Singing for Lung Health: Service evaluation of the British Lung Foundation Programme

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Abstract

Introduction

Singing for Lung Health (SLH) is a novel intervention for individuals with respiratory disease. Qualitative results suggest benefits to physical, mental and emotional health. Limited data also suggest objective improvements in measures of quality of life with SLH are achievable. It is not known how effective the SLH groups supported by the British Lung Foundation (BLF) in the UK are and what impact they have on individuals with respiratory disease.

Methods

The BLF conducted a questionnaire survey of 228 singers with respiratory disease from its SLH groups in 2016-2017. Questionnaires were administered prior to participants' first session and after 12 weeks of singing.

Results

113 (49.5%) of participants provided 12 week data. There were significant improvements in CAT score (Mean -1.4 CI: (0.25 - -2.48) ($p = 0.017$). Furthermore, 45% of singers reported reduced GP visits ($p = 0.00002$) and 18% reported reduced hospital admissions ($p = 0.01$). However, there were no significant improvements in general quality of life, anxiety, patient activation, breathlessness or inhaler use. Baseline characteristics were not significantly different between people who completed the 12 week evaluation and those who did not.

Conclusion

This service evaluation found that participants in Singing for Lung Health groups report improvement in respiratory health-related quality of life and a reduction in healthcare utilisation. SLH has potential economic and health benefits. Therefore, to confirm these findings these endpoints should be evaluated further in large scale randomised control trials.

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INTRODUCTION

Singing for Lung Health(SLH) is a group based intervention which combines arts and health approaches with the goal of improving the quality of life of people living with lung disease (1-6). There are a number of likely mechanisms of benefit. SLH has many similarities with physiotherapy techniques used for dyspnoea management and airway clearance techniques taught to individuals with chronic respiratory disease. Singers are encouraged to use their abdominal musculature in a way that provides optimum physiological support to the voiced breath. This engagement of the abdominal musculature through the sung phrases enables people with obstructive lung disease to reduce their functional residual capacity towards a more normal, and therefore comfortable operating volume. Some voiced fricatives (consonant sounds produced by reducing the flow of air across the vocal apparatus using the articulators) used in vocal warm ups can be compared to pursed lip breathing exercises(7) as a method to reduce intrinsic positive end expiratory pressure (PEEPi) and prolong expiration to control dyspnoea. Gick and Nicol (8) also propose that singing mimics breathing control and retraining exercise for people with respiratory disease. Furthermore, singing could augment adaptive vocal fold narrowing in COPD patients which may further beneficially reduce PEEPi(9). An improved mucociliary clearance mechanism has also been proposed by Goldenberg (10) whereby singing may increase airway shear stress and alter the viscosity of mucous making it easier to clear. Moreover, COPD patients who received the singing intervention had a significantly lower breath hold time after 6 weeks of intervention compared to a usual care control group(4). This suggests that singing enables COPD patients to take a more controlled breath, due to a learned sensitive discrimination of the point at which inspiratory reserve volume constriction causes dyspnoea, so avoiding unnecessary large volume change.

Besides the physical and artistic benefits of joining a group, SLH may reduce social isolation, improve engagement in self-management, reduce anxiety and improve general quality of life. Regular attendance at a peer support group may also have an impact on healthcare utilisation. A recent consensus statement recommends including certain components in SLH sessions (1) including: physical warm ups; breathing exercises focusing on correct posture and respiratory muscle use, with focus on the exhale for obstructive conditions; voiced and unvoiced fricatives; primal sounds to engage the vocal mechanism; rhythm and pitch games; a balanced repertoire to fit phrase lengths for individuals with breathlessness; a cool down, relaxation and home practice.

Qualitative research shows benefits of SLH for improving breathlessness, reducing exacerbations, improving mood and physical activity (2-6). However, to date large scale randomised controlled trials (RCTs) have not been conducted and evaluations have been fairly small scale or at single institutions(3, 4, 11, 12).

The British Lung Foundation (BLF) has invested in SLH as a potentially beneficial intervention for people with lung disease and there are now 43 groups across the UK run by individuals trained by the BLF. Sessions run weekly and last 60-90 minutes. Many groups are run independently by a freelance singing leader and some have additional clinical or volunteer support. The BLF's objective in carrying out the survey described here was to gain information on the demographics of people attending its Singing for Lung Health groups nationwide, as well as understanding the impact of the programme.

METHODS

Participants in twenty six BLF SLH groups were surveyed before and after 12 weeks of singing. Singing groups were included from England, Scotland, Wales and Northern Ireland. Participants were eligible to be included in the survey if they had no prior experience of Singing for Lung Health and were able to complete the questionnaires independently at their initial singing session. Participants provided written consent to participate in the SLH programme. Ethics committee approval was not sought for this analysis because the data obtained were part of an internal service evaluation. Furthermore, singers were not treated as patients but as members of community singing groups. The service evaluation team had no prior interaction with singers. Individual singing leaders were responsible for collecting the data and sending it back to the BLF. Singing group leaders were informed of the importance of the evaluation and data collection during their training provided by the BLF, but none had specific training or experience in healthcare questionnaire survey administration. The BLF provided free training and funding for singing leaders to set up and run groups once a week for the first twelve weeks. Following this, singing leaders were encouraged to obtain funding for their groups independently.

Content of Survey

Singing participants were given questionnaires by their group singing leaders, to complete at their first singing group session. The questionnaire survey included questions about age, sex, smoking status, recruitment method, respiratory and other diagnoses, previous pulmonary rehabilitation (PR) and exercise group participation and MRC dyspnoea score (see appendix). Questions also included average use of inhaler (regardless of diagnosis), and GP visits and admissions to hospital in the preceding six months.

Four patient reported outcome measures were also included:

The COPD Assessment Test (CAT)(13) is a widely used respiratory health related quality of life measure. The CAT is scored from 0-40 with higher scores representing greater disease burden. The minimal clinically important difference (MCID) of the CAT score has been established for Pulmonary Rehabilitation between a two and three point reduction (14, 15).

The Patient Activation Measure (PAM) describes the extent to which an individual is confident and has the knowledge they need to manage their condition effectively and in collaboration with the healthcare system (16). The PAM is the most commonly used measure to assess patient activation and is the recommended tool by the National Health Service(17). The PAM is scored from 0-100 with four levels of Activation. Level 1 = 0-47, Level 2 = 47.1-55.1, Level 3 = 55.2-67.0 and Level four is above 67. The higher the score the more confident and knowledgeable the individual to manage their condition(18). No MCID in respiratory disease has been established but a change across categories would suggest a change in level of engagement from an individual.

The General Anxiety Disorder-7 (GAD-7)(19) is a measure of anxiety and was developed for use in Primary Care. There are 7 questions with scores ranging from zero to three. For example ‘over the past two weeks how often have you been bothered by not being able to stop or control worrying?’. A response of ‘not at all’ scores 0, several days scores 1, more than half days scores 2, and nearly every day scores 3. A score of five or more indicates anxiety and 10 or more indicates a referral to specialist services is warranted. To the Authors’ knowledge no MCID for the outcome measure has been set in respiratory disease but a change across severity boundaries of a total score of 5, 10 and 15 may signify significant clinical change in Anxiety.

The EuroQOL (EQ-5D-3L)(20) is a generic health related quality of life measure containing five question dimensions (mobility, self-care, usual activities, pain/discomfort and anxiety/depression) in different domains with three limits per question. A utility score can be calculated which can be used to estimate the health value of an intervention in regard to Quality adjusted life years. There is also a visual analogue scale of self-perceived current general health status scored from 0-100. 100 represents best possible health. Minimal important differences have been established for the EQ-5D-5L for the utility score (0.051) and VAS (6.9) in PR(21). The MCID of the VAS would be comparable for the EQ-5D-3L version but research suggests that there are differences in the utility score outputs across an English population between five level and three level versions (22).

All the questionnaires above had previously been piloted in SLH groups and were chosen by the BLF on this basis. Singers were asked to complete the questionnaire survey after completing 12 weekly group sessions and finally after six months of weekly sessions. Singing group leaders collected the questionnaires and sent them back to the BLF. At the end of six months all available data were anonymised and sent to AL to analyse.

Statistical Analysis

Statistical analysis was performed using SPSS statistics 24. Change following participation in SLH was evaluated for categorical/ordinal grouped data and non-normally distributed data using the Wilcoxon rank test, and sign test due to asymmetry in box plots and the presence of outliers. Paired t-tests were used to analyse normally distributed data. Baseline differences between singers with and without 12 week follow up data were evaluated using t-test or Mann-Whitney tests as appropriate. Effect sizes of significant differences were calculated using Cohen's d or the Pearson's R if resulting from non-normally distributed data.

RESULTS

Characteristics of population at baseline

Two hundred and twenty eight participants completed the baseline questionnaire survey (Table 1). The majority (68.4%) of singers were female. Obstructive lung diseases were most common, reflecting their relative prevalence. Approximately a fifth (21.4%) of participants were referred to singing from Pulmonary Rehabilitation groups. The majority of individuals were functionally limited by their breathlessness. Approximately half the participants had completed PR previously. Significant numbers had attended separate exercise/maintenance programmes.

Table 1: Baseline Demographics of Singing for Lung Health participants

Baseline Demographic	**Total baseline = 228 (%)**
Gender (Male: Female)	70(30.7):156(68.4)
Age (yrs.)	70.749 (10.1)
Smoker (Yes: No)	17(7.5):211(92.5)
Never smoker (Yes: No)	102(46.6):117 (53.4)
Recruitment Method	
GP referral	6 (2.7)
Consultant referral	17 (7.5)
Friend	26 (11.6)
Poster	35 (19.6)
Breathe Easy	33 (14.7)
Pulmonary Rehabilitation	48 (21.4)
BLF Website	10 (4.4)
Singing Leader	19 (8.5)
Other	30 (13.4)
Missing data	4
Respiratory Diagnosis	
COPD	114 (47.5)
Bronchiectasis	35 (14.6)
ILD	3 (1.2)
Asthma	68 (28.3)
Lung Cancer	3 (1.2)
Pulmonary Fibrosis	17 (7.1)
Missing data	34
Other Diagnosis	
Heart Disease	18(16.4)
Diabetes	23 (20.1)
Depression	12 (10.9)
Osteoarthritis	29 (26.3)
Anxiety	8 (7.3)
PVD	3 (2.7)
Chronic Pain	4 (3.6)
Sleep Disturbance	11 (10)
Osteoporosis	1 (1)
HIV	1 (1)
Missing data	133

Table 1: Baseline demographics of Singing for Lung Health participants. GP = General Practitioner BLF = British Lung Foundation. COPD=Chronic Obstructive Pulmonary Disease ILD=Interstitial Lung Disease PVD = Peripheral Vascular Disease HIV = Human immunodeficiency virus.

Table 2: Baseline measures for Singing for Lung Health Participants

n=228	**Mean/median(SD/IQR)**
CAT score	18.28 (8.4)
PAM score	40.6(5.82)
GAD-7 score	4(7)
EQ Index	0.691 (0.23)
EQ VAS	60(26)
MRC Dyspnoea Score	2 (2)
Average use of reliever inhaler	**n (%)**
Hardly ever	32 (18.1)
once or twice a week	18 (10.2)
once or twice a day	67 (37.9)
3 to 5 times a day	44 (24.9)
More than 5 times a day	16 (9.0)
GP visits in last 6 months	**n (%)**
0	29 (13.2)
1 to 3	119 (54.3)
4 to 7	56 (25.6)
7 to 10	10 (4.6)
10 +	5 (2.3)
Admissions in last 6 months	**n (%)**
0	155 (76.7)
1 to 3	42 (20.8)
4+	5(2.5)
PR attendance	107(Yes):101(No)
Exercise Programme attendance	104(yes):103(No)

Table 2: Baseline measures of singing participants. CAT = COPD Assessment Test PAM = Patient Activation Measure GAD-7 = General Anxiety Disorder seven question questionnaire MRC = Medical Research Council dyspnoea score PR = Pulmonary Rehabilitation GP = General Practitioner EQ Index = Euroqol Index score EQ VAS = Euroquol Visual Analogue Scale IQR = Interquartile range

Response to 12 weeks of Singing for Lung Health

One hundred and thirteen participants (49.5%) attended the session at 12 weeks when the final questionnaire survey was administered and completed it. The median number of sessions attended by these participants was 10 (IQR 3). Data are presented with percentages representing the total of participants who completed the respective questions or questionnaires in the survey (Table 2). Not all questions were completed by individual participants so there are missing data.

Nearly one third had seen their GP four or more times in the preceding 6 months and a similar proportion reported using their reliever inhaler three or more times per day.

At twelve weeks 18 participants reported fewer hospital admissions over the previous six months whereas five participants reported an increased number (p= 0.01). Similarly, there was a significant reduction in reported GP visits in the last six months with 49 participants reporting fewer and 14 reported more (p= 0.00002). Furthermore, there was an improvement in the CAT score of -1.4 (p= 0.017) after participation in SLH for 12 weeks.

Table 3: Outcomes after 12 weeks of Singing for Lung Health in those completing the questionnaire at baseline and 12 weeks.

Outcome measure	Baseline n=113 (SD/IQR)	12 weeks n=113(SD/IQR)	Δ (CI) Effect size	p value
CAT score	17.9 (8.1)	16.5 (7.5)	-1.4 (-2.48—0.25) 0.17	0.017*
PAM score	41.4 (5.4)	41.9 (5.2)	0.71(0.56-1.99)	0.29
GAD-7 score	4.72 (5)	4.1 (4.7)	0 (-.18-1.43)	0.13
EQ Index	0.710 (0.2)	0.69 (0.3)	0 (-0.13-0.79)	0.15
EQ VAS	63.5 (29.3)	70 (30)	0.5 (0.01--7.48)	0.08
MRC Dyspnoea Score	3 (2)	2 (1)	0 (-0.04-0.34)	0.21

Table 3: Outcomes after 12 weeks of Singing for Lung Health in those completing the questionnaire at baseline and 12 weeks. CAT = COPD Assessment Test PAM = Patient Activation Measure GAD-7 = General Anxiety Disorder seven question questionnaire EQ Index = Euroqol index score EQ VAS = Euroqol Visual Analogue Scale MRC = Medical Research Council dyspnoea score. GP = General Practitioner * = $p < 0.05$ which represents a statistical significant improvement in outcome from baseline to 12 weeks. CI = Confidence Interval. IQR = Interquartile range CI not available for non-normally distributed data. Effect sizes are shown if p value is significant.

Table 4: Healthcare utilisation and resource use after 12 weeks of Singing for Lung Health in those completing the questionnaire at baseline and 12 weeks.

Healthcare/resource measure	Baseline n=113 (%)	12 weeks n=113 (%)	p value (effect size)
Average use of reliever inhaler			0.51
Hardly ever	12 (13.3)	16 (16.2)	
once or twice a week	11 (12.2)	13 (13.1)	
once or twice a day	37 (41.1)	46 (46.4)	
3 to 5 times a day	22 (24.4)	16 (16.2)	
More than 5 times a day	8 (8.9)	8 (8.1)	
GP visits in last 6 months			0.00002* (0.29)
0	11(13.1)	27 (31.8)	
1 to 3	47 (56.0)	45 (52.9)	
4 to 7	21 (25.0)	9 (10.6)	
7 to 10	1(1.2)	2 (2.4)	
10 +	4 (4.8)	2 (2.4)	
Admissions in last 6 months			0.01* (0.20)
0	80 (78.5)	102 (91.9)	
1 to 3	19 (18.6)	9 (8.1)	
4+	3 (2.9)	0 (0)	

Table 4: Healthcare utilisation and resource use after 12 weeks of Singing for Lung Health in those completing the questionnaire at baseline and 12 weeks. GP = General Practitioner * = $p < 0.05$ which represents a statistical significant improvement in outcome from baseline to 12 weeks. Effect sizes are reported when the p value is significant.

Differences between participants with and without follow-up data

One hundred and fifteen participants did not complete the questionnaires at the twelfth singing session. There were no differences in gender, age, smoking status, recruitment method or diagnoses between completers and non-completers.

Table 5: Comparison of completer and non-completer baseline data demographics

Baseline Demographic	**Non-completer n = 115 (SD) (%)**	**Completer n = 113 (SD) (%)**	**P value**
Gender (male:female)	40 (32):85 (68)	37(32.5):77 (67.5)	0.57
Age	70.5 (11.5)	71 (8.7)	0.71
Smoker Yes:No	10(8)(Yes):115(92)(No)	7(6.1)(yes):107 (93.9)(no)	0.47
Never Smoker Yes:No	52(48.1):56(51.9)	50(44.6):62(55.4)	0.65
Recruitment Method			0.24
GP referral	4 (3.3)	2 (1.8)	
Consultant referral	12 (9.8)	7 (6.2)	
Friend	16 (13.1)	11 (9.7)	
Poster	18 (14.8)	18 (15.9)	
Breathe Easy	18 (14.8)	17 (15.0)	
Pulmonary Rehabilitation	23(18.9)	27 (23.9)	
BLF Website	9 (7.4)	1 (0.9)	
Singing Leader	7(5.7)	14 (12.4)	
Other	15 (12.3)	16(14.2)	
Respiratory Diagnosis			0.74
COPD	52 (47.2)	62 (47.6)	
Bronchiectasis	16 (14.5)	19 (14.6)	
ILD	1 (1)	2 (1.5)	
Asthma	30 (27.2)	38 (29.3)	
Lung Cancer	1 (1)	2 (1.5)	
Pulmonary Fibrosis	10 (9)	7 (5.4)	
Other Diagnosis			0.25
Heart Disease	29 (18.6)	15 (15.6)	
Diabetes	16 (10.2)	12 (12.5)	
Depression	19 (12.2)	16 (16.7)	
Osteoarthritis	34 (21.8)	25 (26.0)	
Anxiety	19 (12.3)	9 (9.3)	
PVD	5 (3.2)	2 (2.1)	
Chronic Pain	16 (10.2)	3 (3.1)	
Sleep Disturbance	17 (10.8)	10 (10.4)	
Osteoporosis	1 (0.6)	2 (2.1)	
HIV	0 (0)	2 (3.7)	

Table 5: Comparison of completer and non-completer baseline data demographics. BLF = British Lung Foundation. COPD=Chronic Obstructive Pulmonary Disease ILD=Interstitial Lung Disease PVD = Peripheral Vascular Disease HIV = Human immunodeficiency virus * = P<0.05 which represents a statistical significant improvement in outcome from baseline to 12 weeks.

Table 6: Comparison of completer and non-completer healthcare utilisation

Healthcare utilisation measure	**Non-Completer n=115 (%)**	**Completer n=113 (%)**	**P value**
Average use of reliever inhaler			0.59
Hardly ever	20 (20.8)	12 (13.3)	
once or twice a week	8 (8.3)	11 (12.2)	
once or twice a day	33 (34.4)	37 (41.1)	
3 to 5 times a day	26 (27.1)	22 (24.4)	
More than 5 times a day	9 (9.4)	8 (8.9)	
GP visits in last 6 months			0.78
0	16 (13.6)	11(13.1)	
1 to 3	61 (51.7)	47 (56.0)	
4 to 7	32 (27.1)	21 (25.0)	
7 to 10	8(6.8)	1(1.2)	
10 +	1 (0.8)	4 (4.8)	
Admissions in last 6 months			0.65
0	85 (76.6)	80 (78.5)	
1 to 3	24 (21.6)	19 (18.6)	
4+	2 (1.8)	3 (2.9)	
PR attendance (Yes:No)	53(45.7):63(54.3)	60(56.6):46(43.4)	0.10
Exercise Programme attendance (Yes:No)	53(46.9):60(53.1)	54(53.5):47(46.5)	0.44

Table 6: Comparison of completer and non-completer healthcare utilisation. GP = General Practitioner PR = Pulmonary Rehabilitation * = P<0.05 which represents a statistical significant improvement in outcome from baseline to 12 weeks.

Table 7: Comparison of completer and non-completer baseline questionnaire scores

Outcome Measure	Non-Completer n=115 (SD)	completer n=113 (SD)	p value
CAT score	18.7 (8.58)	17.9 (8.1)	0.42
PAM score	39.8(6.31)	41.4 (5.4)	0.06
GAD-7 score	4(9.25)	4.72 (5)	0.43
EQ Index	0.691 (0.21)	0.710 (0.2)	0.84
EQ VAS	60(25)	63.5 (29.3)	0.85
MRC Dyspnoea Score	2(1)	3 (2)	0.29

Table 7: Comparison of completer and non-completer baseline questionnaire scores. BLF = British Lung Foundation. CAT = COPD Assessment Test PAM = Patient Activation Measure GAD-7 = General Anxiety Disorder seven question questionnaire EQ Index = Euroqol Index score EQ VAS = Euroqol Visual Analogue Scale MRC = Medical Research Council dyspnoea score IQR = Interquartile range * = $P<0.05$ which represents a statistical significant improvement in outcome from baseline to 12 weeks.

DISCUSSION

We report the first evaluation of a national SLH program. Following participation, respiratory health status improved and there was a reduction in reported hospital admissions and GP visits compared to the period prior to participation. Although these data are uncontrolled they are encouraging and underline the need for prospective randomised controlled trials of SLH including health economic outcomes.

Healthcare utilisation

There have been no previous studies showing reductions in healthcare utilisation as a result of participating in SLH. These are novel findings. The reduction in healthcare utilisation we observed could have been due to a direct effect on patients' ability to cope with symptoms, in particular breathlessness, or because participation in the group itself provided a different pathway for health-seeking behaviour. Our results also add to previous qualitative data(23) that patients perceive that singing provides them with additional support and reduces their need to see their GP. Reducing unnecessary GP visits and admissions are components of controlling costs and optimising value in a financially constricted healthcare system. The effect sizes in healthcare utilisation reduction were small to borderline moderate. These preliminary data are encouraging and an economic evaluation of SLH should be incorporated into further research trials in SLH. The results should be interpreted with caution, as they are based on self-report and not corroborated with Primary Care or Secondary Care database information. However, although the accuracy of self-reported healthcare utilisation is variable (24) the reliability of self-reporting healthcare utilisation has been shown to be high in COPD (25) and a significant bias in underreporting GP visits and admissions exists rather than over reporting, particularly when the frequency of visits is high (26). Finally, recall was over six months, so there is a three month overlap period from when individuals were first asked about their healthcare utilisation and when they were asked again after 12 weeks of singing. This may have led to an underestimation of the impact of SLH.

There was no control group in this service evaluation for comparison. However, participants had a high rate of prior participation in pulmonary rehabilitation or exercise programmes suggesting that they were likely already to be receiving stable optimised medical care which may have made it harder to gain further significant improvements to respiratory related quality of life and reduction in healthcare utilisation. However, these data suggest that SLH adds further benefits to current evidence based care. Pulmonary rehabilitation (PR) appears to be a successful approach for future recruitment to SLH programmes and there are significant opportunities to promote SLH within Primary Care and future promotion strategies should focus on this.

Quality of life effects

Respiratory related health status improved following participation in SLH, although the change in CAT score did not meet the MCID established for PR. PR is normally delivered by a multi-disciplinary team with at least twice weekly sessions (27). Previous studies that have achieved larger improvements in health status ran singing groups twice weekly (3, 4) rather than weekly as in the groups studied here. There is likely to be a trade-off between the "dose" of singing delivered and the cost and inconvenience of taking part more frequently. There have been no previous studies investigating the effect of SLH on CAT score. However, previous feasibility cohort studies have investigated respiratory related quality of life according to the St Georges Respiratory Questionnaire (SGRQ). Morrison et al (6) showed that singing in a large group of people (20-50 per group) with respiratory disease over 36 weekly sessions improved SGRQ by 3.3. This does not meet an established MID for the measure (28). Clift et al undertook the Singing for Better Breathing feasibility study across 4 groups in different urban regions, finding no significant improvement in total SGRQ score (23). Ten months of weekly singing sessions were offered. Thirty one out of 42 total participants had COPD according to spirometry, with other participants having reported other causes of breathlessness. There were 44 singing participants followed up in the feasibility study, less than half the number in our evaluation.

We observed a non-statistically significant improvement in the EQ-VAS, compared to a deterioration of of 4.77 points over 10 months seen in the Singing for Better Breathing feasibility study(23) . This difference may reflect the fact that the leaders of singing groups included in the BLF service evaluation had all been through a competitive application and interview process and then received BLF SLH training. Evaluation of this training suggests that it is effective, producing SLH sessions that match the intention to deliver a lung health specific form of singing training(29). The fact that the CAT score improved compared to a less significant improvement in EQ-5D may suggest that SLH may specifically focus on respiratory health more than general wellbeing which highlights the unique therapeutic potential of SLH compared to attendance to other generic community singing groups.

Methodological considerations

The absence of a control group limits interpretation of the results but does allow hypothesis generation and gives information about possible effect sizes for future trials. Improved breathing control is considered to be a key theoretical justification for Singing for Lung Health. There was a reduction of dyspnoea score from 3 to 2 over the Service Evaluation. This was not statistically significant. Completers had higher average breathlessness scores compared to non-completers at baseline. Again, this was not statistically significant but when analysing at the MRC dyspnoea data as a whole it may be the case that individuals who choose to continually participate in SLH are those

who experience significant higher breathlessness and are finding improved control in their breathing following weeks of intervention. There may be a role for more discriminant and multidimensional outcome measures of breathlessness such as the Multidimensional Dyspnoea Profile (30) or Dyspnoea 12 (31) in future singing research.

Although the statistical analysis resulted in no difference between type of comorbidities of completers and non-completers there was a difference in the total number of comorbidities between groups. The non-completers reported 156 comorbidities compared to 96 for completers. It may be that those who are burdened by more comorbidities are less likely to continue attending SLH.

Data collection was not complete. The BLF singing group leaders worked independently to set up and run groups, are not researchers and were not fully trained in data collection. They did not check all questionnaires were fully completed before individuals left the first and last singing sessions. This was a significant limitation but no further resource could be allocated to individual questionnaire checking in each group. Singing leaders may have been reluctant to explain the importance of baseline and 12 week data collection during the initial session, prioritising building a fun and friendly rapport as a group. Should there have been an additional person employed for evaluation completion in each group the group dynamics of the session may have changed and the singers' answers may have changed if supervision was provided thus introducing bias. Five groups returned no data to the BLF at 12 weeks. Attempts to contact all singing leaders were made. There was participant drop out or lack of attendance during the final session (n= 67). This may reflect the nature of a non-clinical group and that each individual was not a patient needing to complete a therapy or medical regimen. Non-attenders at twelve weeks may have attended the following week as all groups were encouraged to set up and run on a rolling basis with the intention of continuing the groups past the 12 week BLF set up funding period. Future studies should ensure that there is appropriate focus on administration and support. Participant lack of completion or adherence is common(32) in PR where there is a multidisciplinary team of clinicians, assistants and administration staff to optimise attendance and questionnaire completion in groups. Only 42% of individuals complete PR in the UK from referral (32) yet PR is promoted as the gold standard of care for COPD patient. It may be more difficult in SLH groups to perform such an evaluation when such support is not available. Nevertheless, the 49.5% completion rate in this evaluation is comparable to completion rates nationally for PR.

CONCLUSION

This service evaluation included a national sample of singers who had participated in twelve weeks of once weekly SLH group sessions. Questionnaire responses show that SLH improves respiratory related quality of life and reduces healthcare utilisation over 12 weeks. This suggests that these endpoints should be evaluated further in randomised control trials.

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COMPETING INTERESTS:

All authors have completed a declaration of interest form at http://www.icmje.org/conflicts-of-interest/ and declare: SLH Training content and delivery has been created by PC and AL.

AUTHOR CONTRIBUTORSHIP:

AL, PC and NSH advised the BLF on the service evaluation. AL performed the data analysis. AL drafted the initial manuscript and all authors worked on the final revision. AL agrees to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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DATA SHARING

Data can be made available by request to the corresponding author.

REFERENCES

1. Lewis A, Cave P, Stern M, Welch L, Taylor K, Russell J, et al. Singing for Lung Health—a systematic review of the literature and consensus statement. Npj Primary Care Respiratory Medicine. 2016;26:16080.
2. McNaughton A, Aldington S, Williams G, Levack WMM. Sing Your Lungs Out: a qualitative study of a community singing group for people with chronic obstructive pulmonary disease (COPD). BMJ Open. 2016;6(9):e012521.
3. Lord VM, Hume VJ, Kelly JL, Cave P, Silver J, Waldman M, et al. Singing classes for chronic obstructive pulmonary disease: a randomized controlled trial. BMC Pulmonary Medicine. 2012;12(1):1-7.
4. Lord VM, Cave P, Hume VJ, Flude EJ, Evans A, Kelly JL, et al. Singing teaching as a therapy for chronic respiratory disease - a randomised controlled trial and qualitative evaluation. BMC Pulmonary Medicine. 2010;10:41-.
5. Skingley A, Page S, Clift S, Morrison I, Coulton S, Treadwell P, et al. "Singing for Breathing": Participants' perceptions of a group singing programme for people with COPD. Arts & Health. 2014;6(1):59-74.
6. Morrison I, Clift S, Page S, Salisbury I, Shipton M, Skingley A, et al. A UK feasibility study on the value of singing for people with Chronic Obstructive Pulmonary Disease (COPD). UNESCO Observatory Multi-Disciplinary Journal in the Arts. 2013;3(3):1-19.
7. Bott J, Blumenthal S, Buxton M, Ellum S, Falconer C, Garrod R, et al. Guidelines for the physiotherapy management of the adult, medical, spontaneously breathing patient. Thorax. 2009;64.
8. Gick ML, Nicol JJ. Singing for respiratory health: theory, evidence and challenges. Health promotion international. 2015.
9. Baz M, Haji GS, Menzies-Gow A, Tanner RJ, Hopkinson NS, Polkey MI, et al. Dynamic laryngeal narrowing during exercise: a mechanism for generating intrinsic PEEP in COPD? Thorax. 2015.
10. Goldenberg RB. Singing Lessons for Respiratory Health: A Literature Review. Journal of Voice. 2017.
11. Bonilha AG, Onofre F, Vieira ML, Prado MY, Martinez JA. Effects of singing classes on pulmonary function and quality of life of COPD patients. International journal of chronic obstructive pulmonary disease. 2009;4(1):1-8.
12. Morrison I, Clift S. A UK feasibility study on the value of singing for people with Chronic Obstructive Pulmonary Disease (COPD). UNESCO Observatory Multi-Disciplinary Journal in the Arts. 2013;3(3):1-19.
13. Jones PW, Harding G, Berry P, Wiklund I, Chen WH, Kline Leidy N. Development and first validation of the COPD Assessment Test. Eur Respir J. 2009;34.
14. Alma H, de Jong C, Jelusic D, Wittmann M, Schuler M, Blok BF-d, et al. Health status instruments for patients with COPD in pulmonary rehabilitation: defining a minimal clinically important difference. NPJ Primary Care Respiratory Medicine. 2016;26:16041.
15. Kon SS, Canavan JL, Jones SE, Nolan CM, Clark AL, Dickson MJ, et al. Minimum clinically important difference for the COPD Assessment Test: a prospective analysis. The Lancet Respiratory medicine. 2014;2(3):195-203.
16. Hibbard JH, Mahoney ER, Stock R, Tusler M. Do Increases in Patient Activation Result in Improved Self-Management Behaviors? Health Services Research. 2007;42(4):1443-63.
17. Dossing M, Khan J, al-Rabiah F. Risk factors for chronic obstructive lung disease in Saudi Arabia. Respir Med. 1994;88(7):519-22.

18. Mullerova H, Landis SH, Aisanov Z, Davis KJ, Ichinose M, Mannino DM, et al. Health behaviors and their correlates among participants in the Continuing to Confront COPD International Patient Survey. Int J Chron Obstruct Pulmon Dis. 2016;11:881-90.
19. Plummer F, Manea L, Trepel D, McMillan D. Screening for anxiety disorders with the GAD-7 and GAD-2: a systematic review and diagnostic metaanalysis. General hospital psychiatry. 2016;39:24-31.
20. Szende A, Janssen B, Cabases J. Self-Reported Population Health: An International Perspective based on EQ-5D. Dordrecht Heidelberg New York London: Springer Open; 2014.
21. Nolan CM, Longworth L, Lord J, Canavan JL, Jones SE, Kon SSC, et al. The EQ-5D-5L health status questionnaire in COPD: validity, responsiveness and minimum important difference. Thorax. 2016;71(6):493-500.
22. Poor AK, Rencz F. Measurement properties of the EQ-5D-5L compared to the EQ-5D-3L in psoriasis patients. 2017.
23. Clift S, Skingley A, Page S, Stephens L, Hurley S, Dickinson J, et al. Singing for Better Breathing: Findings from Lambeth and Southwark Singing and COPD Project. Sidney De Haan Research Centre for Arts and Health; 2017 01/06/2017.
24. Bhandari A, Wagner T. Self-reported utilization of health care services: improving measurement and accuracy. Medical care research and review : MCRR. 2006;63(2):217-35.
25. Hoogendoorn M, van Wetering CR, Schols AM, Rutten-van Molken MP. Self-report versus care provider registration of healthcare utilization: impact on cost and cost-utility. International journal of technology assessment in health care. 2009;25(4):588-95.
26. O. Roberts R, Bergstralh E, Schmidt L, J. Jacobsen S. Comparison of Self-Reported and Medical Record Health Care Utilization Measures1996. 989-95 p.
27. Spruit MA, Singh SJ, Garvey C, ZuWallack R, Nici L, Rochester C, et al. An official American Thoracic Society/European Respiratory Society statement: key concepts and advances in pulmonary rehabilitation. Am J Respir Crit Care Med. 2013;188(8):e13-64.
28. Jones PW. St. George's Respiratory Questionnaire: MCID. Copd. 2005;2(1):75-9.
29. Lewis A, Cave P, Hopkinson NS. Singing for Lung Health: a qualitative assessment of a British Lung Foundation programme for group leaders. BMJ Open Respiratory Research. 2017;4(1).
30. Banzett RB, O'Donnell CR, Guilfoyle TE, Parshall MB, Schwartzstein RM, Meek PM, et al. Multidimensional Dyspnea Profile: an instrument for clinical and laboratory research. Eur Respir J. 2015;45(6):1681-91.
31. Yorke J, Moosavi SH, Shuldham C, Jones PW. Quantification of dyspnoea using descriptors: development and initial testing of the Dyspnoea-12. Thorax. 2010;65(1):21-6.
32. Steiner M, Holzhauer-Barrie J, Lowe D, Searle L, Skipper E, Welham S, et al. Pulmonary Rehabilitation: Steps to breathe better National Chronic Obstructive Pulmonary Disease (COPD) Audit Programme: Clinical audit of Pulmonary Rehabilitation services in England and Wales 2015. London: RCP; 2016 February 2016.