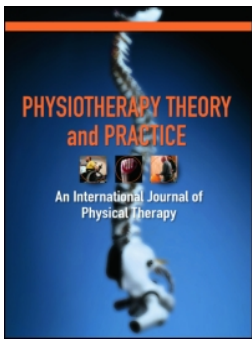


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“SingStrong”: Singing for better lung health in COPD – A pilot study

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ABSTRACT

Background: Chronic Obstructive Pulmonary Disease (COPD) affects up to 440,000 people in Ireland. Multiple domains of biopsychosocial health are affected. Community-based interventions supporting behavioral change and self-management are advocated. The aim of this pilot study was to evaluate the efficacy of an 8-week singing intervention, “SingStrong”, to improve biopsychosocial wellness in persons with COPD.

Methods: Seventy-eight adults with COPD were recruited from three COPD Support groups in the Irish Mid-west. Pre and post-intervention testing performed by physiotherapy and nursing staff comprised Six-Minute Walk Test (6MWT), COPD Assessment test (CAT), Hospital Anxiety and Depression Scale (HADS), and Spirometry: FEV1, FVC, FEV1/FVC. The intervention was a weekly one-hour group class for eight weeks led by a trained choir leader at each site. This included physical and vocal warm-up, breathing exercises and singing. Participants were given a songbook based on their song preferences and a CD with vocal, breathing exercises and songs, and encouraged to practice daily. Semi-structured focus groups were conducted post intervention. Parametric or non-parametric t-tests were conducted to establish significance.

Results: Fifty-eight (74%) participants who attended at least 4/8 session were re-tested. There was a statistically significant improvement in 6MWT ($p = .02$), non-significant improvements in CAT ($p = .24$) and HADS Depression ($p = .238$), and non-significant worsening in HADS Anxiety ($p = .34$). All qualitative feedback was positive, including improvements in breathing, quality of life and intervention enjoyment.

Principal Conclusions: Singing for lung health has positive implications for persons with COPD. Future longer studies should examine outcomes of exacerbation level, hospitalization and medication use.

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COPD; singing; community-based therapy; lung health

Introduction

Chronic Obstructive Pulmonary Disease (COPD) is a pervasive and debilitating condition. It is a source of enormous socioeconomic burden internationally, with potentially devastating consequences for the patient (Blasi et al., 2014). According to the Irish Thoracic Society’s 2018 “Respiratory Health of the Nation” report (Irish Thoracic Society, 2018), respiratory disease was associated with almost 20% of total deaths and 14% of all inpatient hospitalizations in Ireland in 2016. Health Service Executive (HSE) figures estimate that approximately 440,000 people in Ireland suffer from Chronic Obstructive Pulmonary Disease (COPD) (Health Service Executive, 2018). The condition is the fourth most common cause of death in this country and Ireland has the highest rate of hospitalization for COPD in the Organization for Economic Cooperation and Development (OECD), costing in excess of €70 m (USD 77 USD m) in 2014 (Irish Thoracic Society, 2018). The HSE’s 2017 “Living Well with a Chronic

Condition” framework recommends strategies for conditions such as COPD that are underpinned by self-management and multidisciplinary collaboration (Health Service Executive, 2017). Ensuring long-term behavior change can be difficult to achieve however, and community-based structures are helpful to support patients (Zwerink et al., 2014).

COPD is characterized by dyspnea, cough, mucus production, fatigue and pain (Brown, Alsheikh, and Chang, 2018). Additionally patients frequently suffer from co-morbid anxiety, depression and panic leading to social isolation, loneliness and loss of identity (Hussain and Williams, 2017). Group singing has been found to improve holistic wellbeing through mechanisms to address a number of biopsychosocial facets. Effective respiratory muscle recruitment and improvements in oxygenation may be achieved through appropriate recruitment of the diaphragmatic muscle using targeted vocal techniques (Engen, 2005). Singing has

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also been found to improve quality of life (Liu et al., 2019); reduce depression (Skingley et al., 2014); and reduce social isolation (Lewis, Cave, and Hopkinson, 2017) in people with COPD. The British Lung Foundation's "Singing for Lung Health" program supports over 100 groups across the United Kingdom, with research reporting improvements in health status and social participation in group members (Lewis, Cave, and Hopkinson, 2017, 2018). These studies echo the findings of a 2016 systematic review which reported similar outcomes in a number of international trials (Lewis et al., 2016). The cost-efficacy of a singing intervention for lung health was also a key finding of a recent New Zealand study. Here, the annual cost of a weekly singing class was a mere \$NZ4000 (USD 2587 USD) (McNaughton et al., 2017). However, a recent Cochrane review pointed to a paucity of high-quality studies in the area and advocated more research (McNamara, Epsley, Coren, and McKeough, 2017). Group singing for COPD has not previously been conducted or researched in Ireland. This pilot study aimed to establish a number of COPD singing groups in the Mid-West region and to evaluate the efficacy of "SingStrong", a singing intervention to improve the objective and subjective health and wellbeing of participants.

Methods

Participants

Participants were recruited from three COPD Support groups in the Mid-West region of Ireland. These community-based groups were established under the auspices of COPD Support Ireland, which is a national charity, and are self-run and funded by patient members. Each group operates independently and typically organizes regular educational, physical activity and exercise classes, and social events. In total, 106 participants were invited to participate in the study across the three groups. Participants were required to have a confirmed diagnosis of COPD, and to be clinically stable. Additionally, a good command of written and spoken English was required. The principal investigator (PI) delivered an informational talk at each of the three sites, and written information sheets and consent forms were provided. Participants were recruited in May 2019. All participants were under the care of respiratory consultant based in local hospitals. Some, but not all participants had previously attended pulmonary rehabilitation; however, data regarding attendance at pulmonary rehabilitation were not collected. Ethical approval for this project was granted by the faculty

ethical committee of the local University. All participants provided written informed consent prior to study commencement. The trial was registered under ClinicalTrials.gov Identifier: NCT04266951.

Intervention

In advance of the singing intervention, the PI invited participants to contribute suggestions for preferred songs, which were then compiled into a lyrics book. This was provided to participants on the first day of the intervention in addition to a compact disk (CD) with breathing and vocal exercises and recordings of selected songs. Participants were encouraged to practice using the CD on a daily basis to augment the group sessions. No other changes to participant normal behavior or activity levels were suggested. The intervention comprised eight weekly one-hour singing sessions, which were delivered to each of the three groups by an experienced singing teacher and vocal coach. She had additionally undertaken training in singing for lung health in the United Kingdom under the auspices of the British Lung Foundation prior to the commencement of the study. A study period of 8-weeks was deemed to allow for changes in physical (Petrella, Lattanzio, Shapiro, and Overend, 2010) and disease-specific parameters (CAT Governance Board, 2018), as well as providing participants with sufficient information to provide robust feedback about the intervention. The groups varied in size from one smaller group of 12 participants, to two larger groups of 30 and 35 participants each, reflected the respective sizes of the preexisting support groups. The weekly class took place at the regular meeting location of each group and was comprised of a physical warm-up (i.e. a brief mindfulness exercise, and neck, shoulder and upper limb gentle mobilization), breathing, vocal exercises, and singing. The warm-up and breathing exercises lasted approximately 15 minutes each with singing comprising the remaining 30 minutes of the class. In total, the groups prepared three songs, which they performed together at a "SingStrong" symposium on completion of the intervention. This symposium served to disseminate information about stakeholder experience of the "SingStrong" project. Participants continued to attend their regular weekly support meetings as normal over the course of the intervention.

Outcome measures

Pre and post-intervention testing was conducted by the PI, an experienced respiratory physical therapist

and local respiratory clinicians not otherwise involved in the study. Tools selected are widely used and valid for the COPD population, and included the following.

Six minute walk test (6WMT)

Six Minute Walk Test (6WMT) is a sub-maximal exercise test used to assess aerobic capacity and endurance (Jenkins, 2007). Performance capacity is reflected by the distance traveled at a self-selected pace over six minutes. Levels of oxygen saturation, patient breathlessness and heart rate before and during the test were also monitored. The test was conducted in accordance with the European Respiratory Society (ERS)/American Thoracic Society (ATS) Technical Standard (Holland et al., 2014). As all participants were familiar with the test previously, and due to limitations of time, only one test each pre and post-intervention were possible.

COPD assessment test (CAT)

COPD Assessment test (CAT) (Jones et al., 2009) is an eight-point, patient-completed questionnaire designed to measure the impact of COPD on a range of domains (i.e. cough, sputum, breathlessness, chest tightness, confidence, activity, sleep, and energy levels). A higher score (range 8–40) indicates more disease impact.

Hospital anxiety and depression scale (HADS)

This patient-completed questionnaire features seven questions each for anxiety and depression, Each item is scored from 0 to 3 with a higher score (range 0–21) indicating a greater presence of either anxiety or depression (Johnston, Pollard, and Hennessey, 2000).

Spirometry

Measures recorded included forced expiratory volume (FEV1) and Forced Vital Capacity. These values allow for the objective measure of the presence of disease as well as disease severity. The Global Initiative for Chronic Obstructive Lung Disease (GOLD) categorization of disease severity was applied (Global Initiative for Chronic Obstructive Lung Disease, 2019). Spirometry was conducted by experienced respiratory nurses and physical therapists, with relevant prior training, and conducted using ERS guidelines (Miller et al., 2005). Testing required at least three acceptable maneuvers in line with the guidelines.

Post-intervention testing was only completed on participants who had completed at least four (50%) of the

weekly sessions. After study completion, semi-structured focus groups were conducted by an investigator with no prior involvement in the study. Focus groups were conducted using a sample of participants from each site, and audio-recorded for transcription and analysis. These took place at the normal meeting place of the relevant group and lasted approximately 40 minutes each. A semi-structured approach was adopted exploring three areas of interest: 1) participant opinions about a singing intervention prior to project commencement; 2) participant experience of the “SingStrong” intervention including any perceived strengths and weaknesses, and changes that could be made to improve the intervention; and 3) any changes to participant health and wellbeing that participants related to the intervention.

Statistical analysis

Descriptive statistics are reported using mean and standard deviation (SD) for symmetrically distributed variables, median (interquartile range (IQR)) for skewed variables, and percentage for categorical variables. The distributions of all numeric variables were assessed for skewedness using formal tests and through visual inspection of histograms. Paired sample t-tests were used to evaluate pre-post data, with Student’s t-test (normal distribution) or Wilcoxon’s W (non-normal distribution) used as appropriate. Statistical significance was set at $p = .05$.

Familiarization with the qualitative data was supported by verbatim transcription of the interviews, with the PI completing multiple re-reading of scripts while also employing reflexive note-taking to record and audit emerging impressions (Vaismoradi, Turunen, and Bondas, 2013). Line by line coding of the transcripts was conducted to identify themes. The data analysis was conducted manually since the quantity of text was amenable to manual inspection.

Results

Of 106 potential recruits, 77 (72.6%) patients agreed to participate in the study (female: $n = 52$ (67.5%); mean (SD) age: 71.7 (7.2) years) (Table 1). Of those participants who declined to participate, an inability to sing, or a lack of interest in the intervention were common reasons provided. Sixty-eight (88.3%) of these participants were available for spirometry testing, with results for 39 (57.3%) participants indicating obstructive lung disease (mild: $n = 9$ (13.2%); moderate: $n = 19$ (27.9%); severe: $n = 11$ (16.2%)). Pre-intervention, the mean (SD) FEV1, FVC, and FEV1/FVC (% predicted) values were

Table 1. Baseline characteristics and outcome measurements (n = 77).

Age mean (SD) years	71.7 (7.2)
Sex	F: 52 (67.5%), M: 25 (32.5%)
6MWT mean (SD) meters	360(95)
HADS median (IQR)	
Anxiety	6(0–12)
Depression	5(1–9)
CAT median (IQR)	22(11–33)
Spirometry: Disease classification & severity (n = 68)	n (%) Mean FEV ₁ (% predicted)
Obstructive	39 (57.3%) 60.6
Mild	9 (13.2%) 87.0
Moderate	19 (27.9%) 58.6
Severe	11 (16.2%) 40.1
Restrictive	7 (10.3%) 80.0
Mild	5 (7.3%) 71.4
Moderate	1 (1.5%) 67.0
Severe	1 (1.5%) 41.0
Normal	22 (32.4%) 105.8
Total	68 (100%)

SD: Standard deviation; F: Female; M: Male; 6MWT: Six Minute Walk Test; HADS: Hospital Anxiety and Depression Scale; IQR: Interquartile range; CAT: COPD Assessment Test

78 (31), 98 (34) and 66 (18) respectively, reflecting the heterogeneity of the group. Restrictive disease was indicated in seven (10.3%) participants (mild: n = 5 (7.3%); moderate: n = 1 (1.5%); severe: n = 1 (1.5%)). It is likely that these participants had co-morbid obstructive and restrictive disease. Spirometry results for the remaining 22 (32.4%) participants indicated normal spirometry (Table 1). All of these participants had a prior clinical diagnosis of COPD, and it has been found that one-off spirometry may reveal normal findings in the case of mild COPD (Andreeva et al., 2017). The mean (SD) distance walked in the 6MWT at baseline was 360 (95) meters. HADS anxiety and depression median (IQR) scores were 6 (0–12) and 5 (1–9) respectively. The median (IQR) for the CAT at baseline was 22 (11–33).

The mean (SD) number of weekly classes attended was 5.3 (2.7). Fifty-eight (75.3%) participants attended at least four of the sessions and were re-tested and included in the final analysis (female: n = 41 (70.7%), mean (SD) age = 72.4 (6.5) years). Reasons for nonattendance were not formally recorded, however anecdotal reasons for nonattendance include illness, previous commitments including vacations, or other appointments. Disease classification and severity for this subgroup was representative of the overall cohort in the 57 (98.7%) participants available for post-intervention spirometry (i.e. 56.9% obstructive, 13.6% restrictive, and 29.5% normal). Other outcome measures were similarly representative of the initial group recruited. Mean (SD) baseline distance recorded in the 6MWT for these participants was 356 (97) meters, and questionnaire median (IQR) scores were 6 (4–8) for the HADS Anxiety subscale, 4(1–7) for

the HADS Depression subscale, and 21 (10–32) for the CAT.

Post-intervention testing

Forty-three (74.1%) participants completed both the pre and post intervention 6MWT. There was a statistically significant change in the test ($p = .02$) with a mean (SD) improvement in distance covered of 34 (84) meters. This also represented a minimal clinically important difference (MCID) which is between 14.0 and 30.5 meters for patients with COPD (Bohannon and Crouch, 2017). There were non-significant improvements in both the CAT ($p = .70$) and the HADS Depression subscale ($p = .60$), and a non-significant deterioration in HADS Anxiety ($p = .14$) (Table 2, Figure 1). MCIDs for neither questionnaire were achieved. The questionnaires were completed at both time points by 52 (91.2%) participants.

Forty-four (75.8%) participants presented for both pre and post-intervention spirometry testing. Of this number, disease classification was unchanged in 27 (61.4%) participants. Post-intervention mean (SD) FEV₁, FVC, and FEV₁/FVC (% predicted) values were 103 (28), 91 (21) and 65 (16) respectively, again reflecting the heterogeneity of the group. Seven (15.9%) participants improved within their classification (e.g. a change from moderate to mild, or non-normal to normal), while seven (15.9%) participants deteriorated within their classification (e.g. a change from moderate to severe, or normal to non-normal). Spirometry for three (6.8%) participants changed from restrictive to obstructive or vice versa. Changes in overall disease classification are shown in Table 3.

Qualitative feedback was gathered from 21 participants at three sites (female: n = 14 (66%)). Feedback was overwhelmingly positive, with a number of themes emerging in relation to the principal areas of interest as outlined below. Participants reported diverse pre-conceptions of the intervention ranging from skepticism and anxiety, to excitement and openness.

“I think we were all a bit sceptical about it in the beginning. I didn’t understand how it was going to happen” Participant (P)2, Site (S)1

“I was really apprehensive about it you know. We thought we’d never do it” P2, S2

“I thought anything that might improve my lungs, I was going to try anyway.” P2, S3

The inability to sing or the lack of a pleasant singing voice was a common concern mentioned in all three groups.

Table 2. Pre-post test of outcome measures after eight weeks of SingStrong intervention.

	Mean Change	95% Confidence Interval		Statistic	df	p	Cohen's <i>d</i>
		Lower	Upper				
CAT	-1.0	-0.83	6.3	Student's <i>t</i>	50	0.785	-0.0376
				Wilcoxon			
6MWT	+34 m	6.5	61.4	Student's <i>t</i>	41	0.020*	0.3741
				Wilcoxon			
HADS Dp.	-0.51	-1.74	0.72	Student's <i>t</i>	50	0.409	-0.1142
				Wilcoxon			
HADS Ax.	0.68	-0.26	1.62	Student's <i>t</i>	50	0.152	0.1996
				Wilcoxon			

CAT: COPD Assessment test; 6MWT: Six minute walk test; m: meters; HADS Dp: Hospital Anxiety and Depression Scale, depression subscale; HADS Ax: Hospital Anxiety and Depression Scale, Ax anxiety subscale, df: Degrees of Freedom.

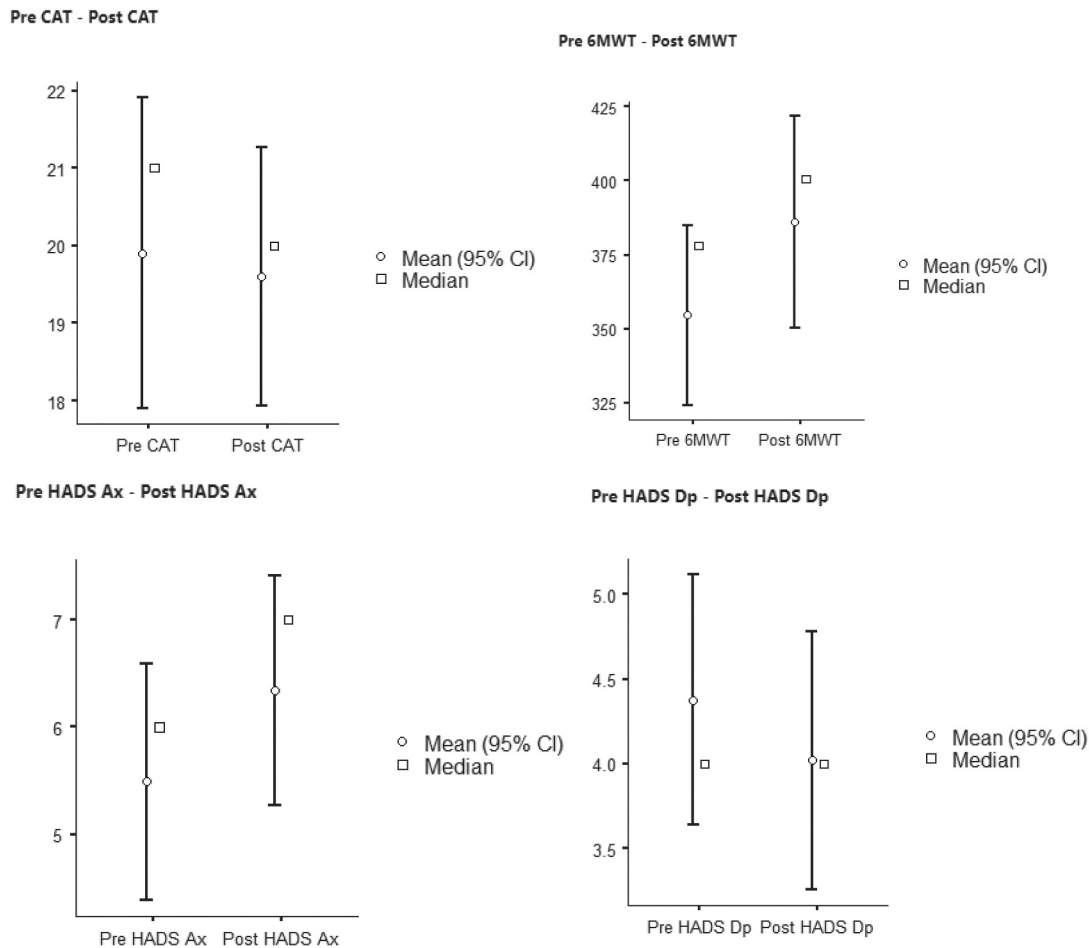


Figure 1. Mean (95% CI) and median values of pre-post CAT, 6MWT & HADS CAT: COPD Assessment test; 6MWT: Six minute walk test (measured in meters); HADS Dp: Hospital Anxiety and Depression Scale, depression subscale; HADS Anx: Hospital Anxiety and Depression Scale, anxiety subscale.

“Being honest, I wasn’t going to do it . . . I couldn’t sing . . . I had no confidence either” P3, S3

“Oh gosh it was in (my case) cause I can’t sing. Yeah. It was like, imagine she picked you to sing!” P3, S2

Feedback regards the experience of the intervention was overwhelmingly positive. Participants reported that they felt welcome, that the sessions were enjoyable, and that

the singing coach was hugely supportive and encouraging.

“Oh it was fabulous” P2, S1; “having a bit of fun, and we should do more of that” P5,S1 “It was brilliant” P3, S2

“She (singing coach) made it so much fun, do you know what I mean? And we do something and shed clap and we’d feel on top of the world” P2, S3

Table 3. Spirometry pre and post-intervention disease classification including net change.

	Pre-intervention n (%)	Post-intervention n (%)	Change \pm : n (%)
Obstructive	25 (56.9%)	23 (52.3%)	-2 (-4.5%)
Mild	9 (20.5%)	3 (6.8%)	-6 (-13.7%)
Moderate	9 (20.5%)	13 (29.5%)	+4 (+9%)
Severe	7 (15.9%)	7 (15.9%)	No change
Restrictive	6 (13.6%)	4 (9.1%)	-2 (-4.5%)
Mild	4 (9.0%)	1 (2.3%)	-3 (-6.7%)
Moderate	1 (2.3%)	2 (4.5%)	+1 (+2.2%)
Severe	1 (2.3%)	1 (2.3%)	No change
Normal	13 (29.5%)	17 (38.6%)	+4 (+9.1%)
Total	44 (100%)	44(100%)	

“she made it very enjoyable - because she never gave out - always praising us” P6, S2

Participants were also positive about the social aspect of group singing:

“it has made us a lot more pal-y (friendly sic)”, P6, S3

and expressed a hope that the intervention could be continued. They also indicated that it had stimulated interest in their groups from potential new members. The participants were also particularly positive about the CD, which they said greatly supported their engagement with the program.

Despite repeated probing, the only negative feedback was in relation to the lyrics of one song which they found a little complicated. There were no recommendations for changes to the program.

In terms of perceived changes to health and well-being, participants referred to improvements in their breathing in particular.

“...you know how to breathe properly”P4,S3; “we were able to hold our breath for longer” P4, S3; “it made us more aware of breathing and breathing properly”P4, S1

Additionally, participants spoken about how the program had improved their confidence.

“helped with confidence ... in ourselves, yeah” P4, S2

“Since I joined this class my children (say) “god mam you’ve really come on” like you know. I’ve come out of myself - before I wouldn’t even sit in a group and talk” P5, S3

Discussion

This is the first Irish study of the efficacy of group singing for people with COPD. As stated, this condition is among the most common and burdensome diseases in Irish society, affecting approximately 10% of the population (Health Service Executive, 2018). It is therefore unsurprising that addressing the socio-economic

burden and clinical management of people with COPD was highlighted as an urgent priority in the Government’s 2017 National Healthcare Quality Reporting System annual report (Department of Health, Ireland, 2019). Community-based interventions designed to engender self-management are recognized as an appropriate strategy to optimize health and well-being in these patients (Van Wetering et al., 2010). Group singing for COPD is well established in other countries and proven to address a host of biopsychosocial problems for sufferers (Lewis et al., 2016; Liu et al., 2019).

Outcome measures: Participants in the “SingStrong” study improved their 6MWT by a clinically and statistically significant amount. This is of note considering that all participants were already engaging in weekly exercise classes associated with their support groups. Potential mechanisms for this change include enhanced oxygenation of peripheral muscles related to improved breathing patterns and consequent oxygenation (Engen, 2005). As all participants undergo frequent reviews with their hospital-based and community clinical teams, including periodic 6MWTs, the learning affect associated with improvements in the 6MWT in other studies is unlikely here (Knak, Andersen, Witting, and Vissing, 2017). The frequency of health-care testing by medical teams is determined by the patient presentation and consultant practice, and varied between participants.

There were no significant changes in either the HADS or the CAT questionnaire scores. As these participants typically presented with long-standing and stable disease and had low baseline scores, this was not unexpected. Median HADS scores on both domains were below the accepted cutoff value of eleven for a probable clinical diagnosis of depression or anxiety (Puhan, Frey, Büchi, and Schünemann, 2008). Given that participants were already engaged in measures to improve their health through membership of their local COPD support group, this may suggest that this cohort is more self-efficacious than the general COPD population, with potentially lower HADS scores.

Of note however was the fact that the median CAT value (21(11)), was markedly higher than values in similar COPD populations. A cohort of 336 Japanese people with COPD of a similar age, with a similarly heterogeneous presentation of disease severity reported a CAT score of 12.4 ± 8.3 (Miyazaki et al., 2014). A study of 106 Spanish COPD sufferers, also of a similar age, reported CAT scores of 16.6 (5.9) (García-Sidro et al., 2015). However, in the Spanish study, the majority of participants had severe COPD, which limits

comparability due to the influence of disease severity on overall CAT scores. Unlike the current research, the majority of participants in both these studies were male, which may contribute to this disparity, as may cultural differences. Additionally, it has been established that certain co-morbidities increase the CAT score (Miyazaki et al., 2014). As these data were not collected in the current study, it is impossible to establish the potential impact of these factors.

Changes in spirometry classification and disease severity must be interpreted with caution. Although the vast majority of participants maintained or improved their status, once-off spirometry testing is not definitive in the absence of other clinical considerations such as exacerbations and medication use. It is possible however, that improved breathing techniques may have contributed to positive spirometry changes in some instances.

Qualitative feedback

Patient engagement with chronic disease management programs is challenging. Pulmonary Rehabilitation (PR), recognized as the gold standard for the management of chronic COPD, suffers from low levels of patient uptake and compliance (Condon, Moloney, Lane, and Stokes, 2015). Predictors of nonattendance have been found to include female sex, currently smoking, and living alone, while non-adherence is impacted by additional factors including advanced age and long travel distance (Hayton et al., 2013). Once recruited, attendance and adherence in this study was high, despite the older female profile of the participants. It is clear that the fundamentally enjoyable nature of the intervention and the social benefits of a group activity with similar individuals was key in supporting engagement with the study. Stigma, social isolation and loneliness have been identified by COPD sufferers as among the most debilitating and difficult repercussions of the disease (Johnson, Campbell, Bowers, and Nichol, 2007; Kiliçkaya and Asi Karakaş, 2016). Therefore, in addition to the physical benefits of the intervention, the psychosocial impact on participants was hugely important. These findings replicate the results of the aforementioned studies of group singing for COPD in other countries around the world (Lewis, Cave, and Hopkinson, 2017; McNamara, Epsley, Coren, and McKeough, 2017; McNaughton et al., 2017) and add to the body of evidence supporting such interventions.

Limitations

There are a number of limitations to this study including the brief period of the intervention (eight weeks) and the relatively small number of participants. The study took place during the summer months and as people with COPD typically suffer from more exacerbations in wintertime, it is likely that a program at that time would be less successful. Additionally, as there was only one singing coach involved in delivery of the program, it is impossible to assess the impact of her role in isolation from the intervention itself. Due to the intermittent nature of exacerbations associated with COPD, there was a moderate amount of absenteeism on testing days, which limited the availability of comparative data in some participants. However, as approximately 23% of participants failed to attend five or more sessions, reasons for this need to be explored more deeply, and addressed in further intervention iterations. Data on CD home use were not collected and would have added to the findings. Follow-up focus groups were only conducted with participants who completed at least half of the sessions. It is probable that this presented a positively skewed impression of the intervention. Finally, as stated, this study used participants who were already engaged in their own positive health initiatives, which may be a source of selection bias.

Conclusions

“SingStrong” is the first group singing intervention for people with COPD in Ireland. This project recorded high participant attendance and produced statistically and clinically meaningful improvements in walking distance. Non-significant improvements in CAT and HADS Depression, and non-significant worsening in HADS Anxiety were recorded. Disease classification using spirometry was unchanged for the majority of participants, with seven participants each displaying an improvement or worsening of their disease classification. Subjectively, participants expressed strongly positive views about the intervention, and reported perceived improvements in their breathing control and efficacy as well as increased general confidence. Participants found the intervention to be fun and enjoyable, and a source of social support and community. Future studies in an increased range of sites, over a longer duration would be welcomed. Additionally, exploration of

other factors such as cost effectiveness, levels of hospitalization and exacerbation, and additional medication use would add greatly to the knowledge in this area.

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Disclosure statement

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