

A systematic review of the wellbeing outcomes of music and singing in adults and the processes by which wellbeing outcomes are achieved.



music,  
singing  
and  
wellbeing  
in healthy adults

**Corresponding author:**

Professor Norma Daykin

**Co-authors:**

Professor Guy Julier

Professor Alan Tomlinson

Dr. Catherine Meads

Dr Louise Mansfield

Dr Annette Payne

Lily Grigsby Duffy

Jack Lane

Giorgia D'Innocenzo

Adele Burnett

Professor Tess Kay

Professor Paul Dolan

Stefano Testoni

Professor Christina Victor



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wellbeing

**The What Works Centre for Wellbeing** is an independent organisation set up to produce robust, relevant and accessible evidence on wellbeing.

We work with individuals, communities, businesses and government, to enable them to use this evidence make decisions and take action to improve wellbeing.

The Centre is supported by the ESRC and partners to produce evidence on wellbeing in four areas: work & learning; culture and sport; community; and cross-cutting capabilities in definitions, evaluation, determinants and effects.

Corresponding Author: Professor Norma Daykin<sup>2</sup>

Co-authors:

Professor Guy Julier<sup>3</sup>

Professor Alan Tomlinson<sup>3</sup>

Dr. Catherine Meads<sup>4</sup>

Dr Louise Mansfield<sup>1</sup>

Dr Annette Payne<sup>1</sup>

Lily Grigsby Duffy<sup>1</sup>

Jack Lane<sup>3</sup> Giorgia D'Innocenzo<sup>1</sup>

Adele Burnett<sup>1</sup>

Professor Tess Kay<sup>1</sup>

Professor Paul Dolan<sup>5</sup>

Stefano Testoni<sup>5</sup>

Professor Christina Victor<sup>6</sup>

<sup>1</sup> Welfare, Health and Wellbeing, Institute for Environment, Health and Societies, Brunel University London.

<sup>2</sup> University of Winchester

<sup>3</sup> University of Brighton

<sup>4</sup> RAND, Europe

<sup>5</sup> The London School of Economics

<sup>6</sup> Ageing Studies, Institute for Environment Health and Societies, Brunel University London

## Executive Summary

### Introduction

The protocol for this review was registered on the PROSPERO International Prospective Register of Systematic Reviews (Registration number CRD42016038868).

The review sought to address the question: ‘What are the wellbeing outcomes of music and singing for adults and what are the processes by which wellbeing outcomes are achieved?’

This volume includes an overview of the review process and a discussion of the findings of research into healthy adults. Research on music and singing interventions for adults with identified health conditions is reviewed in Volume 2. Volume 3 examines studies of participants with dementia.

### Review approach

The review included empirical research that assessed the relationship between music and singing interventions with subjective wellbeing (excluding clinical treatment), published from 1996 – June 2016. We also included systematic reviews published between 2010 and 2016. Grey literature and practice reports published from 2013 were included (see Daykin et al. 2016).

In this document we report on the H1 studies that included a current comparator and qualitative studies eligible for inclusion

### Results

The electronic searches returned 5397 records for screening. Of these 145 were relevant studies of music, singing and wellbeing in adults.

The studies were grouped into three main categories:

H1: studies with healthy populations. This group of studies includes healthy people and people who may be living with chronic conditions who take part in music and singing interventions.

H2: this group of studies includes participants who are living with diagnosed conditions but not receiving music and singing interventions as part of clinical treatment.

U: unhealthy populations. This group of studies includes people with diagnosed conditions, including patients in hospital, who are receiving music and singing interventions to support wellbeing.

## Characteristics of included studies

This volume reports on 24 H1 quantitative studies with a concurrent comparator and 15 qualitative studies that met our inclusion criteria.

The included studies investigated the effects of a range of music and singing interventions for a wide range of wellbeing outcomes.

The review includes a range of study designs including 15 randomised control trials and 10 quasi experimental studies and 14 in-depth qualitative studies. There were some methodological challenges noted including small sample sizes in some of the quantitative studies and limited theoretical analysis in a small number of qualitative studies. However, the bulk of the studies were rated as being of moderate to high quality by the research team.

The review includes data from over 2500 participants from many countries. A third of the studies included older people. Studies encompassed a wide range of groups including young adults, working age adults, mixed age members of community ensembles, pregnant women, people in justice settings, homeless people, and drug users.

The most common form of intervention reported in over a third of studies was music listening. Other interventions were group singing and, relatively rarely, playing musical instruments.

A wide variety of wellbeing measures were used. While there was a great deal of heterogeneity across the studies, it was possible to undertake an exploratory meta-analysis on music/singing and anxiety and depression.

## Summary of study findings

The strongest evidence surrounds music and singing for older people and includes effects of music, particularly singing, on morale, mental health-related quality of life, loneliness, anxiety and depression. There is also moderate quality evidence for wellbeing outcomes of music and singing for specific sub groups including young adults, marginalised groups and people in justice settings. Outcomes for these groups include changes in mood, anxiety and sense of purpose.

### There is high quality evidence that:

Listening to music can alleviate anxiety and improve wellbeing in young adults.

Regular group singing can enhance morale and mental health-related quality of life and reduce loneliness, anxiety and depression in older people compared with usual activities. Participatory singing can maintain a sense of wellbeing and is perceived as both acceptable and beneficial for older participants. Engagement in music activities can help older people to connect with their life experiences and with other people, and be more stimulated.

Singing can maintain a sense of wellbeing in healthy older people.

Structured music therapy can reduce the intensity of stress, anxiety and depression in pregnant women

**There is moderate quality evidence that:**

Short duration listening to music can enhance mood in young adults. Listening to music during exercise may enhance the positive effects of physical activity on state anxiety in young adults.

Music interventions can enhance healthy adults' sense of purpose in life. Listening to music can reduce stress, negative mood and state anxiety in healthy adults. Regular listening to particular genre of music can alleviate anxiety, stress and depression in males.

Listening to music may act as an effective intervention to prevent or reduce depression in older people. Singing in a community choir can provide positive musical and social experiences. Membership of a choir or musical ensemble can provide a vehicle for identity construction and revision in later life, including people with little or no previous experience of music. Song-writing and performing can contribute to happiness in older people.

Performing and sharing their songs with others can be significant and meaningful to them. Music can help older people to develop self-identity, or connect with other people, expressing spirituality and reminisce.

Participants from marginalised groups value the benefits of group singing and the opportunity to learn, build relationships and engage in a meaningful exchange with the wider community.

Listening to relaxing music can alleviate anxiety and anger in prison populations.

**There is low quality evidence that:**

Group singing can foster happiness as well as provide musical and social benefits in healthy adults. Brief group singing can enhance perceived psychological wellbeing. Being a member of a music ensemble can enhance subjective wellbeing, support the development of musical identity and a sense of purpose. Brief music and non-music interventions can decrease stress and enhanced wellbeing in the workplace.

Learning music may help older adults to realize long-held ambitions and promote spiritual growth. Older adults are motivated to participate in musical activities to broaden their social networks and to learn.

Music and singing projects for young offenders are valued by participants and have a positive effect on self-esteem. Participatory music making, singing and particularly performing in public, can support prison inmates' perceived wellbeing.

Active music making in community choirs and music ensembles may be an effective way to support individuals from marginal communities, enabling them to build a sense of community and share culture and heritage.

Listening to relaxing music can enhance wellbeing and mood in pregnant women

## Exploratory Meta-Analysis

Our exploratory meta-analysis suggests that music participation in healthy people can reduce depression, but has no effect on anxiety. It is possible that music has a small effect on anxiety and the few studies available may not be sufficient to demonstrate this. There was a large amount of heterogeneity and to mitigate this we used random effects models, although this approach only partly removes effects of heterogeneity.

## Strengths and limitations of the review

The large number of hits following initial searches and the overlap between clinical and wellbeing interventions means that it is possible that some relevant evidence has not been included in this report. However, we undertook a comprehensive search strategy to identify all existing eligible studies published prior to the search dates. The pre-publication of our protocol on PROSPERO ensures methodological transparency and militates against potential post-hoc decision making which can introduce bias to the process. Dual screening of searches and data extraction and independent quality assessment using GRADE and CERQual criteria ensured a rigorous process.

Taking published studies as the sole evidence increases the potential risk of publication lag, wherein possible important new evidence that has not yet been included in published reports is not identified and included. However, the grey literature review (Daykin et al. 2016b) did include recent unpublished data from studies completed in the last three years.

## Implications for policy and practice

There is high quality evidence that music and singing activities can enhance and maintain subjective wellbeing in healthy adults. The highest quality evidence supports the promotion of group singing and music programmes. In particular, there is convincing evidence that participatory music and singing programmes can help to maintain wellbeing and prevent isolation, depression and mental ill health in older adult age groups. There is, therefore, evidence to support the development of policy and continuation of support for music and singing interventions for wellbeing outcomes for this group. .

There is also high quality evidence that listening to music can improve wellbeing in other groups: for example, alleviating anxiety in young adults, who have to date been relatively neglected in debates and programme development around music, arts and wellbeing, and reducing anxiety in pregnant women.

Further, there is moderate quality evidence for wellbeing outcomes of music and singing for specific sub groups including, marginalised groups and people in justice settings and further developments. Addressing issues of context, social diversity and wellbeing inequalities represents an important focus point for policy and practice agendas on music singing and wellbeing.

## Implications for research

A key challenge for establishing evidence in this field is the breadth and diversity of projects and research approaches adopted. Studies included in this review encompass a wide range of music and singing activities in delivery formats that range from very brief interventions lasting less than half an hour to projects lasting a year as well as ongoing participation over several years. More research is needed to understand the relationship between music activity and wellbeing over time. Furthermore, there is scope for additional well-designed evaluations and robust research studies which examine music and singing interventions other than group singing, playing and listening. It is particularly important to understand which specific components work and do not work to improve wellbeing outcomes in terms of duration, type and delivery formats and to understand the processes by which wellbeing outcomes are achieved. Qualitative research in this field needs to move beyond descriptive reporting of participant responses to analyse and report on conflict and challenges associated with music, singing and wellbeing projects.

# **A systematic review of the wellbeing outcomes of music and singing in adults and the processes by which wellbeing outcomes are achieved.**

## **Volume 1: Music and singing for wellbeing in healthy adults**

## Introduction

### Background

A growing body of research has examined the impacts of music and singing programmes on health and wellbeing in a range of population groups and contexts. The literature is theoretically and methodologically diverse and no systematic review has attempted to identify and synthesise the wellbeing outcomes across music and singing interventions and to examine how best to deliver music and singing for wellbeing enhancement. This is the first of three reports that form the review of wellbeing outcomes of music and singing for adults. This first report (Volume 1) presents studies of music and singing with healthy adults (H1) and includes studies with a concurrent comparator (CC) or qualitative studies where it would not be expected to include a comparator (Daykin et al. 2016a). Volume 2 includes CC studies with participants who are living with diagnosed conditions but not receiving music and singing interventions as part of clinical treatment (H2). This third and final volume discusses studies of music and singing for the subjective wellbeing of people with dementia.

The protocol for this review was registered on the PROSPERO International Prospective Register of Systematic Reviews (Registration number CRD42016038868).

### Research Question

What are the wellbeing outcomes of music and singing for adults and what are the processes by which wellbeing outcomes are achieved?

### Methodology

#### Types of studies

We included reports that assessed the relationship between music and singing interventions with subjective wellbeing. This included empirical research: either quantitative, qualitative or mixed methods outcomes or process evaluations, published from 1996 – June 2016. We also included systematic reviews published between 2010 and 2016. Grey literature and practice reports published from 2013 were included. Discussion articles, commentaries or opinion pieces not presenting empirical or theoretical research will be excluded.

## Types of participants

We included general adult populations, worldwide, healthy or unhealthy. This includes any group or individual taking part in listening or performing but not as paid professionals and not in clinical music therapy. We included studies from countries economically similar to the UK.

## Types of outcome measure

In order to be included, studies needed to have measured subjective wellbeing using any recognised method or measure. For the health economic component key outcomes are the outputs from cost, cost-utility, cost-effectiveness, cost-benefit and cost-consequence analyses.

## Types of interventions

We focused on participatory music or singing interventions including listening and performing. This includes music therapy offered to enhance wellbeing but excludes clinical treatment. We excluded evidence relating to paid professional musicians, clinical music therapy, and clinical procedures such as surgery, medical tests and diagnostics.

## Comparison

No music or singing, white noise, usual routine i.e. inactive comparator

## Search methods for identification of reviews

### Electronic searches

Electronic databases were searched using a combination of controlled vocabulary (MeSH) and free text terms. Search terms were incorporated to target empirical evidence on music, singing and wellbeing (Figure 1). We incorporated specific filters to identify health economic evaluations. The OVID MEDLINE search strategy can be found below. All database searches were based on this strategy but were appropriately revised to suit each database. The following databases were searched from 1996-2016:

- PsychInfo

- OVID MEDLINE
- Eric
- Arts and Humanities Citation Index (Web of Science)
- Social Science Citation Index (Web of Science)
- Science Citation Index
- Scopus
- PILOTS
- CINAHL

For the review of health economic evaluations we undertook a separate search of the following databases

- OVID MEDLINE
- Scopus
- CINAHL
- NHS EED (NHS Economic Evaluation Database)
- HEED (Health Economic Evaluations Database)
- HTA database

### Search Strategy (OVID MEDLINE)

1. MeSH descriptor: [well being]
2. wellbeing
3. wellbeing
4. music/ or music.mp.
5. singing.mp or Singing/
6. sings.mp.
7. singer\*.mp.
8. song\*.mp.
9. choir\*.mp.
10. concert\*.mp.
11. jazz.mp.
12. hymn\*.mp.
13. acapella.mp.
14. guitar.mp.
15. piano.mp.
16. oboe .mp.
17. reggae.mp.
18. karaoke.mp.

19. (1 or 2 or 3) and (4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18)
20. Quality of life.mp. or “Quality of Life”/ Life
21. Anxiety/ or anxiety.mp.
22. self-esteem.mp.
23. loneliness/ or lonel. mp.
24. life adj satisfaction.mp.
25. happiness.mp.
26. worthwhileness.mp.
27. 19 and (20 or 21 or 22 or 23 or 24 or 25 or 26)
28. limit 25 to humans and all adult

### Searching other sources

The reference lists of all relevant reviews from the last 5 years were hand-searched to attempt to identify additional relevant empirical evidence. A search of ‘grey literature’ was conducted via an online call for evidence. This is reported in a separate document (Daykin et al. 2016). Grey literature was included if it was a final evaluation or report on empirical data, had the evaluation of music or singing intervention as the central objective, was published between 2013-2016, and included details of authors (individuals, groups or organisations).

### Identification of studies for inclusion

Search results were independently checked by two overview authors. Initially the titles and abstracts of identified studies were reviewed. If it was clear from the title and abstract that the study did not meet the inclusion criteria it was excluded. Where it was not clear from the title and abstract whether a study is relevant the full article was checked to confirm its eligibility. The selection criteria were independently applied to the full papers of identified reviews by two overview authors. Where two independent reviewers did not agree in their primary judgements they discussed the conflict and attempted to reach a consensus. If they could agree then a third member of the review team considered the title and a majority decision was made. Studies in any language were included.

Because of the large number of papers identified, and in view of the timescale for reporting, we have divided the research into three groups:

H1: studies with healthy populations. This group of studies includes healthy people and people who may be living with chronic conditions who take part in music and singing interventions. The most common example is older people living in care homes, some of

whom may have dementia. However, the music and singing interventions are generally open access and participants are not recruited on the basis of a diagnosed condition.

H2: this group of studies includes participants who are living with diagnosed conditions but not receiving music and singing interventions as part of clinical treatment. The most frequently targeted groups are people with long term physical and mental health conditions including COPD, coronary heart disease, cancer, mental health conditions and dementia.

U: unhealthy populations. This group of studies includes people with diagnosed conditions, including patients in hospital, who are receiving music and singing interventions to support wellbeing.

In this document we report on the H1 studies that included a current comparator and qualitative studies eligible for inclusion

## Data collection and analysis

### Data extraction and management

Data were extracted independently by two overview authors using a standardised form (Appendix 1). Discrepancies were resolved by consensus. Where agreement could not be reached a third overview author considered the paper and a majority decision was reached.

For quantitative evidence of intervention effectiveness the data extraction form included the following details:

- evaluation design and objectives (the interventions studied and control conditions used, including detail where available on the intervention content, dose and adherence, ethics)
- sample (size, representativeness, reporting on drop-out, attrition and details of participants including demographics)
- the outcome measures (independence, validity, reliability, appropriateness to wellbeing impact questions)
- analysis (assessment of the methodological quality/risk of bias)
- the presence of possible conflicts of interest for authors

For qualitative evidence of intervention effectiveness the data extraction form included the following details:

- research design and objectives (interpretive, examining subjective experiences of participants, ethics)

- data collection (type/form, appropriateness, recording, theoretical justification)
- participants (numbers and details including demographic, recruitment strategy, theoretical justification)
- analysis (rigor, assessment of methodological quality, identification of bias/involvement of researcher, attribution of data to respondents, theoretical justification, relevance to wellbeing impact question)

Health economic studies will be extracted when there is agreement by WWW evidence review programmes regarding methods. We do not report on health economic studies here.

Our approach would be to extract the following additional information:

- Included study designs, analytic methods, perspective, time horizon, discount rate
- type of sensitivity analysis undertaken
- type and sources of data use for resource use and costs, reporting figures for costs;
- methods of preference elicitation (e.g. contingent valuation, revealed preferences, trade-off methods), reporting estimates of preference values
- main results including specified types of ICERs (e.g. health service or societal perspective)
- main health economic conclusions of the review

Our protocol allowed us to contact the authors of articles in the event that the required information could not be extracted from the studies if this was essential for interpretation of their results. We did not need to take this action.

### Assessment of methodological quality of included studies

We used the quality checklists for quantitative and qualitative studies detailed in the What Works Centre for Wellbeing [methods guide](#), and for economic evaluations (The Drummond Checklist, 1996) to assess the methodological quality of the included studies.

Included studies are likely to have assessed the methodological quality/risk of bias in a variety of ways. We refer to the judgements made by the authors of studies regarding the quality of evidence/risk of bias and report it within the context of our assessment of the quality of a study itself. We employed GRADE and CERQual schema for judging certainty / quality of evidence as high quality, moderate quality, low quality and very low quality.

## Results

### Results of the searches

After removal of duplicates the electronic searches returned 5397 records for screening. Of these 375 were retained after abstract and title screening and the full texts were assessed. 249 records were excluded at this stage and relevant records were identified through hand-searching of the reference lists of included reviews, resulting in 19 records in total. The search screening process is illustrated in Figure 1.

The search identified 145 studies of music, singing and wellbeing in adults. These studies were grouped into three main categories: music, singing and wellbeing in healthy adult populations (H1), studies where participants were targeted because they are living with a diagnosed chronic condition such as COPD, Parkinson's or Dementia (H2) and studies of unhealthy participants who were receiving music as part of treatment or therapy (U).

In view of our focus on wellbeing rather than clinical outcomes, and the time and resources available for this review we have included H1 studies in this report. We also categorised studies according to comparator and into three groups: studies with a concurrent comparator (cc), such as randomised control trials and quasi experimental research, studies with an historic comparator (hc), such as pre and post -test assessments with no controls, and studies with no comparator (nc), such as cross sectional surveys. In the H1 category we report on 24 quantitative studies with a current comparator that met our inclusion criteria and 15 qualitative that we would not expect to have a comparator or control but that met our inclusion criteria. For this report we have reviewed a total of 39 studies listed in the references and Table 1. Appendix 2 presents the full list of excluded studies with reasons for exclusion.

### Characteristics of Included Studies

The included studies investigated the effects of a range of music and singing interventions for a wide range of wellbeing outcomes. For a summary of the characteristics of the included papers see Table 1.

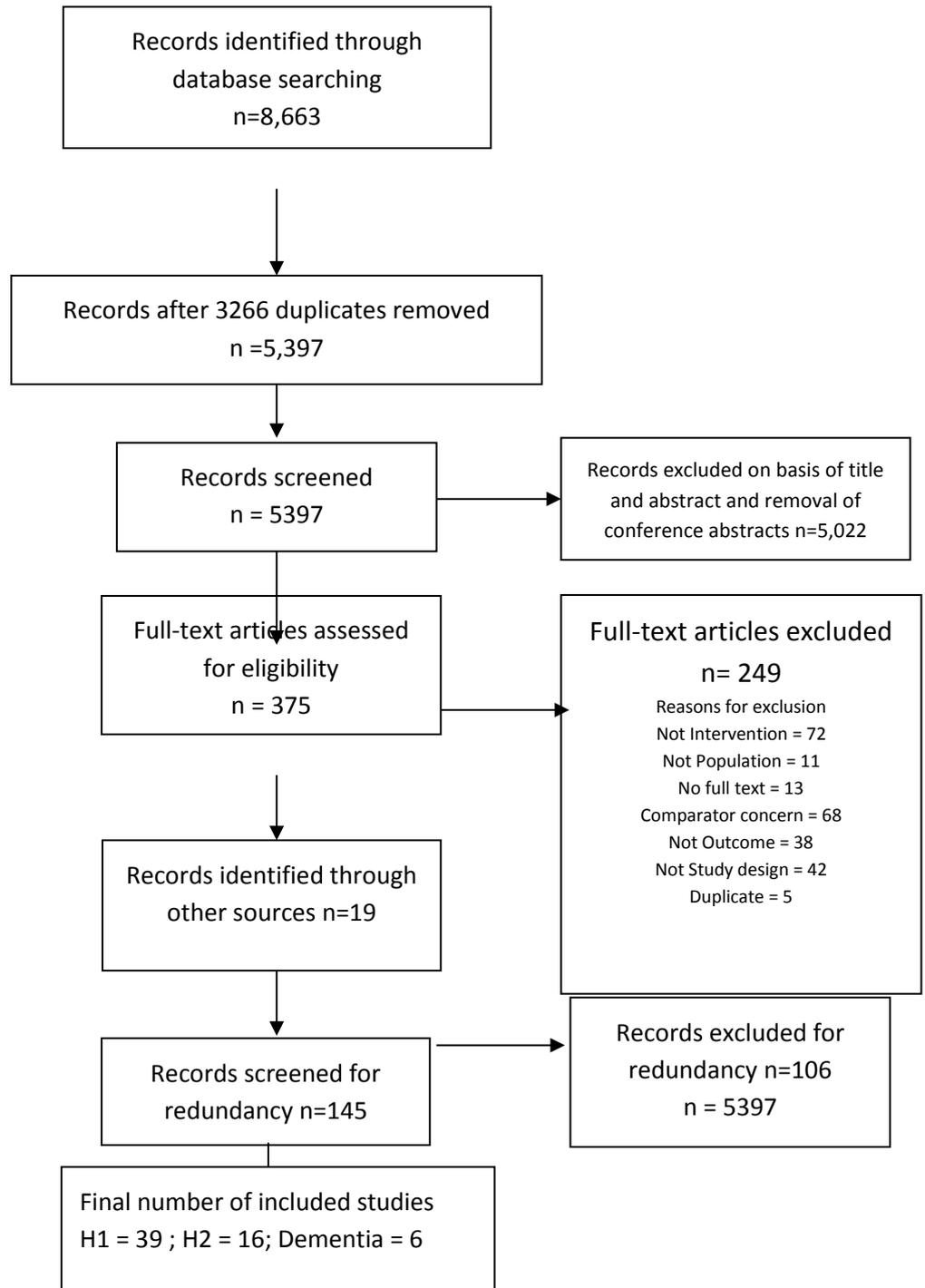
### Quality of Included Studies

The use of the GRADE and CERQual schema for judging quality of evidence resulted in 8 high quality studies, 18 moderate quality studies, 12 low quality studies and 1 very low quality study.

The review includes a range of study designs including 15 randomised control trials and 10 quasi experimental studies and 14 in-depth qualitative studies. There were some methodological challenges noted including small sample sizes in some of the quantitative studies and limited analysis in a small number of qualitative studies.

**Figure 1: PRISMA flow diagram of the search screening process**

Note: a very small number of studies have not been returned through the inter-library loan system. They will be screened for inclusion and included as appropriate when received.



**Table 1. Characteristics of included studies (studies on healthy adult populations)**

Authors	Date	Participant Description (include protected characteristics)	Music/singing intervention	Numbers of Participants	Wellbeing related outcomes	Wellbeing measures	Study Design	Conclusions	GRADE or CERqual judgement	DOI
<a href="#">Anderson &amp; Overy</a>	2010	19 male young offenders in a HMYOI, Participants were aged 17-21 (mean age 18.2).	10 week sessions of music, art or education	14 completed	Increase in self-esteem in music and education groups. Emotion scores decreased in the music and arts groups and increased in the education group.	The Emotion Scale. The Rosenberg Self-Esteem Scale.	Pre-and post-project assessment using structured instruments and measures.	The project was valued by participants and had a positive effect on self-esteem but not emotions.	Low	<a href="http://dx.doi.org/10.1386/ijcm.3.1.47/1">http://dx.doi.org/10.1386/ijcm.3.1.47/1</a>
<a href="#">Aloui et al.</a>	2015	Male physical education students at a Tunis University (age: 21±1.1 years).	Four experimental warm up and shuttle run test sessions: with/without music; before and during Ramadan.	9	Improvements in cognitive anxiety but not enjoyment or self-confidence were recorded before Ramadan.	A 7-item enjoyment subscale of the Enjoyment Inventory.	Non-random pre and post-assessment following a brief intervention.	Evidence of a beneficial influence of music on affects and mood in male PE students.	Very low	<a href="http://dx.doi.org/10.1371/journal.pone.0136400.s001">http://dx.doi.org/10.1371/journal.pone.0136400.s001</a>
<a href="#">Baldari et al.</a>	2010	30 University students from the	Listening to instrumental music with headphones while performing	26	Anxiety was reduced significantly following exercise. When	State Anxiety questionnaire (STAI-S) before and after the intervention	RCT. Participants were randomly assigned to groups and	Listening to music during exercise may enhance the	Moderate	PMID: 20842088

		Faculty of Sport Sciences at an Italian University. Participants were age from 20 to 28 years (22 ± 1.9) and homogeneous in socio-cultural status. 13 males and 13 females completed	a treadmill running test. No-music group performed the exercise with headphones.		controlling for the effect of training status, post-exercise anxiety score in the music condition was more reduced than in post-exercise in no-music condition.		tested before and after the intervention. A week later they were assigned the opposite condition in a second testing session.	positive effect linked to participation in physical activity on state anxiety dimension in moderately fit subjects.		
<a href="#">Bailey &amp; Davidson</a>	2002	The participants were 7 of the 17 active members of the all male Homeless Choir. Participants were aged 45 to 62 years ( $m = 52.14$	Regular singing in a choir and performing.	7	Group singing appears positively to influence emotional & social wellbeing. Participants report benefits across four categories: clinical-type benefits, benefits derived from audience-choir reciprocity, benefits associated with	Thematic focus on depression, self-esteem and social interaction skills.	Qualitative: A phenomenological approach utilizing a semi-structured interview was employed to explore the choristers' group singing experience.	Evidence that marginalised participants value therapeutic benefits of singing and the opportunity to learn, build relationships and engage in a meaningful	Moderate	<a href="http://dx.doi.org/10.1177/102986490200600206">http://dx.doi.org/10.1177/102986490200600206</a>

		years). 6 had participated in group singing in elementary school and/or in church, but 6 had no formal music training.			group process and benefits related to mental engagement.			exchange with the wider community.		
<a href="#">Baker &amp; Ballantyne</a>	2013	Participants were six female and two male, mean age = 80.5, SD = 12.3). All participants were of Anglo-Celtic origin, were residing in independent living units within the village and had no diagnosis	Participants attended five songwriting sessions facilitated by music therapy students and music students followed by a performance over a three-week period (duration of each session 90 minutes).	8	Retirees reported that their wellbeing had improved because they were stimulated and enjoyed the programme (the pleasant life). They told us it gave them something to look forward to (the engaged life). Some retirees were so positive about the group songwriting process that they were stimulated to engage in	Themes: the pleasant life; the engaged life; the meaningful life.	Qualitative: inductive and deductive thematic analysis.	Evidence that songwriting and performing can contribute to happiness in older people. Performing and sharing their songs with others can be significant and meaningful to them.	Moderate	<a href="http://dx.doi.org/10.1080/0809813.1.2012.678372">http://dx.doi.org/10.1080/0809813.1.2012.678372</a>

		of dementia or generalized cognitive deterioration			additional musical activities (the engaged life). They gained personal satisfaction from recognition of their abilities and accomplishments as they composed their own songs (the meaningful life). Retirees noted that they had also reached out to others in the community.					
<a href="#">Bensimon &amp; Gilboa</a>	2010	Students: 26 female students from the Department of Criminology at Bar-Ilan University, Israel.  26 Drug abusers: male and female recruited	Musical Presentation: 7 weekly sessions in which participants in a small group setting present themselves through musical pieces of their choice and subsequently receive feedback from their peers. Control groups Did not go to MP sessions.	52	Students and Das who took part in MP reported significant increases in PIL compared to the controls for whom no increases were reported. Similar improvement was found in students for SCS but not for the DA group.	The Purpose in Life test The Self-Consciousness Scale	Cluster n-RCT. Assessments were given at the beginning and a week after the last MP session.	MP enhanced participants' sense of purpose in life for both samples. Regarding self-consciousness, findings showed that MP had a positive effect on the ST sample but not on	Moderate	<a href="http://dx.doi.org/10.1016/j.aip.2010.03.002">http://dx.doi.org/10.1016/j.aip.2010.03.002</a>

		from a halfway open house rehabilitation program for ex-prisoners and from the Telem Day Centre, Israel.						the DA sample		
<a href="#">Bensimon et al.</a>	2015	Adult male prisoners from two wings at the Ela medium-security prison facility in Israel. Prisoners in both wings were comparable in terms of age and cultural	During the 3 weeks of exposure to music, music was played through loudspeaker for 45 minutes three times a day for six days. Thus, throughout the experiment, prisoners (n=24) were exposed 40.5 hours of relaxing music. The comparison group (n=24) was not exposed to	48	After 1 week, STAI measures improved substantially for the treatment group but not for the comparison group. The change was maintained at 3 weeks and remained substantial and significantly different from the comparison group. After 1 week state anger	State-Trait Anxiety Inventory (STAI). The Hebrew version of STAI was used State-Trait Anger Expression Inventory (STAXI). The Hebrew version of STAXI was used	Quasi-experimental. Measurements were taken at baseline, twice during the 3 week exposure period and one week following 3-week exposure to music.	Relaxing music alleviated anxiety and anger in this prison population, with changes sustained after three weeks.	Moderate	<a href="http://dx.doi.org/10.1177/0306624X13511587">http://dx.doi.org/10.1177/0306624X13511587</a>

		composition. Prisoners in both sections received similar length of prison sentence (20.3 months vs. M = 18.8 months) and had served a similar length of prison sentence (16.8 months vs. 15.3 months).	music during that period.		measurements decreased moderately for treatment group but not for comparison group. The difference between the groups was not maintained and was significant 3 weeks into manipulation. Changes in anger were reversed after elimination of the music.					
<a href="#">Boothby &amp; Robbins</a>	2011	Healthy adults recruited through sign-up sheets at Arcadia University. Participants were 19	Four conditions: music listening/ no music and art production; music listening/ no music and arts sorting. Music a 10-min segment of Bach's Magnificat	60	Music significantly reduced negative mood levels compared to a no-music and art conditions.	POMS and STAI-S	RCT. Measures before and after a 10 minute intervention.	Listening to music reduced negative mood and state anxiety in healthy adults.	Moderate	<a href="http://dx.doi.org/10.1016/j.aip.2011.06.002">http://dx.doi.org/10.1016/j.aip.2011.06.002</a>

		males and 41 females between 18 and 55 years of age (mean = 21.5, SD = 6.5).								
<a href="#">Burns et al.</a>	2002	Undergraduate volunteers at a US University: 31 males and 29 females. Participants ranged in age from 18 to 49 years (M = 21.6, SD = 5.60). The sample was 85% Caucasian (n = 51), 7% African-American (n = 4), and 8% other (n = 5); other	Participants were allocated to one of four conditions: listening to classical music (Mozart); listening to rock (Alice in Chains); listening to their own choice 'relaxing' music; and silence.	60	Relaxation ratings were significantly higher for the own choice music and classical music groups after listening to music. Anxiety scores decreased for all groups after listening. The control, self-selected music, and classical music groups' state anxiety scores all significantly decreased compared to the hard rock group.	State-Trait Anxiety Inventory (STAI) And self-assessed relaxation	RCT, measures were taken pre and post a 30 minute intervention.	Evidence that music, particularly classical music and music that participants believe to be relaxing may have an effect on the cognitive component of the stress response.	Moderate	<a href="http://dx.doi.org/10.1093/jmt/39.2.101">http://dx.doi.org/10.1093/jmt/39.2.101</a>

		includes Indian, Asian, and Hispanic.								
<a href="#">Campion &amp; Levita</a>	2014	Undergraduate students at a UK university. Participants were 47 female and 9 male, aged from 18–23 (mean age 20.4 ± 1.34),	Participants were randomly assigned to one of four conditions: listening to music, dancing, cycling or sitting quietly.	56	Dancing and listening to music significantly increased measures of positive affect and significantly decreased negative affect	Mood was measured using the Subjective Exercise Experiences Scale (SEES)	RCT: measures were taken pre and post 5 a minute activity.	Evidence in support of short duration dancing or passively listening to music as enhancing mood in young adults.	Moderate	<a href="http://dx.doi.org/10.1080/17439760.2013.848376">http://dx.doi.org/10.1080/17439760.2013.848376</a>
<a href="#">Carolan et al.</a>	2012	6 pregnant women were recruited at antenatal classes at a metropolitan university in Ireland. All but one participant was well educated	The women learnt to sing three lullabies over four group sessions with musicians.	6	All participants reported satisfaction with the programme and that they would enthusiastically recommend it to a friend. Benefits of singing included reduced maternal stress, an increase in maternal confidence and increased feelings	Four broad themes included connection, communication, stress reduction and confidence building, fetal attachment	Qualitative: interviews	Evidence that music can enhance wellbeing by supporting shared activity and mood enhancement in pregnant women.	Low	<a href="http://dx.doi.org/10.1016/j.midw.2010.12.006">http://dx.doi.org/10.1016/j.midw.2010.12.006</a>

		and over 30 years.			of connection with other women. The project engendered connection in the form of maternal alliance that goes beyond peer support. Shared activity and mood enhancement that are particularly associated with singing may be the mechanisms of impact.					
<a href="#">Carissoli et al.</a>	2015	Italian workers aged 20-52 (M=38.11 SD=6.92). White-collar workers comprised 66.1% of the sample.	Meditation participants undertook two 15 minute mindfulness meditations per day for 18 days. Music participants listened two pieces of relaxing music (chosen from a proposed list) per day, lasting about 15 minutes, while	56	No significant differences were found between the groups in the items measured on the MSP questionnaire. However, the waiting list group showed a constant increase in stress on all MSP dimensions. Both the meditation and music groups	Italian version of the Mesure du Stress Psychologique (MSP).	RCT. Measures were taken pre and post a 15 minute intervention.	Evidence that meditation and music-listening can lead to moderate improvements in coping with stress compared with no activity.	Moderate	<a href="http://dx.doi.org/10.1089/cyber.2014.0062">http://dx.doi.org/10.1089/cyber.2014.0062</a>

			doing nothing else.		reported a stress reduction, as measured by self-report.					
<a href="#">Chan et al.</a>	2010	Male and female participants at a community services centre in Hong Kong.	Participants listened to relaxing music chosen from a selection 30 minutes a week for 4 weeks.	42	In the experimental group, there were statistically significant reductions in geriatric depression scores at week 4	Chinese short version of the Geriatric Depression Score (GDS-15).	RCT. Measures were repeated every week for four weeks.	Evidence that listening to music may act as an effective intervention to allay depression levels in of older people	Moderate	<a href="http://dx.doi.org/10.1016/j.ctim.2010.02.004">http://dx.doi.org/10.1016/j.ctim.2010.02.004</a>
<a href="#">Chan et al.</a>	2011	Adults aged over 55, 64% female, 32% male. Over half the sample had education level at secondary and above.	Participants (26) listened to their choice of relaxing music for 30 minutes per week for eight weeks. Controls (24)	52	There were significant improvements in depression scores for the music group over eight weeks. In the non-music group, there was no significant reduction in the depression scores over the eight weeks.	Geriatric Depression Scale	RCT. A research nurse visited each subject weekly at home for eight weeks to measure their depression scores.	Evidence that listening to music can help older people to reduce their depression level	Moderate	<a href="http://dx.doi.org/10.1111/j.1365-2702.2011.03954.x">http://dx.doi.org/10.1111/j.1365-2702.2011.03954.x</a>
<a href="#">Chang et al.</a>	2008	Pregnant women expected to have	Four 30 minute CDs containing relaxing music (lullabies, classical	241 enrolled 120 in experimental group	Women in the experimental group had significantly lower	Perceived Stress Scale (PSS), the State Scale of the State-Trait	RCT. Measures were taken before and after	Evidence for a prescribed two-week regimen of	High	<a href="http://dx.doi.org/10.1111/">http://dx.doi.org/10.1111/</a>

		uncomplicated vaginal deliveries recruited from a medical centre in southern Taiwan	music, nature sounds and crystal songs). Participants listened to music for 30 minutes a day for two weeks. The control group received usual prenatal care only.	121 in control group 236 completed 116 in the experimental group 120 in the control group	scores than the control group for PSS, STAI and EPDS.	Anxiety Inventory (S-STAI) and the EPDS.	the two week programme.	music therapy reduce the intensity of stress, anxiety and depression in pregnant women		<a href="https://doi.org/10.1365-2702.2007.02064.x">i.1365-2702.2007.02064.x</a>
<a href="#">Chang et al.</a>	2015	Pregnant women recruited from an ante natal clinic of a medical centre in Tainan Women were over 18 and expected to have an uncomplicated vaginal delivery.	Patients listened to 30 min of relaxing music (crystal music, nature sounds, classical music, lullabies, and symphonic music) daily through two weeks.	320 were recruited (162 in the intervention group, 296 in the control group) 296 completed (145 in the intervention group, 151 in the control group).	There were significant differences between pre-test and post-test PSRS scores (but not for PSS scores), between experimental group and the control group.	Pregnancy Stress Rating Scale (PSRS), Perceived Stress Scale (PSS).	RCT, measures taken before and after a two week intervention.	Evidence that a 2-week music listening intervention may help woman cope with pregnancy-related stress	High	<a href="https://doi.org/10.1016/j.ctim.2015.05.002">http://dx.doi.org/10.1016/j.ctim.2015.05.002</a>
<a href="#">Cohen et al.</a>	2006	Participants were from the	Weekly choral singing group facilitated	166	Statistically significant differences were	Morale and loneliness using the Philadelphia	Repeat measures. Participants	Musical intervention improved	High	<a href="http://dx.doi.org/">http://dx.doi.org/</a>

		Washington, DC, area and were English-speaking adults aged over 64 (average age 79-80 years) who were physically able to participate regularly in community-based activities. Participants were mostly White, with over three quarters female.	through the Levine School of Music.		reported for morale, depression and loneliness. Both groups evidenced a slight decline in morale in loneliness over 12 months but in both instances the decline was steeper for the comparison group. The intervention group showed reduced risk of depression after 12 months.	Geriatric Center, Morale Scale, the Loneliness Scale-III and the Geriatric Depression Scale-Short Form.	were assigned to an intervention or comparison (usual activity) group and were assessed at baseline and after 12 months.	the measures.		<a href="#">10.1093/geront/46.6.726</a>
<a href="#">Cohen</a>	2009	Intervention group was 10 prisoners aged 23-60 (m = 38.30)	Regular singing in a prison choir and performing as a group and with 38 non-prisoners to an approved audience. Control	20	Both groups showed a significant increase between pre-and post wellbeing scores	Friedman Wellbeing Scale (FWBS)	Repeat measures with a non-random sample.	Evidence that some aspects of singing, particularly performing in public, can	Moderate	

		Control group was 10 prisoners aged 22-44 (m = 34.50) who did not perform in a choir.	group followed usual activities.		and on subscales for joviality and emotional stability. Participants reported positive experiences of singing and performing as well as challenges such as worry and stress.			support inmates' perceived wellbeing		
<a href="#">Coulton et al.</a>	2015	Older participants in East Kent. Mean age of participants was 69 years, 84% were female and 98% White.	Weekly group singing sessions of 90 minutes duration for 14 weeks. Led by experience Silver Song Club facilitators.	258	At 3 months, significant differences between the groups were observed in mental health-related quality of life, anxiety and depression. At 6 months, significant differences were observed in terms of mental health-related quality of life in favour of group singing. In addition, the intervention was found to be	York SF 12 mental health-related quality of life. Anxiety and depression were measured by HAD Scale. Health utility was measured by the EQ5D.21.	A pilot pragmatic individual RCT trial comparing group singing with usual activities in those aged 60 years or more. Participants were assessed at baseline and at 3 and 6 months post-randomisation.	Group singing intervention improved the measures	high	<a href="http://dx.doi.org/10.1192/bjp.bp.113.129908">http://dx.doi.org/10.1192/bjp.bp.113.129908</a>

					marginally more cost-effective than usual activities.					
<a href="#">Creech et al.</a>	2014	Participants were aged 43-92 (almost a quarter were aged over 75). 80% female and mostly White. The age range was 43-92 with 92 over the age of 75. The majority had been involved in professional occupations.	Community music (singing and instrumental) projects led by professional music leaders at: the Sage, Gateshead; the 'Connect' programme of the Guildhall School of Music and Drama; and Westminster Adult Education Service.	398 questionnaires received (56% response rate).	Through music many older people were able to formulate clear and valued versions of their possible future musical selves. This seemed to help them navigate challenges in later life and enhanced their subjective wellbeing by providing a sense of purpose, a significant degree of autonomy and a strong sense of social affirmation.	Subjective wellbeing, conceptualised as basic needs and quality of life. Underlying components of wellbeing identified as 'purpose', 'autonomy/control' and 'social affirmation'.	Qualitative: focus groups with 15 participants and interviews (29).	Community music participation can enhance subjective wellbeing.	low	<a href="http://dx.doi.org/10.1080/14613808.2013.788143">http://dx.doi.org/10.1080/14613808.2013.788143</a>
<a href="#">Dabback</a>	2008	Members of the Rochester, New York Horizons Band.	The band includes players from all levels of ability based on the belief that all people have the	14-21	Communal engagement provides structure, connection and a sense of purpose.	Themes: social connection, sense of purpose, spiritual	Five focus groups: initially a convenience sample of 7 participants then two	Evidence that band membership can provide a vehicle for identity	Moderate	<a href="http://dx.doi.org/10.1386/ijcm.1.2.267/1">http://dx.doi.org/10.1386/ijcm.1.2.267/1</a>

			potential to play and perform music in a group, in a qualitative study. The band programme is a network of over 100 participants.		Volunteers emphasised the spiritual, physical and mental health benefits they gain from participation.	benefits, musical identity.	further groups were recruited.	construction and revision in later life, with the opportunity to construct musical identity extended to people with little or no previous experience of music.		
Field et al.	1997	Employees in a major US public hospital. Participants were adults aged 22-38, 64 were female	10 minute sessions of: music relaxation, music relaxation with visual imagery, social support group	100	All groups reported decreases in anxiety, depression, fatigue, and confusion. That the groups did not differ on these variables suggests that these particular therapies, when applied for short periods of time, are equally effective for reducing stress among hospital employees.	STAI and POMS subjective measures in a rating scale	Repeat measures. Participants were assigned to one of four interventions and assessed at baseline and after a 10 minute intervention period.	Brief music and non-music interventions decreased stress and enhanced wellbeing in the workplace.	Low	PMID:9210776

<a href="#">Gold et al.</a>	2014	Prisoners in a prison near Bergen.	Participants undertook an average of 5.27 group sessions, most commonly of structured music interplay led by a music therapist.	113	At 2 weeks, about 70% of participants were available but measurements were only scheduled in the experimental group. Post hoc tests of were undertaken within-group changes at 2 weeks. STAI-State had changed significantly.	State-Trait Anxiety Inventory measuring anxiety levels; and Hospital Anxiety and Depression Scale measuring symptoms of depression and anxiety.	Pilot RCT	While this analysis suggests that participants' anxiety states had changed, it is not possible to draw causal conclusions about the potential effects of music therapy compared with standard care.	Low	<a href="http://dx.doi.org/10.1177/0306624X13498693">http://dx.doi.org/10.1177/0306624X13498693</a>
<a href="#">Gupta</a>	2005	Healthy male volunteer postgraduate students aged 19-24 years	Experimental group listened to Indian classical instrumental music without lyrics, with eyes closed, through headphones, for 30 minutes daily for 20 days, from 9-9.30am. Comparison group sat in	80	Significant decreases were found in scores on depression, state and trait anxiety, and the four components of anxiety (somatic, cognitive, behavioural, and affective).	State-Trait Anxiety Inventory; Four Factor Anxiety Inventory; Beck Depression Inventory.	RCT with testing at baseline and after 20 day intervention.	Evidence that regular listening to particular genre of music can alleviate anxiety, stress and depression in males.	High	<a href="http://dx.doi.org/10.1177/0305735605056144">http://dx.doi.org/10.1177/0305735605056144</a>

			silence between 9 and 9.30am for the 20 days.							
<a href="#">Hays &amp; Minichiello</a>	2005	A sample of older Australians aged 65 years and over who live in rural and urban settings. 19 were male and 19 were female.	Music in everyday life.	38	Music provided entertainment and enabled sharing and connecting with others, linking life events and helping to manage time. In relation to wellbeing, informants spoke of music as providing a sense of 'inner happiness', 'inner contentment', 'inner satisfaction' and 'inner peace'. For some it was therapeutic, and for some it had a strong spiritual significance, linked with a sense of timelessness. Specifically, the results show how music is used as a	Themes: wellbeing, connection, spirituality, and the benefits of music.	Qualitative interviews The initial data collection was from two focus group discussions that identified the primary themes for in-depth interviews Following the two focus group discussions, 38 in-depth interviews were conducted, 19 with men and 19 with women (and only four with members of the focus groups).	Evidence that music can help older people to develop self-identity, of connect with other people, expressing spirituality and reminisce.	Moderate	<a href="http://dx.doi.org/10.1177/0305735605056160">http://dx.doi.org/10.1177/0305735605056160</a>

					<p>source of entertainment as well as a forum to share and interact with others. Music was described as a personal experience to which people assigned meaning and emotions. The informants also described how music allowed them to engage in imaginative play and to escape from some of the hardships experienced in later life.</p>					
<p><a href="#">Henley et al.</a></p>	2012	15 male prisoners at HMP Grendon aged between 26 and 62 years, seven of whom had previously	The Good Vibrations gamelan project: a charity that runs Javanese music projects with offenders in prison and on probation. Projects typically run over one	15	<p>Participation in a project was observed as acting as a catalyst for positive change. Themes: continued positive change; personal factors; confidence,</p>	Identity. Emotions using a scale developed by the research team.	Qualitative interviews and a bespoke questionnaire.	Evidence that participatory music making can support wellbeing in male prisoners.	Low	<p><a href="http://dx.doi.org/10.1080/14613808.2012.714765">http://dx.doi.org/10.1080/14613808.2012.714765</a></p>

		participated in a Gamelan project.	week with an average of 15/20 offenders		emotional and psychological impacts; self-expression and coping.					
<a href="#">Joseph &amp; Southcott</a>	2014	Members of a community choir	Participation in the Skylarkers, a choir and entertainment troupe that engages with the wider community.	3	Belonging to this musical group enabled participants to achieve and to develop notions of themselves as musicians and performers.	Themes are: musical self-identity; and a sense of purpose.	A phenomenological qualitative single case study.	Evidence of a link between membership of a music ensemble and the development of the musical identities as well as a sense of purpose.	Low	<a href="http://hdl.handle.net/10536/DRO/DU:30070610">http://hdl.handle.net/10536/DRO/DU:30070610</a>
Joseph & Southcott	2015 (a)	Members of the Hawthorn U3A choir in Melbourne, Australia.	Non-competitive choral singing	5	Theme one: musical engagement Making music in childhood and youth Finding security in shared music-making Lifelong pursuit music engagement Music learning Broadening musical horizons	Themes: musical engagement; social connections.	IPA interviews	Evidence that singing in a community choir can provide musical and social experiences for a group of older people active in society.	Moderate	<a href="http://dx.doi.org/10.1080/02601370.2014.91951">http://dx.doi.org/10.1080/02601370.2014.91951</a>

					<p>Theme two: social connections</p> <p>Engaging in regular shared activity</p> <p>Making friends and socializing</p> <p>Feelings of happiness</p> <p>Overcoming isolation</p> <p>Depending on others in shared activity</p>					
<a href="#">Joseph &amp; Southcott</a>	2015 (b)	Members of three community choirs in Melbourne, Australia: the all-female Skylarkers, the Bosnian Behar Choir made up of participants aged from over 50 Bosnian	Choral singing	3	Wellbeing is generally discussed under the headings physical, cognitive and emotional wellbeing. Participants identified the importance of gaining a sense of validation and purpose through belonging to their particular ensemble.	Social benefit, health happiness community, and shared culture and heritage.	Three case studies	Evidence of musical, social benefits and happiness derived from group singing. Active music making in community choirs and music ensembles may be an effective way to support individuals,	Moderate	<a href="http://dx.doi.org/10.4102/td.v10i2.103">http://dx.doi.org/10.4102/td.v10i2.103</a>

		and Croatia, and the all-male Coro Furlan choir.						build community, and share culture and heritage.		
<a href="#">Judd &amp; Pooley</a>	2013	Members of amateur community choirs within the metropolitan area of Perth, Western Australia. Participants were 6 females and four males, aged 33 to 72 (m = 54).	Choirs rehearsed once a week and performed several times during the year. The music performed was eclectic in nature but excluded classical pieces.	10	Wellbeing themes were positive emotions, joy of singing, and positive social experiences. Choir ethos and group dynamics had a bearing on wellbeing outcome, as did previous experience of singing, choir characteristics and musical director.	Themes: positive emotions, group bonding and mediating factors.	Qualitative interviews	Evidence that wellbeing outcomes are mediated by individual, interpersonal and contextual factors.	Moderate	<a href="http://dx.doi.org/10.1177/0305735612471237">http://dx.doi.org/10.1177/0305735612471237</a>
<a href="#">Koelsh et al.</a>	2010	Volunteers who considered themselves non-musicians. Participants were aged 19-31	Groups of two to three participants took part in a music making session in which they played along to joyful recorded music from various genres,	154	Post measures showed significant changes, with depression/anxiety and fatigue decreasing in the music group but not in the control	POMS Depression/anxiety/fatigue and vigour.	RCT, measures before and after the session.	Evidence that music making can improve mood in young healthy adults.	High	<a href="http://dx.doi.org/10.1525/mp.2010.27.4.307">http://dx.doi.org/10.1525/mp.2010.27.4.307</a>

		(m= 24.4 years). 78 were females and 76 were males).	e.g. classical, jazz and world music.		group. Vigor increased in the music group but not in the control group while irritability increased in the control group but not in the music group.					
<a href="#">Kreutz</a>	2014	Participants were recruited to a choir using advertisements on TV in Germany. 21 participants aged 18-65 completed both sessions (14 were aged 50-65). 16 were female, 5 male; 12 participant	Participants attended a series of 10 rehearsals in which a pre-selected repertoire of pieces was prepared for public performance at the end of the rehearsal period. Participation was free of charge and subject to varying numbers of attendees between rehearsals. A TV company was documenting the choir.	40	Positive feelings increased significantly after both singing and chatting. Negative feelings decreased significantly after singing but not after chatting.	Ad hoc questionnaire of subjective feelings tested 'feeling well', being 'in good spirits', 'feeling tired' and 'feeling bored'. Each item was rated on a 7-point Likert-type rating scale.	A naturalistic controlled within-subjects trial. Participants were tested in a singing condition (week 7) and a chatting condition (week 8) of a 10 week choir project. Measures were at baseline then after 30 minutes of activity.	Evidence that half an hour of singing can enhance perceived psychological wellbeing. Chatting was associated with similar improvement but was not associated with reduced negative feelings, whereas singing did show such a significant	Low	

		s had substantial singing experience while 9 participants reported no previous experience in choral singing at all.						decrease at group level.		
<a href="#">Lally</a>	2009	A thirty week singing workshops , The 'Sweet Tonic' programme series in Sydney, Australia. Participants from 51 to 83.	Regular group singing	26	Participants reported benefits of weekly singing including social wellbeing, reduced isolation and creativity.	Physical and mental wellbeing, benefits of creativity.	Qualitative: observation, focus groups and interviews (5)	Evidence of a broad range of self-reported benefits from singing for older people.	Low	<a href="http://dx.doi.org/10.1386/jaac.1.1.25_1">http://dx.doi.org/10.1386/jaac.1.1.25_1</a>
<a href="#">Lee et al.</a>	2010	Adults aged 65 or older in a community centre setting in	Weekly music listening group, 30 minutes duration, participants selected from a CD which	66 (31 intervention and 35 controls)	Significant improvements in QoL scores on most of the subscales compared with the control group.	Quality of Life – SF-36 Version 2, Hong Kong SAR, Chinese	RCT, measures collected at baseline then once a week for four weeks in total.	Evidence that engagement in music activities can help older people to	High	<a href="http://dx.doi.org/10.1111/j.1365-2648.201">http://dx.doi.org/10.1111/j.1365-2648.201</a>

		Hong Kong.	included meditative, relaxing music including Chinese and Western classical music.					connect with their life experiences and with other people, and be more stimulated.		<a href="#">0.05445.x</a>
Li	2012	Members of the KCSCC Singing Group. All participants were born in Mainland China and migrated to Australia from different countries.	Regular group singing	8	Emotional wellbeing was subdivided into: enjoyment and relaxation; and belonging. Participants also spoke ties to the past and shared nostalgia for their place of birth, Mainland China. All the members of the group shared interests and activities. The participants identified that singing assists in the maintenance and renewal of their ability to remember and to learn. Their discussion of physical wellbeing	Emotional wellbeing, connections with the past, shared interests, and physical and mental wellbeing.	Qualitative: IPA interviews	Evidence that a singing group can help recent and longer term migrants to form positive bonds as well as musical experiences and confidence.	Moderate	<a href="http://dx.doi.org/10.1386/ijcm.5.1.59_1">http://dx.doi.org/10.1386/ijcm.5.1.59_1</a>

					centered on their attitude to illness, rather than specific physical issues.					
<a href="#">Perkins &amp; Williamon</a>	2013	People aged over 50 with little or no music playing experience . Project took place at RCM London. 86% of participants were female. Mean age was 67.87 (SD = 8.76). All comparison group participants were higher SES (receipt of no state benefits), while the music-	A 10-week programme of instrumental lessons, one to one at home or in small groups and workshops at a college. A comparison group were participants in a project at the University of the Third Age.	98	Wellbeing scores improved significantly for all groups. There was a significant increase in the spiritual growth subscale of HPLPII, the rate of increase being steepest in music-learning participants with higher SES. IPA of qualitative interviews revealed six themes: (1) pleasure; (2) social interactions; (3) musically-nuanced engagement in day-to-day life; (4) fulfilment of musical ambition; (5) ability to make music; and (6)	7 item short-WEMWBS and 52 item Health-Promoting Lifestyle Profile II (HPLPII).  IPA of qualitative data	Mixed methods: Pre and post project assessment comparing music learners in two socio-economic groups with non-music learners. Non-random, convenience sample. Qualitative interviews with 21 music learners.	Evidence that learning can support wellbeing in older adults. Learning music may particularly promote behaviours promoting spiritual growth. Learning musical instruments appears to offer the opportunity to realize long-held musical ambitions and help to realise possible musical selves.	Low	<a href="http://dx.doi.org/10.1177/0305735613483668">http://dx.doi.org/10.1177/0305735613483668</a>

		learning group comprised both higher and lower (receipt of one or more benefits) SES.			self-satisfaction through musical progress.					
<a href="#">Skingley et al.</a>	2015	Participants were volunteers aged 58-91 (m = 67.3) recruited to the intervention arm of a study of singing (n = 131) in East Kent. 99% of respondents were White, 84% female, 75% were retired, 65% had continued	A 14-week singing programme.	128 at baseline. 65 respondents commented at all three time points.	Q1 - was positive anticipation by participants of the effect of community singing on health and wellbeing. Q2 and Q3 positive changes in wellbeing were reported and attributed to the programme. 107 individuals reported on the effects of singing on mental health, the majority of comments were	Self-reported psychological, social, and community wellbeing.	Qualitative study nested within a RCT. Semi structured interviews with a subsample. Intervention participants wrote comments on their experiences at baseline, mid-point and end. A subsample (n = 19) participated in semi structured interviews.	Evidence that participatory singing for older people can be both acceptable and beneficial for perceived wellbeing of those taking part. Those in pre-existing good health, participation reported that singing helped to	High	<a href="http://dx.doi.org/10.1177/0733464815577141">http://dx.doi.org/10.1177/0733464815577141</a>

		education beyond the minimum school leaving age.			positive. On participant stated that singing made him feel miserable. 59 individuals made reference, mostly positive, to the social aspects of community singing groups.			maintain wellbeing.		
<a href="#">Sole et al.</a>	2010	Participants were older adults living at home independently in the Barcelona area. The average age of was 72.6 years. 13% (n = 69) were women.	Three conditions (a choir, a music appreciation class and a preventive music therapy program).	83	Participants perceived improvements in some aspects of their quality of life although no significant pre and post intervention changes in QOL	Ad hoc QOL questionnaire.	Questionnaires administered pre and post an intervention that lasted one academic year.	Evidence that older adults are motivated to participate in musical activities to broaden their social networks and to learn.	Low	<a href="http://dx.doi.org/10.1093/jmt/47.3.264">http://dx.doi.org/10.1093/jmt/47.3.264</a>
<a href="#">Valentine &amp; Evans</a>	2001	Undergraduate students. As far as possible equal numbers	Participants were regularly engaged in one of three activities: solo singing, group singing and swimming.	33	Improved mood was noted for all groups, with the strongest changes for swimming.	Mood assessed by the UWIST model adjective checklist (UMACL).	Non-random pre and post-test assessment following 30 minutes of activity.		Low	<a href="http://dx.doi.org/10.1348/000711201160849">http://dx.doi.org/10.1348/000711201160849</a>

		of male and female subjects recruited. Mean age was 21.2 (range 18–54) years.								
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Table 2. Numerical Results (studies on healthy adult populations)

Authors (date)	Intervention	Outcome description	Follow up 1		Follow up 2 (if reported)		Comments/Issues
			<u>Intervention</u> Numbers Means (SD) / %	<u>Control</u> Numbers Means (SD) / %	<u>Intervention</u> Numbers Means (SD) / %	<u>Control</u> Numbers Means (SD) / %	
Anderson & Overy (2010)	3.5 hour music session	Emotional state (The Emotional Scale) Self-esteem (Rosenberg Self-Esteem Scale)	N=4 Emotion -11.23% (nr) Self-esteem +8.47% (nr)	N=10 (5 art, 5 education) Edu= Emotions +7.22% (nr) Self-esteem +2.33% (nr) Art= Emotions -7.42% Self-esteem 0	n/a	n/a	Low
Aloui et al. (2015)	10 minute warm up with or w/o listening to Self-selected music	participants' affective state (Enjoyment Inventory) anxiety and self confidence (Mental Readiness Form-Likert)	N=9 (within subject design) Sig change in affect (test = 19.94, p<0.001) Sig change in cog anxiety (test = 17.88, p<0.001) sig change in self-confidence (test = 12.04, p= 0.007), but pairwise	N=9			Very low Small sample

			comparisons revealed no sig diff between the conditions				
Baldari et al. (2010)	Treadmill running test whilst listening to music vs no music	state-anxiety - State Anxiety questionnaire (STAI-S) before and after intervention (running with or without music). NB Higher scores indicate higher anxiety levels.	N=26 (in control and intervention – breakdown not specified) From 39.7 (± 1.8) to 32.1 (± 2.0)	N= n/a From 35.2 (±2.5) to 33.3 (±2.2)	n/a	n/a	Moderate
Bailey & Davidson (2002)	Members of a choir for homeless men	Thematic focus on depression, increase self-esteem, improve social interaction skills and induce cognitive stimulation	qualitative	Qualitative	n/a	n/a	Moderate
Baker and Ballantyne (2013)	Participants attended five song writing sessions facilitated by music therapy students and music students followed by a performance over a three-week period (duration of each session 90 minutes).	A number of themes emerged from the data, presented under three major components– the pleasant life, the engaged life and the meaningful life.	Qualitative	Qualitative			Moderate
Bensimon & Gilboa (2010)	7 MP sessions (a therapeutic tool in which people in a group setting present themselves through musical pieces of their choice and receive	-The Purpose in Life test (High scores = presence of purpose in life). -The Self-Consciousness Scale	N=24 (11 students, 13 drug abusers) S pts - higher PIL after the procedure. [F(1,24)=13.99, p<0.01, n <sup>2</sup> =0.37] And higher SCS [F(1,24)=24.75, p<0.001, n <sup>2</sup> =0.51]	N=28 (15 students, 13 DA) S pts – no increase in PL or SCS DA pts - no increase in PL or SCS	n/a	n/a	Moderate -Quasi-experimental

	feedback from their peers)		DA pts - higher PIL after the procedure [F(1,24)=12.02,p<0.01,n <sup>2</sup> =0.33]. No diff in SCS, [F(1,24)=1.36,p>0.10,n <sup>2</sup> =0.05]				
Benismon et al. (2015)	3 weeks of music played in prison wing	-State-Trait Anxiety Inventory (STAI). -State-Trait Anger Expression Inventory (STAXI).	N= 24 Anxiety: Week 1 vs baseline: -0.34, (MD int vs control = 0.16 (95%CI -0.78, -0.04) p=0.002)  Anger: Week 1 vs baseline -0.41 (MD = -0.31 (95%CI -0.44, -0.18) p>0.05)	N= 24 Anxiety: Wk 1 0.03  Anger: Wk 1 -0.20	Anxiety: Wk 3 vs baseline: -0.50, (MD = -0.27 (95%CI -0.42, -0.12) p=0.001) 1 wk Follow up: -0.34 (MD = -0.11 (95%CI -0.26, 0.04) p=0.001)  Anger: Wk 3 vs baseline -0.57 (MD = -0.40 (95%CI -0.56, -0.24) p=0.047) 1 wk Follow up: -0.35 (MD = -0.21 (95%CI -0.44, 0.01) p>0.5)	Anxiety: Wk 3 -0.06 1 Wk FU 0.13  Anger: Wk 3 -0.24 1 wk FU 0.08	Moderate
Boothby & Robbins (2011)	4 conditions: A. music listening and art production, B. music listening and arts sorting. C. no music	Mood states (POMS and STAI-S)	N= Group A: 16 Group B: 14 Music Listening (Groups A+B, n=30). Mean scores (SD): POMS pre: 46.7 (34.1) post: -1.7(23.3)	N= Group C: 15 Group D: 15 No Music (Groups C+D, n=30): POMS pre: 42.1(34.2) post: 18(40.4)	N/a	n/a	Moderate -small groups -short intervention

	listening and art production D. no music listening and arts sorting		STAI-S pre: 47.8(10.3) post: 32 (7.4)	STAI-S pre: 18(40.4) post: 40.2 (11.4)			time (10 mins)
Burns et al. (2002)	4 conditions: listening to classical music, rock, their own choice or silence	-State-Trait Anxiety Inventory (STAI) -relaxation rating scale	N= (13 rock, 16 classical, 18 own) <u>Relaxation</u> means (SD) Rock pre: 4.54 (1.39) post: 5.54 (1.39) Classical pre: 4.44 (1.26) post: 5.75 (1.13) Own pre: 4.06 (1.11) post: 5.94 (0.73) <u>Anxiety</u> Rock pre: 35.15 (9.87) post: 31.62 (7.34) Classical pre: 33.38 (6.98) post: 26.25 (6.55) Own pre: 37.94 (8.79) post: 29.56 (6.84)	N=13 <u>Relaxation</u> pre: 3.77 (1.30) post: 5.77 (1.01) <u>Anxiety</u> pre: 39.46 (7.48) post: 29.38 (6.69)	n/a	n/a	Moderate -small groups -short intervention time
Campion & Levita (2014)	4 conditions: listening to music, dancing, cycling or sitting quietly.	-Mood (Subjective Exercise Experiences Scale (SEES))	N=14 Increased positive affect: T = 4, Z = -2.936, p = 0.003 Decreased negative mood: T = 0.00, Z = -2.555, p = 0.011	N= Dancing = 15, Cycling = 14, Quiet = 13. Increased Positive affect: Dancing, T = 6, Z = -3.085, p = 0.002. Cycling and sitting quietly had no effect on positive mood (Cycling, T = 34.5, Z = -0.780, p = 0.436; Quiet, T = 16.0, Z = -0.787, p = 0.431). Decreased negative mood: Dancing, T = 2.5, Z = -2.736, p = 0.006. cycling, T = 9.5, Z = -1.860, p = 0.063) and	n/a	n/a	Moderate -small numbers

				sitting quietly, T = 11, Z = -1.723, p = 0.085)			
Carolan et al. (2012)	The women learnt to sing three lullabies over four group sessions with musicians	Nr	Qualitative	Qualitative			Low
Carissoli et al. (2015)	Meditation: 2x 15 minute mindfulness meditations per day for 18 days. Music: listened to two pieces of relaxing music (chosen from a proposed list) per day (~15 mins), while doing nothing else and waiting list group.	-Mesure du Stress Psychologique (MSP) questionnaire; 49 items in 6 dimensions.	N=56 (break down into groups NR) Mean change (SD) MSP Hyperactivity: -0.56 (1.76) Irritability: -0.44 (2.15) Psychophysiological feelings: -0.17 (1.46) Confusion: -0.56 (1.25) Depressive anxiety: 0.22 (1.93) Pain: -1.06 (1.83)  No sig diffs between the groups in the items measured on the MSP	N=nr MSP <u>Waiting list</u> Hyperactivity: 0.06 (1.92) Irritability: 0.67 (2.03) Psychophysiological feelings: 0.28 (0.96) Confusion: 0.56 (1.89) Depressive anxiety: 0.00 (1.81) Pain: 0.33 (1.33) showed a constant increase in all MSP dimensions <u>Meditation</u> Hyperactivity: -1.00 (1.56) Irritability: -0.15 (3.03) Psychophysiological feelings: -0.30 (2.41) Confusion: 0.15 (2.27) Depressive anxiety: 0.15 (2.6) Pain: -0.05 (2.53)	n/a	n/a	Moderate -Small sample. - Mediation had to be learnt through progress of intervention – longer required for intervention
Chan et al. (2010)	Listening to their choice of music for 30 min/wk x 4 weeks	Chinese short version of the Geriatric Depression Score (GDS-15)	N=21 significant reductions in geriatric depression scores ( $\chi^2= 27.87, p< 0.001$ )	N=21 No sig reduction in depression ( $\chi^2= 1.042, p= 0.791$ )	n/a	n/a	Moderate -small sample

		NB 0—2 normal, 3—5 some depressive symptoms, 6—15 depressed.	pre: 4.1 (4) post: 2.1 (3)	Pre: 1.8 (1.7) Post: 2 (2.4)			
Chan et al. (2011)	Listened to their choice of music for 30 mins/wk x 8 weeks	Geriatric Depression Scale	N=24 Pre: 4.17 (3.14) Post: 1.38 (1.84) between-group difference in depression score over 8 wks = sig diff (p=0.016) (Trend analysis ,F=7.05,p=0.016)	N=26 Pre: 4.23 (2.89) Post: 4.15 (3.53) No significant change in GDS score. (Trend analysis, F=0.18,p=0.677)	n/a	n/a	Moderate
Chang et al. (2008)	Listening to relaxing music CD (lullabies, classical music, nature sounds and crystal songs). 30 mins/day x 2wks vs usual care	-Perceived Stress Scale -State Scale of the State-Trait Anxiety Inventory (S-STAI) - Edinburgh Postnatal Depression Scale (EPDS)	N=116 PSS pre: 7.44 (4.56) post: 5.29 (5.22) (p< 0.01) S-STAI pre: 7.92 (9.79) post: 5.79 (10.86) (p<0.05) EPDS pre: 12.11 (3.54) post: 0.27 (4.05) (p<0.01)	N=120 PSS pre: 16.71 (4.31) post: 5.79 (5.99) (p<0.05) S-STAI pre: 7.08 (10.04) post: 37.79 (12.11) (not sig) EPDS pre: 12.17 (3.92) post: 12.14 (4.60) (not sig)	n/a	n/a	High
Chang et al. (2015)	Listened to 30 min of relaxing music (crystal music, nature sounds, classical music, lullabies, and symphonic music) daily for two weeks.	Pregnancy Stress Rating Scale (PSRS), Perceived Stress Scale (PSS), Maternal—Fetal Attachment Scale (MFAS)	N= 145 PSS pre: 16.49 (4.85) post: 15.97 (5.62) MfAS pre: 96.11 (19.19) post: 100.96 (20.47) PSRS pre: 53.70 (24.21) post: 54.02 (23.64)	N= 151 PSS pre: 16.40 (4.78) post: 16.38 (5.25) MfAS pre: 92.04 (21.26) post: 95.60 (22.83) PSRS pre: 49.92(22.26) post: 54.94 (22.73)	n/a	n/a	High
Cohen, D. et al. (2006)	Weekly choral singing group facilitated through the Levine School of Music.	Morale and loneliness using the Philadelphia Geriatric Center, Morale Scale, the Loneliness Scale-III and the Geriatric Depression Scale—Short Form.	N= 77 Morale pre: 14.15 (2.42) post: 14.08 (2.66) Depression pre: 1.39 (1.66) post: 1.14 (1.84) Lonliness pre: 35.11 (8.09) post: 34.60 (7.86)	N= 64 Morale pre: 13.51 (3.07) post: 13.06 (3.29) Depression pre: 2.12 (2.23) post: 1.84 (1.89) Lonliness pre: 38.26 (10.07) post: 7.02 (10.33)			High

Cohen (2009)	Regular singing in a prison choir and performing as a group and with 38 non-prisoners to an approved audience. Control group usual activities.	Friedman Wellbeing Scale (FWBS)	N= nr increase between pre-and post wellbeing scores for both groups (F (1, 18) = 6.080, p = 0.024) no sig dif between control and experimental groups' composite wellbeing scores (F (1, 18) = .038, p = 0.848).	N = nr			Moderate
Coulton et al. (2015)	Weekly group singing sessions of 90 minutes duration for 14 weeks.	York SF 12 mental health-related quality of life. Anxiety and depression (HAD Scale). Health utility (EQ5D.21).	3 month N=113 Mean (CI) SF12 mental pre: 48.8 (46.8–50.8) post: 5.55 (53.9–57.1) Anxiety pre: 6.40 (5.62–7.18) post: 4.14 (3.64–4.64) Depression pre: 4.95 (4.53–5.57) post: 2.63 (2.21–3.05) EQ5D pre: 0.76 (0.71–0.80) post: 0.80 (0.76–0.85)  MD between intervention and control (CI) P value SF12 mental: 4.77 (2.53–7.01) p<0.01 Anxiety: - 1.78 (72.50–1.06) p<0.01 Depression: -1.52 (72.13–0.92) p<0.01 EQ5D: 0.02 (0.01–0.03) p=0.05	N=109 SF12 mental pre: 50.0 (11.9) post: 50.7 (49.1–52.3) Anxiety pre: 6.41 (4.57) post: 6.01 (5.41–6.42) Depression pre: 4.28 (3.52) post: 4.15 (3.72–4.56) EQ5D pre: 0.76 (0.72–0.81) post: 0.78 (0.74–0.82)	6 month N=105 SF12 mental: 52.3 (50.7–54.0) Anxiety: 5.26 (4.75–5.76) Depression: 3.69 (3.20–4.18) EQ5D: 0.78 (0.73–0.83)  MD between intervention and control (CI) P value SF12 mental: 2.35 (0.06–4.76) p=0.05 Anxiety: -0.57 (-1.31–0.16) p= 0.13 Depression: - 0.53 (-1.24–0.18) p= 0.1	N= 99 SF12 mental: 49.9 (48.2–51.7) Anxiety: 5.83 (5.30–6.36) Depression : 4.22 (3.71–4.73) EQ5D: 0.77 (0.72–0.82)	high

					EQ5D: 0.01 (0.01–0.02) p=0.01		
Creech et al. (2014)	Attending community musical groups	Subjective wellbeing, conceptualised as basic needs and quality of life. Underlying components of wellbeing identified as ‘purpose’, ‘autonomy/control’ and ‘social affirmation’.	Qualitative	Qualitative	n/a	n/a	low
Dabback (2008)	Qualitative study, 5 focus groups involving members of the ‘Rochester, New Horizons Band Programme’.	Communal music engagement provides structure, connection and a sense of purpose. Volunteers emphasised the spiritual, physical and mental health benefits they gain from participation.	Qualitative study – no numerical data				Moderate – no control
Field et al. (1997)	10 minute sessions of: music relaxation, music relaxation with visual imagery, social support group	STAI and POMS subjective measures in a rating scale: Brief music and non-music interventions decreased stress and enhanced wellbeing in the workplace. Groups reported decreases in anxiety, depression, fatigue, and confusion,	Music Relaxation.  Pre test > post test, t and P scores. <b>Anxiety:</b> 48.18 > 29.18, t = 5.98, P = .001. <b>Depression:</b> 5.89 > 2.63, t = 2.10, P = .05 <b>Fatigue:</b> 12.13 > 6.89, t = 4.13, P = .001	4 controls, all with very similar and positive pre > post test results. See table. P. 55.			Low

		as well as increased vigour following the sessions	<b>Confusion:</b> 5.93 > 2.17, t = 2.91, P = .05 <b>Vigour:</b> 14.29 > 20.10 t = -3.07, P = .01				
Gold et al. (2014)	Participants undertook an average of 5.27 group sessions, most commonly of structured music interplay led by a music therapist.	State-Trait Anxiety Inventory measuring anxiety levels; and Hospital Anxiety and Depression Scale measuring symptoms of depression and anxiety: Analysis suggests that participants anxiety states had changed, although it is not possible to draw causal conclusions about the potential effects of music therapy compared with standard care.	Paired t tests for differences between baseline and 2 weeks revealed that STAI-State had changed significantly (M difference = -3.95, 95% CI = [-7.36, -0.54], t= -2.34, df= 38, p= .025). Dividing this mean difference by the scales standard deviation at baseline (Table 1) suggests a small-to-medium effect size of d= 0.33.	No significant results, due to methodological limitations.			Low
Gupta (2005)	Experimental group listened to Indian classical instrumental music without lyrics, with eyes closed, through headphones, for 30 minutes daily for 20 days, from 9-9.30am. Comparison group sat in silence between 9 and	State-Trait Anxiety Inventory; Four-Factor Anxiety Inventory; Beck Depression Inventory. Significant decreases were found in scores on depression, state and trait anxiety, and the four components of anxiety (somatic,	Pre test > Post test scores  <b>Depression:</b> 8.94 (3.01) > 6.24 (2.14) p < .001 <i>Anxiety Scores (FFAI)</i> <b>Somatic component:</b> 30.65 (8.78) > 23.14 (8.05) p < .001 <b>Cognitive component:</b> 31.47 (9.04) > 25.01 (8.49) p < 0.1 <b>Behavioural component:</b>	Pre test > Post test scores  <b>Depression:</b> 8.76 (3.01) > 8.49 (3.59) <i>Anxiety Scores (FFAI)</i> <b>Somatic component:</b> 29.79 (9.16) > 28.95 (9.34) <b>Cognitive component:</b> 31.55 (9.46) > 31.76 (9.23) <b>Behavioural component:</b>			High

	9.30am for the 20 days.	cognitive, behavioural, and affective).  <i>Data Tables on page 368</i>	29.24 (9.25) > 23.03 (8.27) p < 0.1 <b>Affective component:</b> 28.76 (8.69) > 23.89 (7.98) p < .02	28.69 (9.34) > 27.95 (9.68) <b>Affective component:</b> 28.93 (9.27) > 27.69 (8.67)			
Hays and Minichiello (2005)	Music in everyday life.	Evidence that music can help older people to develop self-identity, of connect with other people, expressing spirituality and reminisce.	Qualitative study – no numerical data				Moderate
Henley et al (2012)	The Good Vibrations gamelan project: Javanese music projects with offenders in prison and on probation. Projects typically run over one week with an average of 15/20 offenders	Using qualitative interviews and a bespoke questionnaire: Evidence suggests that participatory music making can support wellbeing in male prisoners.	Qualitative study – no numerical data				Low
Joseph and Southcott (2014)	Case study looking at 3 members of the Skylarkers Choir in Melbourne.	A phenomenological qualitative single case study: Evidence of a link between membership of a music ensemble and the development of the musical identities as well as a sense of purpose.	Qualitative study – no numerical data				Low – only 3 participants

Joseph and Southcott (2015(a))	Interviews with Members of the Hawthorn U3A choir in Melbourne, Australia.	Evidence from IPA interviews shows that singing in a community choir can provide musical and social experiences for a group of older people active in society.	Qualitative study – no numerical data				Moderate
Joseph and Southcott (2015(b))	Interviews with individuals at 3 choirs The singing groups are the Skylarkers, the Bosnian Behar Choir, and the Coro Furlan.	Three case studies reveal evidence of social benefit, health, happiness, community, and shared culture and heritage.	Qualitative study – no numerical data. 3 case studies with semi-structured interviews				Moderate
Judd and Pooley (2013)	Interviews with members of amateur community choirs in Perth, Western Australia.	Wellbeing themes were positive emotions, joy of singing, and positive social experiences. Choir ethos and group dynamics had a bearing on wellbeing outcome, as did previous experience of singing, choir characteristics and musical director.	Qualitative study – no numerical data				Moderate
Koelsh et al. (2010)	Groups of 2 - 3 participants took part in a music making session in which they played along to joyful recorded music from	POMS –Depression / anxiety / fatigue and vigour: Evidence that music making can improve	a) Depression/anxiety decreased in the music group ( $Z = -5.46, p < .0001$ )  b) Fatigue decreased in the	a) Depression/anxiety did not change in the control group ( $Z = -0.98, p = .33$ ).  b) Fatigue tended to increase in the control			High

	various genres, e.g. classical, jazz and world music.	mood in young healthy adults.  A comparison of pre and post measures were utilized using Wilcoxon Signed Rank tests, with $n = 81$ for the experimental group, and $n = 73$ for the control group.	music group ( $Z = -2.98, p < .003$ ).  (c) Vigor increased in the music group ( $Z = -3.46, p < .001$ ).  (d) Irritability did not change in the music group ( $Z = -0.62, p = .54$ ).	group ( $Z = -2.31, p < .03$ ).  (c) Vigor decreased in the control group ( $Z = -3.36, p < .001$ ).  d) Irritability increased in the control group ( $Z = -4.76, p < .0001$ )			
Kreutz (2014)	10 minutes of warm-up exercises were followed by rehearsing sections of pre-selected repertoire pieces. The programme included three pieces in four-part choral arrangements for soprano, alto, tenor, and bass.	The present findings corroborate the view that half an hour of singing is sufficient to enhance perceived psychological wellbeing.	A significant Time X Condition interaction emerged for positive feelings [ $F(1,20)=9.655, p<0.01, \eta^2=.326$ ], and this effect was robust after the inclusion of either taking medication or choral experience as a between subjects factors.  Positive feelings increased significantly in the singing group [ $t(21)=5.593, p<.01$ ] A significant interaction was also observed for negative feelings [ $F(1,20)=4.735, p<.05, \eta^2=.191$ ].  Negative feelings decreased significantly after singing [ $t(21)=3.0448, p<.01$ ],	Positive feelings increased significantly after chatting [ $t(20)=2.400, p<.01$ ].  Negative feelings did not decrease after chatting [ $t(20)=.336, p=.741$ ].			Low
Lally (2009)	Regular group singing: 30 week singing workshops. The 'Sweet Tonic'	Participants reported benefits of weekly singing including social	Qualitative study – no numerical data: observation, focus groups and interviews.				Low

	programme series in Sydney, Australia.	wellbeing, reduced isolation and creativity.					
Lee et al. (2010)	Weekly music listening group, 30 mins duration, participants, included meditative, relaxing music including Chinese and Western classical music.	Significant improvements in QoL scores on most of the subscales compared with the control group.	<b>Physical functioning</b> Baseline Week 2 Week 3 Week 4 Friedman test <b>Role – Physical</b> Baseline Week 2 Week 3 Week 4 Friedman test <b>Bodily Pain</b> Baseline Week 2 Week 3 Week 4 Friedman test <b>General Health</b> Baseline Week 2 Week 3 Week 4 Friedman test <b>Vitality</b> Baseline Week 2 Week 3 Week 4 Friedman test <b>Social Functioning</b> Baseline	<b>Control Group</b> 17.5 (21.0) 17.3 (20.9) 17.4 (21.0) 16.5 (20.8) P = 0.815 44.3 (9.0) 46.9 (10.8) 44.3 (8.2) 44.0 (8.4) P = 0.474 37.4 (9.8) 37.3 (9.4) 38.8 (9.6) 37.6 (9.5) P = 0.606 50.5 (8.0) 49.3 (7.7) 50.2 (7.6) 49.1 (7.1) P = 0.984 53.8 (9.8) 54.9 (9.2) 54.1 (8.9) 53.0 (9.2) P = 0.984 37.4 (16.6)	<b>Music Group</b> 31.8 (15.9) 33.6 (16.0) 34.8 (15.2) 36.1 (14.0) P = 0.876 48.1 (7.7) 50.5 (5.2) 51.4 (4.2) 53.5 (7.9) P = 0.046 39.4 (11.2) 44.5 (9.4) 44.8 (8.4) 46.4 (7.8) P = 0.946 55.6 (9.8) 54.6 (7.0) 57.0 (6.3) 56.5 (6.5) P = 0.064 56.4 (11.8) 58.5 (9.2) 60.7 (7.9) 62.5 (7.1) P = 0.064 42.7 (14.0)	<b>Mann Whitney (P)</b> 0.013 0.0045 0.0014 0.0010 0.195 0.035 0.0036 0.0002 0.630 0.008 0.025 0.0004 0.052 0.015 0.0008 0.0001 0.654 0.130 0.008 0.0001	High

			<p>Week 2 Week 3 Week 4 Friedman test</p> <p><b>Role Emotional</b></p> <p>Baseline Week 2 Week 3 Week 4 Friedman test</p> <p><b>Mental Health</b></p> <p>Baseline Week 2 Week 3 Week 4 Friedman test</p>	<p>36.8 (15.5) 36.6 (14.9) 35.5 (15.6) P = 0.681</p> <p>52.0 (6.1) 51.2 (6.1) 50.9 (6.6) 50.9 (5.9) P = 0.192</p> <p>52.4 (10.1) 51.7 (9.0) 52.5 (9.0) 52.0 (9.0) P = 0.536</p>	<p>43.6 (13.5) 48.0 (10.2) 49.5 (8.0) P = 0.704</p> <p>52.2 (6.6) 53.9 (5.5) 54.8 (4.1) 56.1 (2.9) P = 0.139</p> <p>50.4 (11.2) 53.9 (12.0) 55.0 (10.8) 59.3 (8.9) P = 0.520</p>	<p>0.394 0.130 0.006 0.0004</p> <p>0.922 0.133 0.022 0.0005</p> <p>0.480 0.248 0.207 0.0007</p> <p><b>Statistically significant at P &lt; 0.006</b></p>	
Li (2012)	Participants were all members of the KCSCC Singing Group who regularly sing together.	Evidence that a singing group can help recent and longer term migrants to form positive bonds as well as musical experiences and confidence.	Qualitative study – no numerical data				Moderate
Perkins & Williamson (2013)	A 10-week programme of instrumental lessons, 1 to 1 at home or in	Evidence that learning can support wellbeing in older adults. Learning music may	Across all three groups mean scores on the short WEMWBS increased by 1.67 points. These increases were significant: F(1,				Low

	small groups and workshops.	particularly promote behaviours promoting spiritual growth. Learning musical instruments appears to offer the opportunity to realize long-held musical ambitions and help to realise possible musical selves.	95) = 24.02, $p < 0.01$ . Additionally, there was a significant increase over time for participants in all groups in overall health-promoting behaviours, $F(1,95) = 15.22$ , $p < 0.01$ , as well as in the sub-scales of interpersonal relations, $F(1,95) = 8.31$ , $p < 0.01$ , spiritual growth, $F(1,95) = 11.01$ , $p < 0.01$ , and physical activity, $F(1,95) = 7.86$ , $p < 0.01$ . While there was no significant interaction between time, group and Short-WEMWBS scores, $F(2,95) = 1.32$ , $p > 0.05$ , there was a significant interaction between time, group and two of the HPLPII subscales: physical activity, $F(2,95) = 3.51$ , $p < 0.05$ , and spiritual growth, $F(2,95) = 3.91$ , $p < 0.05$ .				
Skingley et al. (2015) ??							High
Solé, et al. (2010)	3 music programs ran for 1 academic year at senior centres in the Barcelona area. - The final sample included 83 people out of 101 in the initial sample. They were enrolled in a choir (n = 52), a	Participants perceived improvements in some aspects of their quality of life although no significant pre and post intervention changes in QOL	The results of the t Tests for repeated measures show no significant differences between the pretest and the posttest scores for the Rosenberg's self-esteem test ( $t = -.70$ , $df = 48$ , $p = .49$ ), the Yesavage's depression scale ( $t = 1.14$ , $df = 51$ , $p = .26$ ) and the Lawton's life satisfaction scale ( $t = -1.19$ , $df = 49$ , $p = .24$ ).				Low



## Findings of included papers

### Study Participants

The review includes data from over 2500 participants in controlled, quasi-experimental and qualitative studies from many countries. A third of the studies included older people although studies encompassed a wide range of groups including students, members of community choirs and ensembles, pregnant women, and marginalised groups including adult prisoners and young offenders, homeless men and drug users. Together these projects encompass male and female adults of all ages although the data show that some projects, such as community choirs, seem more likely to be attended by women than men. Where ethnic backgrounds and other demographic characteristics of participants were reported this revealed that the majority of participants were white and relatively well educated. However, a number of interventions were aimed specifically at other groups including males, marginalised groups including migrants and people in justice settings.

### Music and singing interventions

The most common form of intervention reported in over a third of studies was music listening, most often listening to music deemed to be relaxing. After that, just under a third of studies examined group singing, usually in the form of a weekly choir leading to performances. A small number of projects reported using musical instruments (for example Creech, et al. 2014, Dabback et al. 2008, Koelsh et al. 2010, Perkins & Williamon, 2013). Three of the interventions were led by music therapists and encompassed a range of activities including song-writing.

### Wellbeing measures

A wide variety of wellbeing measures were used, perhaps reflecting the fact that wellbeing is a relatively recent topic of study, with research on the impact of music and singing to date having been focused to some extent on health and clinical outcomes. Since April 2011 the ONS has measured personal wellbeing. The Annual Population Survey (APS) includes four questions which are used to monitor personal wellbeing in the UK:

Overall, how satisfied are you with your life nowadays?

Overall, to what extent do you feel the things you do in your life are worthwhile?

Overall, how happy did you feel yesterday?

Overall, how anxious did you feel yesterday?

The measures used in the review studies reflect some of these domains to some extent. A number of studies measured anxiety using The State-Trait Anxiety Inventory (STAI), a commonly used measure of trait and state anxiety (Spielberger et al. 1983). A small number of studies used the Profile of Mood States (POMS) (McNair et al. 1971) which asks participants to respond to 65 words or statements that describe a range of positive and negative feelings. Other wellbeing measures included the Friedman Wellbeing Scale (FWBS) (Friedman, 1994), the York SF 12 (Iglesias et al. 2001) and SF 36 measure of mental health-related quality of life (McHorney et al. 1993), and the Hospital Anxiety and Depression Scale (HAD) (Snaith, 2003). Validated measures also encompassed many dimensions of psychological wellbeing, such as self-esteem, emotion, enjoyment, purpose in life, self-consciousness, loneliness, and mood. However, there was no consistency in how wellbeing was measured across the studies.

## Wellbeing outcomes reported

The diversity of the studies and the range of wellbeing measures used means that it is not possible to synthesise the literature as a whole. Rather, we have concentrated on different population groups across the life cycle including young adults, general population, older adults and other targeted healthy populations. While the music interventions, needs and outcomes for each of these sub populations are different, there are some commonalities in wellbeing outcomes reported across the studies.

### Young adults

Several studies of young adults were reported, often in educational settings. The largest of these was the study by Gupta (2005) who undertook a RCT to examine the effects on anxiety of listening to relaxing music daily for 20 days on 80 male postgraduate students aged 19-24 years. In the intervention group, significant decreases were found in state anxiety ( $p < .05$ ) and trait anxiety ( $p = p < .01$ ) using the STAI and the Four Factor Anxiety Inventory respectively. Significant changes were not found for the control group.

Some of the studies tested the effects of listening to different types of music as well as the effects of music generally. Burns et al. (2002) examined the effects of music listening on relaxation in 60 male and female undergraduate students. Relaxation ratings were significantly higher for participants in own choice music ( $p < .001$ ), classical music ( $p = .001$ ) and silence ( $p = .001$ ) conditions compared to a hard rock condition. State anxiety scores for these groups all significantly decreased compared to the hard rock group.

Some of these studies compared music with other activities. Campion & Levita (2014) compared brief 5 minute periods of music, dancing, cycling or sitting quietly in a study of 56 male and female (n=47) undergraduate students. Mood was measured using the Subjective Exercise Experiences Scale (SEES). Significant increases in positive affect were noted for dancing ( $p = 0.002$ ) and music ( $p=0.003$ ), but cycling and sitting quietly had no effect on positive mood. Valentine & Evans (2010) undertook a non-random pre and post-test assessment of 33 participants engaged in 30 minutes sessions of solo singing, group singing and swimming. Improved mood was noted for all participants, with the strongest changes for swimming.

Other studies examined music as an adjunct to exercise. For example, in a study of 26 male and female sport and exercise students Baldari et al. (2010) found that listening to music through headphones while running on a treadmill was associated with a significant reduction in anxiety compared to running with no music ( $p<0.05$ ,  $d=0.80$ ). Similarly, Aloui et al. (2015) who found improvements in cognitive anxiety in 9 male physical education students following a warm up and shuttle run test with music.

Most of the studies of young adults focused on music listening. However, Koelsh et al. (2010) undertook a RCT to examine the effects of music making in which male and female participants aged 19-31 ( $m=24.4$ ) played along to joyful recorded music. Post activity assessment using the POMS and measures of depression, anxiety, fatigue and vigour showed significant changes, particularly for depression/anxiety. Mean scores in the music group decreasing significantly ( $p < .0001$ ) from 6.57 (SD=8.01) to 3.51 (SD=5.91). No significant changes were reported for the control group. Vigour increased in the music group but not in the control group while irritability increased in the control group but not in the music group. Bensimon and Gilboa (2010) tested the effects of Musical Presentation (MP) – a seven week programme in which participants present themselves to a small group of peers through chosen pieces of music – in a study of 52 male and female criminology students. The intervention group reported significant increases on a measure of Purpose in Life ( $p<0.01$ ).

### *General studies of adults*

Six studies were of general adult populations. The largest of these was by Boothby & Robbins (2011) who compared music listening with no music and an arts activity in 60 male (n=19) and female (n=41) adults aged between 18 and 55. The music condition was associated with significantly reduced negative moods, measured using the Profile of Mood States and STAI-S ( $p<.01$ ) compared with other conditions. Carissoli et al. (2015) undertook a study of 56 employed adults aged 20-52, comparing a 15 minute mindfulness meditation

with 15 minutes of listening to relaxing music. Although no significant differences were found on a validated measure (Mesure du Stress Psychologique) both groups reported reductions in stress. Kreutz (2014) undertook a naturalistic controlled experiment where 40 choir participants were tested using ad hoc measures of wellbeing in a singing condition and, a week later, a chatting condition. Positive feelings increased significantly after both singing and chatting, while negative feelings decreased significantly after singing but not after chatting.

Adult population studies included qualitative research with small samples. Judd and Pooley (2013) undertook qualitative interviews with 10 members of community choirs. Themes that emerged included positive emotions and group bonding. The study also examined mediating factors, noting that choir ethos and group dynamics had a bearing on wellbeing outcome, as did previous experience of singing, choir characteristics and the capabilities and qualities of the musical director. Dabback (2008) explored experiences of music making in five focus groups with members of a community ensemble. Participants' accounts suggest that communal engagement provides structure, connection and a sense of purpose. Volunteers emphasised the spiritual, physical and mental health benefits they gained from participation. Field et al. (1997) undertook a repeated measures study comparing 10 minute sessions of music, relaxation and social support with 100 hospital employees aged 22-38 (64 were female). All groups reported decreases in anxiety, depression, fatigue, and confusion. Joseph and Southcott (2014, 2015a, 2015b) undertook three qualitative case studies of members of community choirs, including an all-female choir, an all-male choir, and a choir made up of migrants to Australia from Bosnian and Croatia. A number of themes are reported including musical self-identity, purpose, engagement, happiness and social connections. Belonging to musical ensembles was seen as enabling participants to achieve, connect with their heritage and culture, and to develop notions of themselves as musicians and performers.

### *Older people*

The strongest evidence has been identified from studies of music and singing with older people. Two relatively large studies were identified. Coulton et al. (2015) undertook a pilot pragmatic randomised control trial comparing group singing with usual activities in 258 older participants (mean age = 69 years, 84% were female and 98% White). The intervention group took part in a 14 week programme of weekly singing sessions of 90 minutes led by experienced facilitators. Mental health-related quality of life was assessed at baseline, at 3 months and at 6 months post randomisation. At 6 months, significant differences were observed in terms of mental health-related quality of life in favour of group singing. Mean scores for the control group changed from 50.0 (95% CI 47.9–52.2) to 49.9 (48.2–51.7). In

the intervention groups mean scores were 48.8 (46.8– 50.8) at baseline and 52.3 (50.7– 54.0), a mean increase of 2.35 (0.06–4.76) which was significant ( $p=0.05$ ). This study builds on a previous study by Cohen et al. (2006) who researched 166 people aged over 64 who took part in a weekly choral singing group over a period of one year. While the selection and assignment of participants to intervention and control groups was not random, participants were carefully selected from the same community settings, programmes and neighbourhoods. A high degree of comparability was established, further mitigating problems caused by the selection process. The researchers measured morale and loneliness using the Philadelphia Geriatric Center Morale Scale, the Loneliness Scale-III and the Geriatric Depression Scale–Short Form. Significant differences between the groups from baseline to 12 month follow up include morale, loneliness and depression. Because of the exploratory nature of the study, differences between group statistics are reported at the  $p<0.10$  level of significance. Both groups evidenced a slight decline in morale and loneliness over 12 months. Mean scores for morale in the intervention group were 14.15 (SD=2.42) at baseline and 14.08 (SD= 2.66) at follow up. This was compared with a change from 13.51 (SD=3.07) to 13.06 (SD=3.29) in the control group. For loneliness, mean scores for the intervention group changed from 35.11 (SD=8.09) to 34.60 (SD = 7.86), compared with a change from 38.26 (10.07) to 37.02 (SD = 10.33). Hence in both instances the decline was steeper for the comparison group. The intervention group also showed reduced risk of depression and increased activity levels after 12 months.

These findings are repeated in smaller quantitative studies. Chan et al. (2011) studied the effects of eight weeks of music listening on depression scores in 52 adults over 55 (64% were female). There were significant improvements in depression scores for the music group over eight weeks. On the other hand, there was significant reduction in the depression scores over the eight week for the music group ( $p = 0.016$ ). Lee et al. (2010) compared weekly music listing sessions of 30 minutes duration with usual activities with 66 adults aged 65 or older in a community setting. In week 4, statistically significant differences were found between the two groups on all subscales of the SF-36 Version 2 including vitality ( $P < 0.0001$ ), social functioning ( $P < 0.0004$ ), role emotional ( $P = 0.0005$ ) and mental health ( $P = 0.0007$ ). In a similar study, Chan et al. (2010) assessed the effects of listening to relaxing music for 30 minutes a week on 42 male and female older participants in a community setting. In the experimental group, there were significant reductions in depression, measured on the Geriatric Depression Score (GDS-15) after four weeks ( $p<.001$ ) while the control group showed no significant changes.

Mixed methods and qualitative studies also reported wellbeing outcomes of music and singing for older people. Creech et al. (2014) used mixed methods including open questions on a questionnaire to explore experiences of community music (singing and playing instruments) on 398 adults. The age range was from 43 – 92 years but almost a quarter

were aged over 75. 80% were female and most participants were White. The authors report that through music many older people were able to formulate clear and valued versions of their possible future 'musical selves'. This seemed to help them navigate challenges in later life and enhanced their subjective wellbeing by providing a sense of purpose, a significant degree of autonomy and a strong sense of social affirmation. Perkins & Williamson (2013) undertook a mixed methods study using pre and post assessment of 98 older participants (mean age = 67.87, 86% female) following instrumental lessons provided by a music conservatory. A comparison group undertook workshops organised by the University of the Third Age. Wellbeing was assessed by the 7 item short WEMWBS and the Health-Promoting Lifestyle Profile II (HPLPII). After 10 weeks Wellbeing scores improved significantly for all groups. Analysis of qualitative interviews revealed six themes: pleasure; social interactions; musically-nuanced engagement in day-to-day life; fulfilment of musical ambition; ability to make music; and self-satisfaction through musical progress. Solé, et al (2010) undertook pre and post project assessment of 83 older adults living independently in the community (average age = 72.6, over three quarters were female), comparing singing in a choir, music appreciation and preventive music therapy. Participants in all conditions perceived improvements in some aspects of their quality of life although no significant pre and post intervention changes in quality of life were recorded.

Qualitative research on music and singing with older people has reported a number of wellbeing related themes. Skingley et al. (2015) report on a qualitative study that was nested in an RCT. 128 participants were surveyed about their views in relation to participation in a regular singing group. Participants gave written feedback part way through the programme and at the end. Complete data were available for 65 participants. Interviews were undertaken with 19 participants. Participants rated the programme positively and reported improvements in mental wellbeing attributed to singing. The majority of comments were positive although one participant who completed the programme said that singing made him feel miserable.

Other themes from qualitative research on music and singing with older adults include pleasure, happiness, purpose, connection and identity. Baker and Ballantyne (2013) report on a song-writing project with eight participants living in a retirement village. They suggest that participants were highly engaged and gained pleasure and satisfaction from the activity. Hayes and Minichiello (2005) explored the role of music in everyday life with 38 older men and women in rural and urban settings. Music was reported as providing inner happiness and having strong spiritual significance. Music was described by informants as allowing them to engage in imaginative play and to escape from some of the hardships experienced in later life. Lally (2009) undertook qualitative study with 26 participants aged

51-88 who took part in a 30 week programme of singing workshops. Participants reported benefits of weekly singing including social wellbeing, reduced isolation and creativity.

### *Other populations*

A number of the studies were focused on particular segments of the healthy adult population. We found several studies that focused on offender populations, marginal groups including homeless people and migrants, and pregnant women.

Five studies examined music and singing interventions in justice settings. The largest study was by Gold et al. (2014) who undertook a pilot RCT to assess the effects of group music therapy sessions on anxiety and depression in 100 prisoners. Methodological difficulties meant that data were incomplete, however, anxiety states appeared to improve in the experimental group. Bensimon et al (2015) compared daily exposure to relaxing music with no music in a study of 48 adult prisoners. After three weeks, State-Trait Anxiety Inventory (STAI) measures improved substantially for the treatment group but not for the comparison group. Cohen (2009) undertook a repeated measures study on a non-random sample of 20 adult prisoners, 10 of whom performed in a choir while the other 10 continued with usual activities. Wellbeing scores improved for both groups although choir participants reported positive experiences of singing and performing. Anderson and Overy (2010) found increases in self-esteem scores in 19 male young offenders in a custodial setting following a 10 week music programme. The changes in self-esteem were also noted in a group undertaking education activity. Decreased post-project emotion scores were noted for participants in music and art activities. This is attributed possibly to participants' disappointment that the project was coming to an end. Qualitative research on music and singing interventions in justice settings was undertaken by Henley et al. (2012) with 15 prisoners who had taken part in a Gamelan music project. Participation was observed as acting as a catalyst for positive change and enhancing personal wellbeing in the form of confidence, self-expression and coping.

Bailey and Davidson (2002) undertook a qualitative study of seven participants in a choir for homeless men, who reported benefits across four categories including therapeutic benefits, audience-choir reciprocity, group process and mental engagement. Li (2012) undertook a qualitative study of 8 members of a singing group who were born in China and living in Australia. Themes included emotional wellbeing (enjoyment and relaxation) and belonging through connection with the past and shared interests with others.

Chang et al. (2008; 2015) assessed the effects of listening to relaxing music for 30 minutes a day for two weeks in two studies of 241 pregnant women expected to have a normal vaginal

delivery (n=241 and n=320 respectively). In the 2008 study, the intervention was associated with significant reductions in stress, anxiety and depression ( $p<0.001$ ;  $p<0.01$ ;  $p<0.001$  respectively) as measured on the Perceived Stress Scale (PSS), the State Scale of the State-Trait Anxiety Inventory (S-STAI) and the Edinburgh Post Natal Depression Scale. In the 2015 study, there were significant differences between pre-test and post-test stress as measured by the Pregnancy Stress Rating Scale (PSRS) but not for when measured using the Perceived Stress Scale (PSS). Carolan (2012) undertook a qualitative study of 6 pregnant women who took part in a lullaby singing project. Participants enthusiastically supported the intervention. Key themes were reported including connection, communication, reduced stress, confidence and foetal attachment.

## Discussion

### Summary of key findings

The strongest evidence surrounds music and singing for older people and includes effects of music, particularly singing, on morale, mental health-related quality of life, loneliness, anxiety and depression. There is also moderate quality evidence for wellbeing outcomes of music and singing for specific sub groups including young adults, marginalised groups and people in justice settings. Outcomes for these groups include changes in mood, anxiety and sense of purpose.

### Qualitative themes

The qualitative studies explored wellbeing using a diverse range of themes. However, there were some common elements. These are grouped into three categories:

*Personal wellbeing.* This was captured in a number of ways including enhancing positive emotions, confidence and self-esteem, experiencing happiness, enjoyment and pleasure, having a sense of meaning and purpose, enjoyment and experiencing spiritual dimensions of wellbeing. It also included reducing negative emotions.

*Social wellbeing:* almost all the qualitative studies reported social impacts of music and singing as being important to participants. These were described in various themes including: connection, social affirmation, interaction skills, group bonding and enjoying shared interests

*Identity* was a theme which emerged from several in-depth qualitative studies. This theme seems to have both personal and social components, represented by: connecting with the

past, being part of a community, celebrating a shared culture and heritage, as well as forging new, musical identities.

The evidence is summarised below.

*There is high quality evidence that:*

In young adults over the age of 18:

Listening to music can alleviate anxiety and improve wellbeing.

In older people:

Regular group singing can enhance morale and mental health-related quality of life and reduce loneliness, anxiety and depression compared with usual activities.

Participatory singing can maintain a sense of wellbeing and is perceived as both acceptable and beneficial for those taking part.

Engagement in music activities can help older people to connect with their life experiences and with other people, and be more stimulated.

Singing can maintain a sense of wellbeing in healthy older people.

In other population groups:

Structured music therapy can reduce the intensity of stress, anxiety and depression in pregnant women

*There is moderate quality evidence that:*

In young adults over the age of 18:

Short duration listening to music can enhance mood.

Listening to music during exercise may enhance the positive effects of physical activity on state anxiety.

In healthy adults:

Music interventions can enhance participants' sense of purpose in life.

Listening to music can reduce stress, negative mood and state anxiety in healthy adults.

Regular listening to particular genre of music can alleviate anxiety, stress and depression in males.

In older people:

Listening to music may act as an effective intervention to prevent or reduce depression. Singing in a community choir can provide positive musical and social experiences. Membership of a choir or musical ensemble can provide a vehicle for identity construction and revision in later life, including people with little or no previous experience of music. Song-writing and performing can contribute to happiness in older people. Performing and sharing their songs with others can be significant and meaningful to them. Music can help older people to develop self-identity, or connect with other people, expressing spirituality and reminisce.

In other population groups:

Participants from marginalised groups value the benefits of group singing and the opportunity to learn, build relationships and engage in a meaningful exchange with the wider community.

Listening to relaxing music can alleviate anxiety and anger in prison populations.

*There is low quality evidence that:*

In healthy adults:

Group singing can foster happiness as well as provide musical and social benefits. Brief group singing can enhance perceived psychological wellbeing.

Being a member of a music ensemble can enhance subjective wellbeing, support the development of musical identity and a sense of purpose.

Brief music and non-music interventions can decrease stress and enhanced wellbeing in the workplace.

In older adults:

Learning music may help to realize long-held ambitions and promote spiritual growth. Older adults are motivated to participate in musical activities to broaden their social networks and to learn.

## In other population groups

Music and singing projects for young offenders are valued by participants and have a positive effect on self-esteem. Participatory music making, singing and particularly performing in public, can support prison inmates' perceived wellbeing.

Active music making in community choirs and music ensembles may be an effective way to support individuals from marginal communities, enabling them to build a sense of community and share culture and heritage.

Listening to relaxing music can enhance wellbeing and mood in pregnant women

## Exploratory Meta-Analysis

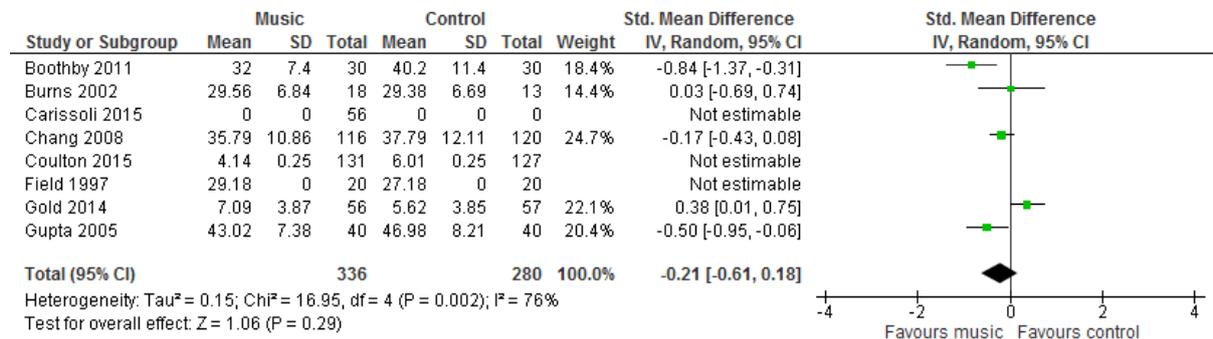
### Meta-analysis methods

We tabulated characteristics and results of all included studies (see table 2). Analysis was quantitative where possible. We chose anxiety and depression to conduct exploratory meta-analyses as several of the included studies reported these. All outcomes were continuous measures. When standard errors, ranges or 95% confidence intervals were provided, standard deviations were calculated using standard formulae. Where no measure of spread was given the study was still entered. We used Review Manager (version 5.3.5, Cochrane Library) for the meta-analyses. We used random-effects models because of heterogeneity of participants and interventions. A variety of anxiety and depression outcome measurement scales were used in the studies so we used standardised mean differences (SMD) as the meta-analysis metric. There were insufficient studies reporting the same outcome to warrant risk of publication bias assessment by use of funnel plots.

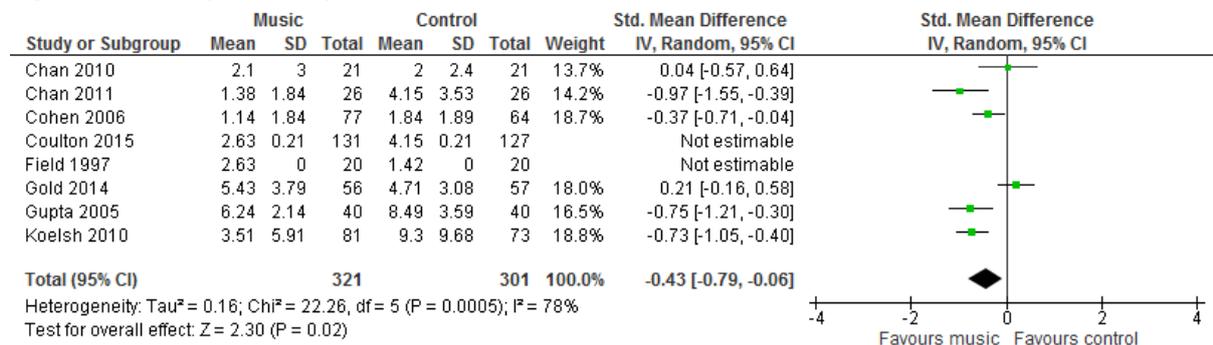
### Meta-analysis results

Five studies contributed to the meta-analysis on anxiety and six studies contributed to the meta-analysis on depression. Music had no statistically significant effect on anxiety (SMD -0.21 (95%CI -0.61 to +0.18)) but improved depression at follow up (-0.43 (95%CI -0.79 to -0.06)). Heterogeneity was high for both anxiety and depression, with  $I^2$  varying between 76% and 78%.

**Figure 1. Forest plot of anxiety outcome results**



**Figure 2. Forest plot of depression outcome results**



## Meta-analysis discussion points

Our exploratory meta-analysis suggests that music participation in healthy people can reduce depression, but has no effect on anxiety. It is possible that music has a small effect on anxiety and the few studies available may not be sufficient to demonstrate this. There was a large amount of heterogeneity and to mitigate this we used random effects models, although this approach only partly removes effects of heterogeneity (Khan et al., 2011).

## Completeness of the included evidence

A challenge for this review has been the large number of returned citations following searches for music and singing interventions that support wellbeing despite the use of a focused protocol using specific inclusion and exclusion criteria. This reflects the burgeoning research in this topic over the last 20 years. As a consequence, we have had to limit the scope of the review to focus on interventions with healthy adults and we have concentrated on higher quality research designs. However, there is some overlap between the H1, H2 and U populations and also some overlap between music and singing interventions for wellbeing and those that are linked with clinical procedures. In reality, many of the H1 studies

included people with mental and physical health conditions although this was not systematically recorded, so it is difficult to assess the impact of underlying health conditions on participation and outcomes. In view of these challenges it is possible that some relevant evidence has not been included in this report.

## Quality of the included evidence

The review includes a range of study designs including 15 randomised control trials and 10 quasi experimental studies and 14 in-depth qualitative studies. There were some methodological challenges noted including small sample sizes in some of the quantitative studies and limited theoretical analysis in a small number of qualitative studies. However, the bulk of the studies were rated as being of moderate to high quality by the research team.

The nature of the interventions meant that there were some inherent challenges including intervention fidelity, although this was reported on in several studies. Clearly it is not possible to blind participants in studies of music and singing. Beyond this, there were a number of methodological challenges including sampling and recruitment of participants, setting for the intervention, and use of appropriate measures.

Sample sizes in the quantitative studies ranged from 9-320. While several studies report reasonably large samples of over 100 (Chang et al. 2008, 2015, Cohen et al., 166, Coulton et al. 258, Gold, et al. 113, Koelsh et al. 2010, Skingley et al. 2015) there were also a substantial number of studies where there were less than 20 participants in the intervention group.

Many studies report difficulties in recruiting and retaining sufficient numbers of participants to research music and singing interventions and also challenges of ensuring representation from diverse population groups (Cohen, 2006). This was sometimes a consequence of the geographical location of the study (Coulton et al. 2015). Attrition was an issue in several studies. Further, many of the study populations were self-selecting and it is not possible to say whether findings from these studies can be generalised to other areas with different demographic characteristics.

A further limitation relates to the context and setting of some studies, such as those in specific exercise performance or education settings. It is not clear whether the findings from these studies are generalizable to other settings or apply in everyday life.

Most of the quantitative studies used appropriate and valid measures, however, the diversity of outcomes means that it is not possible to synthesise the evidence.

Limitations in the qualitative studies relate to sampling, data collection and reflexivity. There were very small numbers of participants in some studies and a lack of representation from diverse population groups. Limitations also relate to data analysis: although well reported in some studies, it was not always clear how themes were identified and developed and it was not always apparent that conclusions emerged from comprehensive data treatment. Some studies made a clear attempt to search for disconfirming cases (see Skingley et al. 2015) but many studies focused only on the positive impacts of music and singing. Further, there was a tendency in some studies to rely on face value reporting of participants' accounts rather than developing latent forms of thematic analysis where appropriate (Braun & Clarke, 2006).

Most studies obtained appropriate ethics approval, although in the case of some older studies this was not stated, which is a reflection on changes in research governance requirements rather than a reflection of the ethical standards of the research. Reflexivity was an issue in some studies, with few details provide of the researcher's role, potential bias and influence on sample recruitment, setting and responses of participants.

Limitations in the qualitative studies also related to reporting of outcomes. While higher quality studies explored themes and processes in depth, there was a tendency in weaker studies to make claims for the music and singing outcomes that were beyond what could be demonstrated by the qualitative research design.

## Strengths and Limitations of the review process

The comprehensive search strategy ensures that this overview represents a comprehensive summary of all existing eligible studies published prior to the search dates and the pre-publication of our protocol on PROSPERO ensures methodological transparency and militates against potential post-hoc decision making which can introduce bias to the process. Dual screening of searches and data extraction and independent quality assessment of included reviews ensured a rigorous process.

Taking published studies as the sole evidence increases the potential risk of publication lag, wherein possible important new evidence that has not yet been included in published reports is not identified and included.

The use of the GRADE and CERQual criteria introduces an element of subjective judgement. A consistent approach to judgements across the different interventions has been applied but it should be recognised that these judgements are open to interpretation.

## Implications for policy and practice

There is high quality evidence that music and singing activities can enhance and maintain subjective wellbeing in healthy adults. The highest quality evidence supports the promotion of group singing and music programmes. In particular, there is convincing evidence that participatory music and singing programmes can help to maintain wellbeing and prevent isolation, depression and mental ill health in older adult age groups. There is, therefore, evidence to support the development of policy and continuation of support for music and singing interventions for wellbeing outcomes for this group. .

There is also high quality evidence that listening to music can improve wellbeing in other groups: for example, alleviating anxiety in young adults, who have to date been relatively neglected in debates and programme development around music, arts and wellbeing, and reducing anxiety in pregnant women.

Further, there is moderate quality evidence for wellbeing outcomes of music and singing for specific sub groups including, marginalised groups and people in justice settings and further developments. Addressing issues of context, social diversity and wellbeing inequalities represents an important focus point for policy and practice agendas on music singing and wellbeing.

## Implications for research

A key challenge for establishing evidence in this field is the breadth and diversity of projects and research approaches adopted. Studies included in this review encompass a wide range of music and singing activities in delivery formats that range from very brief interventions lasting less than half an hour to projects lasting a year as well as ongoing participation over several years. More research is needed to understand the relationship between music activity and wellbeing over time. Furthermore, there is scope for additional well-designed evaluations and robust research studies which examine music and singing interventions other than group singing, playing and listening. It is particularly important to understand which specific components work and do not work to improve wellbeing outcomes in terms of duration, type and delivery formats and to understand the processes by which wellbeing outcomes are achieved. Qualitative research in this field needs to move beyond descriptive reporting of participant responses to analyse and report on conflict and challenges associated with music, singing and wellbeing projects.

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## Appendix 1: Data Extraction Form

<b>Title, Author, year</b>		
<b>Study objectives</b>		
<b>Study design</b>		
<b>Method of allocation to study group</b>		
<b>Measures of wellbeing</b> (Include scale(s) used and time-points)		
<b>Details of analysis</b> (Include type of analysis i.e. quantitative/qualitative/mixed, and method and/or process of analysis e.g. thematic analysis/statistical analysis, any subgroup analysis and any methods used in the treatment of missing data)		
<b>Participants included (at baseline and follow up in each group)</b> (Source/recruitment, eligible and selected, number, age restrictions, gender)	Intervention	Comparator
<b>Intervention(s) and comparison group(s)</b> (Type, content, intervener, duration, method, mode or timing of delivery)		
<b>Results</b> (Key numerical results including proportions experiencing relevant outcomes in each group, means, medians, standard deviations, ranges and effect sizes with precision estimates e.g. confidence intervals/ p values whether or not significant [if P values are not reported this should be stated]. For qualitative data what categories/themes were found, results drawn by authors and evidence provided. Identify any inadequately reported missing data)		
<b>Protected characteristics</b> (methods and findings that relate to protected characteristics [age, sex, gender reassignment, sexual orientation, disability, race, religion, pregnancy/maternity, marriage/civil partnerships] and income and/or socio-economic status.		
<b>Limitations identified</b>		
<b>Review conclusions</b> (for each comparison made)		

Conflicts of interest and sources of funding	
Ethical procedures reported	
Grade/CERQual Rating	

**GRADE and CERQual for judging certainty / quality of evidence**

**Quantitative: Grade**

Type of evidence	Randomized trial = high Observational study = low Any other evidence = very low
Decrease grade if (Each quality criteria can reduce the quality by one or, if very serious, by two levels.)	<ul style="list-style-type: none"> <li>• Serious or very serious limitation to study quality (e.g. Important inconsistency; major uncertainty about directness; imprecise or sparse data; high probability of reporting bias)</li> </ul>
Increase grade if	<ul style="list-style-type: none"> <li>• Strong evidence of association—significant relative risk of &gt; 2 (&lt; 0.5) based on consistent evidence from two or more observational studies, with no plausible confounders (+1)</li> <li>• Very strong evidence of association—significant relative risk of &gt; 5 (&lt; 0.2) based on direct evidence with no major threats to validity (+2)</li> <li>• Evidence of a dose response gradient (+1)</li> <li>• All plausible confounders would have reduced the effect (+1)</li> </ul>
Grade Rating / Range	High quality evidence Moderate quality evidence Low quality evidence Very low quality evidence

**Qualitative: CERQual**

Increase confidence if	<ul style="list-style-type: none"> <li>• Study is well designed with few limitations</li> <li>• Evidence applicable to context (perspective or population, phenomenon of interest, setting) specified in objectives</li> <li>• Findings/conclusions supported by evidence and provide convincing explanation for patterns found</li> <li>• Data supporting findings is rich and good quality</li> </ul>
Decrease confidence if (Each quality criteria can reduce the quality by one or, if very serious, by two levels)	<ul style="list-style-type: none"> <li>• Serious or very serious limitations in design or conduct of the study</li> <li>• Evidence is not relevant to the study objectives</li> <li>• Findings/conclusions are not supported by the evidence</li> <li>• Data is poor quality and inadequate to support findings</li> </ul>
CERQual Confidence Rating / Range	<p><b>High confidence</b> It is highly likely that the review finding is a reasonable representation of the phenomenon of interest</p> <p><b>Moderate confidence</b> It is likely that the review finding is a reasonable representation of the phenomenon of interest</p> <p><b>Low confidence</b> It is possible that the review finding is a reasonable representation of the phenomenon of interest</p> <p><b>Very low confidence</b> It is not clear whether the review finding is a reasonable representation of the phenomenon of interest.</p>

## Appendix 2 Reasons for Exclusions

### Reasons for Exclusion:

- **Population** - Does not include the population of interest i.e. adult participants, worldwide, healthy or unhealthy, excluding paid professionals
- **Outcome** - Does not include outcomes of interest i.e. subjective wellbeing measured as an outcome measure using a recognised measure/method
- **Intervention** - Does not include interventions of interest i.e. interventions focused on music or singing including listening, performing and music therapy offered to enhance wellbeing (Excluding clinical music therapy, clinical procedures, medical tests and diagnostics)
- **Study design** – Is not a study design of interest i.e. primary study with empirical data of wellbeing outcomes and processes by which wellbeing outcomes are achieved. Quantitative, qualitative or mixed methods. Published between 1996-2016
- **Comparator** – does not use a comparator e.g. no music or signing, white noise, usual routine i.e. inactive comparator
- **H2/U-** The population have either a long term conditions but are not undergoing active treatment, e.g. cancer survivors (H2), or are unhealthy (U) (people undergoing treatment including rehabilitation that is under clinical supervision). – these populations will be assessed in a later review

Authors	Year	Reason for Exclusion
AkmeÅŸe, Zehra Baykal; Oran, Nazan Tuna	2014	Intervention
Albertazzi, Liliana; Canal, Luisa; Micciolo, Rocco	2015	Intervention
Augé,P. M.; Mercadal-Brotons, M.; Resano, C. S.	2015	Comparator
Ballantyne, Julie; Baker, Felicity A.	2013	Outcome
Batt-Rawden, KB; Tellnes, G.	2005	Intervention
Baumann, Matt; Peck, Simon; Collins, Carrie; Eades, Guy	2013	Intervention
Baumgartner, T.; Esslen, M.; Jancke, L.	2006	Outcome
Baumgartner, Thomas; Willi, Matthias; Jaencke, Lutz	2007	Outcome
Beekman, Aartjan T. F.; Smit, Filip; Stek, Max L.; Reynolds, Charles F., III; Cuijpers, Pim C.	2010	Study design
Beesley, Kerry; White, Jennifer Helen; Alston, Megan K.; Sweetapple, Anne L.; Pollack, Michael	2011	Intervention
Belgrave, Melita	2009	Intervention
Bell, Beth T.; Lawton, Rebecca; Dittmar, Helga	2007	Intervention
Bellieni, C. V.;Ceccarelli,D.;Rossi,F.;Buonocore,G.;Maffei,M.;Perrone,S.;Petraglia,F.	2007	Outcome

Bergstrom,Ilias;Seinfeld,Sofia;Arroyo-Palacios,Jorge;Slater,Mel;Sanchez-Vives,Maria V.	2014	Outcome
Bertsch, Sharon; Knee, H. Donald; Webb, Jeffrey L.	2011	Intervention
Bittman, B. B.; Berk, L. S.; Felten, D. L.; Westengard, J.; Simonton, O. C.; Pappas, J.; Ninehouser, M.	2001	Intervention
Blais-Rochette, Camille; Miranda, Dave	2016	Intervention
Bodner, Ehud	2014	Outcome
Bodner, Ehud; Bensimon, Moshe	2015	Intervention
Boyd-Brewer, Chris; McCaffrey, Ruth	2004	Intervention
Bradt, Joke; Dileo, Cheryl	2010	Study design
Bradt, Joke; Dileo, Cheryl	2009	Study design
Bradt, Joke; Dileo, Cheryl; Grocke, Denise; Magill, Lucanne	2011	Study design
Bradt, Joke; Dileo, Cheryl; Potvin, Noah	2013	Study design
Brattico,Elvira;Alluri,Vinoo;Bogert,Brigitte;Jacobsen,Thomas;Vartiainen,Nuutti;Nieminen,Sirke;Tervaniemi,Mari	2011	Intervention
Brattico,Elvira;Bogert,Brigitte;Alluri,Vinoo;Tervaniemi,Mari;Eerola,Tuomas;Jacobsen,Thomas	2016	Intervention
Brooks, A. W.	2014	Intervention
Brouwer, Anne-Marie; Hogervorst, Maarten A.	2014	Intervention
Budimčić, M.; Seke, K.; Krsmanović, S.; Živić, L.	2014	Intervention
Bullington, J.; Sjöström-Flanagan, C.; Nordemar, K.; Nordemar, R.	2005	Study design
Burgess, Melinda C. R.; Burpo, Sandra	2012	Outcome
Burns, Debra S.; Perkins, Susan M.; Tong, Yan; Hilliard, Russell E.; Cripe, Larry D.	2015	Outcome
Busch, Sally L.; Gick, Mary	2012	Comparator
Bygren, Lars Olov; Weissglas, Gosta; Wikstrom, Britt-Maj; Konlaan, Boinkum Benson;Grjibovski,Andrej;Karlsson,Ann-Brith;Andersson,Sven-Olof;Sjostrom,Michael	2009	Outcomes
Byrnes, SR	1996	Intervention
Cano, María del Carmen; Miró, Elena; Buela, Gualberto	2001	Outcome

Carbonell-Baeza, A.; Aparicio, V. A.; Martins-Pereira, C. M.;Gatto-Cardia,C. M.;Ortega,F. B.;Huertas,F. J.;Tercedor,P.;Ruiz,J. R.;Delgado-Fernandez,M.	2010	Intervention
Carolan,Mary;Barry,Maebh;Gamble,Mary;Turner,Kathleen;Masc arenas,Oscar	2012	Outcome
Carter, Travis J.; Gilovich, Thomas	2012	Intervention
Cassidy, Gianna; MacDonald, Raymond	2009	Intervention
Chang, En-Ting; Lai, Hui-Ling; Chen, Pin-Wen; Hsieh, Yuan-Mel; Lee, Li-Hua	2012	Outcome
Choi, Carolyn Mi Hwan	2010	Intervention
Choi, Carolyn Mi Hwan		Intervention
Chong, H. J.	2010	Comparator
Christensen, J. F.; Gaigg, S. B.; Gomila, A.; Oke, P.; Calvo-Merino, B.	2014	Outcome
Chuang, Chih-Yuan; Han, Wei-Ru; Li,Pei-Chun; Young, Shuenn-Tsong	2010	Outcome
Ciccarello, A.	2010	Comparator
Clair, A. A.	2002	Outcome
Clair, AA	1996	Outcome
Clements-Cortes, Amy	2013	Comparator
Clennon, Ornette D.; Kagan, Carolyn; Lawthom, Rebecca; Swindells, Rachel	2016	Intervention
Clift, SM; Hancox, G.	2001	Comparator
Cohen-Mansfield, J.; Marx, M. S.; Thein, K.; Dakheel-Ali, M.	2010	Outcome
Cohen-Mansfield, Jiska; Marx, Marcia S.; Freedman, Laurence S.; Murad, Havi; Thein, Khin; Dakheel-Ali, Maha	2012	Duplicate
Cohen, Annabel; Bailey, Betty; Nilsson, Thomy	2002	Intervention
Cooke, M.; Holzhauser, K.; Jones, M.; Davis, C.; Finucane, J.	2007	Comparator
Cox, Elissa; Nowak, Madeleine; Buettner, Petra	2014	Comparator
Cox, WM; Blount, JP; Rozak, AM	1998	Comparator

Crawford, Mike J.; Killaspy, Helen; Kalaitzaki, Eleftheria; Barrett, Barbara; Byford, Sarah; Patterson, Sue; Soteriou, Tony; O'Neill, Francis A.; Clayton, Katie; Maratos, Anna; Barnes, Thomas R.; Osborn, David; Johnson, Tony; King, Michael; Tyrer, Peter; Waller, Diana	2010	Intervention
Creech, A.; Hallam, S.; Gaunt, H.; Pincas, A.	2011	Study design
Creech, A.; Hallam, S.; Varvarigou, M.; McQueen, H.; Gaunt, H.	2013	Comparator
Crisp, Simon; O'Donnell, Matthew	1998	Population
Crouch, Alan; Robertson, Heather; Fagan, Patricia	2011	Population
Dadkhah, Asghar; Liu, Huashan	2012	No full text available from BL
Dann, R. N. J.; Mertens, W. C.	2004	Intervention
Dassa, Ayel et; Amir, Dorit	2014	Comparator
Davidson, Jane W.; Fedele, Julie	2011	Comparator
Davidson, Jane W.; McNamara, Beverley; Rosenwax, Lorna; Lange, Andrea; Jenkins, Sue; Lewin, Gill	2014	Comparator
Davison, Tanya E.; Nayer, Kanvar; Coxon, Selby; de Bono, Arthur; Eppingstall, Barbara; Jeon, Yun-Hee; van der Ploeg, Eva S.; O'Connor, Daniel W.	2016	Intervention
de Guzman, Allan B.; Satuito, James Cyril B.; Satumba, Miko Anne E.; Segui, Diego Rey A.; Serquiña, Faith, Evelyn C.; Serrano, Lawrence Jan P.; Sevilla, Madelyn D.	2011	Intervention
De L'Etoile, S. K.	2002	Comparator
Delphin-Combe, Floriane; Rouch, Isabelle; Martin-Gaujard, Geraldine; Relland, Solveig; Krolak-Salmon, Pierre	2013	Intervention
DuRousseau, Donald; Mindlin, Galina; Insler, Joseph; Levin, Iakov	2011	Outcome
Einarsdottir, Sigrun Lilja; Gudmundsdottir, Helga Rut	2016	Intervention
Eisendrath, Stuart J.; Gillung, Erin P.; Delucchi, Kevin L.; Chartier, Maggie; Mathalon, Daniel H.; Sullivan, Jude C.; Segal, Zindel V.; Feldman, Mitchell D.	2014	Intervention
El Haj, Mohamad; Postal, Virginie; Allain, Philippe	2012	Outcome
Elefant, C.; Baker, F. A.; Lotan, M.; Lagesen, S. K.; Skeie, G. O.	2012	Comparator
Ellard, Kristen K.; Farchione, Todd J.; Barlow, David H.	2012	Intervention
Elliott, D.; Polman, R.; McGregor, R.	2011	No full text
Elliott, D.; Polman, R.; Taylor, J.	2014	Outcome

Elliott,Dave;Sander,Lindsay	2014	No full text
Engen,R. L.	2005	Study design
Erkkilä,Jaakko;Gold,Christian;Fachner,Jö;Ala-Ruona,Esa;Punkanen,Marko;Vanhala,Mauno	2008	Study design
Etzel,Josef A.;Johnsen,Erica L.;Dickerson,Julie;Tranel,Daniel;Adolphs,Ralph	2006	Intervention
Eyre,Lillian	2011	Comparator
Fachner,Jorg;Gold,Christian;Erkkila,Jaakko	2013	No full text
Ferguson,Yuna L.;Sheldon,Kennon M.	2013	Intervention
Flores Gutierrez,Enrique Octavio;Teran Camarena,Victor Andres	2015	No full text
Freeman,L.;Caserta,M.;Lund,D.;Rossa,S.;Dowdy,A.;Partenheimer, A.	2006	Outcome
Fresco,David M.;Mennin,Douglas S.;Moore,Michael T.;Heimberg,Richard G.;Hambrick,James	2014	Intervention
Friedman,B. H.;Stephens,C. L.;Thayer,J. F.	2014	Study design
Fritz,Thomas H.;Halfpaap,Johanna;Grahl,Sophia;Kirkland,Ambika;Villringer,Arn o	2013	Intervention
Frolov,M. V.;Milovanova,G. B.;Mekhedova,A. Ia	2005	Intervention
Froufe,M.;Schwartz,C.	2001	Intervention
Furnham,A.;Bradley,A.	1997	Outcome
Gadberry,A. L.	2011	Intervention
Gale,N. S.;Enright,S.;Reagon,C.;Lewis,I.;Van Deursen,R.	2012	Comparator
Gallagher,L. M.;Lagman,R.;Walsh,D.;Davis,M. P.;LeGrand,S. B.	2006	Intervention
Gao,Tian;O'Callaghan,Clare;Magill,Lucanne;Lin,Sisi;Zhang,Junhan; Zhang,Jingwen;Yu,Jiaao;Shi,Xiaomeng	2013	Comparator
Gayvoronskaya,E.;Shapovalov,D.	2010	Intervention
Gehrmann,Richard	2014	Study design
Gingras,B.;Pohler,G.;Fitch,W. T.	2014	Intervention
Gori,G.;Pientini,S.;Vespa,A.	2001	Intervention
Grant,M.	2005	Study design

Grape,Christina;Sandgren,Maria;Hansson,Lars-Olof;Ericson,Mats;Theorell,TÅ¶	2003	Comparator
Grocke,Denise;Bloch,Sidney;Castle,David	2009	Comparator
Groener,J. B.;Neus,I.;Kopf,S.;Hartmann,M.;Schanz,J.;Kliemank,E.;Wetekam, B.;Kihm,L.;Fleming,T.;Herzog,W.;Nawroth,P. P.	2015	No full text
Guerin,Pauline;Guerin,Bernard;Tedmanson,Deirdre;Clark,Yvonne	2011	Study design
Gutiérrez,E. O. F.;Camarena,V. A. T.	2015	Intervention
Habron,J.;Gordon,I.;Butterly,F.;Roebuck,A.	2012	No full text
Habron,John;Butterly,Felicity;Gordon,Imogen;Roebuck,Annette	2013	Outcome
Hallam,Susan;Creech,Andrea;McQueen,Hilary;Varvarigou,Maria; Gaunt,Helena	2016	Population
Hammar,Lena Marmstal;Emami,Azita;Engstrom,Gabriella;Gotell,Eva	2011	Comparator
Hammer,SE	1996	Intervention
Han,Peimin;Kwan,Melanie;Chen,Denise;Yusoff,Siti Zubaidah;Chionh,Hui Ling;Goh,Jenny;Yap,Philip	2010	Intervention
Hanser,Suzanne B.;Butterfield- Whitcomb,Joan;Kawata,Mayu;Collins,Brett E.	2011	Intervention
Harmat,Laszlo;Takacs,Johanna;Bodizs,Robert	2008	Outcome
Harmer,Barbara J.;Orrell,Martin	2008	Outcome
Harvey,Robin;Smith,Michael;Abraham,Nicholas;Hood,Sean;Tann enbaum,Dennis	2007	Study design
Hasegawa,Hiroki;Uozumi,Takashi;Ono,Koichi	2004	Not available from BL
Haslam, C.; Haslam, S. A.; Ysseldyk, R.; Mccloskey, L. -G; Pfisterer, K.; Brown,S. G.	2014	Outcome
Hays,Terrence	2005	Duplicate
Hays,Terrence;Minichiello,Victor	2005	Duplicate
Hays,Terrence;Minichiello,Victor	2005	Duplicate
Hernandez-Ruiz,E.	2005	Intervention
Hilliard,Russell E.	2004	Outcome

Hillier,Ashleigh;Greher,Gena;Poto,Nataliya;Dougherty,Margaret	2012	Comparator
Hills,P.;Argyle,M.	1998	Comparator
Im,M. L.;Lee,J. I.	2014	Intervention
Irle,Kevin;Lovell,Geoff	2014	Comparator
Iwaki,T.;Tanaka,H.;Hori,T.	2003	Outcome
Iwanaga,M.;Ikeda,M.;Iwaki,T.	1996	Comparator
Jallais,Christophe;Gilet,Anne-Laure	2010	Comparator
Janos,Kollar	2014	Study Design
Jenkins,Andrew	2011	Comparator
Jenkins,Andrew;Mostafa,Tarek	2015	Duplicate
Jiang,J.;Zhou,L.;Rickson,D.;Jiang,C.	2013	Comparator
Johnson,J. K.;Louhivuori,J.;Era,P.;Ross,L.;Stewart,A.	2012	Not available from BL
Johnson,Julene K.;Napoles,Anna M.;Stewart,Anita L.;Max,Wendy B.;Santoyo-Olsson,Jasmine;Freyre,Rachel;Allison,Theresa A.;Gregorich,Steven E.	2015	Study design
Jonas-Simpson,CM	2001	Comparator
Jonason,Peter K.;Webster,Gregory D.;Lindsey,A. Elizabeth	2008	Intervention
Jones,JD	2005	Comparator
Juslin,Patrik N.;Liljestrom,Simon;Laukka,Petri;Vastfjall,Daniel;Lundqvist,Lars-Olov	2011	Study design
Juslin,Patrik N.;Liljeström,Simon;Västfjäll,Daniel;Barradas,Gonçalo;Silva,Ana	2008	Intervention
Jutras,Peter J.	2006	Study design
Kafali,H.;Derbent,A.;Keskin,E.;Simavli,S.;Gözdemir,E.	2011	Intervention
Kallinen,K.;Ravaja,N.	2004	Intervention
Karaguen,Elif;Yildiz,Mustafa;Basaran,Zekiye;Caglayan,Cigdem	2010	Intervention

Kerer,Manuela;Marksteiner,Josef;Hinterhuber,Hartmann;Kemmler,Georg;Bliem,Harald R.;Weiss,Elisabeth M.	2014	Outcome
Kerr,T.;Walsh,J.;Marshall,A.	2001	Intervention
Khalfa,Stephanie;Dalla Bella,Simone;Roy,Mathieu;Peretz,Isabelle;Lupien,Sonia J.	2003	Outcome
Killoran,Sheila	2006	Not available from BL
Kluge,Mary Ann	2014	Study design
Knight,W. E. J.;Rickard,N. S.	2001	Study design
Koelsch,Stefan;Jaencke,Lutz	2015	Outcome
Koger,S. M.;Brotons,M.	2000	Study design
Kokotsaki,Dimitra;Hallam,Susan	2007	Population
Konieczna-Nowak,Ludwika	2015	Outcome
Koszarny,Z.	2001	Intervention
Kreutz,Gunter	2008	Intervention
Krout,R. E.	2007	Study design
Kunikullaya, Kirthana Ubrangala; Goturu, Jaisri; Muradi, Vijayadas; Hukkeri, Preethi Avinash; Kunnavil, Radhika; Doreswamy, Venkatesh; Prakash, Vadagenahalli S.; Murthy, Nandagudi Srinivasa	2015	Outcome
Kushnir,Jonathan;Friedman,Ahuva;Ehrenfeld,Mally;Kushnir,Talman	2012	Outcome
Ladinig,Olivia;Schellenberg,E. Glenn	2012	Study design
Lai,Hui-Ling;Chen,Pin-Wen;Chen,Chia-Jung;Chang,Hui-Kuan;Peng,Tai-Chu;Chang,Fwu-Mei	2008	Outcome
Lamont, Alexandra	2012	Population
Lamont, Alexandra	2011	Population
Leeds,J.	1996	Study design
Li,X.-X.;Yao,Y.	2005	Intervention
Liddle,J. L. M.;Parkinson,L.;Sibbritt,D. W.	2012	Comparator
Lingham, Joseph; Theorell, Tores	2009	Intervention
Michalos, Alex C	2005	Study design
MacIntosh,H. B.	2003	Study design

Macone, Damiano; Baldari, Carlo; Zelli, Arnaldo; Guidetti, Laura	2006	Intervention
Maratos, A. S.; Gold, C.; Wang, X.; Crawford, M. J.	2008	Study design
Marich, Jamie; Howell, Terra	2015	Intervention
Marley, J.E.; Searle, P.; Chamberlain, N.L.; Turnbull, D.R.; Leahy, C.M.	2001	Study design
Martinez, Juanita	2009	Intervention
Matthews, Steve	2015	Study design
McFerran, Katrina Skewes	2016	Study design
McLellan, Lucy; McLachlan, Emma; Perkins, Laurence; Dornan, Tim	2013	Population
Meeks, S.; Van Haitsma, K.; Kostiwa, I.; Murrell, S. A.	2012	Intervention
Meekums, B.; Vaverniece, I.; Majore-Dusele, I.; Rasnacs, O.	2012	Intervention
Mellor, Liz	2013	Population
Mischner, Isabelle H. S.; van Schie, Hein T.; Wigboldus, Daniel H. J.; van Baaren, Rick B.; Engels, Rutger C. M. E.	2013	Intervention
Mongrain, Myriam; Trambakoulos, John	2007	Outcome
Montello, L.; Coons, E.E.	1998	Population
Mori, Kazuma; Iwanaga, Makoto	2014	Intervention
Mossler, Karin; Chen, XiJing; Heldal, Tor Olav; Gold, Christian	2011	Study design
Nielzen, S.; Cesarec, Z.	1982	Study design
North, A.C.; Hargreaves, D.J.; O'Neill, S.A.	2000	Population
O'Callaghan, Clare	2012	Study design
Olson, B. K.	1984	Study design
Onishi, J.; Masuda, Y.; Suzuki, Y.; Gotoh, T.; Kawamura, T.; Iguchi, A.	2006	Intervention
Paton, Rod	2011	Study design
Pitts, Stephanie	2015	Study design
Ray, Kendra D.; Fitzsimmons, Suzanne	2014	Study design
Riley, Philippa; Alm, Norman; Newell, Alan	2009	Outcome
Roberts, Anne E. K.; Farrugia, Maria Daniela	2013	Population
Rohwer, Debbie	2010	Outcome

Schmid,Wolfgang;Ostermann,Thomas	2010	Study design
Shepherd,Daniel;Sigg,Nicola	2015	Study design
Sherratt,K.;Thornton,A.;Hatton,C.	2004	Intervention
Skingley,A.;Clift,S. M.;Coulton,S. P.;Rodriguez,J.	2011	Study design
Smith,C.;Viljoen,J. T.;McGeachie,L.	2014	Comparator
Stoyanov,Stoyan;Papinczak,Zoe;Dingle,Genevieve A.;Zelenko,Oksana;Hides,Leanne;Tjondronegoro,Dian	2013	Not available from BL
Vaag, Jonas; Saksvik, Per Oystein; Theorell, Tores; Skillingstad, Trond; Bjerkeset, Ottar	2013	Comparator
Vasionyte,Ieva;Madison,Guy	2013	Study design
Villaverde Gutierrez,Carmen;Torres Luque,Gema;Abalos Medina,Gracia M.;Argente del Castillo,Maria J.;Guisado,Isabel M.;Guisado Barrilao,Rafael;Ramirez Rodrigo,Jesus	2012	Intervention
Walsh,Sandra M.;Lamet,Ann R.;Lindgren,Carolyn L.;Rillstone,Pam;Little,Daniel J.;Steffey,Christine M.;Rafalko,Sharon Y.;Sonshine,Rosanne	2011	Intervention
Walsh,Sandra M.;Martin,Susan Culpepper;Schmidt,Lee A.	2004	Intervention
Williams,AM;Diehl,NS;Mahoney,MJ	2002	Intervention
Wu,Shiun-Jie;Tang,Hsin-Pei	2014	Not available from BL
Young-Mason,Jeanine	2012	Study design
Zanon,C. C. S.;Franca,B. A. L.;Campos,E. R. C.;Lima,M. B. B. P.;Lima,C.	2006	Not available from BL
Ziv,Naomi;Rotem,Tomer;Arnon,Zahi;Haimov,Iris	2008	Outcome

## H2 Populations

Augé, P. M.; Mercadal-Brotons, M.; Resano, C. S.	2015	H2
Baker, Felicity Anne; Rickard, Nikki; Tamplin, Jeanette; Roddy, Chantal	2015	H2
Batavia,A. I.;Batavia,M.	2003	H2
Batt-Rawden,K. B.	2010	H2
Batt-Rawden,Kari;Tellnes,Gunnar	2011	H2
Batt-Rawden, KB	2006	H2

Bekiroglu,Tansel;Ovayolu,Nimet;Ergun,Yusuf;Ekerbicer,Hasan Cetin	2013	H2
Bensimon,Moshe;Amir,Dorit;Wolf,Yuval	2012	H2
Bensimon,Moshe;Amir,Dorit;Wolf,Yuval	2008	H2
Camic,P. M.;Williams,C. M.;Meeten,F.	2013	H2
Chen,S. -L;Lin,H. -C;Jane,S. -W	2009	H2
Chen,Xi Jing;Hannibal,Niels;Xu,Kevin;Gold,Christian	2014	H2
Erkkila,Jaakko;Punkanen,Marko;Fachner,Jorg;Ala-Ruona, Esa;Pontio,Inga;Tervaniemi,Mari;Vanhala, Mauno;Gold, Christian	2011	H2
Haslam, C.; Haslam,S. A.; Ysseldyk, R.; Mccloskey, L. -G; Pfisterer, K.; Brown, S. G.	2014	H2
Hays, Terrence	2006	H2
Kim,Dong Soo;Park,Yoon Ghil;Choi,Jung Hwa;Im,Sang-Hee;Jung,Kang Jae;Cha,Young A.;Jung,Chul Oh;Yoon,Yeo Hoon	2011	H2
Lipe,A. W.;Ward,K. C.;Watson,A. T.;Manley,K.;Keen,R.;Kelly,J.;Clemmer,J.	2012	H2
Lord,V. M.;Cave,P.;Hume,V. J.;Flude,E. J.;Evans,A.;Kelly,J. L.;Polkey,M. I.;Hopkinson,N. S.	2010	H2
Lord,V. M.;Hume,V. J.;Kelly,J. L.;Cave,P.;Silver,J.;Waldman,M.;White,C.;Smith,C.;Tanner,R.;Sanchez,M.;Man,W. D. -C;Polkey,M. I.;Hopkinson,N. S.	2012	H2
Mandel,Susan E.;Davis,Beth A.;Secic,Michelle	2014	H2
McCaffrey, R	2011	H2
Mezey,G.;Durkin,C.;Krljes,S.	2015	H2
Narme,Pauline;Clement,Sylvain;Ehrle,Nathalie;Schiaratura,Loris;Vachez,Sylvie;Courtaigne,Bruno;Munsch,Frederic;Samson,Severine	2014	H2
Raglio,Alfredo;Bellelli,Giuseppe;Traficante,Daniela;Gianotti,Marta;Ubezio,Maria Chiara;Villani,Daniele;Trabucchi,Marco	2008	H2
Ragneskog, H.; Asplund,K.; Kihlgren, M.; Norberg,A.	2001	H2
Sakamoto, Mayumi; Ando, Hiroshi; Tsutou, Akimitsu	2013	H2
Sekhon,P.;Piccoud,I.;Wadibia,M.;Soni,S.;Dhairyan,R.	2014	H2
Sherratt,K.;Thornton,A.;Hatton,C.	2004	H2
Sixsmith, Andrew; Gibson, Grant	2007	H2
Solé,C.;Mercadal-Brotons,M.;Galati,A.;De Castro,M.	2014	H2
Sun,J.;Buys,N.	2013	H2

Sun,Jing;Zhang,Ning;Buys,Nicholas;Zhou,Zheng-Yuan;Shen,Shu-Ying;Yuan,Bao-Jun	2013	H2
Tamplin, Jeanette; Baker, Felicity A.; Jones, Bronwen; Way, Anneliis; Lee, Stuart	2013	H2
Warth,Marco;Keßler,Jens;Hillecke,Thomas K.;Bardenheuer, Hubert J.	2015	H2
Włodarczyk,N.	2007	H2
Wu,SM	2002	H2

**H1 Populations**

Ahmadi,Fereshteh	2013	U
Alexander,J. L.;Wagner,C. L.	2012	U
Beck,Bolette Daniels;Hansen,Ase Marie;Gold,Christian	2015	U
Bergold,Leila Brito;Titonelli Alvim,Neide Aparecida	2009	U
Boldt,S.	1996	U
Bonilha,Amanda Gimenes;Onofre,Fernanda;Vieira,Maria Lucia;Prado,Maria Yuka Almeida;Martinez,Jose Antonio Baddini	2009	U
Bozcuk,H.;Artac,M.;Kara,A.;Ozdogan,M.;Sualp,Y.;Topcu,Z.;Karaagacli,A.;Yildiz,M.;Savas,B.	2006	U
Bradt,J.;Potvin,N.;Kesslick,A.;Shim,M.;Radl,D.;Schriver,E.;Gracely, E. J.;Komarnicky-Kocher,L. T.	2015	U
Brooks,Dina;Sidani,Souraya;Graydon,Jane;McBride,Sandra;Hall,Leslie;Weinacht,Krisztina	2003	U
Buetow, Stephen A.; Talmage, Alison; McCann, Clare; Fogg, Laura; Purdy, Suzanne	2014	U
Bunketorp Käll,L.;Lundgren-Nilsson,Å.;Blomstrand,C.;Pekna,M.;Pekny,M.;Nilsson,M.	2012	U
Burns,D. S.	2001	U
Burns,SJl;Harbuz,MS;Hucklebridge,F.;Bunt,L.	2001	U
Camic, P. M.; Williams,C. M.; Meeten, F.	2013	U
Canga, Bernardo; Azoulay, Ronit; Raskin, Jonathan; Loewy, Joanne	2015	U

Cantekin, Isin; Tan, Mehtap	2013	U
Cevasco, Andrea M.; Kennedy, Roy; Generally, Natalie Ruth	2005	U
Chan, Moon Fai; Chung, Yuet Foon Loretta; Chung, Siu Wai Anne; Lee, On Kei Angela	2009	U
Chen, Chen-Jung; Sung, Huei-Chuan; Lee, Ming-Shinn; Chang, Ching-Yuan	2015	U
Chiang, Ling-Chun; Good, Marion; Daly, Barbara J.; Burant, Christopher J.; Lane, Deforia	2015	U
Choi, Ae-Na; Lee, Myeong Soo; Lim, Hyun-Ja	2008	U
Chu, Hsin; Yang, Chyn-Yng; Lin, Yu; Ou, Keng-Liang; Lee, Tso-Ying; O'Brien, Anthony Paul; Chou, Kuei-Ru	2014	U
Clément, Sylvain; Tonini, Audrey; Khatir, Fatiha; Schiaratura, Loris; Samsony, Sé	2012	U
Cohen-Mansfield, J.; Marx, M. S.; Freedman, L. S.; Murad, H.; Regier, N. G.; Thein, K.; Dakheel-Ali, M.	2011	U
Cohen-Mansfield, J.; Marx, M. S.; Thein, K.; Dakheel-Ali, M.	2011	U
Cook, Erin Lane; Silverman, Michael J.	2013	U
Cooke, Marie L.; Moyle, Wendy; Shum, David H. K.; Harrison, Scott D.; Murfield, Jenny E.	2010	U
Cooke, Marie; Moyle, Wendy; Shum, David; Harrison, Scott; Murfield, Jenny	2010	U
Cordobes, TK	1997	U
Deshmukh, Abhijeet D.; Sarvaiya, Avani A.; Seethalakshmi, R.; Nayak, Ajita S.	2009	U
Dingle, Genevieve A.; Brander, Christopher; Ballantyne, Julie; Baker, Felicity A.	2013	U
Dickerson, D.; Robichaud, F.; Teruya, C.; Nagaran, K.; Hser, Y.	2012	U
El Haj, M.; Antoine, P.; Nandrino, J. L.; Gély-Nargeot, M. -C; Raffard, S.	2015	U
Erkkila, Jaakko; Punkanen, Marko; Fachner, Jorg; Ala-Ruona, Esa; Pontio, Inga; Tervaniemi, Mari; Vanhala, Mauno; Gold, Christian	2011	U
Fischer-Terworth, C.; Probst, P.	2012	U
Gallagher, Ann	2008	U
Garland, K.; Beer, E.; Eppingstall, B.; O'Connor, D. W.	2007	U
Grocke, D.; Bloch, S.; Castle, D.; Thompson, G.; Newton, R.; Stewart, S.; Gold, C.	2014	U
Guétin, S.; Giniès, P.; Siou, D. K. A.; Picot, M. -C; Pommié, C.; Guldner, E.; Gosp, A. -M; Ostyn, K.; Coudeyre, E.; Touchon, J.	2012	U
Guétin, S.; Portet, F.; Picot, M. C.; Pommié, C.; Messaoudi, M.; Djabelkir, L.; Olsen, A. L.; Cano, M. M.; Lecourt, E.; Touchon, J.	2009	U

Hilliard, R. E.	2003	U
Hills, P.; Argyle, M.	1998	U
Horne-Thompson, A.; Grocke, D.	2008	U
Hsu, Ming Hung, Flowerdew, Rosamund; Parker, Michael; Fachner, Joerg; Odell-Miller, Helen	2015	U
Jespersen, Kira Vibe; Vuust, Peter	2012	U
Leung, C. M.; Lee, G.; Cheung, B.; Kwong, E.; Wing, Y. K.; Kan, C. S.; Lau, J.	1998	U
Lin, Yen-Ju; Lu, Kuo-Cheng; Chen, Ching-Min; Chang, Chia-Chi	2012	U
Nakayama, Hisako; Kikuta, Fumio; Takeda, Hidekatsu	2009	U
Puhan, Milo A.; Suarez, Alex; Lo Cascio, Christian; Zahn, Alfred; Heitz, Markus; Braendli, Otto	2006	U
Spitzer, M.; Rath, F.; Groen, G.	2005	U
Troice, EM; Sosa, JJS	2003	U
Vollert, J. O.; Stork, T.; Rose, M.; Mockel, M.	2003	U
Waldon, E. G.; Thom, J. C.	2015	U
Wazen, Jack J.; Daugherty, Julie; Pinsky, Karen; Newman, Craig W.; Sandridge, Sharon; Battista, Robert; Ramos, Patricia; Luxford, William	2011	U
Weeks, B. P.; Nilsson, U.	2011	U
Wepner, Florian; Hahne, Julia; Teichmann, Angelika; Berka-Schmid, Gertraud; Hoerdinger, Annette; Friedrich, Martin	2008	U
White, J. M.	1999	U
White, J. M.	1992	U
Wong, HLC; Lopez-Nahas, V.; Molassiotis, A.	2001	U
Wu, Shiau-Jiun; Chou, Fan-Hao	2008	U
Yang, Chyn-Yng; Chen, Chiung-Hua; Chu, Hsin; Chen, Wen-Chun; Lee, Tso-Ying; Chen, Shyi-Gen; Chou, Kuei-Ru	2012	U
Yang, M.; Li, L.; Zhu, H.; Alexander, I. M.; Liu, S.; Zhou, W.; Ren, X.	2009	U
Yates, Greta J.; Silverman, Michael J.	2015	U

Zanini, Claudia Regina de Oliveira; Jardim, Paulo Cesar Brandao Veiga; Salgado, Claudia Maria; Nunes, Mariana Cabral; Urzedo, Fabricia Lanusse de; Carvalho, Marta Valeria Catalayud; Pereira, Dalma Alves; Jardim, Thiago de Souza Veiga; Souza, Weimar Kunz Sebba Barroso de	2009	U
Zare, Maryam; Ebrahimi, Azizeh Afkham; Birashk, Behrooz	2010	U
Zhang, Z.; Cai, Z.; Yu, Y.; Wu, L.; Zhang, Y.	2015	U
Ziegler, Aaron; Abbott, Katherine Verdolini; Johns, Michael; Klein, Adam; Hapner, Edie R.	2014	U
Zimmerman, L. M.; Pierson, M. A.; Marker, J.	1988	U
Ziv, N.; Granot, A.; Hai, S.; Dassa, A.; Haimov, I.	2007	U