuss the growing literature on singing and lung disease (Gick and Nicol, 2016; Daykin et al., 2016; Lewis et al., 2017). A Cochrane review on singing and COPD is in progress (McNamara et al., 2016).

Singing and COPD: a review of the evidence

Quantitative evidence

There is growing evidence that group singing may be beneficial for people with chronic respiratory disease in helping to raise awareness of breathing patterns, extend the out-breath, reduce breathlessness, and improve quality of life and social and psychological wellbeing. The findings from the current literature are reviewed here.

It is important to note, before considering these studies, that all available research to date involves small numbers of participants. The numbers involved in singing groups and assessed are: Engen (2005) - seven; Bonilha et al. (2009) - 15; Lord et al. (2010) – 15; Lord et al. (2012) – 13; Goodridge et al. (2013) – 14; Morrison et al. (2013) – 72; McNaughton et al. (2017) – 23, and BLF (2017) – 80. In the McNaughton et al. and BLF studies, the samples were composed mainly of people with COPD, but some participants were affected by other lung conditions. In total, therefore, in the entire singing for breathing research literature, the number of participants is no greater than 239, and 152 of these (over 60%) are accounted for by the Morrison et al. and BLF studies – both of which were uncontrolled.

A further factor to take into account is that every study employs a different set of measures to evaluate the effects of the singing interventions (which also vary in length, frequency, approach and content). As a result, synthesis of findings across these studies is problematic to say the least. Systematic reviews of this literature published recently, also highlight the limitations of the existing evidence base for singing as an intervention to support people with COPD and other respiratory illnesses (Gick and Nicol, 2016; Lewis et al., 2016).

Engen (2005)

Engen (2005) recruited participants from a gerontology clinic and pulmonary rehabilitation clinic who had a diagnosis of emphysema and were willing to participate in at least 10 out of 12 group singing lessons. Twelve people participated but only seven completed the programme. Participants met in small groups twice a week for six weeks. Sessions lasted three-quarters of an hour and consisted of warm-up exercises and choral singing and speaking. None of the physical health and quality of life measures employed showed improvements over the six weeks of the study, but measures of breath control and voice intensity both improved significantly. In addition, breathing mode changed from being 'predominantly clavicular to 100% diaphragmatic that was maintained in all but one subject two weeks after the treatment sessions ended.'

Bonilha et al. (2009)

Bonilha et al. (2009) reported a small randomised controlled trial in Brazil assessing the impact of singing groups on lung function and quality of life among patients diagnosed with COPD. This study randomised 43 patients to a programme of singing or handcraft classes. Fifteen participants in each group completed 24 sessions. A wide range of lung function and health status measures were employed, but with little evidence of difference between the singing group and controls. However, while the control group showed a clear decline in maximal expiratory pressure, the group involved in singing showed a small improvement, and the difference was statistically significant. Both groups showed increased health status scores on the St. George's Respiratory Questionnaire (SGRQ) at follow-up, but with no statistically significant difference between the groups.

Lord et al. (2010, 2012)

Two small trials examining the effects of singing lessons for patients with COPD have been completed at the Royal Brompton Hospital, London (Lord et al, 2010, 2012). In the first study thirty-six COPD patients were randomised to either 12 one-hour sessions of singing lessons over six weeks, or usual care. In addition to group sessions, the singing group participants were also offered a CD with exercises to practice at home. Following attrition, 15 patients in the singing group were compared with 13 controls. Significant improvements were found for participants in the singing group in levels of anxiety assessed by the Hospital Anxiety and Depression Scale (HADS), and the physical component score of the SF-36. Breath hold time increased more in the control group than the singing group. No differences were found between the groups for 'single breath counting', Incremental Shuttle Walking Test (ISWT) scores or recovery time following ISWT.

In the second study, thirty-three participants were randomised to either 16 one-hour sessions of singing over eight weeks (again with a practice CD), or to a film watching and discussion group which met once a week over eight weeks. The frequency of meetings is actually a confounding factor in this study. Following attrition, 13 in the singing group were compared with 11 controls. Significant benefits associated with singing were again found for the physical component score of the SF-36, confirming the findings from the earlier study, but no differences were found on the HADS anxiety or depression scales. Both singing and the film condition appeared to have positive effects on the mental health component of SF-36, but the difference was not significant. No differences were found, however, on measures of breathing control, exercise capacity or daily physical activity.

Goodridge et al. (2013)

A feasibility study conducted in Canada explored whether group singing can have a positive therapeutic effect for people with COPD when used as an adjunctive treatment in association with pulmonary rehabilitation (Goodridge, et al., 2013). Twenty-eight patients following a rehabilitation programme agreed to participate in a non-randomised trial. Fourteen patients were willing to join a singing group following their regular rehabilitation session, for one hour a week over eight weeks and seven agreed to act as a control group. After attrition, 14 patients in the singing group were compared with 5 controls. No significant improvements were found for the singing group on the SGRQ and exercise capacity as assessed by the Six-Minute Walk Test. Nevertheless, as with the Royal Brompton studies, singers enthusiastically endorsed the value of the programme and felt that regular singing had helped to improve their breathing.

Morrison et al. (2013)

Morrison et al. (2013) recruited a sample of 106 people with COPD who took part in one of six community singing groups set up in East Kent over ten months (Morrison et al, 2013; Skingley et al, 2014). Groups were also open to spouses, partners or family carers. A total of 72 participants remained in the study until follow-up. Standardised measures of breathlessness and health (the St. George's Respiratory Questionnaire (SGRQ), MRC breathlessness scale, EQ-5D and York SF-12) were administered at baseline, mid-point and end of study, and spirometry to assess lung function at baseline and study end. Participants were also invited to provide feedback in written comments on the questionnaires at these three data collection points. Health-related quality of life assessed by SGRQ showed a significant 3.3 point change in the direction of health improvement. Improvements were also found in FEV₁%, FVC and FVC%. Such changes have not been found in other studies on singing and COPD, however, and may have emerged given the more extended intervention. Part of the rationale for the current project in Lambeth and Southwark, was to test the repeatability of the spirometry findings in the Kent study.

McNaughton et al. (2017)

McNaughton et al. (2017) report a feasibility single group cohort study in New Zealand along similar lines to that undertaken by Morrison et al. (2013), particularly in evaluating a programme of singing over the course of one year. Twenty-eight patients with chronic lung disease, who had completed pulmonary rehabilitation, were enrolled in the study but five dropped out fairly quickly leaving 23 participants. Of these, 21 were found to meet the GOLD criterion for COPD.

Participants joined one community-based singing group which met for one hour each week throughout the study period, with 45 minutes devoted to warm up exercises, singing and cooling down. The final 15 minutes were for socialising. Recordings of songs were provided so participants could practice at home, and over the year the singing group was involved in six public performances. An important confounding factor in this study, however, is that members of the singing group continued to engage in weekly exercise classes, in addition to weekly singing.

Participants were assessed at baseline, after four months and then again after one year. Measures included: pulmonary function tests, the Clinical COPD Questionnaire (CAP), the Hospital Anxiety and Depression Scale (HADS) and the Six-Minute Walk Test (6MWT).

No change was found after four months and one year on the HADS total score (the primary outcome measure). However, a significant reduction was found for the HADS anxiety score after one year, replicating the finding from the Lord et al., 2010 study. In addition, participants were also able to walk further in six minutes at four months (a mean increase of 28 metres) with a further improvement after one year (a mean further increase of 49 metres). No significant improvement nor deterioration was found for the FEV₁ and FVC measures over four months or a year. This points to relative stability over the period of the study despite the general natural history of decline expected with COPD. However, significant reductions were found in total lung capacity and residual volumes after four months but not a year. The authors do not attach substantive significance to these findings, suggesting that the significant reduction in residual volume may simply be a type 1 error.

The authors conclude that their findings support the feasibility of long-term participation in a community singing group for adults with COPD who have completed pulmonary rehabilitation. Given that participants were regularly engaged in singing and exercise classes, however, it is difficult to determine whether the changes observed were due to singing or exercise or both.

British Lung Foundation (2017)

The British Lung Foundation (BLF) have been at the forefront of promoting the value of 'singing for lung health' and supported the development of singing groups for people with lung disease throughout the UK during 2015-2016, while the current study was underway. Their recent report (BLF, 2016) describes this programme and the training provided, and presents a quantitative and qualitative evaluation of participant outcomes from taking part in singing groups. Participants experienced a range of diagnosed lung conditions, with the majority affected by COPD. Approximately half the patients had previously attended an exercise class or Pulmonary Rehabilitation to help improve their condition.

A number of validated questionnaires were used to assess physical, psychological and general wellbeing outcomes in participants in newly established groups, with the measures administered at baseline and three and six months later. Data from the three-month follow-up are reported from a sample of 80 participants. The measures employed were: COPD Assessment Test (CAT), EuroQoL five dimensions visual analogue health rating scale (EQ-5D), Medical Research Council Dyspnoea Scale (MRC), Patient Activation Measure (PAM) and the General Anxiety Disorder scale (GAD-7)

Statistically significant improvements were found for the CAT, EQ-5D health rating scale and GAD-7. The change in CAT is of particular importance as the size of the change approached a clinically important improvement of two points on the scale. The observed improvement in anxiety is also of interest as it corresponds to changes seen in anxiety on the Hospital Anxiety and Depression Scale (HADS) in the Lord et al. (2010) study.

Qualitative evidence

Most studies reviewed above have reported some qualitative evidence on the effects of singing for people with COPD.

Lord et al. (2010)

Lord et al. (2010) interviewed eight patients who took part in the singing groups. Everyone described the experience in positive terms with no negative effects and with positive benefits for physical and general wellbeing.

Positive physical effects related to the breathing training involved in singing, which brought a feeling of awareness and control. Participants found that this helped their breathing and eased symptoms of breathlessness:

It has made my life easier; I would have liked this when I was first diagnosed

I increased my out breath from 4 to 14 counts

I started breathing much better, from the stomach

The exercises, thinking about breathing and relaxing when I have (breathing) problems...this has been very useful

I always felt better afterwards physically

Positive effects on lifestyle and functional ability were also described:

I have better posture now

Walking better, I go out more when it's not cold

Now things are less of a chore, housework is no longer a struggle

Benefits for mood and a sense of pleasure were also reported:

It was very enjoyable

It opened up a new lease of life

Emotionally...during singing it lifts you. I feel on top on the world. I also feel like that the day after. It makes COPD a lot easier to live with

Its uplifting to sing... this diagnosis is gloomy so the psychological effect of the group is good



Dulwich group in action, 2015

A further important theme was the sense of feeling part of a community and gaining social support from the group:

Nice to have human contact, we achieved something together in the group

I enjoyed the social contact it was great fun

In six weeks we gelled as a group

It felt good to be part of a team

Finally, a sense of achievement and greater efficacy was reported, which participants appeared to carry into their life outside the group. Participants continued to sing songs and perform the exercises taught in the group, supported by song sheets and a CD provided:

I do the exercises from the CD 2-3 times a week. I am looking for a local choir

I will keep it up; it's more enjoyable than other kinds of exercise

Lord et al. (2012)

Lord et al. (2012) interviewed five singers in the second study and report substantially similar findings from the earlier project. All participants in the singing group reported positive physical benefits, particularly a greater awareness of their breathing and improved sense of control:

Helped my fitness... using the breathing technique in the gym and everyday life

Have more control over my breathing... know how to use my breath more

Learnt something about breathing through the singing group and about pacing

In addition, the singing participants felt improvements to their general wellbeing and mood, reporting feelings of pleasure:

Helped with my mood

Depressing being in all the time... group got me out of the house

Positive impact on my mood

Being part of the singing group also created a sense of social support and community, and members learned from one another:

Being around others with COPD prepares me for the future... helps me to learn more about my illness

Others understood what I was saying about my chest... gave me tips to talk with my doctor about

Meeting other people with similar illness helped... felt like everyone understood me... didn't look down on me like at the gym

Finally, the theme of achievement, self-efficacy and learning new skills emerged again as in the 2010 study:

Hadn't felt like going out before course due to breathing problems... now feel I can overcome anything

Want to build singing into daily routine... helps me to overcome difficulties

Had forgotten how much I enjoyed singing

Lord et al. (2012) sum up their findings from discussions with participants:

The findings highlight how enjoyable the participants found the singing group. As well as providing social support, participants felt that the group had had lasting positive physical effects in terms of their breathing techniques. All the participants were keen to continue to use what they had learned within the group. Participants felt they had achieved something both personally and physically. Lord et al. (2012) p.5

Skingley et al. (2014)

Skingley et al. (2014) present an analysis of written comments from participants in the East Kent study on their experiences of singing, which also testify to improvements in breathing and personal and social wellbeing.

Comments were received from 97 individuals (out of the total sample of 106) over the course of the project, with 66 comments at baseline, 77 at mid-study follow-up and 73 at final follow-up (total number of comments 216).

Presentation of findings based on these comments were organised under the following four broad categories: breathing, physical health, psychological health and social wellbeing.

Most participants stated that breathing had improved, and many individuals were able to identify particular mechanisms through which these were achieved. Singing, participants suggested:

- Promotes learning to breathe properly
- Improves posture
- Promotes relaxation
- Helps concentration/provides distraction
- Provides a good workout/more energy
- Opens lungs/increases lung capacity
- Makes physiotherapy easier
- Helps prevent panic/hyperventilation

A large number of comments also reported improvements in physical health including comments related to more positive energy levels, vocal capacity, mobility, physiotherapy being easier post-singing and general physical health.

More common, however, were comments on improvements in mental wellbeing. Ninety-one data extracts alone referred to 'enjoyment' or a similar term, and a further 18 to 'fun.' More interesting than references to enjoyment and fun, however, were statements that point to the process or mechanisms through which psychological health was promoted by singing:

- Lifts spirits (feel uplifted, contributes to spiritual health)
- Promotes general psychological/mental/emotional wellbeing/feeling better/therapeutic
- Boosts confidence, provides sense of achievement and pride
- Provides a feel-good factor/adrenaline buzz
- Provides a purpose in life/reason to get out of the house/something to look forward to
- Helps relaxation
- Promotes a positive attitude/feeling upbeat/counteracts feeling low
- Helps coping/dealing with illness
- Reduces anxiety and depression
- Encourages self-help

The social aspects of the singing groups were also widely mentioned, and comments were universally positive in nature. The frequency of such comments exceeded the number related to breathing and the content related to a sense of friendship and support gained from meeting others affected by COPD. The following comments sum up the general feedback:

...the friendship, team spirit etc. is wonderful ... personally I have benefited from seeing friends, which makes me feel cheery. (Female, age 62)

...as I am retired, the social "get together" has been wonderful. (Male, age 77)

...group has become very friendly and we seem to be becoming a "choir" under excellent guidance. (Male, age 68)

COPD is socially isolating and the singing class has allowed me to share experiences about my condition and pick up tips from others on how to cope. There's always a welcoming comforting atmosphere at singing, it's the one place I don't feel unusual or different from other folk and you don't get comments or looks from those around you if you experience discomfort as they understand your condition and its limitations. (Male, age 70)

Skingley et al. (2014) conclude by considering their results in relation to the earlier Brompton studies:

The evidence from participant comments in our study adds to the research base on singing for breathing. Improvements in breathing, in physical health more generally and in mental wellbeing, experienced by our sample as a result of singing, are supported in the responses to interviews conducted in the two studies by Lord et al. (2010, 2012). In addition, the Lord studies also reported social benefits and support from the group nature of the intervention, adding credence to our findings. Skingley et al. (2014) p.13)

McNaughton et al. (2016)

Recently, McNaughton et al. (2016) report on feedback from participants in their feasibility study on singing and COPD.

Twelve participants (from a total of 23 in the project) took part in interviews about their experiences of singing after being part of the group for between 6-9 months. In addition, the remaining 11 group members were invited to participate in a focus group meeting about their experiences.

Transcripts from the interviews and focus group was subject to thematic analysis, and four major themes were identified:

- Being in the 'right space'
- Developing a sense of connection with others
- Experiencing shared purpose and growth
- Participation in meaningful physical activity

The authors suggest that these themes help to explain the high levels of engagement with the project among participants and the self-reported health improvements.

Many participants described the singing group as a safe place in which they could relax and enjoy themselves, rapidly overcoming any initial sense of anxiety or apprehension:

I actually feel a sense of kind of relief but also knowing that I am in the right space... so when I went in I thought - I knew I was in the right space... well it's like a space to go that's me and I think that is really important for people to have a space that's theirs. (Participant 1, interview)

The feeling of being at ease arose because participants were with a group of people who had similar experiences and they did not feel embarrassed about their symptoms such as shortness of breath, wheeziness, or needing to cough:

You don't feel different, you don't feel... I don't feel self-conscious as if I got to pretend there's nothing wrong with me. I'm the same as everyone else. (Participant 17, focus group)

Feelings of community and connection also developed and were summed up in the following way by one participant:

I think the fun, I think the laughter here is really good, and I think that the people, most of them, are quite positive. Like, they've all got an illness, we've all got an illness, and they're really positive, and the humour and that feeling of being positive about illness. They're still getting out, still exercising. It's actually good; it's encouragement for you to carry on... we encourage one another to keep going. (Participant 6, interview)

Participants also appreciated the opportunity to do something creative. Learning new songs and words was a challenge, and the group felt pride when they performed these pieces in public:

I'm also doing something that I would never have thought in my life that I would do. Come here and open my mouth and sing away. But also I know that there is no judgement, I look around and know that most people around here are a lot, lot worse off than you are. (Participant 19, focus group)

Finally, participation in the singing group required physical activity. The singing exercises promoted attention to breathing and the muscles and postures used to control the lungs. Choir participants were encouraged to stand for part of each rehearsal, but could sit if uncomfortable. One participant reported that the singing exercises made her breathe out much more than she normally would do:

You sing the words and then it makes you breath in and you find that you do quite a deep breath and the next lot of words goes out and you actually sort of seem to breath out a little bit further than you probably should but then you get another big breath in and it actually sort of encourages your lungs to do a lot more than they normally do. (Participant 5, interview)

Furthermore, many participants reported that mood and overall wellbeing had also improved. They attributed this to a combination of the psychological and physical effects of being part of the group. The participants reported how singing made them feel good, with one participant noting that singing allowed her to be in the moment:

It does something to the mind... When you sing you can't feel sorry for yourself and you don't think of, of something else. For me when I sing it takes me away to a different level. (Participant 4, interview)

All participants reported perceived physical benefits. Many commented that their breathing felt easier the day after singing, with singing helping some to clear sputum. The participants reported that their breathing continued to improve throughout the year:

I mean I can come here at times out of breath, and then I can go home after the group and I'm feeling great. (Participant 16, focus group)

My exercise is getting a little bit better. Before I couldn't even walk down to the gate without puffing too much, now I can walk down the street. (Participant 11, interview)

For some, these improvements translated into better exercise tolerance. Many were significantly tired after the singing sessions and the following day, but reported being happy with this trade-off. One participant was surprised that he had no hospital admissions during the year compared with frequent admissions in previous years.

In concluding, the authors offer some thought-provoking reflections on the implications of their findings for the treatment of people with COPD:

Considering how relatively ineffective current pharmacological treatments are for COPD, we should consider safe, sustainable, patient-centred community interventions that might improve wellbeing and sustain the benefits of pulmonary rehabilitation. Interventions such as singing groups can provide more support in a community where otherwise patients with long-term conditions like COPD can feel abandoned. The results from this study provide information about singing interventions that can inform future clinical trials. Of particular interest is the possibility of using singing interventions as a way of engaging with people who otherwise decline to participate in traditional pulmonary rehabilitation programmes when it is offered to them. McNaughton, et al. (2016), p.6

British Lung Foundation (2017)

As part of the evaluation of the BLF Singing programme qualitative feedback was gathered from participants three months into the programme. The report is not explicit on the number of individuals providing feedback, although the quantitative section of the report indicates that 80 completed questionnaires were gathered at three months. The main themes emerging were:

- Increased understanding of breathing techniques to reduce breathlessness and maintain optimal lung function
- Increased awareness of the benefits of singing for lung health and self-management
- Increased capacity for creative self-expression, increased self-confidence and quality of life, and reduced feelings of stress and anxiety
- Increased accessibility to services which are open and approachable

The following selection of comments from participants illustrate these themes, which clearly overlap with the range of comments reported in previous research:

I can't wait for the next session, it's made such a difference to my breathing and reduced use of blue inhaler substantially

It has transformed my life. The breathing and relaxation techniques I use for singing I now use as preparation for any physical activity

Walking, especially uphill, is much easier for me now. I can walk further and for longer with little reliance on my inhaler now

It has lifted my depression and helped me be able to communicate with people

I was on anti-depressants, but I am now feeling much better and my GP is slowly stopping the dosage. I even wake up in the morning with a song in my head and ready to sing

My confidence in taking part in a group activity is much improved – especially as in life pre-sarcoidosis I was very poor on this as well

The social effect, making friends with other people and the singing activities themselves – therapy that doesn't feel like therapy – rather a creative pass time

Systematic reviews on singing and breathing

As noted above, two recent systematic reviews consider the evidence on the value of singing for respiratory illness.

Gick and Nicol (2016) consider studies on COPD and other respiratory conditions, and reach the following balanced conclusion, highlighting the wellbeing and social benefits from singing:

Most studies do not show improvements in respiratory health but instead in quality of life or well-being, which have positive immediate impact and might further affect respiratory health over time. Selection bias may be present in some studies as a result of recruitment processes, or attrition from singing and control conditions due to low belief in singing or high motivation to sing, respectively. Nonetheless, engaging in an enjoyable activity with others that may benefit wellbeing might be useful for some people suffering from respiratory illness, especially if they are isolated due to their illness. Gick and Nicol (2016), p.732.

Lewis et al. (2016) provide a detailed and critical review of the existing literature on singing for lung health, and identify, in particular, substantial sources of bias that inevitably operate in studies and trials that cannot be effectively blinded (participants know they are singing), and where participants engage because they enjoy singing and believe

that it may be beneficial. They conclude that further, larger-scale and more robust studies are needed to test the therapeutic effects of singing, but acknowledge that: ‘...there is considerable qualitative data to support participation in singing groups as a safe and potentially valuable strategy for people with COPD.’ Lewis et al. (2016), p.5. An important contribution of this paper is that it offers a consensus statement on the conduct of singing for breathing groups and further research on singing for lung health. These guidelines should contribute to ensuring consistency in quality of delivery and the development of a robust and cumulative body of knowledge.

Singing for COPD is also considered in the recent What Works Wellbeing reviews on music, singing and wellbeing (Daykin, et al., 2016). Their assessment is that currently there is ‘initial’ evidence for singing as an intervention for people with COPD: ‘...there may be an effect, which we need to investigate further.’ (Daykin et al., 2016, p.1)

Singing for breathing groups across the UK

Details of a large number of singing groups for people with breathing difficulties now operating across the UK can be found online. Sites often include written testimonials and film material of groups in action, with participants talking about their experiences of singing and the benefits gained. All of the themes documented through research are commonly expressed on these sites and in the films.

Sources particularly worthy of mention are Royal Brompton and Harefield ‘Singing for Breathing’; the British Lung Foundation, ‘Singing for Lung Health’ initiative, and the ‘Singing4Breathing’ project in Northampton.

Details of websites and online films of singing for breathing groups are given in Appendix 1.

Study aim and objectives

The aim of the Lambeth and Southwark Singing and COPD Project (Singing for Better Breathing) was to establish and evaluate the provision of singing groups for people with COPD – with two groups in each borough, with a total sample of at least 100 participants with COPD. In addition to patients with COPD, the groups were open to spouses, partners or family carers. The purpose was essentially to build upon the earlier East Kent study (Morrison, et al. 2013) to assess the feasibility of a network of singing groups for people with COPD in a very different urban environment and evaluate outcomes.

Study objectives were:

- To create a network of four community singing groups for patients with COPD in Lambeth and Southwark (and carers if they wish) tailored to their socio-economic, demographic and ethnic characteristics, and health needs
- To assess the level of willingness among COPD patients to participate in weekly group singing and their willingness and ability to maintain regular participation over a period of one year
- To assess the effects of regular participation in group singing on the wellbeing and health of COPD patients using standard spirometry and physiological assessments before and after the singing programme and validated self-report measures of health (the St. George’s Respiratory Questionnaire (SGRQ), the MRC breathlessness scale and the EuroQoL five-dimensions scale (EQ-5D))
- To assess usage of NHS and social services to provide the basis for an health economic evaluation of singing for COPD
- To offer project participants the opportunity to take part in larger singing workshops and performances
- To help sustain involvement in singing for patients with COPD following the end of the project
- To assess the potential place of group singing activity within recommended care pathways for COPD, and consult with local commissioners on the potential for sustaining and extending the provision of singing groups dependent upon the outcomes of the evaluation



Guillermo and Shilpa leading the Rotherhithe group, 2015

Project and Evaluation

Project timeline

Box 1 gives a timeline for the project, to provide an account of what happened, when and where.

Once funding was confirmed, we started to consult with people with COPD in Lambeth and Southwark, through the Southwark Breathe Easy Group, Dulwich and Surrey Docks Health Centre, Rotherhithe. We identified venues and dates for the planned singing groups so that printed and filmed publicity material could be developed. Following ethical approval, a formal launch event took place at the Royal Festival Hall and this was filmed. The process of recruitment began by contacting GP practices in the vicinity of the venues with a request that they write to all patients on their COPD registers providing information about the study. Posters and leaflets to advertise the project were also provided. Follow-up letters were sent on two occasions. Support from practices was limited, however, and only six practices (out of 44 contacted) sent out letters to patients prior to groups commencing.

By early summer of 2015 it was clear that we would not reach our recruitment target of at least 100 participants with COPD (25 per group), and further efforts were made to recruit throughout the summer and autumn of 2015. Baseline assessments took place in September 2015 for those wishing to take part in the study, by that point, and three singing groups commenced in late September/early October (two in Southwark and one in Lambeth). With continued recruitment, further baseline assessments took place in January 2016 and a second group was established in Lambeth. Groups met until July 2016, when all participants were further assessed.

Groups had the opportunity to come together for combined performance events, starting with a showcase appearance at a national conference on arts and health which took place in February 2016 at the Royal Festival Hall. Subsequent performance events took place at St. Thomas' Hospital as part of the London Culture, Health and Wellbeing Week in June 2016. The evaluation was concluded in September 2016 when the final follow-up assessments took place. Southwark groups recommenced in autumn 2016 supported by funding from The Evening Standard newspaper and the project continued to support the Lambeth groups while the analysis of project data was undertaken and the final report and film was prepared. An end of project celebration event took place at St. Thomas' Hospital in November 2016, at which the combined groups performed and preliminary feedback was given to participants. The final report and film was launched at the Royal Festival Hall in June 2017.

Box 1: Timeline for the project

November 2014	Guy's and St Thomas' Charity approve funding and work begins on developing a detailed protocol for ethical and R&D approval.
November 2014 – February 2015	Initial contacts with Southwark Breathe Easy Group, United Reform Church, Dulwich, and patient representatives at Surrey Docks Surgery, Rotherhithe, to request assistance with the developing the project. Appointment of facilitators for the singing groups and provision of training and guidance for running groups. Setting up pilot groups in Dulwich and Rotherhithe to involve people with breathing difficulties in developing recruitment material for the project.
February 2015	Submission of application for NHS ethical approval via proportionate review.
March 2015	Ethical approval confirmed for the project.
April 2015	Launch event for the project at the Royal Festival Hall London. Members of the small pilot groups attend, together with members of singing for breathing groups in London and Kent to support the event. Filming of the event and group participants in Rotherhithe and Dulwich for an initial film to aid publicity. Website for the project launched.
May 2015	<p>Dover singing for breathing group members invited to the respiratory laboratory at the University of Kent Medway Campus to participate in the proposed assessment process to refine procedures and check timing. Assessments filmed to provide information to potential participants in the study on what the assessments would involve.</p> <p>Application for R&D approval and research passports. Four venues, days and times agreed with a start date for groups in September. Ten to twelve surgeries within easy travelling distance of each venue contacted and asked to assist by writing to people with COPD on their registers, and make information available about the project. Participants required to refer themselves by phoning an information line.</p>
June-July 2015	Second reminder letter to NHS surgeries and taster sessions in four venues. A series of taster sessions organised so that potential participants can learn more about the project.
July 2015	Recruitment is slow and it becomes clear that target numbers for the study are unlikely to be reached. Further efforts are made with publicity through the summer and into the autumn, with advertising in the Southwark News and Lambeth Weekender newspapers.
July-August 2015	Third letter to NHS surgeries due to under-recruitment. Further leafleting in Lambeth, and newspaper advertisements. Decision made to amend the protocol to undertake further recruitment in the autumn, for a second cohort with baseline assessment in January 2016. These participants would experience singing for six months weekly.
September 2015	Newspaper advertising continues. Research Governance assurance confirmed. All research passports approved and letters of access to NHS sites obtained. Additional taster sessions in September in four venues – decision not to proceed with Morley College as a venue – three groups judged to be viable. Baseline assessments take place.
End September – early October 2015	Three groups commence: Rotherhithe, Dulwich, Streatham – careful monitoring each week of attendance. Groups run for ten months until end of July 2016. Continued efforts at further recruitment.
January 2016	Second baseline assessment for further participants and a fourth group in Clapham established.
February 2016	All of the groups are brought together for the first combined performance event at Southbank Centre as part of the Aesop conference and showcase on arts and health for health decision makers. The event is filmed as part of the on-going documentary record of the project.
April-May 2016	Interviews conducted with participants to gather accounts of their experiences and benefits gained. Interviews transcribed and content analysis undertaken.
June 2016	All groups brought together for a second lunchtime performance event at St. Thomas's Hospital as part of London Culture and Wellbeing week. The groups also perform in the evening as part of a reception for the All Party Parliamentary Group for Arts, Health and Wellbeing organised by the National Alliance for Arts, Health and Wellbeing. This event was filmed.
July 2016	Follow-up assessments of participants with lung function and exercise assessments and questionnaire completion. One assessment day is very hot with temperatures reaching 33 Celsius, and most participants booked in on that day unable to keep appointments.
September 2016	Southwark groups continue independently of Guy's and St. Thomas' Charity funding, for one year with the support of a grant from The Evening Standard, Dispossessed Fund. A further assessment day takes place but that too turns out to be one of the hottest September days on record. All but two participants manage to attend. Analysis of project data begins.
November 2016	A final lunchtime performance event at St. Thomas's Hospital and an opportunity to feedback some of the findings to participants and give details of the launch event for the final report and film. Further filming takes place. The Lambeth groups, with the support of members of the Southwark groups, perform at a Lambeth CCG training event on 3 November and make a considerable impression.
April 2017	Filming session in Dulwich to create continuity footage for the project documentary film.
June 2017	Launch of final report and film at Southbank Centre, with members of the Singing for Better Breathing participants, and further singing for breathing groups from across the UK.



Guillermo leading the Dulwich group, 2015

Design and methods

The present study was planned as a further feasibility study to build upon the earlier East Kent project and test the repeatability of its findings (Morrison, et al., 2013). It had proved possible in the small town and rural setting of East Kent to establish a network of singing groups for people with COPD and some encouraging results were obtained from the evaluation over a period of ten months. We wished to assess whether we could successfully set up a similar network in a very different larger inner city urban environment. The formal aim and objectives of the study are given in the introduction above.

A prospective single cohort design was adopted with monitoring at baseline and follow-up using objective and subjective measures of health and wellbeing, including the St. George's Respiratory Questionnaire (SGRQ) as the primary outcome measure together with standardised spirometry and exercise assessments as secondary measures.

Ethical and R&D approvals

The project proposal was subject to proportionate ethical review and approval granted by the Yorkshire & The Humber – Leeds East NHS Ethics Committee on 17 March 2015. Compliance with all internal Canterbury Christ Church ethical procedures was confirmed and a risk assessment was lodged with the university on 15 June 2015. Confirmation of NHS Research Governance was received from the Clinical Research Network for South London on 9 September 2015.

Participants

We aimed to recruit a similar number of participants as in the Kent study (i.e. 100 participants) to allow for four groups of approximately 25 members per group.

The following inclusion/exclusion criteria were specified in the project protocol receiving ethical approval.



Members of the Streatham group, 2015

Criteria for participation

Inclusion

- Patients on COPD registers in general practices in the vicinity of chosen venues for singing groups not excluded by the criteria below
- COPD confirmed by spirometry at baseline
- MRC dyspnoea score (Fletcher et al, 1959; Bestall, et al 1999; Stenton 2008) of at least 2 as assessed at baseline
- Physically mobile and able to travel to sessions independently or with the support of a carer
- Willing to commit to participating in singing groups over the whole period of the project and the planned assessments (health and social commitments permitting)

Exclusion

- Severe dementia or other cognitive or communication problems which would render consent problematic
- Severe co-morbidities which contra-indicate participation

Recruitment commenced following ethical approval. The main strategy was to write to practice managers and the lead GP at between 10-12 surgeries within 30 minutes walking distance of the four venues identified for the singing groups. All surgeries received a supply of posters and flyers for display in waiting rooms. Surgeries were also asked to send out a supplied letter and information sheet to patients with COPD, inviting them to take part, and were offered a fee per letter sent out. Only six surgeries agreed to do this. By early July 2015, it was apparent that only three groups were viable and that a further effort at recruitment would be needed following baseline assessments and the start of the groups. Further requests were made to surgeries to continue advertising the courses and the project was advertised weekly over four weeks in Southwark News and Lambeth Weekender in July-August.

Potential participants contacted the Sidney De Haan Research Centre for Arts and Health to express their interest in being part of the study. Contact details were taken and an invitation given to attend a taster session. At these, the project was explained in more detail and participants had the opportunity to experience some singing. They could then decide whether they wished to join the group and be part of the project.

As of the beginning of September 2015, the numbers of participants were sufficient to allow three viable groups to run from late September/early October 2015. A fourth smaller group began in January 2016.

Evaluation methods

The singing intervention was evaluated using a mixture of quantitative and qualitative methods. Objective lung function and spirometry assessments were used to capture any measurable change associated with participation in singing. Validated questionnaires were used to assess subjectively rated health status as SGRQ as the primary outcome measure. Structured individual interviews were conducted to capture individuals' experiences of the singing groups. Details of service use were also gathered as a basis for a health economics assessment.

Participants had received a full information sheet with a letter confirming their appointment for baseline assessment. On arrival, participants gave written informed consent to take part in the study.

Participants engaged in completing a full battery of questionnaires and physical assessments at baseline (September 2015 for the first cohort, and January 2016 for the second) and then at the end of the singing intervention (July 2016, with some additional assessment in September 2016 due to unusual weather conditions in July as explained below). The assessment process took between 45-60 minutes.

In addition, the project was documented through photography and filming. The audio-visual documenting served to provide a dynamic record of the development of the singing groups; the combined public performances organised to showcase participants' achievements, and was invaluable in capturing personal testimonials from participants.

Rotherhithe group in movement exercises, 2015



Questionnaires

All questionnaires utilised in the study were designed for self-completion, but trained staff were available to support participants in completing them. It was clearly explained to participants that they had the right to leave blank any specific questions they would prefer not to answer.

St George's Respiratory Questionnaire (SGRQ)

St George's Respiratory Questionnaire (SGRQ, 2008) has 50 items with 76 weighted responses. It has good discriminative and evaluative properties and is responsive to therapeutic trials. It was developed and validated for both asthma and COPD, although it has also been validated for other respiratory conditions. There is a large literature concerning the use of the questionnaire in many settings, including norms for different populations. It takes 8-15 minutes to complete and a scoring algorithm is available.

The SGRQ has three sub-scales:

- Symptoms – this component is concerned with the effect of respiratory symptoms, their frequency and severity
- Activity – concerned with activities that cause or are limited by breathlessness
- Impacts – covers a range of aspects concerned with social functioning and psychological disturbances resulting from airways disease

MRC Breathlessness Scale

The MRC Breathlessness Scale (Bestall, et al., 1999; Stenton, 2008) is a simple rating measure consisting of five statements that represent the range of respiratory difficulties from none (grade 1) to considerable incapacity (grade 5). The MRC scale does not provide a quantitative measure of breathlessness, but rather is a numerical measure of the disability associated with difficulties with breathing. The scale is widely used to describe patient groups and a score of at least three is recommended as a criterion for referral to pulmonary rehabilitation (Baxter et al. 2016).

EuroQoL 5-dimensions Scale (EQ5D)

Health utility was measured by the EQ5D (EuroQoL Group, 1990). This is a short, five-dimensional instrument with three levels which allows the generation of quality-adjusted life years (QALYs) (EuroQoL Group, 1990: for further details see: <http://www.euroqol.org/about-eq-5d>). The five areas are: mobility, self-care, usual activities, pain/discomfort and anxiety/depression. Respondents rate each dimension on a three point scale: no problems, some problems and extreme problems. The profile of answers is converted to an overall score ranging from 0 to 1, with higher scores reflecting better health status. The EQ5D is widely used in the economic evaluation of healthcare and recommended for cost-effectiveness analyses.

The Client Service Receipt Inventory

The project was evaluated from a health economics standpoint and data gathered on costs associated with setting up and running the intervention and costs associated with health and social care service utilisation. A Client Service Receipt Inventory was specifically designed for use in this study with its content informed by similar inventories used in previous evaluations of singing interventions conducted by the De Haan Centre (Coulton et al. 2015). At each assessment point, participants were asked to provide information on their health and use of services looking back over a period of six months.

Demographic and personal information

In addition, participants were asked to provide a range of personal data including: age, sex, income, housing, education and any health problems in addition to difficulties with breathing.

Physical measures, physiology and lung function

Participants were asked not to eat, nor drink tea or coffee, during four hours prior to their appointment. In addition, before any physical assessments took place, participants were screened for any potential contra-indications for the planned procedures. No participants were excluded from the assessments following this screening.

Participants were then measured for height and weight, Body Mass Index (BMI), blood pressures (systolic and diastolic), and oxygen saturation. Oxygen saturation assessments were undertaken as a precautionary measure to ensure that values were in the normal range. In addition, basic spirometry parameters were assessed together with exercise potential (Six-Minute Walk Test) and measures of the level of breathlessness provoked by the exertion.

Maximal lung function

The measurement of maximal lung function was performed according to American Thoracic Society (ATS) and European Respiratory Society (ERS) recommendations. Spirometry is a physiological test that measures how an individual inhales and/or exhales volumes of air as a function of time. The primary signal measured in spirometry may be volume (amount of air) or flow (speed of air).

Participants were invited to sit down on a chair and hold the spirometer (ML3500 MicroMedical, Cardinal Health, UK). Participants were fitted with a soft nose clip and instructed to breathe in until they reach total lung capacity and then immediately exhale through a filter mouthpiece connected to the spirometer. They were asked to do this with maximum possible effort, and to continue until they could expel no further air. During the test, the nose clip was used to prevent air escaping through the nose. The baseline measurement was repeated until three attempts were obtained that met the acceptance criteria of ATS and ERS recommendations. The following flow-volume measures were recorded:

- Forced Vital Capacity (FVC)
- Forced Expiratory Volume in one second (FEV₁)

These measures were also expressed in terms of percentage of predicted values. The ratio FEV₁/FVC was calculated to confirm COPD diagnosis (FEV₁/FVC < 0.70). Percentage of predicted value was also derived for this ratio.

Maximal mouth inspiratory pressure

Inspiratory muscle strength was assessed by measuring the maximal inspiratory pressure (MIP). MIP provides a reflection of the global strength of the inspiratory muscles (Polkey et al. 1995).

The POWERBreathe K5 (POWERbreathe International Ltd, UK) was used to measure MIP. Participants were asked to seal their lips firmly around the mouthpiece attached to the device, exhale slowly to residual volume, and then inhale as quickly as possible until they reached total lung capacity. The inhalation was against a pressure of 3 cm H₂O. This maneuver was completed a maximum of 10 times. The measurement with the greatest MIP was recorded as long as it was within 5% of the second largest effort.

Exercise and breathlessness assessments

Six-Minute Walk Test (6MWT)

The Six-Minute Walk Test (6MWT) was used to assess functional capacity in participant cardiovascular and lower limb musculature, attempting to replicate challenges presented in everyday living (Brown and Wise, 2007; Rasekaba et al. 2009; Singh et al. 2014). Both before and afterwards, participants were asked to rate their degree of breathlessness on a Borg dyspnoea scale.

Walking is an activity performed daily by all apart from the most debilitated patients. This test measures the distance that a patient can quickly walk on a level hard surface in a period of six minutes. It evaluates the global and integrated responses of all the body systems engaged during exercise, including pulmonary, cardiovascular, metabolic, neuromuscular, central and peripheral circulatory. It does not provide specific information on the function of each individual system, peak oxygen uptake, cause of dyspnoea, or the mechanism of exercise limitation, as is possible with maximal cardiopulmonary exercise testing (CPET). The self-paced 6MWT assesses the sub-maximal level of functional capacity. Most patients will not achieve maximal exercise capacity during the 6MWT as they control their own exercise intensity and are allowed to stop and rest during the test. However, because most activities of daily living are performed at sub-maximal levels of exertion, the 6MWT may better reflect the functional exercise level for activities of daily living. Care was taken to specify contraindications for using the Six-Minute Walk Test and the risks associated with it.

Borg breathlessness scale

The Borg scale is a simple rating measure from 0-10 with scale points anchored with descriptive phrases used to refer to the intensity of an experience (e.g. 0 nothing at all, 3 moderate, 5 severe, 7 very severe, and 10 very, very severe). The scale was used in association with the 6MWT for participants to report on their degree of breathlessness, before and after the walking test.

Qualitative data and documentary record

In addition to monitoring participants' health and performance using the objective and standardised procedures outlined above, it was considered important to capture participants' subjective experiences of the singing intervention and their views of whether and how this activity had helped them in managing their respiratory illness.

Structured interviews

Participants were invited to take part in a structured interview which, with explicit consent, was digitally recorded and transcribed. Box 2. gives the questions asked, which were specifically designed for this study. For each of the questions, a card was presented with a cue word or phrase for interviewees to keep in mind.

Photography and filming

The East Kent feasibility study employed both photography and filming through the study in order to capture the nature of the intervention, key landmarks, views of facilitators, and above all, the experiences of participants. Experience of disseminating findings from the East Kent project repeatedly highlighted the significant impact associated with having a film documentary of the project for audiences, over and above relatively dry academic presentations of numerical data. Participants in this study were asked to give permission to be photographed and filmed with material to be used in publications, conference presentations and social media.

Box 2: Interview schedule

1. Looking back, could you tell me how you got to hear about the singing group and why you were interested to join?
2. Could you tell me about your lung problem – how it started and what effects it has had on your life?
3. What help have you received in managing your condition?
4. In terms of your physical health and your lungs, has being part of this project made any difference?
 - a. Has it made a difference for your breathing?
 - b. Has it made a difference to how active you are?
 - c. Has it affected the support you have needed from your GP, the surgery and other health services?
 - d. Has it affected your use of medication?
5. Has the group made any difference to your mental and social wellbeing and health? In what ways?
6. Have there been any aspects of the group and the singing activities that you haven't enjoyed or could have been improved?
7. We have evaluated this project by asking participants to complete lung function and exercise tasks and also complete questionnaires. Do you have any views on how we have tried to assess the project?
8. Do you have anything else you would like to add about your involvement in this project or any questions for me?

The singing intervention

Singing groups were led primarily by two skilled and experienced singing leaders, with support from the project musical director, and two additional facilitators who could lead groups if the primary facilitators were unwell or away. The facilitators underwent training and were in regular contact with one another and the musical director throughout the project to ensure a consistent approach and similar repertoire. The musical director also provided a handbook as a common point of reference for all facilitators involved in running groups.

Each weekly meeting lasted 90 minutes, with 15 minutes at the start for arrival, administrative tasks and settling down and 15 minutes at the end for any further administration and leaving. During the hour of the session, singing was preceded by exercises to encourage relaxation, good posture, effective breathing and warming up the voice, as is usual in most singing groups and choirs. A wide repertoire of familiar and new songs was used. Keeping the programme fresh, enjoyable, stimulating and stretching was essential for the project given that it ran over the course of ten months. Songs were taught by ear and generally sung without instrumental accompaniment.

Further examples of activities and repertoire are given in Box 3.

Box 3: Examples of activities and repertoire in the groups

Body work

A strong focus on alignment. Unfurling the body with more space in upper abdominal, midriff, back of ribcage and solar plexus areas. Mobilizing the spine and ribcage in gentle torsion, flexion and extension to activate intercostals and other muscle groups involved in the breathing process. Simple yoga stretches and movements, and exercises based on the Feldenkrais method and Alexander Technique.

Breathing

A focus on lengthening the out-breath and promoting sustained, supported airflow. Encouraging a swift release of the abdomen when inhaling to allow for deeper breathing and the descent of the diaphragm. Activation of deep core muscles in the pelvic floor for a successful exhalation. Panting and pulsating- rhythmic exhalation, with voiced and unvoiced sibilant consonants.

Voice work

Warm-up with call and response and round-the-circle activities with spoken sounds, names and phrases. Exploring diverse vocal qualities to encourage power and confidence, as well as an awareness of longer phrases without top-up breaths. For vocal strength, opening up the vocal tract, engaging the core musculature, and using resonance and articulation for a clear tone. Exercises for the release of unnecessary tension in jaw and face through stretching and facial massage. Upper body movements to free up the muscles. Mobilising the tongue through trills and shakes. Activation of soft palate through a pre-yawn sensation, and humming transition to open vowels. Sighs, glissandi and massage to free up the larynx.

Repertoire

World Music: Togo tongo, Belle mama, Soualle, Senwa dedende

Medieval: Jubilate deo (round), Da Pacem Domine (3 parts)

Gospel: Swing low, Oh when the saints, Freedom is coming (2-3 parts), Tell a me where shall I be (2-3 parts), Wade in the water (3 parts)

Pop: Imagine, Stand by me, Let it be (2 parts)

Latin: El Café (2 part), Perhaps perhaps, Banana Boat song, Guantanamo (2 part)

Jazz: Bye Bye Blackbird, Sometimes I'm happy, It had to be you, What a wonderful world, I got rhythm

Other: A nightingale sang in Berkeley Square, Cockles and mussels, Country road, Lambeth Walk

The dates for the delivery of the singing groups following baseline assessment were:

Rotherhithe, Southwark	29 September 2015 – 26 July 2016	40 sessions
Dulwich, Southwark	29 September 2015 – 2 August 2016	40 sessions
Streatham, Lambeth	1 October 2015 – 21 July 2016	38 sessions
Clapham, Lambeth	14 January 2016 – 21 July 2016	25 sessions

Singing groups met weekly on Tuesday or Thursday mornings and afternoons, with two-week breaks for holiday periods over Christmas and Easter.

Aesop Arts & Health conference, Royal Festival Hall, 2016



Findings

Confounding factors

This section reports the findings from the evaluation. There are, however, two important considerations to bear in mind before examining the results: firstly, the impact of the weather on follow-up assessments and secondly, the potential effects of high levels of atmospheric pollution across London throughout 2015-16.

High temperatures

During the follow-up assessments in July 2016, the weather was dry and hot, and on one of these days, Tuesday 19 July, temperatures in central London exceeded 30C. The Telegraph, ran the headline:

UK weather: Temperatures reach 33C on Britain's hottest day of the year¹

As a consequence, many of the participants due to be assessed that day were unable to attend. For questionnaires, it was possible to request completion by post, but physical assessments had to be rescheduled. For practical reasons, the next possible time for this was Tuesday 13 September. Extraordinarily, this day proved to be one of the hottest September days ever recorded. The BBC reported:

Highest September temperature since 1911 as 34.4C recorded²

Fortunately, most of those booked in for assessments that day made the effort to attend. Nevertheless, the extreme weather conditions may well have adversely affected performance levels for some of the participants.

Air pollution

A further substantial consideration is that over the entire course of the project, there was growing concern regarding air quality in London. The Independent newspaper, for example, reported on the 14 January, 2016 that:

London breaches air pollution limit for the whole of 2016 in just over seven days³

The situation regarding air pollution continued to cause concern throughout 2016, and the Mayor of London, Sadiq Khan, declared in a news conference on 18 January 2017 that air quality in London constituted 'a public health emergency.'⁴

Concern about air quality has recently escalated with a report in the London Evening Standard on 20 March 2017 of a 'super inquiry' involving four parliamentary select committees in the House of Commons into poor air quality in London.

'Super inquiry' into toxic air scandal launched in unprecedented move⁵

We are not able to quantify any impact of pollution on the lungs of our participants, but it is clear that any deterioration in air quality may have had a negative impact on their respiratory health and performance.

¹ <http://www.telegraph.co.uk/news/2016/07/19/british-weather-set-to-reach-temperatures-of-35c-in-a-brief-heat1/>

² <http://www.bbc.co.uk/news/uk-37345436>

³ <http://www.independent.co.uk/news/uk/politics/london-breaches-air-pollution-limit-for-the-whole-of-2016-in-just-over-seven-days-a6811616.html>

⁴ <http://www.independent.co.uk/news/uk/home-news/london-toxic-air-alert-pollution-mayor-sadiq-khan-public-health-emergency-latest-a7532941.html>

⁵ <http://www.standard.co.uk/news/health/super-inquiry-into-toxic-air-scandal-launched-in-unprecedented-move-a3493801.html>

Participants

Two factors complicate the description of the sample of participants involved in this project.

- Two cohorts
- COPD status

In total, 60 participants with breathing problems completed the spirometry and physical exercise assessments and the questionnaires at baseline. A total of 44 participants were followed up with questionnaires. Of these, 28 were assessed at baseline in September 2015 and 16 in January 2016. The sample consisted of 10 males and 34 females.

Out of 42 participants followed up with physical assessments, 31 were shown to meet the GOLD criterion for airways obstruction and a diagnosis of COPD (ie $FEV_1/FVC < 0.7$) at baseline. With respect to air flow limitations: six were mild ($FEV_1 \geq 80\%$ predicted), 15 were moderate ($50\% \leq FEV_1 < 80\%$ predicted); nine were severe ($30\% \leq FEV_1 < 50\%$ predicted), and 1 was very severe ($FEV_1 < 30\%$ predicted). Of these, 18 were recruited in September and a further 13 in January. For both cohorts combined, the sample consists of 8 males and 23 females.

Biographical characteristics

Of the 44 participants followed up, the largest proportion were married (37%), just over a third described themselves as single (35%) and the remainder were separated, divorced or widowed (28%). In the main, participants were living alone (44%) or with a partner or partner and children (40%). Most participants either rented (49%) or were owner-occupiers (44%). Income range was wide with 31% reporting a household income of under £400 per month; 51% £400-1799 per month; 13% between £1800-3800, and just 5% with a monthly income of over £3800. Only 9% were in paid employment. A large majority of participants (95%) described themselves as 'white' with 5% 'mixed' or 'black'. Only 10% of participants were currently smokers, but 57% had been smokers, and a third had never smoked.

Participants followed up and those not

A range of factors account for participants leaving the project. Most discontinued due to personal health issues, the health of their partners or further family responsibilities. In addition, the weather conditions on one of the follow-up days was a factor, as noted above, with two participants lost to follow-up for spirometry and physical assessment. There were no participants who left the project due to disliking the activity or feeling it was not potentially beneficial.

Table 1 reports a comparison at baseline of participants who were successfully followed up and those who were not, on the key spirometry measure (followed up $n=42$) and the structured questionnaires employed (followed up $n=44$). In this and further tables in this report, correlated t-tests, p -values ≤ 0.05 (two-tailed) are used to judge significance, unless indicated. Where $p > 0.05$, 'ns' is used to indicate that any apparent difference is not statistically significant.

The results show clearly that participants followed up, and those not, were similar on the FEV_1/FVC ratio, but those who dropped out from the project reported subjectively poorer respiratory health. This is seen in higher ratings for dyspnoea on the MRC scale, and the higher SGRQ scores, including significantly greater impacts from breathing difficulties and total scores.

	Followed up	Not followed up	t	p
FEV ₁ /FVC	0.59 (0.17)	0.64 (0.15)	-1.09	ns
MRC dyspnoea	2.42 (1.07)	3.14 (1.03)	-2.21	0.031
EQ5D health rating	65.93 (14.89)	58.33 (19.97)	1.56	ns
EQ5D tariff	0.69 (0.26)	0.54 (0.38)	1.73	ns
SGRQ symptoms	54.70 (18.84)	61.84 (23.63)	-1.21	ns
SGRQ activity	59.80 (22.54)	72.41 (24.40)	-1.83	ns
SGRQ impact	29.55 (16.85)	47.14 (21.56)	-3.25	0.002
SGRQ total	42.77 (17.14)	57.74 (19.18)	-2.83	0.006

n=42/18 for FEV₁/FVC; n=44/16 for questionnaires

Comparing the two cohorts at baseline

In what follows, comparisons are made for the whole group, and then for those with a diagnosis of COPD.

Due to issues relating to recruitment before the September 2015 start, further participants were recruited to be assessed in January 2016. This means that some of the participants engaged in singing over a period of 10 months and some for a period of 6 months. The two cohorts were compared at baseline to see whether they differed significantly on FEV₁/FVC and the structured questionnaire measures. Table 2 reports comparisons made for the total sample at baseline followed up at post-test (n=42 for spirometry, n=44 for questionnaires). Table 3 gives the same comparisons for those assessed as having COPD at pre-test and followed up at post-test (n=31).

	September n=28	January n=16	t	p
FEV ₁ /FVC	0.62 (0.16)	0.64 (0.18)	-0.33	ns
MRC dyspnoea	2.52 (1.01)	2.25 (1.18)	0.79	ns
EQ5D health rating	65.19 (15.53)	67.19 (14.14)	-0.42	ns
EQ5D tariff	0.68 (0.28)	0.70 (0.23)	-0.31	ns
SGRQ symptoms	58.90 (18.43)	46.86 (17.57)	2.07	0.04
SGRQ activity	62.14 (20.52)	55.71 (25.89)	0.91	ns
SGRQ impact	31.99 (15.29)	25.29 (19.06)	1.28	ns
SGRQ total	45.55 (15.48)	37.90 (19.27)	1.44	ns

Table 3: Comparing the two cohorts at baseline (COPD sample followed up)

	September n=18	January n=13	t	p
FEV ₁ /FVC	0.53 (0.13)	0.51 (0.12)	0.43	ns
MRC dyspnoea	2.72 (1.07)	2.23 (1.17)	1.21	ns
EQ5D health rating	62.22 (15.17)	64.62 (13.30)	-0.46	ns
EQ5D tariff	0.66 (0.28)	0.73 (0.22)	-0.78	ns
SGRQ symptoms	60.78 (18.89)	49.24 (13.80)	-1.81	ns
SGRQ activity	62.90 (18.867)	60.29 (25.91)	0.32	ns
SGRQ impact	31.26 (13.84)	28.64 (19.23)	0.60	ns
SGRQ total	45.82 (13.95)	41.00 (18.61)	0.83	ns

It is clear for the total sample (COPD and non-COPD), that the profile for the September cohort is slightly poorer than for the January group. However, for those meeting the GOLD criterion for COPD, no differences were found between the two cohorts and they are combined in all further analysis.

Comparing COPD and non-COPD participants at baseline

Table 4 below compares participants with COPD with those identified as not having COPD. This comparison has to be interpreted cautiously, given the small number of non-COPD participants. Not surprisingly, the COPD and non-COPD groups are markedly different on the FEV₁/FVC ratio. For the questionnaire measures, however, the means for the non-COPD participants reflect slightly better breathing and health status, but only for the general EQ5D health rating do the groups differ significantly, with the non-COPD individuals giving a more positive rating.

Table 4: Comparing COPD and non-COPD participants at baseline

	COPD	Non-COPD	t	p
FEV ₁ /FVC	0.52 (0.13)	0.80 (0.06)	-9.82	<0.001
MRC dyspnoea	2.52 (1.12)	2.22 (1.09)	0.7	ns
EQ5D health rating	63.23 (14.23)	78.33 (12.75)	-2.86	0.007
EQ5D tariff	0.69 (0.25)	0.73 (0.30)	-0.47	ns
SGRQ symptoms	56.17 (17.73)	43.66 (17.97)	1.93	ns
SGRQ activity	61.80 (21.72)	51.58 (26.76)	0.22	ns
SGRQ impact	30.15 (15.57)	22.37 (17.33)	0.34	ns
SGRQ total	43.80 (15.96)	34.99 (18.33)	0.48	ns

n=31/11 for FEV₁/FVC; n=34/10 for questionnaires

Comparing participants at baseline by sex and age

For the total sample followed up, no differences were apparent between males and females in the study on the key baseline measures. Comparisons between younger (under 70) and older (70+) participants, revealed, that older people had a significantly lower FEV₁/FVC ratio (0.52 vs. 0.64, $t=2.24$, $p=0.03$, 2-tailed). No significant differences were apparent on any of the structured questionnaire measures. Considering participants who met the COPD criterion, no significant difference emerged between male and female and younger and older participants on any key baseline measure. In comparing changes over time, males and females and different age groups are combined, and no further comparisons are made.

Initial screening

Mean age for the total sample and those with COPD was similar. The mean BMI for all participants was in the overweight classification (> 25 kg.m²) suggesting a higher potential risk for cardiovascular and metabolic disorders and additional cardiopulmonary load during physical activity. Full details are reported in Tables 5-7.

Table 5: Initial screening for whole group (n=42; males=11; females=31)

Measures	Mean (SD)	Minimum	Maximum
Age (yrs)	68.64 (9.01)	44	85
Height (m)	1.62 (0.08)	1.39	1.77
Weight (kg)	71.99 (16.16)	35	115
BMI (kg.m ²)	27.31 (5.20)	14.57	37.45

Table 6: Initial screening for COPD group (n=31; males=8; females=23)

Measures	Mean (SD)	Minimum	Maximum
Age (yrs)	68.94 (9.80)	44	85
Height (m)	1.62 (0.09)	1.39	1.77
Weight (kg)	70.24 (16.03)	35	115
BMI (kg.m ²)	26.67 (5.04)	14.57	39.45

Table 7: Initial screening for non-COPD group (n=11; males=3; females=8)

Measures	Mean (SD)	Minimum	Maximum
Age (yrs)	67.82 (6.59)	61	84
Height (m)	1.62 (0.07)	1.53	1.73
Weight (kg)	76.91 (16.23)	60	105
BMI (kg.m ²)	29.10 (5.48)	23.42	39.45

Changes observed

Forty-four participants completed follow-up questionnaires, and 42 participants completed lung function and exercise assessment at baseline and follow-up. Of the 42 participants 31 (74%) had FEV₁/FVC < 0.7 and met the GOLD spirometry criterion for COPD. Average level of singing group attendance was 26 sessions, with approximately 82% participants attending at least 20 sessions.

The following sections report the changes observed in participants over the course of the project. Physical and physiological measures are considered first, followed by the questionnaire scales and service use. The final section reports themes emerging from detailed interviews with participants together with illustrative comments on their experiences and the benefits gained. GOLD (2017, p.6) notes that there is 'only a weak correlation between FEV₁ symptoms and impairment of a patient's health status.' This was reflected in the current sample of COPD participants at baseline (n=31), with the correlation between FEV₁ and MRC = -0.29 and FEV₁ and SGRQ total = -0.32. Both values are negative as expected, but neither value is statistically significant.

Spirometry and exercise

Total sample

Table 8 reports changes on the health and functional measures for the total sample from baseline to follow-up. Correlations are reported showing moderate to high test-retest coefficients. No changes were observed in blood pressure measures and resting heart rate. Resting oxygen saturation levels were significantly lower at follow up, but the change is small and has no clinical importance. Distance walked was highly correlated over time, and showed a relatively small decline (5%), but was nonetheless statistically significant. Participants reported no change in breathlessness at end of six minutes (Borg breathlessness scale), which is in line with the test being self-paced.

As noted above, environmental conditions on the days of post-testing were very warm with potentially high levels of atmospheric pollution. This may have presented additional pulmonary stress, particularly for those who are sensitive to air borne pollutants. Weather conditions may have placed an additional thermal load on some participants, evidenced by higher resting heart rate (mean 77.05 bpm-1) compared to pre-testing (resting heart rate 73.59 bpm-1), though this difference is not significant.

Health and functional measures	Baseline Mean (SD)	Follow-up Mean (SD)	r*	t	p
Systolic blood pressure (mm Hg)	134.37 (22.74)	128.93 (20.66)	0.52	1.63	ns
Diastolic blood pressure (mm Hg)	75.17 (12.95)	75.51 (10.42)	0.55	-0.19	ns
Resting heart rate (bpm-1)	73.59 (13.07)	77.05 (12.46)	0.43	-1.58	ns
Resting SaO ₂ (%)	95.97 (2.03)	95.00 (2.19)	0.41	2.66	0.01
Distance walked in 6MWT (m)	311.31 (108.40)	294.69 (113.65)	0.92	2.32	0.03
Heart rate Post-6MWT (bpm-1)	90.16 (19.19)	92.22 (16.74)	0.56	-0.74	ns
Heart rate 5-mins. Post-6MWT (bpm-1)	76.03 (13.25)	80.08 (14.62)	0.46	-1.72	ns
Borg breathlessness scale post-6MWT (0–10)	2.88 (1.30)	3.10 (2.12)	0.52	-0.77	ns

* Correlations >0.4 are significant at 0.01 or less

Table 9 shows that over the course of the singing intervention actual and predicted FEV₁ increased slightly (but the change was not statistically significant), despite FVC and FVC% both declining. The absolute change seen in FVC is small (ie 0.15 litres), and while statistically significant is unlikely to be clinically important. There was also a statistically significant increase in FEV₁/FVC and FEV₁/FVC% from baseline to post singing intervention. This appears to be a positive outcome, but may be an artefact of a decrease in mean post-intervention FVC rather than significant improvement in expiratory function efficiency.

Spirometry Measurements	Baseline Mean (SD)	Follow-up Mean (SD)	r*	t	p
FEV ₁ (litres)	1.56 (0.73)	1.58 (0.75)	0.97	-0.58	ns
FEV ₁ predicted (%)	70.31 (27.81)	70.74 (28.67)	0.95	-0.30	ns
FVC (litres)	2.61 (0.90)	2.46 (0.95)	0.92	2.52	0.02
FVC predicted (%)	96.19 (25.85)	88.88 (25.81)	0.83	3.18	0.003
FEV ₁ / FVC	0.59 (0.17)	0.63 (0.17)	0.88	-2.84	0.007
FEV ₁ / FVC predicted (%)	78.29 (22.00)	83.31 (22.35)	0.87	-2.93	0.006
Maximum Inspiratory Pressure (cm H ₂ O)	68.75 (24.07)	69.07 (27.71)	0.89	-0.16	ns

* Correlations >0.4 are significant at 0.01 or less

COPD group

For the COPD participants only, Table 10 shows no statistically significant change on the measures employed with the exception of resting SaO₂(%). As noted above for the total sample, this change is not clinically significant. However, for the COPD sample, distance walked showed a small but non-significant reduction and participants reported no change in breathlessness following the 6MWT (Borg breathlessness scale). This is a positive finding showing no deterioration in exercise potential over the period of the evaluation.

Spirometry Measurements	Baseline Mean (SD)	Follow-up Mean (SD)	r*	t	p
Systolic blood pressure (mm Hg)	131.93 (22.32)	129.67 (20.12)	0.75	0.83	ns
Diastolic blood pressure (mm Hg)	73.13 (12.40)	75.73 (10.07)	0.58	-1.35	ns
Resting heart rate (bpm-1)	74.93 (11.59)	77.72 (12.82)	0.53	-1.27	ns
Resting SaO ₂ (%)	95.76 (2.17)	94.41 (2.11)	0.36	2.97	0.006
Distance walked in 6MWT (m)	312.66 (104.01)	296.62 (108.78)	0.92	1.96	ns
Heart rate Post-6MWT (bpm-1)	91.63 (17.58)	92.74 (17.13)	0.52	-0.34	ns
Heart rate 5-mins. Post-6MWT (bpm-1)	75.79 (11.62)	80.00 (13.49)	0.54	-1.28	ns
Borg breathlessness scale post-6MWT (0–10)	2.97 (1.42)	3.29 (1.80)	0.61	-1.18	ns

* Correlations >0.4 are significant at 0.01 or less

Table 11 reports on the spirometry data for the participants with COPD at baseline according to the GOLD criterion. The patterns are essentially the same as for the total sample in showing no change in FEV₁ or FEV₁% (predicted), but a small, though statistically significant reduction in FVC and FVC%. Again, the ratio FEV₁/FVC shows a significant improvement, but as stated earlier, this likely reflects the decrease in FVC.

Spirometry Measurements	Baseline Mean (SD)	Follow-up Mean (SD)	r*	t	p
FEV ₁ (litres)	1.37 (0.66)	1.38 (0.75)	0.97	-0.13	ns
FEV ₁ predicted (%)	61.51 (21.09)	61.61 (23.31)	0.94	-0.07	ns
FVC (litres)	2.61 (0.93)	2.40 (1.04)	0.95	3.32	0.02
FVC predicted (%)	95.74 (23.11)	86.23 (25.11)	0.83	3.71	0.001
FEV ₁ / FVC	0.52 (0.13)	0.57 (0.15)	0.82	-2.99	0.006
FEV ₁ / FVC predicted (%)	68.61 (16.49)	74.87 (19.07)	0.81	-3.13	0.004
Maximum Inspiratory Pressure (cm H ₂ O)	68.71 (24.87)	68.49 (28.63)	0.94	-0.12	ns

* Correlations >0.4 are significant at 0.01 or less

Standardised scales

In the tables below, comparisons are made between pre-test and post-test scores on the three validated scales used in this evaluation: MRC, EQ5D and SGRQ (three sub-scales and the total scale). The null hypothesis is that no changes occurred over time on these measures. The alternative hypothesis, assuming some beneficial impact of singing over time, is that improvements will be seen on these measures. A two-tailed criterion is employed to test the null hypothesis, as all things being equal some decline in participants health condition might be expected as part of the natural history of COPD. In addition, correlations are reported for the measures showing a moderate to high level of test-retest reliability in participants' relative positions on the scales.

Total sample

Table 12 reports means and standard deviations on the three structured measures employed at baseline and follow-up. A significant reduction in the SGRQ symptom sub-scale score was found, suggesting improvement in symptoms. For the remaining measures, however, there are no significant changes, indicating stability in self-reported effects of breathing difficulties on breathlessness, activities and impacts. No changes occurred in the EQ5D health rating and EQ5D health utility measure.

	Baseline	Follow-up	r*	t	p
MRC dyspnoea	2.42 (1.06)	2.52 (1.09)	0.55	-0.74	ns
EQ5D health rating	66.25 (14.87)	61.48 (19.70)	0.6	1.98	ns
EQ5D tariff	0.69 (0.26)	0.67 (0.31)	0.81	0.67	ns
SGRQ symptoms	54.70 (18.84)	49.25 (22.19)	0.72	2.27	0.029
SGRQ activity	59.18 (22.42)	59.97 (24.33)	0.85	-0.40	ns
SGRQ impact	29.55 (16.85)	29.90 (17.85)	0.81	-0.21	ns
SGRQ total	42.77 (17.14)	42.23 (18.48)	0.86	0.37	ns

* Correlations >0.4 are significant at 0.01 or less

Participants with COPD

Table 13 reports the same comparisons for people who met the GOLD criterion for COPD. The same pattern emerges for this group as for the total sample, and reveals a significant improvement on the symptom scale, but no significant improvement in reported activity and impact of their condition.

	Baseline	Follow-up	r*	t	p
MRC dyspnoea	2.47 (1.11)	2.57 (1.01)	0.68	-0.65	ns
EQ5D health rating	63.67 (14.26)	62.00 (17.15)	0.74	0.79	ns
EQ5D tariff	0.69 (0.26)	0.66 (0.33)	0.83	0.89	ns
SGRQ symptoms	56.57 (17.91)	48.77 (21.73)	0.67	2.57	0.016
SGRQ activity	60.73 (21.28)	63.22 (22.44)	0.88	-1.23	ns
SGRQ impact	29.36 (15.17)	30.12 (16.48)	0.80	-0.42	ns
SGRQ total	43.10 (15.75)	43.34 (16.88)	0.86	-0.15	ns

* Correlations >0.4 are significant at 0.01 or less

The same comparisons were also made for the two cohorts, those recruited in September and those in January. No significant changes were found on any measure for these subgroups, including the SGRQ symptoms sub-scale. This most likely reflects the reduced sample sizes (September n = 21, January n = 13).

Pre and post self-report measures: The SGRQ symptom items

As a significant improvement was found for the total sample and for participants with COPD on the SGRQ Symptoms Scale, the profile of changes on symptom scale items was compared to clarify the specific nature of the changes seen. These data have to be considered with some caution, as the St George's questionnaire is not validated at the level of individual items. Nevertheless, the findings are of interest, and reflect the feedback gained from interviews (see below). Table 14 gives the results for six of the symptom items for the total sample (measures of the length of attacks of chest trouble and wheezing are not given due to reduced sample sizes). Changes are judged against a 1-tailed criterion given the observation of a significant improvement on the summed scale. A clear increase in the number of 'good days (with little chest trouble)' is apparent.

	Baseline	Follow-up	r*	t	p (1-tailed)
I have coughed	2.42 (1.37)	2.38 (1.42)	0.63	0.25	ns
I have brought up phlegm	3.02 (1.44)	3.07 (1.44)	0.59	-0.23	ns
I have had shortness of breath	2.14 (1.27)	2.30 (1.29)	0.80	-1.30	ns
I have had attacks of wheezing	3.33 (1.34)	3.26 (1.48)	0.41	0.30	ns
Severe attacks of chest trouble (last 3 months)	3.89 (1.42)	4.14 (1.32)	0.31	-1.03	ns
Good days with little trouble (last 3 months)	2.93 (1.22)	3.28 (1.20)	0.57	-2.02	0.025

* Correlations >0.4 are significant at 0.01 or less

Table 15 gives the findings on the same scale items for participants who met the COPD criterion (maximum n=31). Here it is apparent that significant improvements emerge on two items: a reduction in 'severe attacks of chest trouble' and an increase in the number of 'good days with little trouble.'

	Baseline	Follow-up	r*	t	p (1-tailed)
I have coughed	2.33 (1.30)	2.40 (1.43)	0.58	-0.03	ns
I have brought up phlegm	2.79 (1.40)	3.00 (1.46)	0.49	-0.77	ns
I have had shortness of breath	1.97 (1.27)	2.24 (1.27)	0.76	-1.68	ns
I have had attacks of wheezing	3.17 (1.44)	3.31 (1.61)	0.52	-0.49	ns
Severe attacks of chest trouble (last 3 months)	3.83 (1.44)	4.41 (1.02)	0.27	-2.07	0.024
Good days with little trouble (last 3 months)	2.79 (1.29)	3.29 (1.15)	0.62	-2.47	0.010

* Correlations >0.4 are significant at 0.01 or less

Service use

One of the concerns of the evaluation was to monitor health service usage to assess whether any changes took place which could provide evidence on potential cost savings associated with participation in group singing. The questionnaire contained a section entitled 'Treatments and services to help you with your breathing', and included questions on: oxygen and inhaler use; admission to hospital, and health and social services used (including visits to a hospital A&E department, appointments with a GP, appointments with a practice nurse and home visits). The overall picture is one of stability in reports of service use, and there is no evidence of either a clear increase or decrease over the period of the project.

Only two participants reported being on prescribed oxygen at the start of the project, and continued to use oxygen throughout. Inhaler usage was also stable, with 32 people reporting use of an inhaler at baseline, two of whom reported not using one at follow-up. However, among those participants not using an inhaler at baseline, three were using them at follow-up. The question on frequency of use of a rescue inhaler also revealed no evidence of change. At baseline, 20 participants reported 'daily use' and nine 'less than daily use' and this pattern was substantially unchanged at follow-up (19 and 10 respectively). The same pattern of stability was true for responses to a question asking about 'other inhalers/medicines' to help with breathing. At baseline 33 reported additional medication, and of these 31 gave the same report at follow-up.

For admissions to hospital, participants were asked to think back over the last six months. At baseline, seven people reported between 1-3 admissions, and at follow up eight people reported such admissions. Of the seven admitted prior to the project, three were admitted again during the project. Of 34 participants who had not been admitted to hospital during the six months at baseline, five were admitted during the course of the project. By comparison, of 33 people who were not admitted to hospital during the course of the project, four had experience of hospital admission in the six months prior to the project starting.

With respect to visits to accident and emergency departments a similar pattern was seen, but A&E visits were more common than admissions. At baseline, 37 participants reported no visits in the last six months, but three people had visited once or twice, and two had visited no less than six times. At follow-up, 25 participants had not visited A&E over the previous six months, but 15 people had visited once or twice, and two between 6-8 times.

Comparisons were also made between baseline and follow-up on number of GP appointments, home visits and telephone contacts; and nurse appointments, home visits and telephone contacts, and for none of these was there any evidence of change.

A fuller health economics assessment of the findings from this study are given in a companion report from the London School of Economics.

Qualitative findings

In addition to the physical assessments and use of structured, standardised questionnaires, the project evaluation placed particular emphasis on gathering qualitative feedback from participants. Such information can provide valuable insights into a wide range of experiences and outcomes that are difficult to capture using questionnaires.

Individual interviews

Interviews were conducted with 37 participants across all four groups, who reported breathing difficulties on recruitment. Of these, 32 completed questionnaires at follow-up; 30 completed spirometry at baseline and follow-up, and 24 met the GOLD criterion. This analysis uses the interview schedule as a framework (see Box 2 above) and the questions put to participants are addressed in turn. Interview transcripts were imported into NVivo v.11 (©QSR International Ltd.) to aid analysis and the extraction of illustrative quotations. Within each question specific issues were picked up and, where noteworthy and appropriate, quantified in terms of number of people giving a similar response.



Aesop Arts & Health conference, Royal Festival Hall, February 2016

Hearing about the project and decision to take part

The first question in the interview: How did you get to hear about the project? required participants to think back to when they heard about the project. Answers indicate a variety of sources of information with GP (10 responses), friend or relative (6 responses) or a leaflet in the surgery (5 responses) being the most frequent. Other answers given by only 1-2 participants, included: Breathe Easy Group, Pulmonary Rehabilitation, newspaper advertisement or leaflet in public place. Participants were then asked: What made you decide to join the project? The most popular reasons were because of enjoying singing or because of a hope the experience might be good for them (12 responses each). Other reasons included a recommendation from the GP (7) or asked by a relative or friend to accompany them (5).

History, diagnosis and treatment

Interviewees were asked: Could you tell me about your lung problem – how it started, what effect it has had on your life and what support you have received in managing your condition?

Participants generally described living with serious lung problems over a number of years – over 30 years in one case but generally between 5 and 10 years. For a minority, onset had been more recent. Many could describe a specific occasion when they first noticed a breathing problem and dated their problem from then:

*I smoked quite a lot from about seventeen years up to sixty-two, right? And erm, in Christmas 2006 I was running for a forty-seven bus and just like that, my breath left, you know? And the pressure was severe, you know? And erm, the following day I went to the doctor and he says 'Mr (name removed) how many times did I tell you to stop smoking?' And I didn't listen, and now I'm paying the price.
Rotherhithe Michael 72*

Although some 18 participants, like this one, mentioned smoking as a cause, there were other contributory factors given such as pollution in Central London (mentioned by 5), work-related causes (painting materials, woodworking materials), a family history of breathing problems and in one case passive smoking. For 15 participants a diagnosis of asthma had been given, often originating in childhood. Others experienced a protracted diagnostic process, often including misdiagnosis:

The doctor just dismissed it as a cough and it persisted and persisted and eventually I had an x-ray and a sputum test which showed that I had a consolidation in my right lung and erm, so consequently antibiotics, which didn't work to start off with and then I had, I think it's the tetracycline ones, not the penicillin ones, and after a while that started to clear it up, but it left me with like a feeling of mucus in my throat the whole time. (...) So then my doctor sent me to the, they have in my surgery a chest nurse, and she did various tests and they diagnosed it as COPD. Rotherhithe Pat 71

Effects on life and lifestyle

Nearly all participants related how having COPD limited their activities, most commonly mentioning walking uphill, climbing stairs, walking to catch a bus or tube, shopping and housework:

And what it has done over the years, I have noticed that can't walk as fast as I can, I get very breathless, I used to be able to. In the washing machine, wash my son's shirts, take them out the washing machine and iron them, I may iron eight in one time but now over the last year I can't, he takes them over to the cleaners. I've got a little girl now, I can't Hoover, if I try and brush the kitchen I'm straight away out of breath, even if I talk too much, I get out of breath. I can't walk and talk, I have to sit and be able to talk. Before I used to be able to run for the bus; there's no way I can do that now but I do try and walk quickly. Clapham Marie 70

Others talked about having to retire or adapt their working practices, not being able to sing in church due to a voice change and not being able to keep up with grandchildren. Beyond this, the condition could affect the individual's social life and lead to isolation:

You're ill and you have to take antibiotics and then you have recovery time and then a lot of the time you can't go out and about in this weather, damp weather, so you have to stay indoors a lot. And sometimes that can be a bit isolating and also when I get bad sort of bronchitis, I can't go to work either, you know, so it's not debilitating, but it's limiting to what I can do. Dulwich Liz 63

Treatment, support and management

Most participants mentioned their GP and nurses (surgery nurse, specialist respiratory nurse or community nurse) as being very supportive and helpful in managing their condition:

My doctor's surgery are very good to me, you know. If I feel a bit anxious I can either pop in there 'cause it's just across the road from me or phone and they're like, you know, if they can't fit me in anywhere they can always say 'Oh we'll get a doctor to ring you.' Clapham Marie 70

Fourteen participants had taken part in pulmonary rehabilitation (PR) courses and found them helpful, as much for the information and education they received as for the exercises they did:

But I did the pulmonary rehabilitation which was extremely good, because that more or less taught me, you know, don't sit on the edge of the sofa watching daytime TV think you're ill 'cause it's counter intuitive, and you've got to exercise and do things. Dulwich Colin 66

Engaging in activity was something that many participants agreed was necessary, and some joined a gym, as recommended to them. However, others were deterred as they felt self-conscious, and this is where the PR courses had the advantage of being specifically geared to people with breathing problems; they appeared to be supportive in encouraging exercise, as:

I felt it was a safe environment. But I don't find an ordinary gym a safe environment. I think that's just for, you know, people who want to keep fit. Streatham April 73

However, as one individual commented, PR consists of a limited number of sessions and there is a long waiting list.

Many of those asked the question about management and support mentioned the medication they had been prescribed, most commonly inhalers, tablets, or in certain cases, oxygen. Other support came from hospital personnel, chest clinics, self-management courses or simply because an individual had got to know their condition and so was best placed to help themselves:

And I know myself. If something's not right then, you know, if I feel like I'm getting a chest infection or something, which I've had many, then I'll know myself, you know? Rotherhithe Iris 72

Finally, a small minority felt they had received no support at all in managing their condition while one respondent mentioned the support of his wife.

Effects of participation in singing on breathing

Interviewees were asked: Has being part of the project made a difference to your breathing? This was intended to be a direct and non-leading enquiry.

Most participants felt that singing had definitely made a difference and were able to give details on the benefits they felt they had received (n=27). A further five participants felt that the project might have made a difference, if only a slight one (n=5), and five felt it hadn't helped or were not sure.

In describing a difference (or lack of difference) participants talked about:

- Inputs from the singing sessions they considered important
- Mechanisms they considered to be explanations for any improvements
- Outputs in terms of what they themselves do outside the session
- Outcomes in terms of what has changed or what they can do now that they couldn't do before

Inputs – what the singing sessions provided

The overall input in the project was the weekly singing for COPD programme. For the first cohort, this ran from September 2015 to July 2016, and for the second cohort from January 2016 to July 2016. Some ten people interviewed mentioned particular aspects of the programme which they considered influential in improving their breathing. The teaching from the facilitators was considered to be crucial and included: how to breathe correctly, breath control, relaxation, warming up and knowing your body:

It tells you how to control, teaches you how to control... We all think we've got to keep gulping in all this air all the time 'cause we're feeling a bit sort of tight and things and instead of breathing it all in we should be letting some of it out and that's what it's taught us. Rotherhithe Pat 71

Also considered to be important was the exercise component of the sessions, which some participants referred to as a 'workout':

An hour's continuous exercise here my lungs feel like they've had a better work out than an hour in the gym. This is erm, yeah, I was quite surprised coming here to find out how much of an exercise it was for my lungs. Rotherhithe Les 67



Elaine and Mark at a lunchtime performance at St Thomas' Hospital, 2016

Mechanisms – suggested explanations for the effects of singing

A number of 'mechanisms' were offered to explain how, according to participants, the singing sessions affected breathing. These were largely seen in terms of either psychological, physical or cognitive (learning) explanations.

Seven participants talked about a subconscious effect of relaxing, of 'getting over' the breathing problems because singing 'gives you a lift', and of forgetting about the breathing problems due to concentrating on getting the songs right. This was seen to be one advantage the singing had over the exercises performed in pulmonary rehabilitation classes:

And also interestingly, you're not worried about it. In the gym you're worried about heart rate and all the rest of it, but when you're singing here you just sort of, you forget that you're here for the lungs, cause you get involved in singing and you're trying to remember the words and do the singing. So psychologically that's rather good, it's distracting the mind isn't it? And so you're, I just feel so much better. Dulwich Colin 66

A few participants referred to the physiological mechanisms whereby the exercises opened the lungs and loosened the breathing:

It does work... and er, it seems to loosen it. Rotherhithe Sue 66

Some participants also talked about learning that took place within the sessions, and this mirrored the teaching input. This learning covered how to breathe, breath control and being aware of what had been taught:

It's excellent for learning to control not being out of breath, when you are out of breath how to get back to normal breathing again, it's excellent, yeah. Dulwich Carol 58



Shilpa warming up participants at a lunchtime performance St. Thomas' Hospital 2016

Outputs – what participants do outside the sessions

Closely related to, and sometimes overlapping these mechanisms, are the descriptions of what participants actively do outside the sessions which also contribute to the overall effects felt. Ten of the interviewees talked about how they continued with the exercises or the singing at home. In most of these cases, this was seen to lead to definite improvement:

That has really taught me and even at home now I mean all of a sudden, I've just done that now, I thought 'I'm sitting wrongly' let's take a couple for breaths you know to sort of get me back into a rhythm, or I may not be panicking or anything, but it'll just all of a sudden remind me, 'just check that I'm breathing properly or not', you know, so it really has helped, it's been very very good. Clapham Marie 70

Because I know when I sit down I can practise that breathing and just calm myself down and it's amazing that, it's just become second nature to me, you know. And I think in singing I've learnt without even realising it how to control my breathing. Streatham Trudie 55

However a minority of those interviewed found trying to transfer the breathing and singing exercises into the home setting was not easy, or required motivation and encouragement, suggesting that guidance may be needed:

I do try to do breathing exercise indoors, but it's not, it's not like when the instructor... he does it with such enthusiasm you know? That I follow as hard as I can but when I'm at home I don't think I do it quite as good. Rotherhithe Patricia 76

There was also evidence of selected use of what was learned in home practice, dependent on what the individual picked out as being particularly helpful:

I try to remember as many of them as possible, and I follow them through the week at home. And some of them I find don't help, especially the moving this back, I find it's quite painful. But most of them, and a lot of the [makes humming sound] noise ones, that he does with us, really do work. And also, singing. The actual thing of singing, I've always loved singing... I do that at home yeah. I hum and sing. And in the car I put tapes in - I've got CDs - and my husband said: 'You've started singing much more different things now.' Because if I hear them here I look for them on CD and do them. I really think it has made a difference to my breathing. Rotherhithe Maria 70

Outcomes – changes in behaviour and health

Most, but not all, participants felt that being part of the project had helped their breathing (see figures above). While a number of the responses were just articulated in general terms (improved breathing, helped voice, it does help, breathing easier etc) many also provided concrete illustrations of what they could do following the project that they could not do before:

Yes, in fact my doctor was so pleased for me he made me blow into the puffer and I've actually gone down and he was over the moon. He was very very pleased with what's been happening to me. Rotherhithe Jean 65

Well, my breathing has improved because I don't now take the blue pump at all ...since I've been here.

Interviewer: And how often were you taking it before?

All the time if I was going uphill or walking up a slope, or walking the stairs. I had to. Before I went here, I wouldn't go on a walk even. Rotherhithe Jennifer 65

When I'm singing I can sing without taking a breath longer, whereas before it was [demonstrates gasping] but now I can go. So that's definitely made a difference. Rotherhithe Joan 78

You can hold a note longer, not saying I got any better at singing, but I can hold a note longer. Dulwich Jill 68

I've thought about this long and hard. When I first joined, I think, I wasn't singing at all. I mean I'm not really singing now, anyway, but what I do do is, I do that counting song 'I can sing for one'. Well I can get up to seventeen or something. I definitely could not have done that before. Streatham April 76

However most participants remained realistic that their condition was not going to be cured and also that the singing group might not be the only reason for any change. These sentiments are reflected in some of the responses:

I do get out of breath, I'd be lying to say: 'Oh I can run round the block' I can't. But I can walk round the block, and that's the difference. Rotherhithe Elaine 61

Others stated a difference in terms of a more psychological difference such as feeling more relaxed, making a difference to outlook on life or feeling there is someone to turn to. Though more relevant to the question about psychological effect, this does illustrate the way participants saw the psychological interacting with the physical.

Effects of participation in singing on activity

Interviewees were asked whether participation in the project had made any difference to their patterns of activity in daily life. Their responses were less unanimous than those related to differences to breathing. Just under half of participants felt that their activity levels had improved (n=17); 14 gave a qualified answer or were not sure, and six that their activity levels had not changed. All except two respondents enlarged on their responses by illustrating or explaining their answers which can be categorised as positive, negative or equivocal.

Positive changes in activity

Some respondents enlarged on this question by relating it to their activity levels during, or in order to get to, the actual sessions, for example 'making me get out of the house', 'exercising different parts of the body' and 'doing the exercises in the group':

It has made a difference, you know. Number one, I got up at seven o'clock this morning, right? Now normally I don't get up until nine, so it gives me a purpose in that field, do you know what I mean? Rotherhithe Michael 72

A larger number, however, interpreted the question as asking about their activity during the time they were not in the group and there were many illustrations of changed activity levels such as having more energy, feeling more like doing things, and being more confident walking upstairs:

It has, you know, I bought new trainers... Yeah, what I did is instead of... just doing the singing I've started walking. I sort of go to Brockwell Park or near off there, and I walk around it, and I do my breathing at the same time. And you know it's sort of really helped to improve my breathing. So I am trying to be proactive. Streatham Trudie 55

Qualified responses on activity

A number of respondents (n=14) were unsure ('don't know', 'not sure', 'don't think so') or provided a qualified answer ('not at the moment', 'not really', 'still get out of breath'). Responses also highlighted the limits to asking this question which implies a degree of causality, suggesting that the level of activity is attributable to the singing groups. For example, four participants said that they had always been fit and active (suggesting that they would not necessarily expect this to change), others commented on having been less active due to being in hospital or because it was winter which negatively impacted on their health.

No change to activity

Six respondents replied negatively to this question, though on further elaboration there were different reasons given for this, such as being active anyway (so levels had not changed), having confidence 'knocked back' because of a recent hospital admission, and having to work long hours which left little time for becoming more active. One individual did comment however, that simply getting to the sessions meant some increase in activity, implying that there may be some changes not articulated by those responding negatively:

Interviewer: Has it made any difference to how active you are, coming to the singing group?

No, no. I get up a bit earlier to catch the bus but apart from that everything's working alright. Clapham Warwick 81

Support from GP and other services and use of medication

Interviewees were asked whether being part of the project has resulted in any changes to the level of support they needed from the health service. A further question asked about their use of medication and whether this had changed.

No difference as a result of the project

Some 20 of the participants felt that there had been no difference to their level of support. While some gave no reason for this, others provided an explanation, the majority commenting that they rarely had contact with their GP or surgery anyway. This was often because health professionals were perceived as too busy or because there was little that could be done for the condition and so individuals had decided to do what they can for themselves :

To be honest with you, I haven't needed to see my GP so much, because, um, I think I've decided just see what else I can use to manage it. Because there's only so much they can do, giving you the inhaler and the asthma nurse, prescribing additional tablets, apart from that, you know, there isn't an awful lot they can do except, for you, you know, for you to look for other ways of helping yourself really, I think. Streatham Trudie 55

A change in support due to the project

Of those who felt there was a difference in level of support, a few ascribed this directly to having participated in the singing group:

Yeah I don't need so much support now. It's brilliant, absolutely brilliant. If we ever lost the funding for this choir, I don't know what I'd do. I'd probably go back to seeing the doctor more often, you know? I truly believe that choir has done good to, not just me, to all my colleagues in the choir, we all feel the benefit I believe. Rotherhithe Charles 53

Others explained that they now rely on self-management (as in the example above) or the support of other singing group members, through the sharing of experiences. One respondent (Streatham, April) commented that she had not been in hospital over winter which was unusual. On the other hand another (Rotherhithe, Sue) had seen her GP more often but that was due to a bad flare-up of the condition over winter. A number of individuals were unsure about whether they had seen their doctor less than they might normally have done:

Well I don't really see my GP very often and I do go to chest clinic regularly erm... and I don't think, you know, I don't think it's aided me, oh I don't know, maybe, maybe, I might've gone more to the GP if I hadn't have been doing the singing group, I don't know. I find it very difficult to answer that question, that's a difficult one. Rotherhithe Joan 76

Use of medication

Eighteen of the participants interviewed stated that there had been no difference to their medication, usually because they were not taking any drugs for their breathing previously. Others commented that they were on prescription medication, which they had been told it was important to continue irrespective of symptoms.

Of those who had noted a change, for the majority (10 respondents) there had been a reduction in the use of bronchodilators prescribed to use 'as necessary'. One individual had been prescribed a nebuliser, suggesting a condition of some severity:

I would only use the nebuliser either first thing in the morning or last thing at night, because of, if I feel clogged up, but I mean last time I used it now, because I keep a note by the nebuliser of when I've used it, and so that last time I used it was in January and only that, I think, I only used it for two days at one session a day. Clapham Marie 70

Others gave an estimate of how their use had changed, either by number of 'pumps' or frequency of use:

Erm, the only medication I had for breathing was the, you know, the pump thing, but as I say, when I first had it I did use it quite a lot, but now I don't use it, not often during the day but sometimes, about three times a week, four times a week, or at night, and erm, that's it, I definitely haven't used it as much, I haven't had to. Rotherhithe Joan 78

Two participants mentioned a reduction in number of antibiotics prescribed compared to previously:

...and also I must say this year I've needed less steroids and antibiotics, this is the best winter I've had. Streatham April 73

And one mentioned a reduction in use of painkillers. In addition, the individual who had experienced a flare-up of her condition noted that she had needed an increase in medication while unwell.

Mental and social wellbeing

Interviewees were asked whether the project had made any difference to their mental and social wellbeing. All but two of the 37 respondents found no difficulty in articulating a positive response to this question. Responses can be broadly categorised under the following headings: the 'feel good factor', motivation to action, having fun, the highlight of the week, camaraderie and friendship, support for COPD, and singing together.

The 'feel good factor'

A large number of participants spoke of how the group made them feel more positive through phrases such as 'feel-good factor', 'picks/cheers me up', 'lifts your mood', 'lifting spirits', and 'feel happier':

Lifts your mind a bit, and all the rest of it, I would say yes, yeah. 'Cause since I've been attending this group I haven't experienced what I call, anything negative as such. Streatham Darlton 55

And my husband says 'I can guarantee if you've been to the choir on Tuesday when I come home you'll be smiling.' Rotherhithe Maria 70

For some, this contrasted with previous negative mental health experiences:

Well, I've been going through a couple of dodgy patches lately. Yeah, that was the only mental thing, you know, and er, this helps. Rotherhithe Edward 75

And you do feel better, you do. You haven't got that depression that COPD gives you, honestly. Rotherhithe Jennifer 65

Motivation to action

Related to feeling better was the motivation to attend the singing group and also to begin activities in other areas, which some participants related:

It makes you feel happier and gives you more, like you feel more like doing stuff you know, and that... Like this, makes you feel like carrying on, don't it? Not sitting at home worrying about it, it's best to get out and enjoy it. Dulwich Mary 72

Well as I said, it's made me want to push this group further on. It's made me want to go out and look for work, in the sense of the word work. Doing the social care as work and wanting to go back to university, so it's given me a lot, it's given me a life. And that's what's important, it really has. Rotherhithe Elaine 61

Having fun

There were a number of references to laughter within the responses, often connected to comments about their own inability to sing and the fact that 'getting things wrong' actually added to the enjoyment, since the emphasis was on wellbeing rather than the standard of the singing:

I mean we do laugh a lot which is quite good and you can laugh at yourself 'cause I don't think anybody pretends to be a singer, but the noise we make sometimes can be quite amusing, and the fact you can't, you know, you can't follow a pattern, or you can't come in the right time or so forth. So we spend quite a lot of time laughing which is good. Yeah, you laugh on a Tuesday afternoon I suppose, opposed to not laughing on a Tuesday afternoon. Dulwich Quetta 75

But no, we can have a laugh you know, if we sing a wrong note or whatever, it's not frowned upon you know, whereas it would be anywhere else. So but we all try to help each other, you know, so it's nice. Rotherhithe Iris 72

Highlight of the week

Some of the participants talked about living alone and not having an opportunity to meet with others, making the singing group one of the few opportunities they had to socialise and something they looked forward to:

You quite look forward to meeting up, I thoroughly enjoy it. Clapham Rosemary 68

Socially certainly, and you know it's turned into quite a highlight of the week actually, you know, meeting up with people and 'cause we always start gossiping the moment we meet up again, you know we actually start a bit earlier than we're meant to so we can have a bit of a gossip before we start singing, which is really nice. Streatham Rosemary 63

Camaraderie and friendship

Many participants spoke about the friendliness of the groups, with the performance events serving to further cement relationships. Chatting together had become part of the format in at least one group (see above) which arranged to either meet earlier or stay later to continue socialising. One group had also taken to meeting up outside of the singing sessions:

The atmosphere has been so welcoming. Everybody helps everybody else, you know? And nobody is... top or bottom, and... I suppose that I've noticed people do small things for me that I'm not meant to notice, but I also do small things for other people here. Like a group of friends. Because any time I see them shopping they go: 'Oh hello see you Tuesday!' and when you get to seventy, it's amazing to make even one new friend. But from this group I would say if it finished I would take away maybe two or three really good friends from it anyway. Rotherhithe Maria 70

Oh yes, there's some lovely people there. Very nice. And they're all friendly and they're trying to get the group going like, as soon as you keep going. And that, he's excellent isn't he, William? We couldn't, we'd never get somebody like that would we in a normal choir? But he's very good, we enjoy it. And he's very friendly, yeah. Dulwich Rose 85

Support for COPD

The fact that nearly all participants were living with COPD was of importance for some of the group members. This mutual experience may have accounted at least in part for the strength of the group effect since it reduced any feelings of embarrassment and isolation and increased the feeling of being supported with the condition:

I think that's really important, there's something about coming together as a group and doing an activity as a group and knowing that everybody else has got a lung condition so you're not querying 'Oh why are they gasping or coughing' or whatever. Dulwich Colin 66

What the classes do, they give you a sense that you're not on your own. There's a lot of support here, people give each other phone numbers and erm, you know if you need a chat you're whatever, as well as the people involved in the project who are very supportive and I just think that's fantastic. It's probably the best group I've ever experienced and I've done a huge number of groups over the years. Rotherhithe Sue 66

Singing together

But though the shared group experience of having COPD was important, it was also clear that the singing itself within a group was important since it seemed to have the power to bring people together and to instil confidence. Some even felt that their singing had improved:

Well, I suppose it's really nice to feel part of a singing group because even though sometimes you don't have a lot in common with people and you don't come from the same walk of life, singing really brings you together. Dulwich Liz 63

it's very uplifting to sing together. Streatham Joan 76

Two participants were not so sure on first questioning whether the group had improved their mental or social wellbeing. However, on further probing, they offered a different viewpoint:

*Interviewer: And has being part of the group made any difference to your mental wellbeing?
Not really no. I just plod along, as the time comes I come up and do it and that it's like.*

*Interviewer: Has being part of the group made any difference to your social wellbeing?
Oh yeah, I should say that it has yes.*

Interviewer: Yeah?

Yeah, I'd say it has, yes 'cause I meet all these nice people, you know? Clapham Warwick 81

Aspects of the project that could be improved or not enjoyed

Interviewees were asked: Have there been aspects of the group and the singing activities that you haven't enjoyed or could have been improved?

Reassuringly, the majority of interviewees could not think of anything. Seventeen either just gave a simple response or added comments such as it had been 'wonderful', 'great' or 'brilliant':

I enjoy every bit of it. I think it's that teacher, he's wonderful, absolutely wonderful, you see? And I can appreciate his efforts 'cause I like to see, in my family there's music, piano, I'm guitar and all sorts, and you know. And I have an ear for music. I wouldn't consider myself a great singer, you know, but he, I tell you something, we're not great, but he's tops. He's tops. Rotherhithe Michael 72

Of those who did have further comments, these were always prefaced, or followed, by positive remarks. Suggestions and comments were broadly around the timing, the venue, the singing programme or occasionally other areas.

Two people suggested there could be more time for singing, and less for exercises or other activities such as going round the group for individual responses. A further two found that an hour was not long enough and one commented on the change of time at one venue to an earlier time which was less convenient (though the individual did acknowledge that there was a reason behind the change). At another venue, where the sessions were held in the afternoon, one person commented that the finish time meant that the public transport was crowded with school children going home. Finally, the day of the week was mentioned by a participant who had moved from an original venue which had been found to be non-viable and the new venue was also further away.

With regard to the singing programme, two people commented that they found the foreign words in many songs difficult to learn and pronounce. One person said she would appreciate having the music (instead of just the lyrics) as she found it easier to learn that way and another commented on the song choice:

Some of the songs I wouldn't have chosen but that's none of, nothing to do with, people don't all have the same taste in music, there we go. No, not, it's fun and it's good. Dulwich Quetta 75

This acknowledgement that all tastes need to be catered for was a recurrent theme among those who did comment, not only on this issue of the songs, but this did not seem to limit the participants' enjoyment significantly. Other comments on the programme included a request for further information on how to practise at home and a desire for more complicated songs, which were included as the programme progressed.

Finally, there were a few individual comments on less central areas. One person felt that it would be good if their surgery was more involved, while another thought it was not their place to say how it could be improved. An interesting observation in one of the venues showed how those attending had developed as a group who identified with each other:

Well, there's nothing that can be done about this and you'll laugh. No you will laugh. I'm a great believer in an amount of control over what happens. We're like twenty-five kids out on a spree when we get here. And they have such a hard time sometimes getting us quiet, but I try, I give myself up until 11 o'clock to be crazy and then I try to calm down myself. Rotherhithe Maria 70

Project evaluation

Interviewees were asked whether they had any views on the approach adopted to evaluation of the project (physical testing, questionnaires and interviews).

As with the previous question, few respondents were critical of the research process. Positive comments included phrases such as 'run well', 'quite straightforward', 'happy with everything' or, as with one of the previous comments, a feeling of not being in a position to comment ('I'll leave that to the medical people'). One interviewee expressed a broader, altruistic sentiment:

Despite my age, people of my age not wanting, I've always been on the side of research, cause without research you get no answers. Don't you think? Research I think is good. And this might help other people to breathe. Rotherhithe Patricia 76

Those who had some thoughts on this question expressed a variety of issues, with no general theme emerging though three people asked about finding out the results of the tests and research and whether there was any feedback from stakeholders following the South Bank event (in February 2016):

When we went there it was erm a lot of obviously mainly erm, you know, [inaudible] businesses and doctors, nurses whatever, and it'd be nice to actually know if, that if our singing had any effect on them. I know they all enjoyed it, erm, but if it had any effect on like, funding, things like that. Rotherhithe Iris 72

For one individual the questionnaire form was rather long and another two found the walking test hard for people who were not fit and well.

Final reflections

At the end of the interview, participations were asked if they had any further comments about the project or any questions. An overwhelming sentiment was a hope that the groups would continue, with some 17 asking about this or commenting in other ways. A few others added some favourable final comments along the lines of praising the facilitators, saying they looked forward to attending, suggesting more performances or noting the low dropout rate. A final comment probably speaks for a number of the other participants in comparing how their breathing problems make life difficult and how attending the singing group changed how they feel:

There have been times... where I thought 'Oh I really don't want to go'. But it's not because of that class it's just because, you know, it's just difficult. I don't wanna struggle today. But once I've got myself up and doing it I'm glad I did, and I must admit that every time I leave here I have this feeling of almost jubilation you know, but it's a lovely feeling, you feel that you've done something, you've achieved something, and you hope that you've helped someone else along. Streatham Joan 75

Commentary

Findings from the qualitative element of this study build on those obtained from the earlier study in East Kent. Data relate to a very different socio-demographic context and also to a different means of data collection, given that researchers interviewed participants rather than inviting written comments. This meant that coverage of topics was potentially much more comprehensive, focused and extensive. Nevertheless, the testimonies support the findings from the previous study in a number of ways, including, crucially, the reporting of improved respiratory symptoms from baseline to follow-up. Further, the baseline data provide a detailed picture of what it is like to live with COPD, including the secondary issues, such as depression and isolation which are not always readily captured in a few written sentences.

Participants claimed that regular singing helped them in managing their respiratory symptoms, and reported improvements in mental wellbeing, attributing this to the singing group. Social benefits were also in evidence, extending to the groups meeting outside of the singing sessions, and other group members offering welcome support and advice. These aspects of wellbeing also emerged from the East Kent study.

Participants also talked about what elements of the facilitation they valued most and learned from; how they saw the singing groups contributing to their improved state of wellbeing, and what they could do following the programme that they could not do before. Such feedback provided rich and practical information on what participants found meaningful, which supplements the quantitative data and strengthens the potential for building on the findings from this evaluation.

Reflections

Since 2005, when the Sidney De Haan Research Centre for Arts and Health was established, there has been a clear growth of interest in the value of regular group singing for wellbeing and health. This is reflected not only in the growth of community singing groups in the UK, but the substantial increase in evaluation and research documented in recent reviews (Clift, et al., 2010; Gick, 2011; Gick and Nicol, 2016; Lewis et al., 2016). Singing is a holistic activity. It engages people physically, mentally, emotionally and socially, and can be seen as a form of 'exercise' on each of these levels, with singing commonly experienced as: 'energising', 'calming', 'uplifting', 'stimulating', 'enjoyable' and 'sociable.'

The research challenge, currently, is not so much to evidence such benefits which are so widely reported, but more to address the extent to which regular community singing can have clinical benefits for people experiencing challenges to their mental and physical health. In addition, work is needed to explore the feasibility of setting up and running singing groups in association with, or embedded within, existing health and social care structures. These type of creative interventions may reduce demand for more costly health interventions, such as hospital admissions.

In the current project, we aimed to build upon an earlier project on singing for COPD in East Kent (Morrison et al., 2013; Skingley et al., 2015) to test the feasibility of establishing a network of singing for better breathing in Lambeth and Southwark and to assess their effectiveness with respect to improved breathing, exercise, health status and general wellbeing. Specific objectives are given in the Introduction to this report.

Over the period of the planning and implementation of this project, there was growing recognition nationally of the potential value of regular singing for people with breathing difficulties and new groups were being established across the UK. In addition, the British Lung Foundation launched a significant programme to promote 'Singing for Lung Health' and was able to provide funding and training support to help establish further singing groups for people with lung problems. The nature and scale of provision currently can be seen on the BLF website, which offers a facility to search for local singing for breathing groups.

Sadie warming up participants at the APPG reception St Thomas' Hospital, 2016





Shilpa in action at St Thomas's Hospital lunchtime performance, 2016

The BLF website also sum up the benefits that participants might experience if they engage in regular singing – both with respect to management of breathing difficulties and also in terms of general wellbeing. The benefits for symptoms of respiratory illness they identify are:

- Better vocal strength and stamina
- More control over the speaking and singing voice
- Feeling more in control of breathing
- Learning techniques to breathe more efficiently
- Less coughing
- Increased awareness of the body
- Improved mobility

Similarly, a list of benefits for wellbeing is given:

- Positive feelings, feeling uplifted, less anxiety and depression
- Confidence, sense of achievement and increased motivation to engage in other activities
- Feeling part of a group, sharing experiences, making new friends
- New skills, better concentration, stimulation of memory

As we have seen, many of these points emerge from the qualitative data gathered in the current project.

In addition, while the Lambeth and Southwark work was in progress, new empirical research was published from New Zealand – a very similar single-group longitudinal feasibility study conducted in a community setting over the course of one year. (McNaughton, et al., 2016, 2017). This study provides a particularly interesting point of comparison, and very similar qualitative findings were obtained, though the quantitative outcomes were different.

Challenges and limitations

As a feasibility study, the present project substantially achieved its aim and specific objectives. We were able to establish, monitor and evaluate four singing for better breathing groups, which ran concurrently on a weekly basis with good regular attendance – two in Southwark and one in Lambeth for the whole life of the project from September 2015-July 2016, and a further group in Lambeth running from January-July 2016. We were also able to bring the groups together as planned for larger events in which they were able to showcase their achievements. In the first of these, in February 2016, the combined groups were featured as part of the closing session of the First National Arts and Health Conference and Showcase for health decision-makers, organised by the charity Arts Enterprise with a Social Purpose (Aesop) at the Royal Festival Hall in London. The project was one of 24 arts and health projects selected from across the whole of the UK to be presented at this event. The whole of the session can be viewed on the Aesop website: <http://www.ae-sop.org/welcome-to-the-aesop-website/>. Further performance events took place at St. Thomas' Hospital, in London, in June 2016, as part of the London Creativity and Wellbeing Week, at lunchtime within the Breathe Arts Health Research programme, and then in the evening as part of a reception for the All Party Parliamentary Group for Arts, Health and Wellbeing. We have also been successful in supporting the Southwark groups to secure funding from the Evening Standard Dispossessed Fund, to continue until September 2017. Continued support from Guy's and St. Thomas' Charity funding has also been used to support the Lambeth groups as efforts are made to find alternative sources of support.

Nevertheless, the project did face some challenges. First and foremost, despite our best efforts, we did not recruit to the level we originally hoped for. It is clear, in retrospect, that we under-estimated the degree of time and effort needed to communicate effectively with health professionals and with people affected by COPD across the two boroughs, and encourage participation. Box 1 in the Introduction presents a time-line, and we did feel at the outset that a well thought out strategy was adopted. Firstly, we made contact with the only BLF Breathe Easy group operating in the two boroughs, which met at the Methodist and United Reformed Church in Dulwich, and enlisted their support in developing the project in terms of design and materials. Secondly, we identified suitable venues for the groups in both boroughs, and a start date (from September 2015), days and times when taster sessions would happen and groups would run, so that they could be advertised. Thirdly, we printed attractively designed recruitment posters and flyers; created a website for the project; organised a high profile launch event at the Royal Festival Hall, and produced a high quality promotional film, describing the nature of the project and including supportive testimonies from health professionals and powerful first-hand accounts of the power of singing from people with COPD.

The main strategy followed to inform and recruit people with COPD was to contact lead GP's and Practice Managers at between 10-12 health centres within 30 minutes walking distance of the advertised venues. Posters and flyers were sent to surgeries in April 2015, and a request was made to the surgeries to send out information to patients on their COPD registers. Starting in April gave us six months for recruitment, prior to the planned baseline assessments and start of the groups in late September/early October. This request was sent out for a second and third time as it transpired that there was little take up from surgeries, and eventually only six practices undertook to write to patients. By mid-July it was apparent that we were in danger of not meeting our recruitment target of 100 participants, with approximately 25 per group, and so further efforts were made to enhance publicity for the project through advertising over three weeks in two local newspapers – Southwark News and Lambeth Weekender. The proprietor of these newspapers, Kevin Quinn, took a special interest in the project, as his mother had been affected by COPD, and he offered us advertising at a reduced rate, and arranged for one of his journalists, Joey Millar, to write a feature news items for us. We also undertook street level leafleting, particularly in Lambeth, in public buildings, shops, pharmacies etc. in the vicinity of our chosen venues. Eventually, in late August, we decided not to run a group in one of the Lambeth venues due to very low numbers, but continued with the recruitment efforts. Baseline assessments took place in September 2015, and three groups commenced. Further baseline assessments took place in January 2016, and by this time there were sufficient numbers to establish a fourth, smaller group, in Clapham, Lambeth.

At the end of the recruitment process, we had 60 people with reported breathing difficulties involved in the study, which was just over half of our original target. The sample consists of two cohorts, and this potentially complicated the analysis and interpretation of findings. The group assessed in September 2015 could have participated in up to 40 weekly sessions over the life of the project, whereas those assessed in January 2016, could have experienced up to 25 sessions. The groups did not differ significantly as baseline, however, on any of the key variables assessed, and there was no evidence that the two cohorts differed in the changes seen over the different periods of time. It was decided, therefore, to treat the two cohorts as one group for the purposes of this report.

Apart from the challenges, there are limitations to the current study, which were known from the outset. Chief among these is the lack of a comparison or control group. As we have seen, three clinical studies reported by Bonilha et al., 2009, and Lord et al., 2010, 2012 were randomised controlled trials, and they had the advantage of being able to compare the outcomes from the singing intervention to randomised controls receiving usual treatment or an alternative intervention. This is important, since the control group comparison allows for a clearer interpretation of any changes or lack of them for the singing group, as attributable to singing. For example, in the Bonilha et al. study, an apparently positive change on an outcome variable in the singing group, such as the improved St. George's Respiratory Questionnaire total score, was also found in the control group. Similarly, an apparent lack of change for the singing group on expiratory pressure, appears to be a positive and significant finding, when compared with a clear reduction in this measure in the control group.

On the other hand, the Bonilha and Lord studies were undertaken in the context of hospital settings, with readily accessible patients receiving care, who took part in 'singing lessons' in small groups, with the intervention delivered over relatively short time periods. In the Morrison et al. study, by contrast, the concern was to develop a community-based intervention, involving larger numbers of participants, over a longer period of time, and focused on the potential for performance events. In other words, the model was not one of small numbers engaged in singing lessons, but rather the development of 'community singing' groups, meeting regularly to learn and rehearse songs and develop the skills and confidence to sing in public. This accounts for the 'feasibility' character of the East Kent study, as we were attempting something new and there was no guarantee of success on a number of practical levels: recruitment, acceptability of the approach, commitment to engage over time and willingness to perform. Such practical matters needed to be tested out before taking the further, and considerably more expensive step, of attempting a community-based large-scale randomised controlled trial. The East Kent study achieved its aims, and produced some positive outcomes, not least in apparent improvements in spirometric parameters and self-reported health status on the SGRQ. These changes appeared to be due to the singing activity, given that they were positive and counter to changes expected over time, given the natural history of COPD. Nevertheless, it was considered appropriate to run a further feasibility study in a very different urban context, to further test the feasibility issues, and determine whether the positive results arising from the East Kent study would be replicated.

As it turned out, however, two environmental factors, which could have had a bearing on the outcomes from the present study, became strikingly apparent as the research progressed towards its conclusion: firstly, extremes of weather and secondly, high levels of atmospheric pollution across London. Both of these factors may have had a negative impact on the health and performance capacity of our participants at follow-up. Such factors would still have operated even if we had conducted a randomised controlled trial of course, but at least they would have been 'controlled' in the sense that both, as 'independent' variables, would have equally affected participants in the intervention and control arms of the trial.

Nevertheless, the study ran successfully despite difficulties over recruitment and lower participant numbers than planned. The story that emerges from the research is a mixed one, with some disappointing outcomes, but others that are strikingly positive.

Participants

Participants referred themselves into the study on the basis of information received through their surgeries or various other routes. Everyone, describing themselves as affected by breathing problems, whether COPD or another lung condition, was accepted into the study, with the intention of focusing on the results for those meeting the inclusion criteria for COPD in reporting on the findings. However, of the 60 people recruited, at follow up, 44 were assessed by questionnaire, and 42 by spirometry. Of these 42 participants, 31 were found to meet the GOLD criterion for COPD at baseline. It is clear from the comparisons made between those with COPD and those not diagnosed, that the FEV₁/FVC ratios significantly lower for the COPD group, but the two groups did not differ significantly on the other self-assessed health measures, in particular, the St. George's questionnaire, exercise performance, and directly assessed breathlessness after six minutes of walking. Consequently, the decision was made to analyse and report the findings for the whole group together with focusing specifically on those diagnosed with COPD.

Respiratory and exercise outcomes

Tables 8-11 above report on the changes observed from baseline to follow-up on the health, functional and spirometry measures, for the whole group and then those with COPD. It is reasonable to restrict discussion to the COPD group as the findings are essentially the same as for the total sample.

Firstly, it is noteworthy that a number of the key measures show very high correlations over time. This is particularly true for the Six-Minute Walk Test (6MWT), $r=0.92$; FEV_1 , $r=0.97$, and FVC, $r=0.95$. This points both to stability in relative rankings on these measures, as well as accuracy of assessment.

Secondly, it is clear that resting SaO₂ is slightly lower at follow-up – 1.35% lower – and that this change is statistically significant. However, the values are very high, and well within the normal range. Notwithstanding its statistical significance, the change is not considered to have any clinical importance.

Thirdly, the general picture for the health and functional measures, and for FEV_1 , $FEV_1\%$ and inspiratory pressure, is one of no change. This can be considered a positive result, as there is no evidence of a decline, even with the passage of time.

And finally, and in contrast to the results for FEV_1 , there is a relatively small, but statistically significant decline in total lung volume expressed (FVC), especially when this is considered normatively as a percentage of predicted values (a fall of 9.51%). This had an effect on the FEV_1/FVC ratio, of significantly increasing its value from 0.52 to 0.56 (ie just over half of expressible lung volumes on average were forcibly expressed in one second). As this ratio is a key variable in the diagnosis of COPD, it is striking that this value had increased. Nevertheless, the change is very small, and it is unlikely that the change has any clinical importance. In addition, as we have seen, participants did report a significant improvement in ease of breathing as reflected in the SGRQ symptoms scale.

As noted earlier, the central aim of the current feasibility study was to test whether the successful development of a network of community singing for breathing groups in East Kent, could be replicated in Lambeth and Southwark. In the Kent study, statistically significant improvements were found on spirometry measures, but this key finding has not been confirmed here. In the East Kent study, $FEV_1\%$ for example, changed from 54.3 to 56.3. This increase was statistically significant, though the effect size was small at approximately 0.1. In the current study the values remained the same: 61.5 to 61.6. With total lung volumes, in the East Kent study FVC% changed from 81.7 to 85.4, a significant improvement, whereas in the present study the values significantly declined from 95.7 to 86.2 (a fall of 9.5%).

A pattern of little or no improvement, or a small decline, is found in other studies of singing and COPD where spirometry was used to assess changes (the Lord et al. and Goodridge et al. studies did not assess changes in spirometry). In the Bonilha et al. (2009) study, for example, a small reduction was found in FEV_1 and FVC in the singing group, with no difference compared with their control group (% values are not reported). McNaughton et al. (2017), interestingly, reports an improvement in $FEV_1\%$ in their singing group from 60.3 to 64.5 over the course of a year, though this is not significant. For FVC%, the values also improve over a year, from 103.5 to 107.0, though again the change is not significant. The change seen here of 3.5% points, is very close to the 3.7% improvement seen in the East Kent study. In the Morrison et al. study the sample size was higher, at 65 participants for the spirometry assessments, whereas in the McNaughton et al. study only 18 participants were followed up over the year. The different sample sizes most probably account for the different outcomes from the statistical analysis.

In terms of walking performance, a reduction was seen in the current study in the distance covered in the Six-Minute Walk Test (6MWT) by participants with COPD, from 312.7 to 296.6 metres. This is a small decline of approximately 16 metres or just over 5% and the change is not statistically significant. In addition, participants reported a slight increase in breathlessness on the Borg scale following exercise (2.9 to 3.1), but the change is not significant. It is noteworthy also that the mean ratings are low given the range of the scale (from 0-10) and represents a subjective rating of 'moderate' breathlessness. This reflects the self-paced nature of the assessment.

Exercise capability was not assessed by Bonilha et al. (2009). In the Lord et al. (2010, 2012) studies the Incremental Shuttle Walk Test was employed. An improved distance in the singing group was reported in the first study, but a reduction in the second study, and in neither were significant differences with the control groups found. In Goodridge et al. (2013) a small decline was seen in 6MWT distances between baseline and follow-up, which was not significant. McNaughton et al. (2017) report a marked and significant improvement for their participants on the 6MWT over one year from 300 to 377 metres (a change of just under 26%). However, in this study, participants also continued with regular exercises classes post pulmonary rehabilitation, and the change seen in distance covered is more likely a consequence of continued physical exercise than the singing activity.

Health status outcomes

Table 13 reports the findings for participants with COPD on the standardised self-report health measures employed in the evaluation. As with the Morrison et al. (2013) study on which the current project was based, the St. George's Respiratory Questionnaire (SGRQ) was adopted as the primary outcome measure. All of the test-retest correlations are in excess of 0.6 and point to satisfactory reliability of the scale between baseline and follow-up assessments. This gives some confidence in the reliability and validity of the assessments.

In the East Kent study, significant improvements were found on the SGRQ total and impact scores, whereas here a significant improvement is seen only on the symptoms scale. For the total SGRQ score, for example, in Morrison et al. the baseline and follow up scores were 48.7 and 45.4 respectively – a positive change of 3.3 points, whereas in the current study, the values were 43.1 and 43.3 – a slight increase in a negative direction. The change seen in the current study for the symptom scale, from 56.6 to 48.8, represents a positive improvement of 7.8 points. However, there are no available guidelines on the interpretation of sub-scales within the SGRQ, as an assessment of the 'minimum clinical important difference' (MICD) in scores for the SGRQ has only been made for the total score.

Given the significant improvement on the SGRQ symptom scale, individual items making up the scale were considered. The SGRQ is not validated with respect to individual items making up the questionnaire. Nevertheless, it was considered of interest to see whether the change on the overall symptom score was due to changes on specific items. Table 15 reports findings for six of the symptom items in the questionnaire, and this reveals significant changes on two items. Ratings of the frequency of 'severe attacks of chest trouble' over the last three months, and 'good days with little trouble' in an average week, both showed significant improvement. For severe attacks, the change is from '2 attacks' to '1 attack' in the last three months; whereas for good days the movement is from '1 or 2 days' to '3 or 4' days in an average week.

No changes were found on the MRC dyspnoea scale, the EQ5D tariff and the EQ5D health rating scale for the day the questionnaire was completed.

In previous studies, researchers have used a variety of validated questionnaires for assessing self-reported health status. Only Bonilha et al. (2009), Lord et al. (2010) and Goodridge et al. (2013) employed SGRQ. Bonilha et al. report a fall of 5.9 points (an improvement) in the total SGRQ score for their singing group, but this is similar to the positive change found in their alternative intervention (handicraft lessons) control group. Lord et al. (2010) report a 1.1 point fall in SGRQ for the singing group with no significant difference from the 'usual treatment' control. Goodridge et al. (2013) by contrast found a 5.9 point increase (a decline in health status) in total SGRQ for the singing group but a smaller decline in the control group, though the difference is not significant.

Only the BLF (2017) evaluation of the 'Singing for the Lungs' programme employed the MRC breathlessness scale to assess change. They report a slight and non-significant fall in values (an improvement) over a period of three months from a mean of 2.76 to a mean of 2.61. In the present study, the baseline value of 2.47 increased to 2.57 on follow-up (a small but non-significant increase in breathlessness).



Participants singing at St Thomas' Hospital lunchtime performance 2016

Service use

None of the questions asked regarding medication or service use before and during the project revealed any changes, either improvement or decline, so the picture was one of stability. This is a positive finding in itself, especially given the decline seen on the spirometry measures, and also the concerns expressed regarding air quality in London over the course of 2016. One limitation of the study is that service use was based on self-reports, and so was reliant upon memory, rather than being directly assessed. Also, some of the response options may have been insufficiently sensitive to pick up change. For example in assessing inhaler use, participants were asked to report whether they used their inhaler 'daily' or 'less than daily'. No change was seen on this measure, which in retrospect was probably too crude to detect possible changes in the pattern and frequency of inhaler usage. The study also suffers from the lack of a control group, to assess whether a 'treatment as usual' group would be comparable in service utilisation or not.

Qualitative testimonies

Notwithstanding the findings from the objective and standardised measures, the majority of participants in this research study agreed that the singing programme led to improvements in respiratory symptoms between baseline and follow-up. Additionally, respondents also noted improvements in mental wellbeing, attributing much of this to the singing group. Social benefits were also in evidence, extending to the groups meeting outside of the singing sessions and often acting as support and advice channels. Participants also talked about particular

elements of the facilitation they valued most and learned from; how they saw the singing groups contributing to their improved state of wellbeing, and what they could do following the programme that they could not do before. Their accounts provided rich and practical insights into what is meaningful for participants.

These findings build on those obtained from previous qualitative work. Skingley et al (2014) similarly noted incremental improvements in breathing, physical health, psychological wellbeing and social support in their study, drawing on written comments from 97 participants invited to write about their experiences. The British Lung Foundation's (2017) evaluation of its network of singing for lung health groups also found that the same broad areas emerged from participants responding to an invitation to make comments within a questionnaire. It is interesting, and perhaps noteworthy, that the comments in these studies emerged without the prompting an interview might provide.

Like the present study, Lord et al (2010, 2012) undertook interviews with participants in their studies (n=8 and n=9 respectively) and, although limited in number, interviewees reported similar improvements to those noted above, in breathing, general wellbeing, posture, social support and achievement. As with the present study, Lord et al included quantitative measures in the form of standardised health related questionnaires, the results of which did not always point to the same conclusions as the interview data. This led the authors to question the suitability of traditional, objective metrics alone as outcome measures of complex interventions and to stress the need for data from the participants' perspective.

McNaughton et al (2016, 2017) reported a relatively small cohort study comprising standardised respiratory and quality of life measures, together with interviews (n=12) and a focus group discussion (n=11). Interviews appear to have been relatively unstructured and improvements were noted in breathing, sputum clearance, exercise tolerance and wellbeing. Four themes encapsulated similar findings to those reported in other studies, with an emphasis on the social aspect of the singing group.

All these studies are remarkably consistent in respondent testimonies and written comments, illustrating the varied potential benefits gained from singing programmes for breathing. This is despite differences in sample size, data collection method and length of singing intervention reported. The current study has recruited a much larger number of participants for interviews than previous studies and therefore adds significantly to what is now a substantial body of evidence on what the experience of singing means to people with COPD.

Recommendations

The present study makes a useful contribution to the growing literature on the potential value of regular group singing for people with COPD and other respiratory illnesses. The study was designed as a further feasibility study to build upon the earlier study conducted in East Kent by Morrison et al. (2013) and as such it successfully met its aim and primary objectives.

Clearly, the study is limited by the lack of a randomised control group, although in retrospect, it is perhaps fortunate that the study was not planned as a community-based randomised controlled trial given the difficulties experienced with recruitment. A sufficiently powered trial may well have required finding over 200 people with COPD at the outset to take into account estimated attrition. From our experience, such an enterprise in future will require a considerable investment of time and energy to ensure support at the level of primary care and local respiratory services, and ensure successful recruitment of participants. A multi-centre cluster randomised trial of the kind needed to take account of seasonal variations and background pollution levels, might require recruitment of 500-1000 participants.

Lewis et al. (2016) in their systematic review of previous research (not including the McNamara studies), carefully assess the limitations of studies reported so far, and we are in agreement with their basic recommendation that 'larger trials are needed to establish the impact of SLH (singing for lung health) on patient relevant outcomes', and specific questions in need of further research:

Which aspects of singing training are most important for an effective programme which is attractive to patients?

What are the objective physiological changes in people who participate in singing?

What value-based outcome measures are required to demonstrate the impact of SLH programmes on patients' physiological, psychological and social well-being, over a sufficient duration of follow up, necessary to persuade commissioners to provide sustainable funding for this intervention?

What impact does SLH have on health resource utilisation?

What is the most effective way to train and support singing group leaders?

What is the best way to integrate singing programmes into PR and other aspects of integrated health care?

What is the optimal duration and capacity of singing classes? (Lewis et al. 2016, p.7)

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Appendix

Websites and videos of singing for breathing initiatives

British Lung Foundation, 'Singing for Lung Health'
<https://www.youtube.com/watch?v=jaJ-7Lz3JaE>

Brighton and Hove, 'Singing for Health'
<https://www.youtube.com/watch?v=ZgJokbZVA8w>

Burnley 'Singing for Lung Health' group
<https://www.youtube.com/watch?v=8TIY0jVmmqg>

Cambridge 'Singing for Breathing'
<https://www.youtube.com/watch?v=INISsnHFRO0>

East Kent Singing and COPD Project
<https://www.youtube.com/watch?v=c0UK2X3i-FU>

East Kent Singing and COPD Project – BBC coverage
<http://www.bbc.co.uk/news/health-25231910>

Ludlow 'Singing for Lung Health'
<https://www.youtube.com/watch?v=ZRShtxcrIs>

Northampton 'Singing4Breathing' Group
<https://singing4breathing.wordpress.com/author/singing4breathing/>

Rhyll 'Singing for Lung Health' Group
<https://www.youtube.com/watch?v=3ldzqFWrSUc>

Royal Brompton and Harefield 'Singing for Breathing Group'
<https://www.youtube.com/watch?v=S43cTh-xjCg>

Solent 'Singing for Lung Health' Group
<https://www.youtube.com/watch?v=bmTrsxxwCpA>

Tayside NHS 'Singing with COPD'
<https://www.youtube.com/watch?v=qaLAFcBinJs>

Wales, 'Singing for Breathing'
<https://www.youtube.com/watch?v=mVmvv0zWgn4>

Westminster Breathe Easy 'Singing for Health' group
<https://www.youtube.com/watch?v=TbHAD7BDKns>

Wolverhampton Singing for Lung Health
<https://www.youtube.com/watch?v=x3Rqjoy5gg8>

Whittington Hospital - Myra Stern on the benefits of singing for respiratory illness
<https://www.youtube.com/watch?v=WdFh4ImTYk4>

Wigan Warblers
<http://www.wiganwarblers.co.uk/homepage/>
<https://www.youtube.com/watch?v=3-sMvzOYio>

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Singers at St Thomas's Hospital performance, 2016

It tells you how to control, teaches you how to control (...) We all think we've got to keep gulping in all this air all the time 'cause we're feeling a bit sort of tight and things and instead of breathing it all in we should be letting some of it out and that's what it's taught us.

An hour's continuous exercise here my lungs feel like they've had a better work out than an hour in the gym. This is erm, yeah, I was quite surprised coming here to find out how much of an exercise it was for my lungs.

And also interestingly you're not worried about, in the gym you're worried about heart rate and all the rest of it, but when you're singing here you just sort of you forget that you're here for the lungs cause you get involved in singing and you're trying to remember the words and do the singing. So psychologically that's rather good, it's distracting the mind isn't it? And so you're, I just feel so much better.

It's excellent for learning to control not being out of breath, when you are out of breath how to get back to normal breathing again, it's excellent, yeah.

To be honest with you, I haven't needed to see my GP so much, because, um, I think I've decided just see what else I can use to manage it. Because there's only so much they can do, giving you the inhaler and the asthma nurse, prescribing additional tablets, apart from that, you know, there isn't an awful lot they can do except, for you, you know, for you to look for other ways of helping yourself really, I think.

Yeah I don't need so much support now. It's brilliant, absolutely brilliant. If we ever lost the funding for this choir, I don't know what I'd do. I'd probably go back to seeing the doctor more often, you know? I truly believe that choir has done good to, not just me, to all my colleagues in the choir, we all feel the benefit I believe.