

# Healthy ageing and the arts: a rapid synthesis

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# Contents

Contents.....	3
Executive Summary .....	4
Purpose.....	4
Literature capture .....	4
Findings .....	4
Conclusion and Recommendation .....	5
Introduction.....	6
Approach .....	6
Literature search.....	6
Databases.....	6
Study selection .....	7
Reviews and single studies .....	7
Synthesis.....	9
Theoretical foundations .....	9
General impact of participatory arts in older adults (5 studies) .....	9
Impact of dance interventions .....	10
Impact of music interventions.....	11
Impact of expressive arts and reminiscence interventions, including art therapy and those directed to clients with mental illness.....	12
Limitations, recommendations and future directions .....	13
Bibliography .....	15
Appendix A: Summary of included studies.....	17
Systematic reviews .....	17
Controlled intervention studies .....	25
Before and after studies.....	31
Observational Cohort Studies .....	35
Appendix B: Quality Assessment of Studies.....	38
Quality assessments – Systematic reviews .....	40
Quality assessments – Controlled intervention studies.....	44
Quality Assessments – Before and after studies .....	48
Quality assessments – Observational cohort studies.....	50
Appendix C: Types of interventions and outcomes measured .....	52
Reviews.....	52
Controlled studies.....	55
Before and after studies.....	57
Observational cohort studies .....	58
Appendix D: Expanded limitations, recommendations and future directions .....	59
Appendix E: Search Terms .....	62

# Executive Summary

## Purpose

This rapid synthesis has been commissioned by the NSW Department of Family and Community Services (FACS) to address the question: *What initiatives or programs in arts participation (receptive and participatory) have been shown to be effective in providing benefits for people over the age of 50?*

## Theoretical foundations

The creative arts are considered to have a unique capacity to support *integration across* and *transferability between* brain plasticity, improvements in physical function, improvements in mental health, and increased social engagement.

## Literature capture

This synthesis is based on a literature search conducted in-house at the NSW Department of Family and Community Services plus additional systematic reviews identified by the Sax Institute and the subject matter expert. A total of 34 papers were included. The papers:

- focused on active, participatory creative arts programs intended for healthy older adults, predominantly in community settings
- included relevant systematic, critical and descriptive review studies of the impact of creative arts on health in relation to healthy aging
- included relevant comparative studies
- included only one paper that specifically examined receptive arts participation (museum visits)
- specifically excluded qualitative studies that are more characteristic of the field, thus providing a selective snapshot of research in this field
- included participants that were both healthy older adults and those with cognitive impairments, dementia and Alzheimer's disease, and a range of illnesses, however
- specifically excluded literature on the use of the creative arts in dementia care contexts, in rehabilitation situations including following stroke and cardiac events, in cancer care and at end of life

## Findings

### *What has been shown to be of benefit?*

Reviews found '**overwhelmingly positive cognitive/ affective/ quality-of-life outcomes for various participatory art forms**', [1] noting a slew of outcomes across cognitive function (word recall, story recall, problem solving, and verbal fluency) and physical function outcomes (e.g.. balance, motor performance, improved levels of Human Growth Hormone, decreases in doctor visits, numbers of falls, and use of over the counter medication). The studies included in this rapid synthesis also consistently indicated **benefits in mental health outcomes and social determinants of health**, including lowered scores for depression and anxiety, improved social inclusion, and improved well being, consistent with the extensive but predominantly qualitative studies that characterize the field in general. Only a few studies, either directly reviewed or included in systematic reviews reported no benefits at all from participating in arts in health programs.

**Active participation in dance** has been shown to lead to improvements in physical health, with some evidence that it also leads to cognitive, tactile, and motor performance generally plus subjective wellbeing. **Dance Movement Therapy** has been shown to be effective for increases in positive mood, affect and body image and for decreasing depression and anxiety. Studies on **group singing** showed improvements in measures of psychological and social wellbeing. **Expressive arts based practices (such as creative writing and painting)** are shown to support the psychological and social aspects of recovery from illness especially in relation to self discovery, self expression, relationships and social identity. **Life writing** has been shown to have positive impacts on depressive symptoms. **Evidence-based theatre** (acting interventions) can be devised to enhance healthy cognitive aging. **Individual piano instruction** was shown to improve cognitive abilities associated with executive function and attention and concentration.

#### *What has been shown to be of little or no benefit?*

Very few studies, either directly reviewed or included in systematic reviews, reported no benefits at all from participating in arts in health programs. However, **some health outcomes appear not to benefit from participation in the arts**. For example, two systematic reviews found no benefit from participating in dance on skinfold measures, waist circumference, BMI, falls prevention or lipid profile.

#### *Where is the evidence unclear?*

The quality of studies as a whole shows very significant limitations, in line with the early stage of research in the field. The predominance of female participants in most studies and the heterogenous samples of both participants and interventions in reviews are of concern, meaning there is **limited evidence to determine who benefits greatest from arts in health intervention**.

There is an urgent need for further research that can establish consistent, comparable and in some cases, standardised approaches to evaluation and hence develop adequate methodologies for accurately assessing benefit in the future.

### **Conclusion and Recommendation**

Creative arts in health shows considerable potential. The evidence base is still emerging and remains weak, though increasing numbers of higher quality controlled interventions and reviews are appearing. Qualitative evidence (which is only partly included in this synthesis where it has been reviewed as part of systematic reviews) shows that **participants often report these programs to be deeply valuable and of great significance in their quality of life**.

**There is sufficient evidence to suggest that creative arts programs are an effective means of promoting healthy aging through improving and sustaining social inclusion and functioning, self efficacy, wellbeing, resilience and positive affect, with potential to support and improve physical and cognitive function in many circumstances. However, the evidence base at present is insufficiently extensive, robust or sensitive to indicate precisely where the best investments would lie or for what populations, and under what circumstances, impacts would be greatest.**

Better quality, research is needed and the authors recommend a varied investment along with ensuring adequate evaluation as part of that investment.

## Introduction

The NSW Department of Family and Community Services (FACS) commissioned the Sax Institute to provide a rapid synthesis of evidence in response to the question:

***What initiatives or programs in arts participation (receptive and participatory) have been shown to be effective in providing benefits for people over the age of 50?***

The purpose of the evidence summary is to understand the benefits of targeting older people's participation in the arts and to inform a creative ageing strategy.

The evidence will also be used to inform two engagement initiatives:

1. A research organisation will engage older people in NSW to understand the appetite for and barriers/opportunities to participation in the arts
2. Targeted consultations with arts organisations in NSW to understand the market and gain further insights for the development of the Strategy.

## Approach

Following a literature search and consultative exclusion process (see below) all studies were quality assessed using a standardised tool as appropriate for the study type by a team member. The synthesis and use of the quality assessment was then undertaken by the subject matter expert. The subject matter expert also provided additional commentary of applicability of studies, as it was found that some higher rating studies were of little direct relevance to the research question, while other lower rating descriptive studies had a higher utility.

In synthesising the papers included in this review, we focused on the research question and therefore organised the synthesis according to type of program studied. The results are therefore divided into subsections on general arts participation, dance, music and self-expressive programs. Within each subsection we provide a rationale for the benefits of each type of program as well as a summary of where there are shown benefits, where evidence suggests there are limited, or no benefits, and where limitations of the evidence mean that messages for policy are unclear.

## Literature search

### Databases

This short synthesis is based on literature found through a systematic search conducted at FACS with the in-house librarian of the following resources:

*MEDLINE with Full Text / Psychology and Behavioral Sciences Collection / PsycINFO / PsycARTICLES / PsycBOOKS / PsycEXTRA / SocINDEX with Full Text / AgeLine / CINAHL with Full Text / Australia/New Zealand Reference Centre / Business Source Complete / Health Business Elite / Regional Business News / Mental Measurements Yearbook / EBSCO eBook Collection, IngentaConnect, EmeraldInsight, ERIC, Science Direct, Google Scholar, Libraries Australia.*

Search terms are found in Appendix E.

This systematic search uncovered 92 articles.

This search was supplemented at the Sax Institute with a search for *systematic reviews only* from the following 2 databases.

- *Medline via Ovid SP*
- *Health Evidence Canada (healthevidence.ca) (3 additional reviews)*

A search of these two databases uncovered an additional 6 papers and an additional systematic review was identified by the subject matter expert. Meaning that a total of **99 papers** were found prior to the application of exclusion criteria.

### Study selection

In light of limited resources to conduct the synthesis, the Sax Institute in consultation with FACS set exclusion criteria as outlined in the table below.

Exclusion criteria	Number of papers excluded
Focus of study is on arts as a therapy for specific illnesses or conditions	24
Commentary or Expert Opinion	14
Descriptive case report (without evaluative element)	7
Qualitative study	14
Protocol or interim report	1
Full text not available	1
Systematic review of low quality and utility	3
<b>TOTAL EXCLUDED</b>	<b>66</b>

Of the excluded papers, 54 were identified on an initial abstract review, and a further 7 were excluded during full text assessment and a further 5 during quality assessment.

The remaining articles that were included in the review are summarised in the table below.

Paper type	Number of papers
Reviews	12
Controlled intervention studies	11
Before and After studies	7
Observational cohort studies	3
<b>TOTAL PAPERS SYNTHESISED</b>	<b>33</b>

### Reviews and single studies

Many of the reviews captured, summarized and critiqued single studies that were in our sample, indicating an appropriate capture of the literature.

- Castora-Binkley et al. (2010) reviews Bugos et al. (2007), Cohen and Perlstein (2006), Noice and Noice (2006, 2009)
- Noice, Noice and Kramer (2014) reviews Kattenstroth et al. (2011, 2013), Hui et al. (2009), de Meideros et al. (2007, 2011), Chippendale and Bear-Lehmon (2011), Clift et al. 2012, Coubard et al. 2011, Hanna-Pladdy and MacKay (2011), Sole et al. (2010), Yuen et al. 2011, Kim (2013)
- Clift (2010) reviews Cohen (2006) and Clift (2011)
- Fernandez-Arguelles et al. (2015) reviews Hui et al. (2009), Keogh et al. (2009)
- Hwang and Braun (2015) reviews Hui et al. (2009), Coubard et al. (2011),
- Rodrigues-Krause et al. (2016) reviews Kattenstroth et al. (2013)

# Synthesis

## Theoretical foundations

Arts in health benefits in promoting healthy aging are founded on two main theoretical frameworks:

- (1) Promoting brain plasticity and cognitive reserve through enhancing capacity for creativity, adaptation and flow
- (2) Promoting the high demonstrable benefits from impacting on the social determinants of health, especially resulting from increasing social inclusion, enhancing the quality of relationships and extent of social capital, and increasing self efficacy and self esteem through skill building and self expression

The creative arts are considered to have a unique capacity to support *integration across* and *transferability between* brain plasticity, improvements in physical function, improvements in mental health, and increased social engagement.

As commented in one review included in this synthesis, (with extensive citation), obvious advantages of arts participation include its intrinsically pleasurable and self-motivating nature, the social support inherent in group arts instruction, the multimodel nature of participation, the well-researched benefits of stimulating or productive activities. [1]

## General impact of participatory arts in older adults (5 studies)

Five studies included in this synthesis were framed as contributing to the general gap between field experience in arts and health and formal evidence of benefit. [1-5]

### *What has been shown to be of benefit?*

The two broad reviews of arts and health ageing from Noice, Noice and Kramer [1] and Castora-Binkley et al. [2] (the former updating the latter) summarised 31 and 11 studies respectively. They found **'overwhelmingly positive cognitive/ affective/ quality-of-life outcomes for various participatory art forms'**, [1] including those involving dance, music, expressive writing, theatre and visual arts and noting a slew of outcomes across cognitive function (word recall, story recall, problem solving, and verbal fluency); affective and mental health outcomes (e.g. reduced anxiety, depression and hostility); and physical function outcomes (improved levels of Human Growth Hormone, decreases in doctor visits, numbers of falls, and use of over the counter medication). Almost all studies included in these reviews recorded at least some benefit, however, the heterogeneity of study designs, target populations and intervention types **prevents any comparison or conclusions as to which interventions are most beneficial, for whom and in what context.**

Qualitative data in Phinney, Moody and Small (2014) associates these **benefits with six themes: *providing structure and discipline; facilitating coping (including emotional expression); requiring hard work and effort (including acquiring new skills and gaining confidence); bringing out one's artistic side (including a sense of personal transformation); promoting social involvement; and making a contribution.*** These 6 themes are broadly reflective of qualitative outcomes across the field.

### *What has been shown to be of little or no benefit?*

It is to be expected that there is variation in the extent to which studies find significant effects from interventions. Within the broad systematic reviews from from Noice, Noice and Kramer [1] and Castora-Binkley et al. [2], the only studies that demonstrated little or no benefit were one on autobiographical writing [6] (also included in this synthesis in the section on self-expressive art below), which showed no improvement in autobiographical memory; and one study on participating in a musical choir [7] which showed no

significant results in terms of self-reported quality of life. In addition, the study by Flood and Sharer [4] included in our selection of papers found no change in 'creativity', 'successful aging' or physical function (hypothesized as inter-related) in controlled intervention study of 57 older adults with an intervention of participation in weekly hour-long 'creativity group' sessions for 8 weeks. There were however considerable study design weakness of that study.

### *Where is the evidence unclear?*

There are limitations in the evidence on the general impact of participatory arts.

- 1) In the systematic reviews, quality assessment was not systematic.
- 2) Individual studies show shortcomings in randomization, sample size and composition, and the restricted use of control or comparison groups (3)
- 3) The methodology used in Flood and Scharer (2006) was inadequate in multiple dimensions
- 4) Some studies attempted to synthesise data concerning heterogenous arts practices, including jazz dance, chorale singing, piano playing, drawing and painting, expressive writing, other dance and music forms, puppetry, digital storytelling, a 'creativity syllabus' (predominantly verbal) and theatre and acting, meaning that it was not possible to determine whether impacts differed with different arts practices and interventions
- 5) Participant health and living circumstances, and the settings for studies, were often not distinguished, with data collected about samples that included both healthy older adults and those experiencing cognitive and other functional disabilities, or those recruited from or located in both community settings and health care facilities, which may have had substantial impacts on study outcomes in most cases.
- 6) There was dominance of community dwelling white women, often assessed as relatively well-educated, in the majority of individual studies.

**Despite these limitations, general review studies such as Noice, Noice and Kramer (2014) usefully identified many studies showing benefits from arts participation, across wellbeing, mental health and social and physical function categories.** A sampling of the 'treatment studies' literature is usefully provided in an appendix to Noice, Noice and Kramer (2014).

### **Impact of dance interventions**

From the 11 reviews included in this synthesis, five [8-12] focused specifically on dance interventions, in which standardized measures of physical function can be applied. Two controlled intervention studies [13, 14], one observational study [15] and one before an after study also focused specifically on dance [16].

#### *Rationale for the benefits of dance:*

Dance is a universal human expression consistent across generations, cultures, and social classes throughout the world. Dance comprises rhythmic motor coordination, balance and memory, emotions, affection, social interaction, acoustic stimulation, and musical experience with improvements in physical fitness in general (e.g. cardiovascular health) and in specific aspects of gait, balance, posture, specific limb strength, and similar variables. Dance offers integrated training procedures and multisensory stimulation to support adaptive neuroplasticity in aging (Kattenstroth et al. (2013))

#### *What has been shown to be of benefit?*

There is strong evidence that **active participation in dance** has been shown to lead to:

- Improvements in peak oxygen of elderly subjects [12]
- Improvements in aerobic power, lower body muscle endurance, strength and flexibility, balance, agility and gait, heart rate, blood pressure, reaction time, motor and postural performance [9, 10].

There is weaker evidence that participation in dance also leads to improvements in lower body bone mineral content and muscle power, falls prevention and reduction in cardiovascular health risk [8, 10], as well as cognitive, tactile, and motor performance generally plus subjective wellbeing [15].

**Dance Movement Therapy** is effective for increases in positive mood, affect and body image and decreasing depression and anxiety [11].

Dance styles in the synthesised studies were heterogenous, but **required similar medium intensity and similar physiological and kinesiological patterns** to be effective [14, 15]; benefits could be found even without corresponding improvements in cardiovascular fitness.

#### *What has been shown to be of little or no benefit?*

Two systematic reviews found no benefit from participating in dance on skinfold measures, waist circumference, BMI, within a limited time frame [9, 12]. One study included in the systematic review by Noice, Noice and Kramer [1] found no significant cognitive benefit from participation in social dance.

#### *Where is the evidence unclear?*

The evidence is unclear in terms of improvements in falls prevention and falls prevention [8, 9] or lipid profile. [12].

The following limitations found in the studies on the impact of dance suggest that further research is needed to determine the potential impact of dance on health for certain populations:

1. Unweighted analyses indicate that larger studies are required to detect positive effects of dancing e.g. on lipid profile, or over longer term e.g. for potential impacts on bodily composition
2. Small numbers of RCTs were identified, with general low statistical power, so findings are not yet robust, for any specific intervention type.
3. Measurement tools across the studies are very heterogeneous, even for physical function tests such as balance, making any comparisons difficult.
4. Studies were dominated by female participants.
5. There were often shortcomings across the sample respecting blinding, Hawthorn effects, small sample sizes, diversity of study design and types of dance interventions.

### **Impact of music interventions**

Four of the eleven included reviews specifically sought to determine the impact of music interventions, [17-20] as did 3 controlled intervention studies, [3, 21, 22] two observational studies [23, 24] and one before and after study [7].

We note that there is a split in the literature on music interventions. The intersection of music therapy approaches with animal model, fMRI and other neurological studies has in fact given rise to an entire subfield of music therapy, 'Neurologic Music Therapy', where evidence can be accumulated for very specific outcomes such as improvements in stroke rehabilitation tasks. Bolwerk et al. [25] is an example of this research. This is distinct from community based participatory music initiatives such as participation in choirs.

#### *Rationale for the benefits of music*

Evidence exists that music stimulates different brain regions with different rates of amplitude modulation. Playing music a variety of complex motor, auditory, and multimodal skills that induce functional and structural brain plasticity. Group singing generates integrated physical and psychosocial benefits.

### *What has been shown to be of benefit?*

**Group singing** showed improvements in measures of psychological and social wellbeing and, for motivated older participants, improved self-rated overall physical health, fewer doctor visits, less medication use, fewer instances of falls, better morale, less loneliness and an increase in total number of activities [3, 7, 20, 22, 24].

**Home-based music therapy** is a positively evaluated health service that meets the needs of elderly and impaired clients. [19]

**Individual Piano Instruction** (with practice) was shown in one study to improve transfer from domain-specific, sensory-motor training to cognitive abilities associated with executive function, and improves cognitive abilities related to attention and concentration. [21]

### *What has been shown to be of little or no benefit?*

The studies indicate that there is no evidence that listening to music during a session of physical activity increased physical performance at any of these parameters for older adult participants. There is no evidence to show a preference for one kind of music over another, or to indicate the importance of live or composed music versus commercial music. [17]

### *Where is the evidence unclear?*

The studies showed variable physical improvements associated with group singing [20]; only medium-term improvements in physical activity for adults with COPD who listen to music while exercising, [17]; variable improvements in language performance, attention, executive function and memory resulting from music therapy [18, 23], and variable improvements in the Mini Mental State Examination in pooled data on music impacts on cognition [18]. The study by Sole indicated little benefit for participating in choir, music appreciation or preventive music therapy on self-reported quality of life. [7]

There are limitations in the evidence on the impact of music interventions

1. Within the studies, the heterogeneity of participants was not accounted for e.g. recruitment from a variety of healthcare and community settings, with and without health and cognitive impairments
2. The majority of participants were female, and results may not be transferrable to men
3. There is possible insensitivity of tests applied over short time periods.

## **Impact of expressive arts and reminiscence interventions, including art therapy and those directed to clients with mental illness**

Expressive arts interventions based around the process of creation and include activities such as creative writing, painting and theatre. Here, we draw on three of the included reviews [26-28] as well as the broader review from Noice et al. [1]. Three controlled interventions studies [29-31] and two before and after studies [6, 32] also examined the effects of expressive arts interventions.

### *Rationale for benefits of expressive arts and reminiscence*

There is evidence indicating the positive impacts of expressive writing in a variety of contexts, including severe illness (such as cancer). Similarly, life writing and reminiscence therapies of various kinds have been used successfully in aged care and dementia care contexts. Self-expression and meaning making are theorized as processes that have profound impacts on mental health.

### *What has been shown to be of benefit?*

**Expressive arts based practices** have been shown to support the psychological and social aspects of recovery especially in relation to self discovery, self expression, relationships and social identity [26, 28, 31]. Improvements in affect are noticed across several disadvantaged populations [27].

**Life writing** has positive impacts on depressive symptoms [6, 29].

**Evidence-based theatre** (acting interventions) can be devised to enhance healthy cognitive aging [1, 33, 34].

**Social prescribing programs** such as *ArtLift* and *Arts on Prescription*, where doctors prescribe participation in an art making program to older, more socially isolated individuals or those confronting mental health challenges, can effectively improve wellbeing scores [32].

#### *What has been shown to be of little or no benefit?*

Participation in a structured autobiographical writing workshop did not improve autobiographical memory [30]. Participants with schizophrenia, developmental disabilities, and Alzheimer's disease showed limited benefits from art therapy in a descriptive review [27].

#### *Where is the evidence unclear?*

We found only a small number of studies and these showed limitations on blinding, randomization and comparison groups. Participants were majoritively white and female. There were very few studies that focused on older adults. As with other types of arts in the health programs, this limits the generalizability of the studies and the ability to determine what time of expressive arts programs are most likely to be of benefit.

The intersection of music therapy approaches with animal model, fMRI and other neurological studies has in fact given rise to an entire subfield of music therapy, 'Neurologic Music Therapy', where evidence can be accumulated for very specific outcomes such as improvements in stroke rehabilitation tasks. Bolwerk et al. [25] is an example of this research, and was also the only study to examine receptive participation in arts (museum visits). This is distinct from community based participatory music initiatives such as participation in choirs.

## Limitations, recommendations and future directions

Limitations in the studies reported on include:

- Currently, numbers of studies and sample sizes in studies are very small
- The majority of participants were white females; it is unclear how transferrable results will be to other groups
- Heterogeneity in participant health status and claims made across studies of different arts modalities means that current evidence is insufficient to determine what programs are best suited to what populations and under what circumstances.
- There was no consistency in measures used, making comparison difficult
- Few studies were fully blinded and several were not fully randomized; controls were only partial; publication bias was likely
- There was no methodological capacity to capture systems effects, emergence or interaction effects, although these may drive arts and health impacts (as rationales suggest)
- Existing studies were completed in limited timeframes, however, there is evidence that longitudinal benefits may have the greatest impacts. Research is needed to establish how programs can be sustainable over long periods for effective long term engagements.
- Our sample was not integrated with other major studies in the field, including cost effectiveness and economic benefits of creative arts investments; longitudinal benefits of arts participation and engagement; the role of creative arts in the health of communities; qualitative evaluations of a broad range of current programs; or the ethical implications and impacts of creative arts approaches
- These studies may not show sufficient evidence of the joy, spiritual satisfaction, and personal development that many participants identify as the most important aspects of creative arts programs.

**Creative arts in health shows considerable potential.** The evidence base is still emerging and remains weak, though increasing numbers of higher quality controlled interventions and reviews are appearing. This is consistent with the early stage of development of the field.

**There is sufficient evidence to suggest that creative arts programs are effective means of promoting healthy aging through improving and sustaining social inclusion and functioning, self efficacy, wellbeing, resilience and positive affect, with potential to support and improve physical and cognitive function in many circumstances.**

Qualitative evidence (which is only partly included in this synthesis where it has been reviewed as part of systematic reviews) shows that participants often report these programs to be deeply valuable and of great significance in their quality of life. However, **the evidence base at present is insufficiently extensive, robust or sensitive to indicate precisely where the best investments would lie or for what populations, and under what circumstances, impacts would be greatest.**

**Further, and better quality, research is needed and the authors recommend a varied investment along with ensuring adequate evaluation as part of that investment.**

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## Appendix A: Summary of included studies

### Systematic reviews

Name, Year	Aim/PICO	Search strategy	# studies	Total participants	Intervention(s)	Outcomes	Key findings
Castora-Binkley et al. 2010	To describe the effects of participation in art programs on a variety of health outcomes.	Databases: Wolter Kluwer Health (Ageline), Sociological Abstracts and Academic Search Complete.  Terms: creative*, health promotion, art*, program* , aging, perform*, participatory, well-being, and health.  Jun 2009-Nov 2009.	11 reviews	721 75% female	Creative drama workshop  Reminiscence and creative expression  Drawing and painting arts program (Memories in the Making)  Individualised piano instruction  Jazz dance instruction  Chorale group x2  Theatrical training x4	Emotional and psychological wellbeing  Cognitive skills / functioning  Working memory  Balance, cognition and mood  Personal growth  Physical and mental health	Suggests there are a variety of benefits for health and functioning from participatory creative and performing arts programs for older adults.  Limitations: small number of studies and their design methods preclude definitive conclusions about which types of art interventions may have the greatest impact on specific health outcomes for a particular population. Not possible to measure duration of effect due to short timeframes.
Clark et al. 2012	To determine the effectiveness of music interventions in increasing physical activity in older adults	Databases: CINAHL, Medline, EMBASE, PubMed, AMED, PsycINFO, AUSPORT, PEDRO, OTseeker, Expanded Academic ASAP. SPORTDiscus,	12 (review) 4 (meta-analysis)	309 99 (meta-analysis)	Music and exercise  RCTs and random and non-random crossover	Physical activity levels	Meta-analyses did not demonstrate any within session differences in comparisons between music and no-music interventions. Two individual trials of

Name, Year	Aim/PICO	Search strategy	# studies	Total participants	Intervention(s)	Outcomes	Key findings
		Cochrane Library Older adults (>/60yrs), music interventions, physical activity outcomes, quantitative Up to March 2011			designs		moderate quality demonstrated increased capacity to perform physical activity following exercise programs with music over 4-8wks. There was no evidence that any particular music intervention was superior.
Clift et al. 2010	To determine the effectiveness of group singing on wellbeing	Databases: Medline, Embase, Psychinfo, Cinahl Singing, 'health' 'wellbeing' 'quality of life' and 'music therapy'	51	4300+ across various non- comparable studies	Group singing in community (non-clinical) settings	Self-rated health, well-being, mood, immunoglobulin A, cortisol, doctor visits, medication use, health service use, falls	Singing can be beneficial for psychological and social wellbeing, but less clear evidence of benefits for physical health. Group singing may, however, be of therapeutic value for people managing long- term health conditions.
Fernández- Argüelles 2015	To identify the therapeutic effects of dancing as a physical exercise modality on balance, flexibility, gait, muscle strength and physical performance in older adults	Databases: Pubmed, Cochrane, Plus, PEDro, Science Direct, Dialnet, Academic Search Complete. Terms: dance AND older adults, dance therapy AND elderly, dance AND older adults AND balance, dance AND older adults AND gait and dance therapy AND motor skills. English and Spanish Jan 2000-Jan2013.	7	354	Dance: ballroom dance and/or dance based exercise	Balance, gait, risk of falls, strength, functionality, flexibility, QoL	The studies showed positive effects on the risk of falling related to factors (balance, gait, dynamic mobility, strength and physical performance). The studies with better results included other exercises or activities as well as dance. Although the studies showed positive effect on the above factors limitations - only 2

Name, Year	Aim/PICO	Search strategy	# studies	Total participants	Intervention(s)	Outcomes	Key findings
		Older adults (60+yrs) with no disabling disease					studies obtained a score of 6 (good) on the PEDro scale, methodological quality, small sample size, lack of homogeneity in variables and measurement tools, diversity in study design and type of dance – mean the authors were not able to confirm that dance has significant benefits on these factors.
Hwang et al. 2015	To examine the effectiveness of dance programs in improving physical health of older adults	Pubmed Dance, aged, older adults, dance therapy	18	411 Age range: 52-87yrs Over 50% female	Ballroom, contemporary, cultural (Greek, Cantonese, Turkish, Korean, line, Jazz  1-4 times a week  Duration 6wks-8mnths	Physical health (flexibility, muscular strength/endurance, balance, cardiovascular endurance, cognition, body composition)	All but one study showed improvement in at least one of measure of physical health. None showed a significant negative change.  60% of measures of flexibility showed significant positive change  82% of measures of muscular strength/endurance showed significant positive change  89% of measures of balance showed significant positive changes

Name, Year	Aim/PICO	Search strategy	# studies	Total participants	Intervention(s)	Outcomes	Key findings
							<p>80% of measures of cognitive ability showed significant positive changes</p> <p>1 study measured cardiovascular change (showed positive change)</p> <p>2 studies measured body composition (no significant change)</p>
Keogh et al. 2011	To determine the health effects of participation in dance	<p>Databases: Medline (PubMed), CINAHL, SportDiscus, ProQuest 5000 International and Google Scholar.</p> <p>Searches of reference lists of included papers</p> <p>Terms: dance, dancing, older adults, elder</p>	<p>18</p> <p>3 cross-sectional</p> <p>15 longitudinal studies</p>		Various: most common were traditional and aerobic dance.	<p>Physical: most commonly assessed were aerobic power, muscle endurance and strength, static and dynamic balance.</p> <p>Some also assessed: changes in body composition, gait performance, prevalence of falls and cardiovascular risk factors</p>	Although the size of the lit sample is small there appears sufficient strong (Grade B) evidence that dancing can significantly improve older adults' aerobic power, lower body muscle endurance, strength, and flexibility, static and dynamic balance/agility, and gait speed.
Koch et al. 2014	To examine the physical benefits of dancing for healthy older adults	<p>Databases: PubMed/Medline, Psyn dex, PsycINFO, ERIC, CENTRAL, and Google Scholar.</p> <p>Terms: "dance movement psychotherapy", "dance movement therapy", "dance therapy", "therapeutic movement",</p>	23 primary trials	1078	Dance movement therapy (DMT) and the therapeutic use of dance for the treatment of health-related psychological problems.	<p>QoL, body image, wellbeing, clinical outcomes</p> <p>Secondary outcomes: depression, anxiety, interpersonal competence.</p>	Results suggest dance movement therapy and dance are effective for increasing QoL and decreasing symptoms such as depression and anxiety. Positive effects were found for increased subjective wellbeing, positive mood, affect and

Name, Year	Aim/PICO	Search strategy	# studies	Total participants	Intervention(s)	Outcomes	Key findings
		<p>"dance-effectiveness", "dance" and "dance-therapy" "controlled trial" and "random"</p> <p>Additional hand searches of key journals. Requests to key associations to nominate articles.</p>					body image.
Leckey, 2011	To investigate the literature to ascertain the effectiveness of creative activities on mental well-being within the mental health context.	<p>Databases: Medline, Cinahl and PsycINFO</p> <p>Terms: art, therap, well-being, mental health</p> <p>The Arts Council England database was accessed and the UK Department of Health review of Arts for Health Working Group.</p> <p>Additional electronic and hand searching based on reference lists.</p>	11	<p>Unable to determine total participants but sample sizes ranged from 18 to 3900</p> <p>Age range 16-65</p>	Varied – most common were visual arts (drawing and painting) others included crafts, writing, exhibitions, photography	Psychological, social, cognitive	Authors conclude that "the evidence reviewed suggests positive outcomes but there is no clear evidence that participation in creative arts results in social benefits, but does suggest that participation may contribute to improvements within the individual's immediate social networks." They note lack of rigour and limitations of the studies as well as different understanding of mental well-being limit conclusions that can be drawn
Li et al.	To determine whether music therapy affects cognitive function in older	Databases: PsycInfo, PsycARTICLES, PubMed, MEDLINE, CINAHL, AgeLine, Cochrane Library, and the Chinese	5	<p>234</p> <p>Mean ages from 69.4 to 81</p> <p>Diagnosed with</p>	Music therapy intervention offered in nursing homes, hospitals, or	Cognitive function	Meta-analysis found no significant difference between the music therapy and no-music therapy groups occurred.

Name, Year	Aim/PICO	Search strategy	# studies	Total participants	Intervention(s)	Outcomes	Key findings
	people	Electronic Periodical Services (CEPS), reference lists of the included studies.		dementia, dementia-like cognitive impairment, or mild cognitive impairment or were drawn from samples of healthy people.	communities		
Maujean et al. 2014	To examine current knowledge on the efficacy of art therapy	Databases: PsycINFO, MEDLINE, PROQUEST, Scopus, Web of Science, and CINAHL. "Art Therapy Outcome Bibliography" of the American Art Therapy Association (2013) was also searched. Hand searches of reference lists. Keywords: "Art Therapy," paired with key terms: (well-being, health, recovery, rehabilitation, healing, treatment, intervention, psychotherapy, and illness 2008-2013	8	988 People with: schizophrenia, Adults with developmental disability, Inmates Japanese adults with Alzheimer's Older Korean Americans War veterans with stress related disorders Women with breast cancer	Specific to art therapy. Did not combine art therapy with other interventions. More than a single session.	Psychosocial	All but 1 study reported some beneficial effects of art therapy. However, there was substantial variation in the extent to which the interventions were shown to be beneficial. Sample sizes ranged widely. Populations were not homogenous, measurement tools and type and length of intervention varied widely.
Noice, Noice and Kramer	To review the scientific lit on the enhancement	Databases: PsycINFO, PubMed, SpringerLink, JSTORE, Frontiers Journal	31 studies	Older adults (>60 years), without	Participatory Dance, expressive	Cognitive, physical, QoL, mental health, wellbeing. Studies used well-known	Positive cognitive/ affective/ QoL outcomes for various participatory

Name, Year	Aim/PICO	Search strategy	# studies	Total participants	Intervention(s)	Outcomes	Key findings
2013	of healthy ageing in older adults through active participation in the arts	Series, Science Direct, SAGE Journals Online, Google Scholar.  Searched reference lists of included papers.  Keywords: aging, theatre, dance, music, painting, drawing, drama, visual arts, older adults		dementia, in good general health	writing, music, theatre, or visual arts.	instruments e.g. SF-36, Wechsler and original surveys/ questionnaires	art forms
Rodrigues-Krause 2016	To verify the effects of dance interventions on cardiovascular risk (CVR) in the elderly	Databases: MEDLINE, Cochrane Wiley, Clinical Trials.gov, PEDRO and LILACS  Terms: combined search term (exploded versions of MeSH) were used: (Elderly OR Aging OR Ageing OR Aged OR Senescence OR Biological Aging OR Older OR Older Adults )AND (Dance OR Dancing OR Dance Therapy)  Nov 1980-Dec 2015  Reference lists searched manually.	7  5 in meta analysis	377	Dance interventions of moderate intensity.  Most 3 times a week  Aerobic dance, waltz, Greek, Latin, creative dance and a special program designed for elderly people (no style defined).	Primary: Peak oxygen consumption (VO <sub>2</sub> peak)  Secondary: BMI, waist circumference, sum of skinfolds, lipid profile.	Dance interventions may increase VO <sub>2</sub> peak compared to non-exercising controls. Results also indicate it is as effective as other types of exercise in improving aerobic capacity of the elderly. BMI and body weight were not affected.  Larger studies are required to detect effects on lipid profile.

Name, Year	Aim/PICO	Search strategy	# studies	Total participants	Intervention(s)	Outcomes	Key findings
Van Lith 2013	To critically review current research on the benefits of art-based practices in mental health rehabilitation settings	<p>Databases: ProQuest, PsycINFO, CINAHL, Informaworld, EMBASE, AMED, OVID MEDLINE, as well as the university library catalogue and Google Scholar.</p> <p>Terms were created and grouped into three categories including: (i) art therapy (and related terms (ii) mental illness (and related terms) (iii) evaluate (or related terms)</p> <p>Reference lists from articles were reviewed 1987-2011</p>	23			<p>Lal's 6 dimensions of recovery was used to frame the outcomes of the papers:</p> <p>Clinical: Remission or reduction of symptoms;</p> <p>Personal/ Psychological: Hope, empowerment, meaningful activity, personal responsibility agency/self-determination, transformation, spirituality, coping;</p> <p>Self-Care: Meaningful participation in basic and instrumental Self-care activities (symptom management, cooking, transportation, financial management);</p> <p>Social: Meaningful participation in social relationships and roles, social activities;</p> <p>Occupational: Meaningful participation in employment, education, leisure or other related activities;</p> <p>Environmental/ Contextual: Accommodation and support in the individual's physical, political, social, and economic environment.</p>	<p>Using Lal's framework the most prevalent recovery dimension was psychological recovery, followed by social recovery.</p> <p>The evidence suggests that psychological recovery has been most strongly supported in terms of constructs such as self-discovery followed by self-expression. Social recovery was most strongly supported by the constructs of developing relationships and social identity.</p>

### Controlled intervention studies

Name, Year	Population	Intervention	Study design/Detail of control	# participants	Setting	Outcomes/Findings
Bugos 2007	Musically naïve community dwelling adults aged 60-85	Individualised piano instruction (30 min lesson, with 3 hours independent practice per week)  Participants instructed not to practice during three month delay post intervention although compliance was not monitored.	RCT	31  Experimental group (n=16) control (n=15)	Community	Neuropsychological/cognitive assessments were administered at 3 time points: pre-training; post training (6 months); and following a 3 month delay.  A significant increase in performance on the Trail Making Test (of visual processing and planning) and Digit Symbol (WAIS III subtest) in the experimental group was observed as compared to healthy controls.
Chippendale and Bear-Lehman 2012	>/65 yrs	Life review through writing "Share Your Life Story" workshop 1xwk for 8wks  To examine the effects on depressive symptoms	RCT	45  23 treatment, 22 wait list control	4 senior residences	Statistically significant improvement in depressive symptoms among treatment group.  Results suggest the writing workshop (Share Your Life Story) is an effective occupation-based intervention for occupational therapists to use with older adults living in senior residences.

Name, Year	Population	Intervention	Study design/Detail of control	# participants	Setting	Outcomes/Findings
Clift et al. 2012	To assess the effectiveness and cost-effectiveness for older people of taking part in singing groups on measures of mental health	Weekly singing programme of 12 weeks	Random allocation to singing or non-singing groups (carried on with normal activities).  Questionnaire at baseline, end of the program (12 weeks) and 3 months post programme	393  Mean age 67.3yrs, 84% female		<p>Outcomes: health related quality of life (York SF-12). anxiety and depression (HADS) and the EQ-5D (Euroqol Five Dimensional Scale) which asks people to put a value on their health, which can be used when calculating the costs of health and social care to support different health states. The service use questionnaire helps in the costing of health and social services.</p> <p>Both groups SF-12 scores improved after 3 months but the singing group improved more and was still above baseline level at 6 months. The difference was significant.</p> <p>On the HADS both groups showed reduced anxiety at 3 months but the singing group showed a much greater reduction and was still below baseline at 6 months.</p> <p>Findings suggest a significantly greater improvement in mental health quality of life in the singing group compared to the non-singing group. The effect was greatest immediately following the intervention but still apparent 3 months later.</p> <p>Singing groups are probably cost-effective.</p>

Name, Year	Population	Intervention	Study design/Detail of control	# participants	Setting	Outcomes/Findings
Cohen, Perlstein et al. 2006 (professionally conducted cultural programs)	Ambulatory and healthy adults 64yrs and over	Chorale group	Controlled trial.	141 (a subset of a broader longitudinal study)  Intervention = 77  Comparison = 64	Local senior centre or offices made available by retirement communities	Self-reported measures of physical health  Mental health (the Philadelphia Geriatric Center Morale Scale), the Loneliness Scale-III, Geriatric Depression Scale Short Form.  Engagement in social activities (self-reported).  Findings:  The intervention group reported improvement in self-rating of overall health and the comparison reported a decline  Intervention group reported a trend towards increased activities 12mnth post baseline and the comparison group a decline.  Intervention group reported a decline in falls at 12months post baseline.  Loneliness diminished in both groups but more in the intervention group.  Morale declined in both groups but to a statistically lower level in the comparison group.  Depression scale scores were lower in both groups at 12months post baseline. Although no significant difference between the groups, movement toward

Name, Year	Population	Intervention	Study design/Detail of control	# participants	Setting	Outcomes/Findings
						<p>reduced risk was proportionally greater in the intervention group.</p> <p>Doctor visits and medication use increased in both groups. The comparison group reported a statistically greater increase in doctor visits that the intervention group at 12months post baseline. Medication used increased at a greater rate in the comparison group.</p>
De Medeiros, Kennedy et al. 2007	<p>Adults aged 62-84 yrs</p> <p>Recruited from a retired physicians' organisation</p> <p>11 retired physicians and 7 spouses of physicians</p>	Pilot study of an 8 week autobiographic writing workshop	5 memory assessments and 2 writing samples at baseline and follow up were evaluated for linguistic complexity	18 (16 in final analysis)		<p>Results suggest that participating in an activity such as talking and writing about the past may increase information processing speed and attention and verbal learning.</p> <p>Results did not support the hypothesis that grammatic complexity and idea density scores would increase. Idea density scores decreased suggesting the intervention affected idea density in an inverse way.</p>
Flood and Scharer 2006	<p>Senior citizens who attended 1 of 3 senior centres in South Carolina</p> <p>Primarily older adults</p>		Pretest-posttest experimental design investigating the effects of a creativity enhancement intervention in older adults.	57 29 treatment 28 control		Based on the results of this study, the researcher could not identify any significant relationship between creativity and successful aging.

Name, Year	Population	Intervention	Study design/Detail of control	# participants	Setting	Outcomes/Findings
	aged 65-84 yrs					
Hui 2009	Community dwelling adults aged 60-75 recruited from 10 social centres for seniors in Hong Kong	23 sessions of low aerobic dance over 12 weeks (2 x 50-60 min sessions per week).	Controlled study Control group continued with their usual daily activities.	N=111 Intervention n = 57 Control n= 54	Community	Assessed at baseline and 12 weeks. Quality of life and a range of physical outcome measures were assessed.  Significant differences between the groups were observed in 6 outcome measures: resting heart rate, exercise tolerance, lower limb endurance, body pain and general health (QoL measure).
Kattenstroth 2010	Healthy adults aged 61-94 years recruited through advertising	Multi-year regular amateur ballroom dancing	Controls had no record of either dancing or sporting activities and were matched for age and education	N=62 Intervention amateur dancing n= 24 Control (non-dancer) n=38	Community	Participants were assessed on posture and balance parameters as well as cognitive, attentional, intellectual, perceptual and sensorimotor performance.  The intervention group demonstrated superior performance on several of the individual tests. When tests were grouped into key domains, enabling comparison of performance across individual tests, the intervention group showed significantly higher indices of performance.
Kim 2013	Korean American older adults from two adult day health care	4 weeks of art therapy at 3 times per week. 60-75 minutes per session.	Control group continued regular program activities	N=50 Intervention n=25 Control n=25	2 adult day health care programs in New Jersey and NYC.	Three standardised psychological instruments to measure affect, anxiety and self-esteem were used at baseline and after the intervention.  The intervention group reported greater

Name, Year	Population	Intervention	Study design/Detail of control	# participants	Setting	Outcomes/Findings
	programs in New Jersey and New York City.					decreases in both state and trait anxiety post intervention (significant) compared to the control group. They also demonstrated greater increases in self-esteem after the intervention (significant).  Effect sizes were moderate to large.
Noice and Noice 2013	Residents of 4 retirement homes  Aged 68-94	A four week theatre-arts intervention.	Two experiments: 1) used retirement home activity directors with no prior experience to deliver the intervention, 2) used an outside professional acting teacher	115	Retirement homes	Authors found that widespread administration of this short-term (four-week) evidence-based intervention is feasible. Results on cognitive tests were slightly better for the group with the outside professional
Noice, Noice and Staines 2004	Community dwelling adults aged 60-86	9 x 90 minute sessions over 4 weeks in visual art or theatre	No treatment control	N=124  Intervention theatre n=44  Intervention visual arts n=44  Control n=36	Community	Participants were tested on cognitive performance and mental health.  The theatre group experienced significantly greater psychological wellbeing after the intervention compared with the control and visual arts group. The theatre group also performed significantly better on word recall compared to the control group, and problem solving compared to both the control and the visual arts group.

## Before and after studies

Name, Year	Population	Intervention	Study design/Detail of control	# participants	Setting	Outcomes/Findings
Bolwerk 2014	Post retirement adults	fMRI to investigate the brain's default mode network (DMN) before and after 10 weeks of either participation in visual art production (actively produced art in an art class) or cognitive art evaluation (cognitively evaluated art in a museum)	Randomly assigned, stratified by gender and age	28 post retirement adults	Art museums	Visual art production group showed greater spatial improvement in functional connectivity of the posterior cingulated cortex than the cognitive art evaluation group. Moreover, the functional connectivity in the production group was related to psychological resilience.
Coubard 2001	Right-handed French native adults (age range not specified) with no known neurological or psychiatric disorders and normal or corrected to	A contemporary dance (CD) session focused on creative improvisation rather than reproducing or repeating movements. Lessons were 1 hour in duration and the program	Two control groups were trained to other motor activity interventions either fall prevention or Tai Chi Chuan. The training programs differed only in	N=110 Experimental group n=16 Control groups Fall prevention n=67 Tai Chi Chuan n=27	Community	Three components of attentional control were assessed. Setting attention was assessed using arithmetic tasks; Suppressing attention was assessed using the Stroop test; and Switching attention was assessed using the Rule shift card sorting test. Tests were conducted before and after the training intervention.  CD found to improve attentional control in switching tasks (Rule shift test) but not

Name, Year	Population	Intervention	Study design/Detail of control	# participants	Setting	Outcomes/Findings
	normal vision	lasted 5.7 months.	their degree of exploration of the movement.			setting or suppressing. No effects observed for fall prevention or Tai Chi Chuan.
Crone 2013	Patients with anxiety, depression, stress and low self-esteem referred from primary care	'Art Lift' aimed to improve mental wellbeing through a 10 week program of art delivered by an artist within a GP surgery to groups of 3-10 people. Creative arts included poetry, ceramics, drawing, painting and mosaic.	Observational study	N=100 completed the program (of n=202 referred)	Primary care	The study investigated the impact of the program on mental wellbeing, measured by the Warwick-Edinburgh Mental Well-Being Scale (WEMWBS). Wellbeing was assessed pre and post intervention completion.  Participants who completed the program showed a statistically significant improvement in their wellbeing, with higher scores on the WEMWBS.
De Medeiros, Kennedy et al. 2007	Adults aged 62-84 yrs  Recruited from a retired physicians' organisation  11 retired physicians and 7 spouses of physicians	Pilot study of an 8 week autobiographic writing workshop	5 memory assessments and 2 writing samples at baseline and follow up were evaluated for linguistic complexity	18 (16 in final analysis)		Results suggest that participating in an activity such as talking and writing about the past may increase information processing speed and attention and verbal learning.  Results did not support the hypothesis that grammatic complexity and idea density scores would increase. Idea density scores decreased suggesting the intervention affected idea density in an inverse way.

Name, Year	Population	Intervention	Study design/Detail of control	# participants	Setting	Outcomes/Findings
Phinney 2014	Community dwelling seniors aged 55-90	Arts Health and Seniors (AHS) Program – weekly 2 hour arts workshops over a 3 year duration.  AHS Program had 4 groups representing different populations and pursuing different creative endeavours.	Mixed methods:  Quantitative evaluation component – repeated measures no control  Qualitative component - five focus groups of 7-9 participants	N=51  Surveys n=24 (convenience sample)  Focus groups n=38	Community	Survey conducted at 1 year into program and at conclusion focusing on three domains of health: physical, emotional and social wellbeing.  Paired T-Tests indicated that seniors experienced significant improvement in perceived health and chronic pain measures with medium effect sizes.  Significant improvements over time were also shown on the sense of community subscale of the Community Connections Index with a large effect size. The community involvement subscale and the measure of perceived support showed no significant change. None of the emotional wellbeing outcomes indicated significant change over time.  Interviews: interpretive descriptive analysis revealed six themes: providing structure and discipline; facilitating coping; requiring hard work and effort; bringing out one’s artistic side; promoting social involvement; and making a contribution.
Sole 2010	adults over 65yrs (mean age 72.6yrs, 83% female) living at	Evaluation of music programs.  1x session/week of either choir, music	Pre and post-test (2 weeks after end of intervention) i.e. questionnaire given to	83  Choir =52  Music appreciation = 19	Unclear where the sessions were held.	QoL (physical health, subjective health, psychological wellbeing and interpersonal relations).  There was no substantial change in QoL between pre and post test scores.

Name, Year	Population	Intervention	Study design/Detail of control	# participants	Setting	Outcomes/Findings
	home independent no major cognitive impairment	appreciation , or preventive music therapy session	participants in music programs No control group Sessions ran from Oct-Jun	Preventive music therapy = 12		However, the participants QoL scores were already high in the pretest leaving little room for change.  Participants subjective perception was that being involved in the programs improved some aspects of QoL especially social relations (more friendships) and in personal development.
Yuen 2011	residents of a low-income senior apartment and 5 from a senior living community in an urban area of the Southern United States  Cognitively alert, and oriented (i.e. to place, person and purpose)	6 week acting class (weekly 2hr sessions)  Attendance at 5 local theatre performances		12 9 from a low-income senior apartment 3 from a senior living community 11 female, 11 male Age range: 62-88yrs	A theatre	There was significant improvement in wellbeing measured by the GBWS <sup>1</sup>  Significant improvement in physical health measured by the SF-36 <sup>2</sup>

<sup>1</sup> General Well-Being Schedule

<sup>2</sup> 36-Item Short-Form Health Survey

## Observational Cohort Studies

Name, Year	Population	Intervention	Study design/Detail of control	# participants	Setting	Outcomes/Findings
Hanna-Pladdy 2011	Healthy older adults aged between 60-83	No intervention	Observational ?Cross sectional study	Non musicians n=21 Low activity musicians n=27 High activity musicians n=22	N/A	<p>A comprehensive neuropsychological assessment was administered to determine differences in the profile and cognitive strengths of musicians. The assessment was administered in 1 session and included several estimates of verbal intellectual functioning, memory, attention, working memory and language functions.</p> <p>High activity musicians were found to have better performance in non-verbal memory, naming and executive processes in older age relative to non-musicians.</p>
Kattenstroth 2013	Healthy elderly adults aged 60-94	1 hour dance lesson per week for 24 weeks. Agilando is especially developed for elderly adults and does not require a partner	Age matched controls received no intervention	N=35 Intervention n=25 Control n=10	Community	<p>Broad assessment of: lifestyle and general activity; cognition/attention; fluid intelligence; reaction times; Posture and balance; motor performance; tactile performance; Two-point discrimination (2pd) threshold; Haptic object recognition; and cardiopulmonary performance. Data from the various tests was pooled into 7 domains covering similar functional categories to enable comparison between tests. Assessments were made pre and post intervention</p> <p>Lifestyle and general activity improved significantly in the intervention group. Significant improvements were also seen</p>

Name, Year	Population	Intervention	Study design/Detail of control	# participants	Setting	Outcomes/Findings
						<p>in the domain of cognition and attention. There was no significant effect on general intelligence.</p> <p>All tests of reaction times showed significant effects in the intervention group. In motor performance the intervention group demonstrated a significant reduction in the number of errors. For tactile performance, the intervention group showed lower touch and 2pd thresholds, made fewer errors and were faster in the Haptic recognition test. Postural performance also improved significantly in the control group.</p> <p>No effects were observed in the control group for any of the tests.</p>
Teater 2014	<p>Participants in the Golden Oldies singing program, 1hr week led singing groups for older people</p> <p>Mean age 74yrs</p>	Golden Oldies singing program	<p>Questionnaire</p> <p>Individual interviews</p>	<p>Questionnaire, n=120 (82.5% female)</p> <p>Interviews, n=5</p>	<p>Questionnaires distributed to 20 Golden Oldies locations (community centres) in the south-west of England.</p> <p>Interviews took place at interviewees home or at the community centre where the</p>	<p>Over 90% of participants agreed or strongly agreed that participation in the program: gave them confidence, had a positive effect on their life, helped them to relax, contributed to emotional wellbeing, and contributed to overall wellbeing.</p> <p>Between 73% and 89% of participants either agreed or strongly agreed that participation in the program helped them: learn about themselves, to reveal their thoughts, feelings or physical skills to others, develop their social skills, to express their personal identity, stay</p>

Name, Year	Population	Intervention	Study design/Detail of control	# participants	Setting	Outcomes/Findings
					program was held	<p>health, learn about other people, feel connected to the community, and strengthened their community.</p> <p>There was a statistically significant difference between scores of overall health prior to starting the program and at the time of completing the questionnaire (from good to very good health).</p> <p>All 5 interviewees described how participation had reduced social isolation and increased social contact. They also described the program as helping them overcome a difficult time in their lives.</p>

## Appendix B: Quality Assessment of Studies

All studies were quality assessed using a standardised tool as appropriate for the study type. As this is a rapid synthesis, quality assessments were undertaken by one person. The synthesis and use of the quality assessment was then undertaken by a different person who is also the subject matter expert.

### *Systematic reviews*

Systematic reviews were assessed using an adapted version of the SIGN methodology assessment for systematic reviews. The checklist is available at the following site:

<http://www.sign.ac.uk/methodology/checklists.html>

The SIGN quality checklist contains a 12 point quality assessment based on factors such as clarity of question, systematic nature or search, analysis and reporting.

For the purpose of this rapid synthesis, the SIGN methodology was amended down to a 10 point quality assessment checklist. The following two items were removed as no studies reported them.

- At least two people should have extracted data *and* selected studies (our revised checklist accept either/or)
- All excluded studies listed.

Generally the quality of the systematic reviews that were included in the study was high. 4 reviews were excluded on the basis that either 1) literature had not been searched systematically; 2) overall rating of 5/10 or lower. We have included these studies on the summary of quality assessments in Appendix B.

The remaining systematic reviews all undertook an appropriate analysis of studies that were generally of mixed methods, also bringing in lessons from qualitative studies that will otherwise be missed in this rapid synthesis.

### *Controlled intervention studies*

Controlled intervention studies were quality assessed using the National Institute of Health (NIH) Study Quality Assessment Tool for Controlled Intervention Studies. This tool can be accessed at the following site:

<https://www.nhlbi.nih.gov/health-pro/guidelines/in-develop/cardiovascular-risk-reduction/tools>

This tool contains 14 criteria for quality of a controlled study. However, we found that several criteria were inappropriate for undertaking studies in arts and health, in particular those regarding blinding of participants, providers and treatment allocation (not possible) and the use of intention to treat analysis (not reported in this type of literature).

We did not amend this checklist as we consider it important to highlight why it can be difficult to obtain unequivocal evidence on the effects of arts and health due to the way that interventions need to be delivered. However, many of the studies that are included in the study, while rating with scores of between 6/14 – 10/14 still provide valuable evidence of what works, and should be considered acceptable – good quality.

Within this group we found one study (Cohen and Perlstein, 2006) that had a self selecting comparison group and did not meet a standard expected on controlled interventions studies. The decision was made to still include the paper in the synthesis. When interpreting the results of this study it should be treated as a before and after study.

### *Before and After studies*

Before and After studies were quality assessed using the National Institute of Health (NIH) Study Quality Assessment Tool for Pre-Post Studies. This tool can be accessed at the following site:

<https://www.nhlbi.nih.gov/health-pro/guidelines/in-develop/cardiovascular-risk-reduction/tools>

This tool contains 12 quality criteria, several of which were generally not reported in the literature reviewed here. We suspect this is due to the difference in nature of the interventions in this field compared to the medical research for which the NIH checklist was originally intended. We did however keep the full checklist to demonstrate ways in which future research could be strengthened, even in before and after studies.

For example, no studies reported taking outcome measures of interest multiple times before the intervention and multiple times after the intervention. This, the opportunity to use an interrupted time series design was lost.

As was the case with controlled intervention studies, there was little reporting on blinding during analysis or of loss to follow-up. Several studies therefore scored either 6/12 or 7/12 and while acceptable, contain risks of bias. The remaining studies were rated between 8/12 and 10/12 and can be considered good quality.

### *Observational cohort studies*

Observational (retrospective) cohort studies were quality assessed using National Institute of Health (NIH) Study Quality Assessment Tool for Observational Cohort and Cross Sectional Studies. This tool can be accessed at the following site:

<https://www.nhlbi.nih.gov/health-pro/guidelines/in-develop/cardiovascular-risk-reduction/tools>

This tool contains 14 quality criteria which we applied to all three studies in this group. As all three studies were retrospective, scores above 9/14 were not expected; in fact some quality assessment tools explicitly state that a rating above 'acceptable' is not possible for a full retrospective cohort study.

## Quality assessments – Systematic reviews

A note on quality assessment of systematic reviews – here the quality of the process of reviewing and reporting studies is being undertaken. It is not a reflection of the quality of the papers that were reviewed. Ie. in some instances reviews with high ratings in the table below accurately reported on the poor quality of studies in the field.

Abbreviations: CD = Cannot Determine. QA = Quality Assessor. SME= Subject Matter Expert

PAPER	1. Clearly defined research question Reject if no.	2. Comprehensive literature search. Reject if no.	3. At least two people should have selected studies OR At least two	4. The status of publication was not used as an inclusion criterion.	5. The relevant characteristics of the included studies are provided.	6. The scientific quality of the included studies was assessed and reported.	7. Was the scientific quality of the included studies used appropriately?	8. Appropriate methods to combine the individual study findings.	9. The likelihood of publication bias was assessed appropriately.	10. Conflicts of interest are declared	Overall Assessment	Comment
Castora-Binkley and Noelker 2010	√	√	√	√	√	X	√	√	X	√	8/10	QA: The quality assessment in this review was not systematic, rather addressed in the summary and discussion and was manily limited to study type and population size rather than study conduct. However, the authors acknowledge these limitations and draw conclusions appropriately.  SME: <i>Descriptive review, heterogenous participants and arts practices</i>
Clark, Taylor et al. 2012	√	√	√	√	√	√	√	√	√		9/10	QA: This is a high quality review. There is no conflict of interest declaration which is likely more a reflection of the journal than the study.  SME: <i>very useful high quality meta analysis revealing no physical benefit for the addition of music to single exercise sessions for older adults</i>
Clift et al.	√	√	NR	√	√	NA	√	√	X	X	6/10	QA: This narrative review makes an appropriate assessment of the variation in study design and quality across studies. A quality

2011													assessment was not undertaken beyond study design, but the variability in studies means that assessing study design alone is already useful.
Fernandez-Arguelles 2015	√	√	√	√	√	√	√	X	X	√	8/10	QA: The methodological quality of the included studies was low, so that it was not possible to combine individual study findings to draw overall conclusions. This is appropriate considering the studies found.  SME: <i>High quality and very specific assessment of dance in improving falls prevention factors</i>	
Flood and Phillips 2007	√	X	X	√	√	X	X	√	X	X	4/10	QA: This review has value in the extent to which it categorises different types of arts and health interventions. However, no measures are taken to reduce bias, thus there is a risk that the papers reviewed have been selected to demonstrate particular effect. <b>Paper to be rejected on these grounds.</b>	
Hwang and Braun 2015	√	√	X	√	√	√	√	√	X	X	7/10	QA: Didn't report on whether the 4-eyes principle was used in data extraction and assessment. However, there is a standardised set of criteria for evaluating the papers that goes some way to rectifying risk of bias. Although the literature search is comprehensive, it is limited by only included papers in MedLine listed journals.	
Keogh and Kilding et al. 2009	√	√		√	√	√	√	√	X	√	8/10	QA: This study didn't note whether the 4 eyes principle was used in data extraction and assessment. However, there is a standardised set of criteria for evaluating the papers that goes some way to rectifying risk of bias.	
Koch et al. 2014	√	√	√	√	√	√	√	√	X	X	8/10	QA: Includes key reflection on epistemology in arts and sciences. Risk of bias in included studies was not assessed – and study quality was characterised descriptively – as this included baseline comparison, blinding, randomisation this was considered acceptable. It is noteworthy however than no studies seem to have been rejected on grounds of quality.  SME: <i>does not focus specifically on older adults (though is relevant to this group), included participants of any age</i>	
Leckey	√	√	CD	√	√	X	X	CD	X	v	4/10	QA: The methods of this review state that CASP tools were used to determine study quality, but this was then not reported.	

2011													<b>SME:</b> <i>This nonetheless useful for identifying studies and for comments on conceptual clarity in those studies. Include on utility grounds.</i>
Li et al. 2015	√	√	CD	√	√	√	X	X	√	√	7/10	QA: An example of a high quality review with very tight exclusion criteria making the meta analysis possible. Publication bias was assessed, and found to be a potential risk with this set of studies.  SME: <i>Pooling data is good practice but had the effect of absurdly increasing the heterogeneity of the sample in this instance, making the results of the meta analysis useless. Not included on grounds of poor quality.</i>	
Maujean et al. 2014	√	√	√	√	√	√	√	X	X	X	7/10	QA: This review discussed quality of included papers based primarily on study design. It is interesting to note that a large number of papers reviewed here were all targeted at specific populations groups that lie outside of the interest of the rapid synthesis. In fact, only one included study covered a population of health older adults  SME: <i>This review does not focus specifically on older adults. It describes 8 studies of art therapy across an enormously heterogenous population including women experiencing treatment for breast cancer, schizophrenia, people with developmental disabilities, people with Alzheimers, war veterans, and prison populations.</i>	
Noice, Noice and Kramer 2013	√	√	X	√	√	X	X	√	X	√	6/10	QA: This review did not include a systematic quality assessment of papers. Quality assessment was limited to discussion of study type – i.e. few of the studies found included a control (and this was appropriately noted and discussed). Thus the findings are mainly discussed descriptively and caution should be taken with results.  SME: <i>Update of Castora-Binkley et al, comprehensive, usefully descriptive, and includes useful appendices + clear conceptual discussion</i>	
Patterson et al. 2011	√	X	X	√	√	X	X	CD	X	X	4/10	QA: No explanation of the basis for selecting articles to include in this review. Risk of bias in paper selection high. <b>Excluded from synthesis on quality grounds.</b>	

Price and Tinkler 2014	√	X	X	√	√	X	X	CD	X	√	5/10	QA: The review hints at a systematic literature search, however results in terms of number of articles is not included or inclusion/exclusion criteria were not listed. Databases not listed. Risk of bias in selecting studies is therefore high. Description of individual studies in included but poor. <b>Excluded from synthesis on quality grounds.</b>
Rodrigues-Krause et al. 2016	√	√	√	√	√	√	√	√	√	√	9/10	QA: Study has a narrow scope making meta analysis possible – however this also means that the review says little outside of the specific outcome reviewed.  SME: <i>LCH high quality and very specific assessment of dance in improving cardiovascular fitness</i>
Van Lith et al. 2013	√	√	√	√	√	√	√	√	X	X	8/10	QA: Use of 4-eyes principle is assumed based on description of analysis on page 1311. The standardised assessment method also adds to rigour in this regard. Quality assessment focussed on study type and conclusions are drawn appropriately.  SME: <i>This is a critical, not a systematic review and uses Lal's recovery criteria as analytic categories for reviewing the studies included (which is very useful but does not conform to quality criteria in systematic reviews). It does not have a specific focus on older adults nor, by definition, on 'healthy' ones</i>

## Quality assessments – Controlled intervention studies

NA = Not applicable. NR = Not reported QA = Quality Assessor SME = Subject Matter Expert

PAPER	1. Described as randomized, or an RCT?	2. Method of randomization adequate?	3. Treatment allocation concealed?	4. Participants and providers blinded to treatment?	5. People assessing the outcomes blinded to the participants' group assignments?	6. Groups sufficiently similar at baseline?	7. Overall drop-out rate from the study at endpoint 20% or lower?	8. Differential drop-out rate 15 percentage points or lower?	9. High adherence to the intervention protocols?	10. Other interventions avoided or similar in the groups?	11. Outcomes assessed using valid and reliable measures	12. Sample size was sufficiently large	13. Prespecified outcomes?	14. Intention to treat analysis?	Overall Assessment	Comment
Bugos 2007	√	NR	NR	X	NR	√	√	√	√	NR	√	X	√	√	8/14	Due to the nature of this study, it was difficult to measure precisely level of exposure to the activity. Results might therefore be affected by controls participating in similar activities, or intervention group participants undertaking little actual piano instruction and practice. This is a minor point that should be taken into account in interpretation.
Chippendale and Bear-Lehman 2012	√	√	√	NA	NA	√	√	√	X	NR	√	√	√	NA	9/14	QA: A good quality study, where blinding to treatment was not possible for participants. There is possible risk of bias if the analysis was undertaken by the same person who delivered the intervention. This was not reported. Some caution should be taken as many participants only attended a few of the planned intervention sessions.

Clift et al. 2012	√	NR	NR	NA	NR	√	NR	NR	√	NR	√	√	√	NR	6/14	<p>As blinding is not applicable to this type of study, a score of 6/14 represents a fair study. This report obviously deliberately used simple language to explain the study and its results, thus many of the details required for a full quality assessment were missing.</p> <p>SME: Also refer to Clift et al. 2010, which is a systematic review of literature related to group singing</p>
Cohen and Perlstein 2006	X	X	X	X	NR	√	NR	NR	√	NR	√	√	√	NR	5/14	<p>QA: Assuming that participants received both invitation notices, the intervention and control group in this study were self selecting. This may have caused a risk of bias, as participants choosing the intervention may have already been confident in participating in a group activity such as singing, making the intervention particularly effective among this group (more so than it might have been among the self-selecting controls). The quality of this study is low for a controlled trial, but should be included. When interpreting the results this study should be treated as a before and after study.</p> <p>SME: Usefully demonstrates possible dynamics of self-reinforcing positive effects across physical function, mental health, cognitive function and social activity domains, amongst a motivated population.</p>
De Medeiros, Mosby et al. 2011	√	NR	NR	X	NR	√	√	√	√	NR	√	√	√	√	9/14	<p>This was a well conducted study. Blinding to treatment is not possible in this type of study and of less concern. Risk of bias from outcomes assessors being aware of the intervention group is minimised by the instruments used.</p>

Flood and Sharer 2006	√	NR	NR	NA	NR	√	√	√	√	√	√	NR	√	NR	8/14	<p>The main risk of bias stems from a sole or small group of two researchers being involved in recruitment, randomisation, delivery of intervention and analysis. In this study, the fact that the control group was engaged in creative activities such as “educational presentations, crafts and socialising” may have meant that any benefits received through active participation in the arts might already be achieved with this standard of activities.</p> <p>SME: Inadequate methodology to test an interesting and useful theoretical supposition: methods not matched to concepts</p>
Hui 2009	√	X	X	NA	NR	√	√	√	√	NR	√	√	√	NR	8/14	<p>The main risk of bias in this study stems from the method of randomisation. Groups, rather than individuals were randomised to intervention or control. This was to allow peers to remain together and this may be a confounding factor. Peers/friends may experience an intervention differently, e.g. may encourage each other; may engage in related activities outside of the intervention together.</p>
Kattenstroth 2010	√	NR	NR	NA	NR	√	NR	NR	√	√	√	√	√	NR	7/14	<p>QA: This study fails to report of some crucial aspects of implementing a randomised study such as method of randomisation and attrition rates. However statistical calculations are appropriate.</p>
Kim 2013	√	√	X	NA	NR	√	NR	NR	√	NR	√	√	√	NR	7/14	<p>QA: An alternate method of randomisation (as used here) is considered weak, but acceptable in this study. Use of some of standardised instruments reduced the risk of bias in the researcher assessing outcomes, however there is still a risk of bias especially as the researcher also delivered the intervention.</p>

Noice and Noice 2013	X	√	NR	NA	NR	√	√	√	√	NR	√	√	√	NR	8/14	QA: The method of randomisation was not reported. However, other aspects of study design and quality were appropriate for the study and setting. Note that this quality assessment refers to the study of effects of the intervention on participants. The comparison between qualified and non-qualified deliverers of the intervention provides additional useful information for the review.
Noice, Noice and Staines 2014	√	√	NA	NA	NA	√	√	√	√	√	√	√	√	X	10/14	QA: This is an interesting example of a study that was designed as an RCT but due to feasibility issues could only randomly assign treatment to groups of enrolled participants, rather than the other way around. There is therefore some risk that participants recruited at a later time had somewhat different characteristics to earlier participants and could not be distributed randomly across the intervention and control group. The risk of this having an effect on outcomes is slight and therefore rate the method of randomisation as appropriate.

## Quality Assessments – Before and after studies

CD = Cannot Determine, NR = Not reported, NA = Not applicable, QA = Quality Assessor, SME = Subject Matter Expert

PAPER	1. Clearly defined research question	2. Eligibility and selection criteria clearly specified	3. Representative study population.	4. All eligible participants enrolled.	5. Sample size sufficient	6. Intervention clearly described and consistently delivered.	7. Outcome measures prespecified and clearly defined?	8. People assessing the outcomes blinded to exposures/interventions?	9. Loss to follow-up after baseline 20% or less?	10. Changes in outcomes measured ?	11. Outcome measures taken multiple times before and after?	12. Take into account the use of individual-level data?	Overall	Comment
Bolwerk (2014)	√	√	√	√	CD	√	√	√	NR	√	X	√	9/12	QA: A well conducted study. Although no control the comparison between active vs passive participation in arts is of value and relevance to the review.  SME: Merely an exemplar of a study taking a therapy approach for inclusion in this synthesis. Not very useful; merely shows some neural effects of visual art production
Coubard 2011	√	√	√	X	CD	√	√	NR	NR	√	X	√	7/12	QA: This study did not report on drop outs which would be expected in a study such as this. Unfortunately there was no control group, however the comparison between types of intervention is still useful.
Crone 2013	√	√	√	C D	√	√	√	CD	X	√	X	√	8/12	QA: Results comparing completers and non completers of the program should be interpreted with caution, as the study may not have captured other features of that group that mean lead to a better (or more rapid)

															recovery from mild mental illness.
De Madeiros 2007	√	√	√	X	X	√	√	NR	√	√	X	√	8/12	QA: This was a pilot study only and should be interpreted as such. Study population was small, but design and conduct were of appropriate quality.	
Phinney 2014	√	√	√	√	√	√	X	NR	NR	X	X	X	6/12	QA: A weakness of this study is that it was designed and commenced after the intervention, there therefore a risk of bias that outcomes were selected to coincide with observed changes in the population. Caution should be taken in interpreting the results of this study as there is not true baseline. Comparison across groups was not, and should not be made due to the different characteristics of the population. The additional of qualitative data adds strength to the study.  SME: Distinctive for length of intervention (3 years), diversity of participants (deliberate selection of ethnic and sexual minorities) and use of appropriate community based participatory research methodology and framework	
Sole 2010	√	√	√	C D	√	NR	√	NR	X	√	X	X	6/12	QA: This study had a high attrition rate that was not accounted for in analysis. There is a risk of bias that those participants that did not continue to participate in music sessions had declining quality of life. There is additional value in this study however through the qualitative component.	
Yuen 2011	√	√	√	X	X	X	√	NR	√	√	X	√	7/12	QA: Although the intervention was clearly described and consistent, only 10/16 participants attended all classes. The low number of participants means that results of this study should be interpreted with caution, as the author acknowledge. Additional useful information is provided through the qualitative analysis.	

## Quality assessments – Observational cohort studies

CD = Cannot determine. NA = Not Applicable QA = Quality Assessor NR = Not reported

PAPER	1. Clearly stated question/objective?	2. Study population clearly defined?	3. Participation rate at least 50%?	4. Subjects selected or recruited from the same or similar populations?	5. Sample size justification, power description, or variance and effect estimates provided?	6. Exposure prior to outcomes measurement?	7. Study over sufficient timeframe?	8. Different levels of exposure examined?	9. Exposure measures clearly defined?	10. Exposre measured more than once over time?	11. Outcomes measured clearly defined?	12. Outcome assessors blinded to the exposure status of participants?	13. Loss to follow-up after baseline 20% or less?	14. Confounding variables measured and adjusted?	Overall Assessment	Comment
Hanna-Pladdy 2011	√	√	CD	CD	√	√	√	√	√	X	√	NR	NA	√	9/14	QA: This is a strong study however it is not clear how participants were recruited, creating a risk of bias towards certain outcomes or interest. Otherwise a strong study design.
Kattenstroth 2010	√	√	NA	√	X	√	√	X	√	X	√	NR	NA	X	7/14	QA: The study used a binary measure of amateur dancing or control (no amateur dancing) which limited the extent to which effect of exposure could be measured. The study design was not able to capture amateur dancers that ceased dancing for any reason, some of which may have been physical and or mental decline. Few counfounders were accounted for.
Teater 2014	√	√	X	√	√	√	CD	X	√	X	√	NR	NA	NA	7/14	QA: This study used subjective measures, which, while appropriate, need to be interpreted correctly. It was unclear whether survey respondents had attended many, few or only a single Golden Oldies sessions and



## Appendix C: Types of interventions and outcomes measured

This table should be read in conjunction with the quality assessment table and summary table of included papers which contain more detail.

### Reviews

		<i>Outcomes measured (not indicative of effect)</i>							
	Overall quality rating <sup>3</sup>	Comment	Cognitive skills and/ or function	Mental health and wellbeing	Social	Physical <sup>4</sup>	General health <sup>5</sup>	Physical activity	Body weight and/ or BMI
<b>Intervention and papers</b>									
<b><i>Drama/theatre</i></b>									
Castora-Binkley et al. 2010	8/10	Authors' found suggested benefit for physical and mental health from participating in arts programs. Small numbers and designs of included studies limit broad conclusions							
Noice, Noice, Kramer 2013	6/10	Caution should be taken when interpreting results due to lack of quality assessment of included studies and descriptive discussion of findings							
<b><i>Writing/ reminiscence/ creative expression</i></b>									
Castora-Binkley et al. 2010	8/10	Authors' found suggested benefit for physical and mental health from participating in arts programs. Small numbers and designs of included studies limit broad conclusions							
Noice, Noice, Kramer 2013	6/10	Authors found positive outcomes for some cognitive, mental health and QoL measures .Caution should be taken when interpreting results due to lack of quality assessment of included studies and descriptive discussion of findings							
<b><i>Visual art e.g. drawing, painting, ceramics</i></b>									

<sup>3</sup> NOTE: Overall quality assessment refers to the quality of the review – not the quality of the individual included studies or interventions.

<sup>4</sup> e.g. balance, flexibility, cardiovascular, endurance, strength

<sup>5</sup> e.g. less meds, self-reported health

*Note: The strength of the evidence in this table cannot be accrued as the studies use different outcome measures or different instruments for the same outcome measures*

Castora-Binkley et al. 2010	8/10	Authors' found suggested benefit for physical and mental health from participating in arts programs. Small numbers and designs of included studies limit broad conclusions							
Maujean et al. 2014	7/10	Only one included study looked at healthy older adults							
Noice, Noice, Kramer 2013	6/10	Authors found positive outcomes for some cognitive, mental health and QoL measures. Caution should be taken when interpreting results due to lack of quality assessment of included studies and descriptive discussion of findings							
Van Lith et al. 2013	8/10	Does not have specific focus on older adults Used Lal's framework for mental health recovery							
<b>Music (instrumental)</b>									
Castora-Binkley et al. 2010	8/10	Authors' found suggested benefit for physical and mental health from participating in arts programs. Small numbers and designs of included studies limit broad conclusions							
Clark et al. 2010	9/10	No benefit found for adding music to exercise sessions							
Noice, Noice, Kramer 2013	6/10	Authors found positive outcomes for some cognitive, mental health and QoL measures. Caution should be taken when interpreting results due to lack of quality assessment of included studies and descriptive discussion of findings							
<b>Singing</b>									
Castora-Binkley et al. 2010	8/10	Authors' found suggested benefit for physical and mental health from participating in arts programs. Small numbers and designs of included studies limit broad conclusions							
Clift et al. 2010	6/10	Suggests some benefits for psychological and social outcomes. Unclear re benefits for physical health. Short time doesn't allow evaluation of duration of effect.							
Noice, Noice, Kramer 2013	6/10	Authors found positive outcomes for some cognitive, mental health and QoL measures. Caution should be taken when interpreting results due to lack of quality assessment of included							

Note: The strength of the evidence in this table cannot be accrued as the studies use different outcome measures or different instruments for the same outcome measures

		studies and descriptive discussion of findings						
<b>Dance</b>								
Castora-Binkley et al. 2010	8/10	Authors' found suggested benefit for physical and mental health from participating in arts programs. Small numbers and designs of included studies limit broad conclusions						
Fernandez-Arguelles 2015	8/10	Not possible to combine studies to draw overall conclusions. Only 2 of 7 studies were of good quality. Therefore although there appears to be benefit this can't be confirmed.						
Hwang et al. 2015	7/10	Findings suggest improvements in physical health related to dance regardless of style.						
Keogh et al. 2011	8/10	Researchers found relatively (Grade B) strong evidence that dancing can improve physical health outcomes.						
Koch et al. 2014	8/10	Positive effects found for mental health and wellbeing. Note: does not focus spec. of older people although they are included. Difficult to assess quality of the individual studies.						
Noice, Noice, Kramer 2013	6/10	Authors found positive outcomes for some cognitive, mental health and QoL measures. Caution should be taken when interpreting results due to lack of quality assessment of included studies and descriptive discussion of findings						
Rodrigues-Krause 2016	9/10	Specifically looked at VO2 peak (aerobic capacity). Results indicate that dance is as effective as other exercise interventions						
<b>Creative activities broadly</b>								
Leckey 2011	4/10	Low quality study included on utility grounds. See quality assessment table						

Note: The strength of the evidence in this table cannot be accrued as the studies use different outcome measures or different instruments for the same outcome measures

## Controlled studies

	Overall quality rating	Intervention	Comment	Outcomes measured						
				Cognitive skills and/ or functioning	Mental health and wellbeing	Social	Physical <sup>6</sup>	General health <sup>7</sup>	Physical activity	Body weight and/or BMI
Name, Year										
Bugos 2007	8/14	Music (piano instruction)	Researchers report some improvement in cognitive tests. Difficult to measure the level of exposure to the activity – this should be considered when interpreting the results							
Chippendale 2012	9/14	Reminiscence / writing (life review through writing)	Researchers report some improvement in measures of depression. Some caution should be taken with results due to poor attendance at sessions							
Clift 2012	6/14	Singing (singing groups)	Report doesn't include all details. Also refer to Clift 2010							
Cohen, Perlstein et al. 2006	5/14	Singing (chorale group)	Results suggest improvement in the self-reported outcomes measured. See limitations reported in quality assessment							
de Medeiros, Mosby et al. 2011		Reminiscence / writing	In general the intervention was ineffective							

<sup>6</sup> e.g. balance, flexibility, cardiovascular, endurance, strength

<sup>7</sup> e.g. less medication, self-reported health

*Note: The strength of the evidence in this table cannot be accrued as the studies use different outcome measures or different instruments for the same outcome measures*

Flood and Scharer 2006	8/14	Reminiscence, storytelling, bibliotherapy, poetry	Researchers could not identify any significant relationship between creativity and successful aging. Note: inadequate methodology to address the research question																
Hui 2009	8/14	Dance (low aerobic)	Researchers report improvements in physical and general health (QoL). Peers remaining together may influence results																
Kattenstroth 2010	7/14	Dance (ballroom)	Showed improvement in the outcomes measured but some study features (e.g. randomisation method) are not reported																
Kim 2013	7/14	Art therapy	Improvements in measures of mental health. Some risk of bias																
Noice and Noice 2013	8/14	Theatre	Reported on outcomes based on who delivered the intervention (see main table for details)																
Noice, Noice and Staines 2004	10/14	Visual arts of theatre	Authors reported greater improvements in theatre group compared to visual arts or controls.																

Note: The strength of the evidence in this table cannot be accrued as the studies use different outcome measures or different instruments for the same outcome measures

## Before and after studies

	Overall quality rating	Intervention	Comment	Outcomes measured	Reported findings
Name, Year					
Bolwerk 2014	9/12	Visual art: drawing/painting	Shows some neural effects of visual art production (using fMRI) – not very relevant to the review question	Neural effects	Visual art production group showed greater spatial improvement in functional connectivity of the posterior cingulate cortex than the cognitive art evaluation group. Moreover, the functional connectivity in the production group was related to psychological resilience.
Coubard 2001	7/12	Dance	There was no control group and study did not report on drop outs. Comparison between types of intervention is still useful	Cognitive	Contemporary dance was found to improve one measure of attentional control. No effects observed for fall prevention or Tai Chi Chuan.
Crone 2013	8/12	Visual art: drawing/painting	Should be interpreted with caution – see quality assessment table	Mental health, wellbeing	Authors report improvement in wellbeing.
De Medeiros, Kennedy et al. 2007	8/12	Reminiscence/ writing	Pilot study and small study population limit conclusions that can be drawn.	Cognitive	Results suggest that participating in an activity such as talking and writing about the past may increase information processing speed and attention and verbal learning.  Idea density scores decreased suggesting the intervention affected idea density in an inverse way.
Phinney 2014	6/12	Visual art: drawing/painting	Caution should be taken when interpreting the results – see quality assessment table	Wellbeing (physical, emotional and social)	Improvements were reported in general health and chronic pain. Improvements were found in “sense of community”. No change was found in emotional wellbeing indicators.
Sole 2010	6/12	Music Singing	Participants’ subjective reports suggest improvement in some aspects of QoL. The study had a high attrition rate so there is a risk of bias	QoL (physical health, subjective health, psychological wellbeing and interpersonal relations).	There was no substantial change in QoL between pre and post test scores. However, the participants QoL scores were already high in the pretest leaving little room for change.  Participants subjective perception was that being involved in the programs improved some aspects of QoL especially social relations (more friendships) and in personal development.
Yuen 2011	7/12	Theatre	Results should be interpreted with caution due to low number of participants attending all classes	Mental health and wellbeing, physical health	Results suggest improvement in wellbeing and physical health

Note: The strength of the evidence in this table cannot be accrued as the studies use different outcome measures or different instruments for the same outcome measures

## Observational cohort studies

	Overall quality rating	Intervention	Comment	Outcomes measured	Reported findings
Name, Year					
Hanna-Pladdy 2011	9/14	Music	A strong study, but with risk of bias as it is unclear how participants were recruited.	Cognitive	High activity musicians were found to have better performance in non-verbal memory, naming and executive processes in older age relative to non-musicians.
Kattenstroth 2013	7/14	Dance	Results indicate improvement in the intervention group. However, weaknesses in the study design mean results should be interpreted with caution	Broad assessment of: lifestyle and general activity; cognition/attention; fluid intelligence; reaction times; Posture and balance; motor performance; tactile performance; Two-point discrimination (2pd) threshold; Haptic object recognition; and cardiopulmonary performance.	Results indicate improvement in the intervention group.
Teater 2014	7/14	Singing	Participants responses to questionnaire suggest improvements in self-reported health and wellbeing. Results should be interpreted with caution as the analysis could not adequately account for varying levels of exposure.	Self-reported health and wellbeing	Participants responses to questionnaire suggest improvements in self-reported health and wellbeing.

*Note: The strength of the evidence in this table cannot be accrued as the studies use different outcome measures or different instruments for the same outcome measures*

## Appendix D: Expanded limitations, recommendations and future directions

Creative arts in health shows both considerable potential and, currently, enormous weakness in its evidence base and in some of its assumptions.

This literature sample indicates how new the field is, with numbers of papers and numbers of participants in studies being very small

- 4 of 13 reviews did not investigate or specifically focus on impact for older adults – reviews and controlled intervention studies that specifically investigate evidence for creative arts in supporting healthy aging are as yet very few in number
- The numbers of studies captured by each review were small; sample sizes in single studies were mostly also small

Participant profile were extremely limited, both by heterogeneity and absence of diversity

- The majority of participants were white females. This sample generated virtually no data about preferences or outcomes for males or non-white participants or those from varying cultural backgrounds. Socio-economic status impacts were not possible to discern.
- Many review studies, especially those who pooled data, included participants both with and without cognitive deficits, with and without mental health concerns or depression scores, with and without physical function limitations and illness, and from both community and health care settings. This made the pooled data and much of the review claims useless (especially in the light of other study data that indicates that these groups may well have very significantly differing responses and outcomes).

The question of whether and how to discriminate between arts therapies, participatory arts, and other categories of intervention (e.g crafts, Zumba classes), or between healthy and unhealthy participants, was inconsistent across studies

- These categories were often treated in the same sample (as was the case for our own sample)
- There was no consistency across studies, so distinctions were eroded and outcomes impacted by potentially unnecessary exclusions
- There was no capacity to distinguish *when* and *why* such distinctions might be helpful, especially in the light of how interpretive health status is for older adults, and how liable to change

There were significant methodological limitations in consistency, comparability, and sensitivity, and frequent shortcomings in study processes and controlled intervention methods.

- There was very little consistency as to measures used across different studies, even for measures of aspects of physical function such as balance, making it very difficult to institute any meaningful comparisons
- As noted by virtually all reviews, few studies were fully blinded and in many cases, not fully randomized; control groups were often imperfectly constructed or matched to intervention groups particularly as to the impacts of attention; publication bias was likely

- Assumptions were made as to the minimum 'dose' and length of interventions that might be required to demonstrate impacts, in several cases making the results of the study unreliable (except for information about inadequate interventions)
- Many of the measurement instruments used were likely to be insufficiently sensitive to discriminate a variety of cognitive and social, especially outcomes that might be cumulative
- heterogeneity of samples obscured the capacity to discriminate different effects for different populations or types of intervention, again making findings unreliable. It was not possible to discover if an intervention had greater or smaller impacts for those with or without degrees of cognitive impairments, for example.
- Studies eliminated potentially important interaction effects (e.g. differences in performance in multigenerational groups, the impact of dancing *along with* warm up exercises, or squatting exercises) and reinforcement effects (e.g. when motivated individuals achieve far greater positively reinforcing physical, social and psychological outcomes, as was potentially the case for Cohen et al (2006))

Construct validity remains a concern for the field

- The use of several profoundly different analytic and measurement frameworks in our sample indicates the absence of agreement about construct validity (as some authors warned)
- Underlying theoretical and conceptual framework to explain hypothesized effects were often not clarified or explicated; on the other hand, interesting hypotheses (e.g. about the importance of 'creativity') were simply unable to be investigated using current methods

The papers reviewed here specifically excluded qualitative studies, and so is not representative of the literature in the field as a whole, and there was no methodological capacity to capture systems effects, dynamic processes, effects of interactions or emergent effects, or complexity.

- We can predict that standard RCT methodology will be *unable* to capture emergent effects in complex dynamic systems
- This was reflected in the gap between quality scores for some reviews and controlled intervention studies, and the actual utility of these studies
- There was no methodological capacity to capture systems effects, emergence or interaction effects, although these are hypothesized to drive arts and health impacts
- Methodologies drawn from social return on investment, social determinants of health and complexity and system studies in health are appropriate to this field but were not represented in this sample of literature.
- The studies synthesised here was not integrated with other major studies in the field, including cost effectiveness and economic benefits of creative arts investments; longitudinal benefits of arts participation and engagement; the role of creative arts in the health of communities; qualitative evaluations of a broad range of current programs; or the ethical implications and impacts of creative arts approaches
- It is critical to note that commitments to process, intrinsic value, meaning and transformative potential are fundamental to the field and are at odds with measuring impacts and benefits. Goodhart's Law can apply: when a measure of success becomes a target, it loses its utility. Ironically, overcommitments to 'intervention' and a quantified evidence base may prevent the very impacts sought.

This sample provided no studies or evidence respecting cost effectiveness or economic implications

- creative arts interventions are nonetheless hypothesized to be comparatively inexpensive and affordable and to generate important protective and preventive effects

Noice, Noice and Kramer [1] recommend:

1. Standardized measures, common vocabulary, and comparable behavioral outcomes so that effectiveness across interventions can be assessed. Outcome measures in the wellness literature review ranged from memory-assessment instruments (e.g., East Boston Memory Test) to psychiatric inventory (e.g., FN-4), with no two investigative teams employing the same instruments.
2. Consistent use of pre–post designs and appropriate control groups where possible.
3. Large enough samples to be meaningful.
4. Assessment of long-term effects.
5. More diverse populations.

Simultaneously, Phinney, Moody and Small, [5] 'Given this pattern of findings, we are forced to consider the possibility that the measures we used were not able to capture in statistically meaningful ways the kind of emotional effects the participants were experiencing. Putland [35] has argued that feelings of pleasure and joy may be among the most powerful and potentially important outcomes of community-engaged arts, but these have been neglected in evaluation models that draw predominantly on biomedical and social perspectives. Other researchers have identified similar tensions arising from the use of standardized numerical tools in the evaluation of community-engaged arts programming.'

## Appendix E: Search Terms

Sample searches performed by FACE in-house librarian

1. ((ageing OR aging OR gerontol\* OR geriatric) AND cultural AND (benefits OR outcomes))
2. ((ageing OR aging OR gerontol\* OR geriatric) AND fine arts AND (benefits OR outcomes))
3. ((ageing OR aging OR gerontol\* OR geriatric) AND sculpture AND (benefits OR outcomes))
4. ((ageing OR aging OR gerontol\* OR geriatric) AND creativity AND (benefits OR outcomes))
5. ((ageing OR aging OR gerontol\* OR geriatric) AND (creative OR creativity) AND (benefits OR outcomes))
6. ((ageing OR aging OR gerontol\* OR geriatric) AND creative activity AND (benefits OR outcomes))
7. ((ageing OR aging OR gerontol\* OR geriatric) AND "creative activity" AND (benefits OR outcomes))
8. ((ageing OR aging OR gerontol\* OR geriatric) AND "art therapy" AND (benefits OR outcomes))
9. ((ageing OR aging OR gerontol\* OR geriatric) AND "art therapy" AND (benefits OR outcomes))
10. ((ageing OR aging OR gerontol\* OR geriatric) AND "literary arts" AND (benefits OR outcomes))
11. ((ageing OR aging OR gerontol\* OR geriatric) AND (literature OR writing OR authors) AND (benefits OR outcomes))
12. ((ageing OR aging OR gerontol\* OR geriatric) AND (performance OR drama) AND (benefits OR outcomes))
13. ((ageing OR aging OR gerontol\* OR geriatric) AND (built environment OR architecture) AND (benefits OR outcomes))
14. ((ageing OR aging OR gerontol\* OR geriatric) AND "digital arts" AND (benefits OR outcomes))
15. ((ageing OR aging OR gerontol\* OR geriatric) AND "built environment" AND (benefits OR outcomes))
16. ((ageing OR aging OR gerontol\* OR geriatric) AND ("creative arts" AND inclusion) AND (benefits OR outcomes))
17. ((ageing OR aging OR gerontol\* OR geriatric) AND ("creative activity" AND inclusion) AND (benefits OR outcomes))
18. ((ageing OR aging OR gerontol\* OR geriatric) AND ("creative activity" AND employment) AND (benefits OR outcomes))