

Group singing, wellbeing and health: A systematic mapping of research evidence

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ABSTRACT

This paper provides a systematic mapping of existing research literature on group singing, wellbeing and health. It covers both community singing groups, groups especially established for research purposes and group singing used as a music therapy intervention for conditions such as chronic lung disease, Parkinson's disease and dementias. A systematic approach to identifying published research in English from 1985 served to identify 51 papers reporting on 48 studies worldwide. Given the developing nature of the field, no selection was made within the research identified on the basis of a quality screen and no attempt was made to synthesise findings as this would be premature. Studies were categorised into four groups and details of objectives, context, sample, methods and findings are reported in tabular form. Most studies were conducted in English speaking and Nordic countries and reported from 2000 onwards. There is evidence of increased research interest in this field over the last ten years. However, many studies are small scale and exploratory, with only a few large-scale surveys or well-designed experimental studies. The diversity and variations in quality of the research corpus makes it difficult

to draw evidence-based conclusions regarding the value of group singing for wellbeing and health. Nevertheless, there are indications that singing can be beneficial for psychological and social wellbeing, but less clear evidence of benefits for physical health. Group singing may, however, be of therapeutic value for people managing long-term health conditions.

INTRODUCTION

Singing in community groups, choirs and choral societies is one of the most wide-spread forms of active musical participation in many Western societies (Chorus America 2009), and enormous numbers of people regularly come together to sing, motivated primarily by a love of music and the expressive activity of singing itself. Singing together is a social and creative activity, having intrinsic value and rewards for those who participate and for audiences too. While active participation in instrumental music requires both talent and substantial practice, singing as a form of music-making is open to everyone. Even the pinnacles of choral music in the Western classical tradition are not beyond an amateur choir given skilled direction and sufficient practice.

Beyond the intrinsic value and pleasure attached to singing, is there any evidence for real and measureable impacts on the health and wellbeing of those participating? From 2000 onwards, the question of health benefits associated with singing, and the related idea that singing in groups could be used as a form of music therapy for people with compromised health, have attracted increasing attention. This paper aims to systematically map the existing literature, identifying the contributions to knowledge made, but highlighting the shortcoming of studies and the need for further research.

Evidence-based medicine and healthcare is now firmly established, and systematic reviewing and meta-analysis of evidence on treatment interventions occupies a central place in health research and practice. Cochrane reviews of creative arts and music therapy interventions for health have been undertaken (Dileo & Bradt 2009), and researchers in the wider arts and health field have begun to undertake systematic reviews of arts interventions for health (Clift, Camic, Chapman et al. 2009). Clift, Hancox, Staricoff, et al. (2008) report a systematic mapping and descriptive review of research on singing, wellbeing and health, focusing on non-clinical research (i.e. excluding music therapy) and including studies of both group and individual singing.

METHOD

Four databases (Medline, Embase, Psycinfo and Cinahl) were searched using the primary search terms: 'singing', 'health', 'wellbeing', 'quality of life' and 'music therapy'. Search strategies were expanded to take account of the way in which research was abstracted in each database (details of the search strategy can be found in Clift, Hancox, Staricoff et al. 2008). All papers published in peer-reviewed academic journals from 1985 to the end of 2009, concerned with health and wellbeing effects of group singing (amateur and professional), or specifically focused on group singing as a therapeutic intervention, were obtained in hard copy. The review encompasses research which involves clearly identified singing groups, both amateur and professional, and includes studies in which singers may also accompany their singing with instruments. References in papers were searched for additional sources, and authors contacted for copies of any additional publications not already identified. Google Scholar was also used to identify additional research citing each of the papers located. Excluded from this review are studies concerned with individual singing, individual music therapy interventions involving singing, studies of song writing as a form of therapy, and care-giver singing. Also excluded are any research studies in which singing is combined with other forms of music making or creative activity making it impossible to identify specific outcomes associated with singing. As this area of research is in an early stage of development, and studies have employed a very wide range of methods, the aim was to provide an overview of the range of work published, without applying a stringent quality screening process.

RESULTS

A total of 51 papers were identified reporting findings from 48 studies. For purposes of this review, these were categorised into four areas of research. Table 1 reports qualitative and survey studies of pre-existing singing groups in communities or groups established for special populations. Table 2 gives experimental research and studies using objective measures, which involve either pre-existing choirs or singing groups established specifically for research purposes. Table 3 outlines descriptive and experimental studies in which group singing is used as a therapeutic intervention for specific health conditions, and Table 4 gives details of observational and experimental studies exploring the value of group singing for older people with diagnosed dementias.

Out of the 51 papers, approximately 80% were published from 2000 onwards. There is some indication of growing interest in this field of study over this period. Most of the studies were undertaken in English speaking countries (34/48) and Nordic/European countries (9/48). Two studies are reported from Brazil and one from Israel. Two studies are cross-national in character, with one including choirs in South Africa (Louhivuori, Salminen & Lebaka 2005), the only study to consider singing in an African context. Research on group singing varies in scale, with approximately half of the studies involving 20 or fewer participants. Studies also vary in the detail provided on participants' sex and age. It is striking that across all studies specifying sex composition, there are twice as many females than males in the singing groups investigated. Studies also vary in the character of the singing investigated, from research on professional singers engaged with highly demanding choral works (e.g. Beethoven's *Missa Solemnis*) through to members of the public recruited to sing a selection of popular songs without rehearsal for 30 minutes. When such variations are combined with considerable differences in research design and methods, it is clear that general evidence-based conclusions on the impact of singing on wellbeing and health are difficult if not impossible to reach.

DISCUSSION

Qualitative and survey studies involving community singing groups / groups established in special settings

Twelve of the 17 studies reported in Table 1, involve members of an existing choir and gather retrospective or concurrent qualitative evidence on their perceptions of the effects of choral singing. Such participants are voluntarily engaged in a valued activity, and it is not surprising that the findings point to a wide range of positive benefits for a sense of personal and social wellbeing. On a personal level, singing is widely reported to be enjoyable, energising, relaxing, stress relieving, mood enhancing and cognitive stimulating. Singing also enhances self-confidence, self esteem, gives a sense of purpose and of achievement. Socially too, it provides social support, friendship and a sense of community and belonging. The same range of benefits emerge from research which focuses on singing groups established in special settings e.g. Prison (Silber 2005, Cohen 2007), a homeless shelter (Bailey & Davidson 2002, 2005) and these studies provide evidence that singing can be beneficial for a sense of personal and social wellbeing, even for participants who would not otherwise be engaged in this activity.

Most of the studies in Table 1 are small-scale, the major exceptions being Louhivuori et al. (2005) who studied over 500 singers in Finland and South Africa, and Clift, Hancox, Morrison et al. (2009, 2010a,b) who report a survey of over 1,000 choral singers in Australia, England and Germany. The Clift et al. study builds upon an

earlier survey of a single university choral society (Clift & Hancox, 2001), to create a 'singing and wellbeing' scale. An important finding from this study is that women appear to experience greater wellbeing benefits from singing compared with men. This study also asked participants a number of open questions about the effects of singing on wellbeing and health, and Clift, Hancox, Morrison et al. (2009) report an analysis of singers' perceptions of the effects of singing on physical health. Interestingly, while a high degree of consensus was found from the scale that singing had benefits for psychological wellbeing, approximately a third of participants were unable to identify any benefits from singing for their physical health. Those who did identify benefits mentioned the value of singing for breathing, posture, stress relief and relaxation. Even then, many singers were tentative in claiming such benefits. The most definite claims for the benefits of singing for physical health came from singers with experience of acute or chronic health problems e.g. asthma or other lung conditions, stroke and heart disease.

Experimental and objective measurement studies involving community singing groups / groups established for research purposes

The 12 studies in Table 2 are highly diverse. Ten studies adopt a prospective experimental approach to assessing the effects of singing, with either single group pre-post designs (e.g. Sandgren, 2009) or with some form of control group. Three studies (Houston, Mckee, Carroll, et al. 1998; Kuhn 2002; Unwin, Kenny & Davies 2002) involved random allocation to a singing and control condition(s), and only two studies employed previously standardised measures of wellbeing and health (Houston et al. 1998; Cohen, Perlstein, Chapline, et al. 2006, 2007).

Five studies employed standardised measures of mood (Unwin, et al. 2002; Kreutz, Bongard, Rohrmann, et al. 2004), emotion (Sandgren 2009) or wellbeing/health (Houston, et al. 1998; Cohen 2009) before and after singing, and in general positive changes were detected. However, while Kreutz, et al. (2004) found that singing was more effective in enhancing positive mood than listening, two further studies comparing singing with listening, (Unwin et al. 2002; Cohen 2009, second study) found no differences in the effects of singing and listening on mood and wellbeing.

Four studies have attempted to monitor changes in physiological variables associated with singing. Beck, Cesari, Yousefi, et al. (2000), Kuhn (2002) and Kreutz, et al. (2004) found significant increases in immunoglobulin A in saliva following singing, and Beck et al. found that cortisol levels decreased in rehearsal conditions, but increased in performance conditions, reflecting the different levels of stress involved.

Cohen et al. (2006, 2007) have reported the most substantial experimental study on singing and health yet undertaken. Singing groups for older people over retirement age were established and monitored over the course of two years in comparison with a comparable non-intervention group. A wide range of standardised measures was employed to assess mental and social wellbeing, and data gathered on health status, health service use and medication. Remarkably, after one year, the singing groups reported higher ratings of health, fewer doctor visits, less medication, fewer falls and fewer health problems, when compared with the comparison group (Cohen et al. 2006). Differences in favour of the singing group were again reported after two years (Cohen et al. 2007). This study is impressive, not least because it points to the potential value of group singing in helping to support the health of growing numbers of older people. However, the study has methodological and analytical weaknesses (see: Clift, Hancox, Staricoff et al. (2008) which mean that the authors' conclusions have to be interpreted cautiously.

Finally, two important studies have undertaken objective assessments of physical and sensory functions among singers, which might be expected to be affected by the activity of singing. Schorr-Lesnack, Teirstein, Brown, et al. (1985) explored the idea that singing leads to improvements in lung function, but failed to find any evidence of this in a careful comparison of professional singers with professional wind players and string/percussion musicians. Steurer, Simak, Denk, et al. (1998) assessed the hearing thresholds of professional opera chorus singers and found hearing loss at low frequencies which they attribute to damage due to high noise levels produced by choral singing during repeated performances. If no evidence can be found among professional singers of improved lung function, it appears unlikely that even committed and regular amateur choral singing would generate improvements. However, there are studies which suggest that singing may be beneficial for people with compromised lung health (see below). Similarly, with respect to the Steurer et al. study, while it is important to recognise that under certain demanding conditions, singing may well carry risks, it is unlikely that amateur group singing should carry a health warning with respect to hearing.

Studies of group singing as a therapeutic intervention for specific health conditions

The ten studies in Table 3 investigate group singing as a therapeutic intervention for the following health conditions: asthma, chronic obstructive pulmonary disease (COPD), chronic pain, depression, eating disorders, irritable bowel syndrome (IBS), Parkinson's disease (PD), and post-operative depression. All but one study was experimental, predominantly small scale pilot studies, both controlled and uncontrolled. Sample sizes tended to be small (7-30) although Kenny and Faunce (2004) had a sample of 77, and Myskja and Nord (2008) had a sample of 63 after attrition. Measures varied across studies and were often specific to the health condition under study: e.g., Hospital Anxiety and Depression scale for post-operative medical patients (Giaquinto et al., 2006); Montgomery Aasberg Depression Rating Scale for the elderly (Myskja & Nord, 2008); Zung Depression Inventory for depressed patients (Kenny & Faunce, 2004); St George's Respiratory Questionnaire COPD (Bonilha et al., 2009); the Duke Health Profile and subjective visual analog scales for quality of life with emphysema (Engen, 2005), and the Pain Disability Questionnaire for quality of life in chronic pain (Kenny & Faunce, 2004). The detail provided about nature of the singing sessions varied greatly; but it can be noted that singing interventions spanned 3-52 weeks (Mode=12); involved 6-26 sessions (Mode=12), and lasted 30-120 minutes (Mode=45 minutes).

It is notable that half the studies (Bonilha et al., 2009; Di Benedetto et al., 2009; Eley & Gorman, 2010; Engen, 2005; Wade, 2002) focused on lung function (e.g. the volume and speed of air that can be inhaled and exhaled) and used spirometry, one of the most common pulmonary function tests. In addition to spirometry, the PD study (Di Benedetto et al, 2009) also used a neurological and otolaryngological evaluation, and voice analysis. The IBS study (Grape & Theorell, 2009) was unique in using blood samples to measure physiological factors involved in the regulation of gastrointestinal and immunological functions associated with IBS as well as symptom self-report. The remaining four studies (Giaquinto et al., 2006; Kenny & Faunce, 2004; Myskja & Nord, 2008; Pavlakou, 2009) focused on psychosocial variables such as mood, coping, and quality of life.

The small body of research is challenging to summarise. Findings are, at best, promising and certainly not conclusive in providing strong evidence that group singing can promote health. All authors recommend further research. For example, although favourable findings were reported, the two studies investigating the potential value of group singing for asthma were limited by small samples, incomplete data reporting, and uncontrolled designs. Wade (2002) compared the value of vocal exercises and singing with music-assisted relaxation for nine children with asthma and reported that exercises and singing improved peak expiratory flow rates, especially

when singing followed relaxation. Unfortunately, the study ran over a very short period of time and no statistical analysis was completed. Eley and Gorman (2010) offered weekly music lessons over six months to Australian aboriginal children and adults with asthma, and reported significant improvements for peak expiratory flow for 10 adolescent females who received singing lessons. Qualitative feedback indicated that many participants felt their general health, understanding and management of their asthmas had improved because of the music lessons; however, male and female participant comments were not distinguished so the impact of group singing for the females is unclear.

Two studies explored group singing for older adults with COPD. Engen (2005) investigated the impact of vocal exercise and group singing on seven patients' lung function and breathing patterns. None of the physical health and quality of life measures showed improvements over the six weeks of the study, but in both studies counting as a measure of breath control and voice intensity improved significantly. Patients' breathing mode also changed from a predominantly shallow upper chest pattern to one that was more diaphragmatic. A stronger research design was used by Bonilha and colleagues (2009) who implemented a small-scale randomised controlled trial to assess the impact of singing groups on lung function and quality of life for patients with COPD over six months. The major finding was that while the control group showed a decline in measures of maximal expiratory pressure, the group involved in singing showed a small improvement. No improvements were found, however, on additional spirometric measures. Both groups showed increased quality of life scores but with no statistically significant difference.

Di Benedetto and colleagues (2009) implemented a small-scale, uncontrolled study of choral singing to improve speech quality in patients with Parkinson's disease. Two weeks before and after a choral singing intervention that followed 20 hours of vocal exercises to prepare for singing, significant improvements on two spirometric measures (functional residual capacity, maximum expiratory pressure) were reported as well as improved elements of speech and voice.

The remaining five studies investigated group singing in the context of health conditions not specific to breathing and speech. Only one of these, Grape & Theorell (2009) explored physiological variables. They provide a brief report on a small-scale randomised control trial (choir group vs. information discussion group) for people with irritable bowel syndrome that used pre-post blood samples and symptoms self-report. After one year of weekly meetings, the choir group reported less pain with significant or near significant findings for all biological parameters except for cholecystokinin.

Another small-scale randomised control trial involved patients with chronic pain (Kenny & Faunce, 2004). Multiple measures for mood, depression and pain perceptions (including a coping scale) were used but there was no convincing evidence that group singing helped with pain management. The singing group did show post-intervention improvement in active coping compared to those patients who failed to attend and maintained some improvement at six month follow-up compared to those patients.

Improved coping was a theme also identified in Pavlaku's 2009 qualitative inquiry of a six-session group singing programme offered to eight women with eating disorders. Based on post-intervention individual interview data and pre-post diary entries, themes included benefits related to singing (e.g. body awareness, mental engagement, self-expression, belonging) and benefits extending into the women's everyday lives (better coping, feeling better, increased confidence, perception of mastery and control).

The remaining two studies identified in this review reported promising findings for the positive effect of group singing on depression. Giaquinto and colleagues (2006) piloted the use of group singing as a way to reduce post-operative anxiety and depression, which is common in the two-month rehabilitation following knee arthroplasty. Twelve patients provided their own control in an experimental crossover design that contrasted group singing and music discussions plus usual physical therapy. Singing was found to have a positive impact on depression and to be more effective than music discussions.

In the second study (Myskja & Nord, 2008), the authors capitalised on a naturally occurring suspension of music therapy programming in a long-term care home. A test-retest natural experiment design was used with a sample of 72 residents. Data were collected prior to the resumption of the music group and again after two months of twice weekly group singing program. Findings showed that depression decreased significantly over the period of the intervention, with greater improvement among residents who demonstrated higher levels of engagement with singing. Although uncontrolled, this was a strong study based in a naturalistic setting with a frail population.

In sum, there are encouraging findings but limited by the pilot nature of many studies and there is a need for randomised controlled trials to produce convincing evidence.

Studies of group singing with people affected by dementia / Alzheimer's

There is growing interest in the potential application of music as a therapeutic intervention in the treatment of dementia/Alzheimer's disease. Nine papers concerned with the effects of group singing were identified (Table 4). There are difficulties in drawing clear conclusions from the nine papers, as all are relatively small scale exploratory studies with small sample sizes or study durations. Study design and methodology vary considerably and only two papers (Olderog-Millard & Smith 1989; and Korb 1997) employ the same measure and only one paper (Svansdottir & Snaedal 2006) employs a control.

The exact nature of the singing intervention also varies, including music therapy in small groups, larger group 'sing-a-long' sessions, instrumental activities, music and movement, and studies in which non-musical activities are included alongside musical activities for comparison. It is notable that few papers include a detailed description of the musical content. Groene (2001) reports that choice of accompaniment and presentation styles impacts on the quality of subjects' responses.

The use of appropriately chosen, well-known repertoire is considered important by many authors, indeed a number of studies only use familiar material. Bannan & Montgomery-Smith (2008) included a song not previously known to any of the subjects and complex activities involving dividing into multiple parts and found that both were achievable.

Three studies (Clair & Ebberts 1997, Korb 1997, Brotons & Pickett-Cooper 1994) compare group singing to other musical activities such as rhythmic activities, musical games or composition/improvisation. Rhythmic activities seem to elicit greater levels of participation than singing. It is suggested that singing ability may decline as dementia progresses (see: Brown, Gotell & Ekman 2001) and therefore highly structured activities requiring little creativity are most effective in the latter stages of the disease. Where musical activities are compared to other non-musical interventions it is found that musical activities produce measurably more effective results.

The papers support three broad conclusions. Firstly group singing leads to an increase in social behaviours. This is measured either by manifestations of physical behaviours that can reasonably be seen as social, e.g.: physical touch (Clair & Ebberts 1997), walking with others (Olderog-Millard & Smith 1989) or through the use of accepted measures, e.g.: sociability scoring (Smith-Marchese 1994), mood behaviour assessment (Lesta & Petocz 2006), the Bell and Smith check list (Olderog-Millard & Smith 1989, Korb 1997) and the Behaviour Pathology in Alzheimer's Disease Rating Scale (Svansdottir & Snaedal 2006). Secondly group singing is an effective tool for encouraging participation. This is usually measured by recording time on/off-task (Brotons & Pickett-Cooper 1994, Korb 1997). Thirdly there is evidence that group singing reduces anxiety and agitation. Lesta & Petocz (2006) focus on Sundowning, a period of disorientation and/or agitation experienced by residents with dementia in a care home and found that music positively affected the mood and social behaviour.

Smith-Marchese (1994) points out that it is not uncommon for people with dementia to be excluded from group musical activities in care settings due to fears of disruption. It is likely that group dynamics/interaction will impact on observable changes, particularly when using known repertoire with an age group for whom social group singing was a familiar activity.

The potential for singing to positively impact on the quality of the patient/carer relationship is also considered. It is very common for either a spouse or close family member to be the main carer for a person with dementia and the 'burden of care' is well documented. Bannan & Montgomery (2008) and Clair & Ebberts (1997) included carer questionnaires and these showed positive outcomes from participation in musical activities, and Olderog-Millard & Smith (1989) noted positive comments from professional care staff.

It is important to note that singing interventions need not be provided by a music therapist. Smith-Marchese (1994) points out that they used no specialist equipment in the course of the study and therefore the intervention could easily be replicated in other care settings. Bannan & Montgomery Smith (2008) gave participants a CD of the songs used and found it still in use several months after the study.

All authors point to the need for further research in the field and more extensive work could build a credible evidence base for singing with people with dementia/Alzheimer's disease and contribute to developments in the practice and application of singing interventions.

REFLECTIONS

This paper has systematically mapped and reviewed the existing corpus of studies concerned with the potential value of group singing for wellbeing and health. It has shown that this topic has received only limited research attention, but that since 2000 interest has grown and there have been a steadily increasing number of studies, concerned both with group singing as a community activity, and as a therapeutic intervention in relation to specific health issues. Research to date has been highly variable with respect to scope, design, methods, samples and particularly the character of the singing activity investigated. Such variations make it difficult to draw any general conclusions beyond saying that there are suggestive indications that singing can help to promote a sense of personal and social wellbeing, and that it may be effective in promoting physical health. In particular, group singing may have significant potential as a therapeutic intervention in relation to long-term and progressive health conditions, such as chronic obstructive pulmonary disease, Parkinson's disease and dementias.

A number of key challenges need to be addressed if a progressive and accumulative body of knowledge regarding singing, wellbeing and health is to be developed. Firstly, there is a need for a comprehensive and systematic theoretical model of the mechanisms at work linking singing as an activity to wellbeing and health outcomes. Secondly, such a theoretical framework should be linked with the wider field of music and health, to show how the effects of singing might compare with other forms of active musical engagement (e.g. playing instruments), as well as the more receptive activity of listening to music. And thirdly, there is a need for larger, well-designed experimental trials, over reasonable periods of time, utilising standardised and validated measures of wellbeing, with both community and clinical populations.

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Table 1: Qualitative and survey studies involving community singing groups / groups established in special settings					
Source	Objectives	Context	Sample	Method	Findings
Ashley 2005 England	Explores experiences of singing	Choir of a major city centre church	18m Ages: 10-14	Ethnographic case study, participant observation, diaries, interviews, thematic analysis	Personal wellbeing, self-esteem, sense of meaning, purpose and empowerment in the context of macho gender stereotypes
Bailey 2002, 2005 Canada	Explores experiences and benefits of singing	Choir established with homeless men, choir in disadvantage community, traditional choirs in affluent communities	Homeless 7m Ages: 45-62 Disadvantaged 3f, 5m Ages: 43-64 Affluent 7f, 1m Ages: 24-59	Interviews and group discussion, thematic analysis	Emotional effects of singing similar irrespective of training and social status: energy, relaxation, emotional release, joy. Themes of cognitive stimulation, group participation and audience reaction relevant to both marginalised and middle class singers, but have different meanings
Bailey 2003 Canada	Assesses experiences of singing, listening to music with others and listening alone	Participants recruited from three choirs	165f, 47m Mean age: 49	Questionnaire to assess five holistic health effects of music in different contexts	Singing given higher ratings than listening for: improves mood, exhilarating activity, achievement, creative and gives a high
Clift 2001 England	Explores perceptions of the effects of singing	University choral society, student, staff and community members	Qualitative study 84 Questionnaire 74f, 16m Ages: 18-69	Qualitative study, written answers to questions on benefits of singing, content analysis. Questionnaire based on qualitative study. Factor analysis to identify components	In the qualitative study, 84% identified possible health benefits: lung function, breathing, improved mood, stress relief. Majority identified social and emotional benefits from singing. Six components identified from survey: wellbeing and relaxation, breathing and posture, social benefits, spiritual benefits, emotional benefits, effects on heart and immune function. Women expressed greater wellbeing benefits.
Clift 2009 Australia, England and Germany	Assesses beliefs about the effects of singing on physical health	21 amateur choirs and additional choral singers in Australia, England and Germany	767f, 294m Mean age: 58	Questionnaire, open question on the effects of singing on physical health, content analysis	23% gave no information on physical health effects, 77% identified one or more positive physical effects of singing: breathing, posture, relaxation, stress relief, exercise and energy levels Positive psychological effects on mood and cognition identified

Clift 2010a,b Australia, England and Germany	Compares men and women on a measure of singing effects, and relates to the WHOQOL-BREF measure of health-related quality of life.	As above	809f, 310m Mean age: 57	Questionnaire, items on the effects of choral singing, the WHOQOL-BREF and open questions on the effects of singing. Factor analysis used to construct a singing and wellbeing scale	High level of consensus on the positive benefits of singing for wellbeing, higher scores for women than for men. Little or no relationship between singing wellbeing scale and WHOQOL-BREF measure of psychological wellbeing. Evidence of six mechanisms mediating singing and health: positive feelings, focused attention, deep breathing, social support, cognitive stimulation, regular commitment
Cohen, M. 2007 USA	Explores experiences of singing	A joint inmate-community volunteer choir in a minimum security male prison	Inmates 20m Ages: 21-53 Volunteers 24m Ages: 35-82	Questionnaire, participant observation, interviews, use of documentary material, grounded theory based analysis	Social bonds and working cooperatively; joy and peak experiences; sense of achievement, pride, broadened perspectives and increased self-worth. Some evidence of frustration and sadness.
Hillman 2002 Scotland	Explores the perceived effects of singing on quality of life and wellbeing	Community choir for people in retirement	60f, 15m	Questionnaire assessing quality of life, health and wellbeing before joining the choir and at time of survey	Improvements to general quality of life, emotional wellbeing and understanding of singing. Value of singing for coping with bereavement, maintaining physical health and wider social engagement
Jacob 2009 Canada	Explores reasons for singing and perceived effects	Non-auditioned university choir,	9 Ages: 18-25	Semi-structured interviews, thematic analysis	Community and social bonding, personal and group achievement, stress relief, improved mood
Lally 2009 Australia	Assesses effects of a singing workshop on wellbeing	30-week singing workshop for older people	26 Ages: 51-83	Participant observation, focus groups, questionnaires, interviews, case studies, thematic analysis	Perceived improvements in physical fitness, flexibility and stretching, improved mood, relaxation and self esteem, improved social wellbeing, sense of group solidarity, improved singing voice and confidence, feeling more creative
Latimer 2008 USA	Explores the role of singing in gay identity and wellbeing	A gay men's chorus	Questionnaire 87m Ages: 41-45 Qualitative study 30m	Survey followed by two-year participant observation study, interviews, documentary material, Interpretative phenomenological analysis	Reasons for participation: Enjoyment, socialising, feelings of community, enhanced self-esteem, supporting coming out. Singing supported a positive gay identity

Louhivuori 2005 Finland and South Africa	Assesses contribution of singing to social capital	Community choirs, church choirs, youth choirs and senior choirs	500+	Questionnaire on motivations, relationships and communication in the choir, impacts of choir membership	Satisfaction of individual and social needs, building of social networks and feelings of community, friendships, emotional benefits, self confidence
Rowher 2009 USA	Explores perceptions of singing	Two high school choirs	42f, 15m	Written accounts of the choral singing experience	Friendship and social support, musical development, effort and achievement, life enhancing and life changing
Silber 2005 Israel	Explores links between choral processes and the needs of women prisoners	Women's prison choir	7f Ages: 17-35	Ethnography, participant observation, video, interviews, discussions with staff	Increased sensitivity to others, curbing aggression, enhancing trust, group support, self- control, empowerment, self esteem, all linked to processes on three levels in the choir
Soutcott 2009 Australia	Explores experiences of singing	Choir of older people that performs for care home residents	8f, 2m	Phenomenological study, discussion, interviews, documentary material, interpretative analysis	Enhanced sense of purpose and meaning, positive social relationships, personal growth, service to the community
Tonneijek 2008 The Netherlands	Explores experiences of singing	Amateur choir	4f, 2m Ages: 45-58	Participant observation during rehearsals, interviews, interpretative analysis	Personal growth and purpose, sense of wholeness, unity with others, transcends daily life, distraction from daily worries
Wise 1992 USA	Assesses the role of singing in the lives of older people	Retirement community choir and non-singers in the same community	Choir 49 Mean age: 64 Non-singers 47 Mean age: 65	Survey of singers and non-singers in same retirement community, measures of life satisfaction, alienation and self- actualisation	Singers had sung throughout life and continuation provided achievement, social status, socialising and group membership which contributes to successful aging
Zanini and Leao 2006 Brazil	Explores experience of singing in a therapeutic choir for the elderly	Extension university students registered for twelve 90 minute choir workshops	25f, 1m Ages: 58-91	Session feedback, audio-visual recordings, individual interviews, professional commentary on video recordings	Singing as a means for self-expression and self- fulfilment, songs revealing inner subjectivity, self- confidence of participants, expectations for the future

Table 2: Experimental and objective measurement studies involving community singing groups / groups established for research purposes					
Source	Objectives	Context	Sample	Method	Findings
Beck 2000 USA	Effects of singing on IgA and cortisol levels in saliva	Professional choir, two evening rehearsals and one performance of Beethoven's <i>Missa Solemnis</i>	23f, 18m Ages: 25-62	Non-controlled pre-post singing assessments of sIgA and cortisol	sIgA increased during rehearsals and performance; emotional experience during performance predicted sIgA increase. Cortisol decreased in rehearsal and increased in performance
Cohen 2006 USA	Effects of singing on health, social activities and service utilisation	30 professionally led singing workshops and 10 performances over one year	Intervention 70f, 20m Mean age: 79 Control 61f, 15m Mean age: 80	Non-randomised controlled study. Intervention and control groups comparable at baseline. Baseline and one year assessments using a battery of measures	Intervention group had higher ratings of health, fewer doctor visits, less medication use, fewer falls and health problems, than control group
Cohen, G 2007 USA	Effects of singing on measures of health, social activities and service utilisation	30 professionally led singing workshops and 10 performances over two years	Intervention 56f, 12m Mean age: 80 Control 42f, 18m Mean age: 81	Non-randomised controlled study. Intervention and control groups comparable at baseline. Baseline, one year and two year assessments using a battery of measures	Intervention group had fewer health problems and less use of medication than control group. Overall, singing group showed trends towards better health and controls
Cohen 2009 USA Study 1	Effects of singing performance and listening to singing on well-being	Male prison inmate choir performing inside the prison, control inmate group listening to the performance	Intervention 10m Ages: 23-60 Control 10m Ages: 22-44	Non-randomised controlled study. Well-being measure completed before and after performance	Increase in well-being for both groups. No difference in change between singing and listening control group
Cohen 2009 USA Study 2	Effects of singing performance and listening to singing on well-being	Male prison inmate and volunteer choir performing outside the prison, control inmate group did not attend the performance	Intervention Choir inmates 23m Ages: 19-60 Choir volunteers 25m Ages: 23-78 Control Inmates 10m Ages: 22-44	Non-randomised controlled study. Well-being measure completed before and after performance by singing group. Completed by control group on same day	Increase in well-being for the singing group. No change for the control group

Houston 1998 England	Effects of singing on psychological well-being compared with usual activities control	Residents in elderly care home singing one hour a week for four weeks	44f, 17m Ages: 63-97	Cluster randomised controlled study. Three homes singing and three homes usual activities. Measures of health, anxiety and depression	Reduced anxiety and depression after singing compared with control group
Kreutz 2004 Germany	Effects of singing and listening to singing on mood, IgA and cortisol in saliva	Amateur choir, rehearsal of Mozart <i>Requiem</i>	23f, 8m Ages: 29-74	Experimental study, singers acting as own controls in listening condition. Pre-post measures of mood, sIgA and cortisol	Positive mood increased after singing but not listening. Negative mood decreased after singing but increased after listening. sIgA increased after singing but not listening. No change in cortisol with singing, but decreased with listening
Kuhn 2002 USA	Effects of 30 minutes singing, live music listening and no musical activity on IgA in saliva	University undergraduates, experience of singing not specified. Singing simple songs for 30 minutes	28f, 5m	Randomised controlled study. Singing, listening to live music and quiet control groups. Pre-post assessments of sIgA	Increase in sIgA for singing group compared with music listening and no musical activity control
Sandgren 2009 Sweden	Effects of singing on well-being for men and women	Participants recruited from 11 choirs in the Stockholm area	152f, 60m Ages: 19-90	Uncontrolled single group study with assessment of emotional states before and after a regular rehearsal	Greater increases in positive emotional states for women than men: alert, proud, content, satisfied and glad. No differences for changes in negative emotional states
Schorr-Lesnick 1985 USA	Pulmonary function in singers, wind players and string/percussion instrumentalists	Singers from the New York City Opera and Choristers' Union	Singers 8f, 26m Ages: 26-83 Wind 5f, 43m Ages: 26-78 String/percussion 6f, 25m Ages: 25-80	Comparative study, pulmonary questionnaire, inspiratory and expiratory pressures and spirometry	Groups did not differ on any of the tests of pulmonary function. Singers more aware of health, exercised more and smoked less
Steurer 1998 Austria	Hearing thresholds in singers relative to non-singing controls and published norms	Singers from the Vienna State Opera Chorus	Singers 28f, 29m Ages: 30-69 Non-singers 11f, 16m Ages: 20-29	Hearing thresholds measured at 11 frequencies between 125Hz and 8KHz	Hearing loss compared to norms found at low frequencies. Noise levels produced by choral singing considered likely cause

Unwin 2002 USA	Effects of singing and listening to singing on mood	Participants recruited through advertising, experience of singing not specified. Single singing session with vocal exercises and five songs.	84f, 23m Ages: 18-73	Randomised controlled study, singing and listening to singing groups. Mood measured at baseline, after singing and one week follow-up	Both singing and listening group showed increased positive and decrease negative mood, with no difference between them
Valentine 2001 England	Effects of solo singing, choral singing and swimming on mood and physiology	Undergraduate singers and swimmers. 30 minutes of choral singing, solo singing, or swimming	Solo singers 10 Choir members 10 Swimmers 10 Ages: 18-54	Comparative pre-post study. Measures of mood, blood pressure and heart rate	Both singing conditions increased positive mood and decreased negative mood, with no difference between them. No change in blood pressure and heart rate

Table 3: Group singing as a therapeutic intervention for specific health conditions					
Source	Objectives	Context	Sample	Method	Findings
Bonilha 2009 Brazil	Effects of weekly singing classes on pulmonary function and quality of life of patients with chronic obstructive pulmonary disease (COPD)	COPD patients recruited from hospital and community. 24 weekly 60-minute classes and asked to practice singing or do handcrafts at home	Intervention 3f, 12m Ages: 62-77 Control 3f, 12m Ages: 66-80	Randomized control trial – singing group or handcraft control group. Spirometry, maximal respiratory pressure measurements, dyspnoea evaluation and respiratory questionnaire plus functional evaluation at end of study following 10 minutes of singing	Singing well-tolerated for persons with COPD. May improve quality of life and preserve the maximal expiratory pressure of persons with moderate to severe COPD. Significantly improved quality of life for both groups
Di Benedetto 2009 Italy	Effects of combined voice and choral singing as rehabilitation for patients with Parkinson's Disease (PD)	Consecutive referrals to rehabilitation program, no refusals. 20 hours of group speech therapy to prepare for singing (semi-weekly 2 hour sessions) and 26 hours of choral singing (2 hour sessions over 13 weeks)	7f, 13m	Test-retest, singing group non-controlled. Measures of neurological assessment, speech/voice and respiratory function	Significant improvements in functional residual capacity, maximum expiratory pressure, maximum duration of sustained vowel phonation, prosodia and fatigue in reading a passage
Eley 2010 Australia	Impact of didgeridoo playing (males) and singing (females) on asthma management	Indigenous Australian children and adults recruited from two schools and Aboriginal medical services. 1-hour lessons weekly for 26 weeks	Didgeridoo 9m Ages: 5-77 Singing 10f Ages: 13-18	Test-retest, comparative. Spirometry readings at baseline and 3 and 6 months; self monitoring morning and evening peak expiratory flow, asthma symptoms and medication use; end of program written responses.	Significant increase in morning/evening expiratory flow between time 1 and 3 for singing group. Perceived health improved following singing
Engen 2005 USA	Effects of group singing instruction on physical health and general wellness of senior citizens with emphysema or COPD	Outpatients with emphysema Twelve 45-minute singing classes over 6 weeks	4f, 3m Mean ages: 73f, 81m	Test-retest, non-controlled. Measures of physical health, functional outcomes, and quality of life repeated every 2 weeks, total of 5 testing periods	Significant increases in extent of counting and intensity of speech and a change in breathing pattern from clavicular to diaphragmatic one week after the intervention. Inconclusive effects on quality of life
Giaquinto 2006 Italy	Effects of group singing on reducing post-operative anxiety and depression after total knee arthroplasty	Consecutive referrals to rehabilitation program. Usual physical therapy plus twelve 45-minute sessions of choral singing and twelve 45-minute music conversations	4m, 8f Mean Age: 69	Experimental crossover design, randomly assigned to either discussion intervention followed by singing or singing intervention followed by discussion. Measures of cognitive functioning and anxiety/ depression, plus structured interview	Positive and specific effect of singing on depression. Singing more effective than music conversations

Grape 2009 Sweden	Effects of choir singing on psycho-physiological processes of people with Irritable Bowel Syndrome (IBS)	Weekly meetings over 12 months	Intervention 11 Control 14	Randomized control trial, choir vs. information group. Self-report IBS symptoms, biological parameters from blood	Pain less in choir group after one year; Motilin concentration decreased in choir group and increased in information group; Fibrinogen concentration increased in information group but not choir group, and Fibrinogen and Vascular endothelial growth factor increased significantly in both groups
Kenny 2004 Australia	Effects of singing on mood, coping and perceived pain of patients with chronic pain	3-week pain management program. Nine 30-minute singing or listening to music while exercising sessions	77	Randomized control trial with 6-month follow-up. Standard treatment plus intervention or control condition. Analyzed a third group, who failed to attend singing. Measures of depression, pain perceptions and mood	Singing may increase active coping responses, relative to comparison group when pre-intervention active coping differences are controlled for. At 6 months, singers' active coping improvements not maintained, but level of active coping was still greater than before intervention.
Myskja 2008 Norway	Effect of singing on nursing home residents' depression symptoms	Three wards of a nursing home. Twelve 45-minute sessions of singing	72	Test-retest, natural experiment design: pre-test during last week of music facilitator's 11-week absence. Post-test after 6 weeks of resumed music. Depression assessed by nursing staff using a standardised measure	Reduction in depression in all 3 wards after singing sessions resumed
Pavlaou 2009 England	Effects of group singing for women with eating disorders	Community members completing six 90-minute sessions over 3 weeks	8f Ages: 18-62	Individual semi-structured interviews post-intervention, diary entries pre and post intervention, thematic analysis	Benefits from singing: body awareness, relaxation, mental engagement, emotional release, self-expression, enhanced self-esteem, group support, healthy interactions, belonging. Benefits in everyday life: feeling more positive/less stressful, better coping, more confidence, sense of mastery and control
Wade 2002 USA	Effects of group singing for children with asthma	Eight music therapy singing sessions over 4 weeks	9 Ages: 8-13	Two alternating experimental conditions (singing, progressive muscle relaxation) within and across sessions. Measures of breathing and mood	Increase or maintenance of lung functioning after singing; inconsistent results after relaxation

Source	Objectives	Context	Sample	Method	Findings
Bannan 2008 England	Experiences of group singing among Alzheimer's patients and carers	Community group singing with people with Alzheimer's and their carers. One hour sessions, weekly for three weeks	21-25	Videotaped observation of each of the three sessions. Carers completed questionnaires	People with Alzheimer's showed increased confidence and alertness and increasingly complex activities were possible. People with Alzheimer's were able to learn a new song, carers reported high levels of satisfaction.
Brottons 1994 USA	Music activity preferences of people with Alzheimer's	Nursing home residents with a probable diagnosis of Alzheimer's disease. 30 minute sessions, in small groups, for five sessions	20f Ages: 49-98	Sessions videotaped to measure time on and off task and to identify behaviours indicative of interaction/lack of interaction	Singing evoked high levels of participation but less than for playing instruments. Participation in composition/improvisation was significantly lower than for other activities
Clair 1997 USA	Effects of different types of music therapy on participation levels for people with late stage dementia and carers	People with late stage dementia living in residential care. Participants assigned to small groups (2-4 couples)	30 (15 couples)	Sessions videotaped and analysed. Carers completed questionnaires	People with dementia participated most in rhythmic activities, followed by dancing and then singing
Groene 2001 USA	Effects of music presentational style (live or recorded) and accompaniment (simple or complex) on attention and responses of people with dementia	Residents with moderate/severe dementia and in an urban health care facility participating in 16 sing-a-long sessions	7 f, 1 m Ages: 73-90	Sessions videotaped and scored for attention, leaving the group, reading lyrics, compliments and applause	Live music of complex accompaniment was generally most effective followed by recorded complex accompaniment, live simple accompaniment and live recorded accompaniment
Korb 1997 Canada	Effects of music therapy for people with dementia	People with dementia attending day health care. 30 minute group sessions twice weekly for twelve weeks. Eight sessions each of: group singing with piano/guitar accompaniment, playing percussion instruments and non-musical reminiscence activities	10m	Measures of psychological well-being and behaviour	Significant improvements in wellbeing during both singing and rhythmic activities. Solicited and unsolicited feedback occurred more frequently during reminiscence sessions. Tap-to-beat was observed more in rhythm sessions than singing. Watching the activity occurred more during rhythm than singing.

Lesta 2006 Australia	Effects of group singing on disorientation in the evening	Residents with mid-stage dementia. 30 minute group singing daily over four consecutive days	4f Ages: 80-97	Measure of mood and behaviour	Mood and social behaviour improved and there was a significant decrease in non-social behaviour
Olderog-Millard 1989 USA	Effects of group singing on people with Alzheimer's	Nursing home residents with Alzheimer's. 30 minute group sessions of singing and discussion twice weekly for five weeks	7f, 3m Ages: 71-98	Participants acted as own controls, singing vs. group discussion. Measures of behaviour through observation	Vocal/verbal participation higher for singing than for discussion
Smith-Marchese 1994 USA	Effects of participatory music on reality orientation and sociability of people with Alzheimer's	Residents with mid/late stage dementia. 50 minute group sessions twice weekly for six weeks	8f, 2m Ages: 63-98	Observation of reality orientation and sociability pre- and post-intervention	Increase in both reality orientation and sociability between pre- and post-test scores
Svansdottir 2006 Iceland	Effects of music therapy on the behavioural and psychological symptoms of people with Alzheimer's	People with moderate/severe dementia from two nursing homes and two psycho-geriatric wards. Small groups (3-4) for 30 minutes of familiar song singing three times per week for six weeks	Intervention 23 Control 23 Ages: 71-87.	Randomised controlled trial. Observations of behaviour	For the singing group, disturbance activity, aggressiveness and anxiety reduced significantly over the six weeks; confidence and interaction improved. Four weeks after the sessions, minimal effects observed