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REVIEW ARTICLE

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Music-based interventions for community-dwelling people with dementia: A systematic review

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Abstract

The majority of people with dementia (PwD) live in the community. Compared to institutionalised PwD, their access to formalised music therapy is limited. Initial works suggest that non-therapist-led music-based interventions (MBIs) may be an accessible and effective alternative. The aim of this review was, therefore, to synthesise evidence on MBIs for community-dwelling PwD. We systematically searched electronic databases (PubMed, PsycInfo, Web of Science) for records reporting on controlled studies of MBIs delivered to community-dwelling PwD. Two reviewers independently screened records according to inclusion/exclusion criteria. A total of 15 relevant publications reporting on 14 studies were initially identified and assessed using the Cochrane risk-of-bias tool for randomised trials (RoB 2) and the risk of bias. In non-randomised studies of interventions (ROBINS-I) tool. A total of 11 records of 10 studies, with a total of $n = 327$ PwD, were included in the synthesis. MBIs consisted either of singing or music listening interventions and were variable in duration. MBIs had immediate positive effects on cognition. Short-term MBIs (lasting 1–4 months) benefited cognition, anxiety and pain. Evidence on depressive symptoms was conflicting. The benefits of longer term MBIs (lasting 6+ months) were less apparent. According to GRADE criteria, the overall quality of evidence was moderate to low. The inconsistency in designs, procedures and measures prevents specific conclusions at this stage. Still, the diversity observed in existing studies suggests that there are multiple interesting avenues for researchers to pursue, including the involvement of informal caregivers in MBI delivery. Future studies need to ensure adequate reporting to facilitate continued development. The protocol of this review was pre-registered with the Prospective Register of Systematic Reviews (PROSPERO, Registration Number: CRD42020191606).

KEYWORDS
Alzheimer's disease, dementia, music, non-pharmacological intervention, systematic review

1 | BACKGROUND

Globally, approximately 55 million people are currently living with dementia (World Health Organization, 2021). The underlying diseases are variable, the main cause being Alzheimer's disease (AD, accounting for approximately 60%–80% of cases; Alzheimer's Association, 2021). Whilst dementias caused by varying pathologies have distinct profiles, they also share symptomatology and pathologies frequently co-occur. People living with dementia (PwD) face not only progressive cognitive decline but also experience behavioural and psychological symptoms (BPSDs), including agitation, anxiety, and depression. In conjuncture, these symptoms deteriorate the individuals' independence. Pharmacological treatments have shown limited effectiveness and, given the additional concern regarding side effects (Madhusoodanan & Ting, 2014), the focus has shifted to non-pharmacological interventions, including art-based interventions.

Art-based interventions can involve an array of art forms. Within this wider context, music therapy (MT) has been amongst the most popular choices (Beard, 2012). MT is defined as either a receptive (music listening) or an active (music making) intervention delivered by a trained music therapist, who uses a distinct range and order of music-based activities to achieve therapeutic goals. Recent reviews show a robust positive effect of MT on BPSDs (Gaviola et al., 2019; Sousa et al., 2021; van der Steen et al., 2018). Emerging evidence suggests that positive effects may also extend to cognition (Fusar-Poli et al., 2018; van der Steen et al., 2018; Vasionytė & Madison, 2013), general well-being and quality of life (QoL) (Beard, 2012; van der Steen et al., 2018).

However, these findings are largely based on institutionalised PwD. This is because, owing to MT's formalised nature, its application has been largely limited to this population. Yet, the majority of PwD (approx. 70%) remain within the community (Alzheimer's Association, 2019). Numbers are expected to rise as many prefer to remain within their familiar community (Van Dijk et al., 2015) and healthcare systems can no longer stem growing demands (Mogan et al., 2018). To support community-dwelling PwD individuals and unburden healthcare systems, it will be necessary to develop an understanding of informal (i.e. non-therapist-delivered) music-based interventions (MBIs) and any positive effects these may yield. MBIs involving listening to music (taped or live) or singing are low-cost and highly accessible. As of now, it is difficult to judge the effectiveness of MBIs. That is because MBIs are often studied alongside formalised MT without a clear distinction being made. Some researchers have, nonetheless, suggested that MBIs may be as effective as MT (e.g. Beard, 2012; Sousa et al., 2021).

Indeed, one review focused on community-based art interventions (Young et al., 2016), including MBIs, showed that such interventions benefit cognition in community-dwelling PwD. Still, the scope of this review is limited as the authors restricted the focus to interventions delivered by formal care staff and to cognitive outcomes. Moreover, the review included studies lacking a control condition. A more recent scoping review (Elliott & Gardner, 2018) partially addresses these limitations by discussing the effects of a larger range of musical activities delivered, for instance, by caregivers or in an experimental setting—on memory, social well-being, and agitation. Yet, this review is non-systematic and includes non-controlled studies. Thus, the need for a systematic review of controlled investigations of MBIs for community-dwelling PwD persists.

What is known about the topic?

- Formalised music therapy has been empirically shown to have a positive impact on behavioural and psychological symptoms of dementia, as well as cognition, well-being and quality of life.
- Yet, formal music therapy is studied almost exclusively in institutionalised people with dementia.
- For community-dwelling people with dementia non-therapist-delivered music-based interventions are a promising alternative.

What this paper adds

- Music-based interventions delivered to community-dwelling people with dementia are heterogeneous in design, including music listening and singing interventions.
- Music-based interventions show positive effects on cognitive, psychiatric and pain outcomes.
- Quality of evidence is moderate to low, indicating the need for more rigorous investigations to allow for more specific recommendations.

1.1 | Aim

This systematic review aims at giving an overview of the beneficial effects of MBIs in older adults with dementia who remain within the community. The review concentrates on effects relative to control conditions. Specifically, the review will synthesise evidence on domains central to dementia symptomatology, i.e. cognitive functioning and BPSDs. As secondary outcomes, emotional well-being and QoL will be considered.

2 | METHODS

Methods were designed under consideration of the recommendations laid out in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins et al., 2019) and the Preferred Reporting Items for Systematic Reviews (PRISMA, Page et al., 2021). A protocol was pre-registered with the Prospective Register of Systematic Reviews (PROSPERO, Registration Number: CRD42020191606). A minor deviation from the protocol in terms of the population included is detailed and justified below.

2.1 | Inclusion/exclusion criteria

Inclusion and exclusion criteria were determined by the Population, Intervention, Control and Outcomes (PICO) model (Miller & Forrest, 2001).

2.1.1 | Population

We included studies of older adults (all or the majority of participants ≥60 years of age) with a diagnosis of any type of dementia at all stages of severity. We aimed to include only studies of exclusively community-dwelling PwD outside the context of stationary care (i.e. excluding patients in hospital wards and care homes but including individuals that receive outpatient care). However, we identified records ($n = 3$) in which the population sampled included both community-dwelling and institutionalised PwD. We decided to include these studies, taking the participation of community-dwelling PwD in them as proof of applicability to the target population. Studies focused on patients with primary diseases with an increased risk for dementia, such as Parkinson's disease, stroke or psychiatric disorders, were excluded.

2.1.2 | Type of interventions

We included studies reporting on any MBI, irrespective of the mode of delivery (e.g. face-to-face, via sound-transmitting medium), not delivered by a music therapist or centred on the development of a therapeutic relationship. If a musical therapist was initially consulted, but not involved in the delivery beyond this, the record was also included. We considered all settings outside stationary care. There was no restriction in terms of the dosage of the intervention. If the MBI was administered in conjunction with a non-MBI component, the investigation was included as long as there is a condition that allows for separating the effects of the music-based activity. Activities based on rhythmic movement or dance were excluded to avoid confounding effects of physical exercise (Law et al., 2020; Ojagbemi & Akin-Ojagbemi, 2019).

2.1.3 | Type of comparators

Studies that compared the MBI with either an active or passive control condition were included, i.e. randomised-controlled trials (RCTs), controlled trials, quasi-experimental and cohort studies with comparison groups. We excluded case studies, studies lacking a control condition and purely qualitative investigations.

2.1.4 | Type of outcomes

To achieve a broad understanding of the outcomes of our target interventions, we included studies with any quantitatively measured outcomes as long as they were not limited to caregiver outcomes or exclusively measured motor function. For the synthesis, we considered any validated measures of cognitive functioning and BPSDs as primary outcomes. Quality of life and emotional well-being are secondary outcomes. Other outcomes considered were (non-validated) measures of cognitive function, BPSDs, QoL, emotional well-being, social function, daily functioning, pain or biomarkers.

2.1.5 | Language

Only studies published in the English language were included.

2.2 | Search strategy

Terms defined according to the PICO inclusion criteria (see above) were used to define terms (Table S1) search PubMed (Title/Abstract Search), Web of Science (Core Collection, Topic Search) and PsycInfo (Title/Abstract Search). The search was conducted on 14 June 2021. The reference lists of included studies, as well as of reviews identified through the search of electronic databases, were scanned to identify additional potentially relevant studies. Authors of relevant conference abstracts ($n = 2$) identified were contacted to request any published or unpublished results.

2.3 | Study selection

Records identified were imported into an Endnote X9 (The Endnote Team, 2013) library by one reviewer (L.M.H.) and manually deduplicated. Thereafter, they were exported into an Excel sheet used for the remaining three stages of independent screening according to inclusion/exclusion criteria by two authors (L.M.H., S.D.R.). First, record titles were screened. If either reviewer marked a record for retention, the record was retained. Second, the abstracts of remaining records were screened and retained or excluded for further screening based on consensus. Finally, full texts of records were screened and retained based on consensus. For consensus decisions, disagreements were resolved by discussion based on inclusion/exclusion criteria if possible; else, a third reviewer (F.S.R.) was consulted.

2.4 | Risk of bias assessment

The risk of bias was assessed using the *Cochrane risk-of-bias tool for randomised trials* (RoB 2; Sterne et al., 2019) for randomised trials, and the *Risk Of Bias In Non-randomised Studies of Interventions* (ROBINS-I; Sterne et al., 2016) tool for non-randomised trials. These tools consist of five (RoB 2), six (RoB 2 for crossover trials) or seven (ROBINS-I) domains (Tables S3 and S4). They allow for an overall risk of biased judgement (RoB 2: low risk, some concerns, high risk; ROBINS-I: low/moderate/serious/critical risk). Two reviewers (L.M.H., S.D.R.) independently completed risk of bias assessments for all studies included based on the full-text screening. If the reviewers disagreed on a tool domain, they resolved this by discussion based on inclusion/exclusion criteria. A third reviewer (F.S.R.) cross-checked assessments. In line with the guidance provided by Cochrane, we excluded studies from synthesis that, according to the ROBINS-I, were at critical risk of bias and those at high risk of bias according to the ROB 2 (Higgins et al., 2022). The quality of the cumulative evidence was evaluated based on the Grading of Recommendation, Assessment, Development and Evaluation (GRADE, Guyatt et al., 2008) approach. All reviewers (L.M.H, S.D.R., F.S.R.) conferred regarding the grading.

2.5 | Data extraction

One reviewer (L.M.H.) extracted relevant data on the study details, study design, population details, disease-specific details (i.e. dementia type, severity and diagnosis), intervention details, outcome details and results from included studies into tabular form. A second reviewer (S.D.R.) cross-checked these data. A third reviewer (F.S.R.) gave final approval.

2.6 | Synthesis

Per our protocol, we evaluated the feasibility of meta-analysis by grouping evidence according to outcomes and interventions and determining whether we could group five or more studies. As this was not the case, we are narratively reviewing included studies. Evidence was synthesised according to the outcome domain. As pre-specified, outcomes describing cognitive functioning and BPSDs are of primary interest, as these are central to describing the presentation of dementia. Secondary outcomes describe emotional well-being and QoL, other outcomes are considered separately. We further decided to group our synthesis by the time of measurement: immediate effects, effects after 1–4 months of intervention, and effects after 6+ months of intervention. The latter decision was made based on the data extracted from the included studies.

3 | RESULTS

3.1 | Study selection

We identified 2181 records in our search (Figure 1). After deduplication, 1386 were included in the title screening process. Title-based inclusion/exclusion judgements of the two raters (L.M.H., S.D.R.) converged in 77.56% of cases; inter-rater agreement as estimated by Cohen's κ was 0.55 ($z = 20.50$, $p < 0.0001$). A total of 860 abstracts were screened. Inter-rater convergence pre-consensus was 74.65% (Cohen's $\kappa = 0.3$, $z = 9.77$, $p < 0.0001$). One-hundred-ninety records were included in full-text screening (consensus 75.78%, Cohen's κ 0.53, $z = 7.49$, $p < 0.0001$). No further texts could be identified through screening reference lists. Applying the inclusion/exclusion criteria in the full-text screening, we finally identified $n = 15$ publications of $n = 14$ studies. After the risk of bias assessment, $n = 4$ records were removed due to critical/high risk of bias (Table S2). Thus, the final synthesis includes $n = 11$ publications of $n = 10$ studies, all judged to have either a moderate risk of bias (ROBINS-I, see Table S3) or some concerns (RoB 2, see Table S4).

3.2 | Characteristics of included studies

For an overview of all included studies, see Table 1. The studies originated from Australia, Finland, Ireland, Japan, France, Spain, Taiwan, the UK and the US. Only $n = 2$ studies were RCTs (20%). Further were $n = 5$ experimental studies (50%) and $n = 3$ quasi-experimental studies (30%). The majority of interventions were music listening interventions ($n = 7$, 70%); the remainder of interventions were singing interventions ($n = 3$, 30%). Interventions were delivered by researchers ($n = 6$, 60%), musically trained professionals ($n = 3$, 30%) or facilitated at home by informal caregivers ($n = 1$, 10%). Of the interventions delivered by musically trained professionals, two further contained home-based components facilitated by informal caregivers. The majority of studies ($n = 6$, 60%) focused exclusively on people diagnosed with AD. Of the remaining studies, three (30%) included a population with varying dementia types (behavioural-variant frontotemporal dementia [bv-FTD], vascular dementia, mixed dementia and 'other'); of these only one distinguished between diagnoses within their results. One study (10%) did not specify dementia type. In total, $n = 327$ PwD were included. All samples were convenience samples, with PwD recruited via day activity centres ($n = 140$, 42.8%), memory clinics ($n = 85$, 26%), outpatient-clinics ($n = 61$, 18.7%), research centres ($n = 30$, 9.2%), an aged care service ($n = 9$, 2.8%) and residential care ($n = 2$, 0.6%).

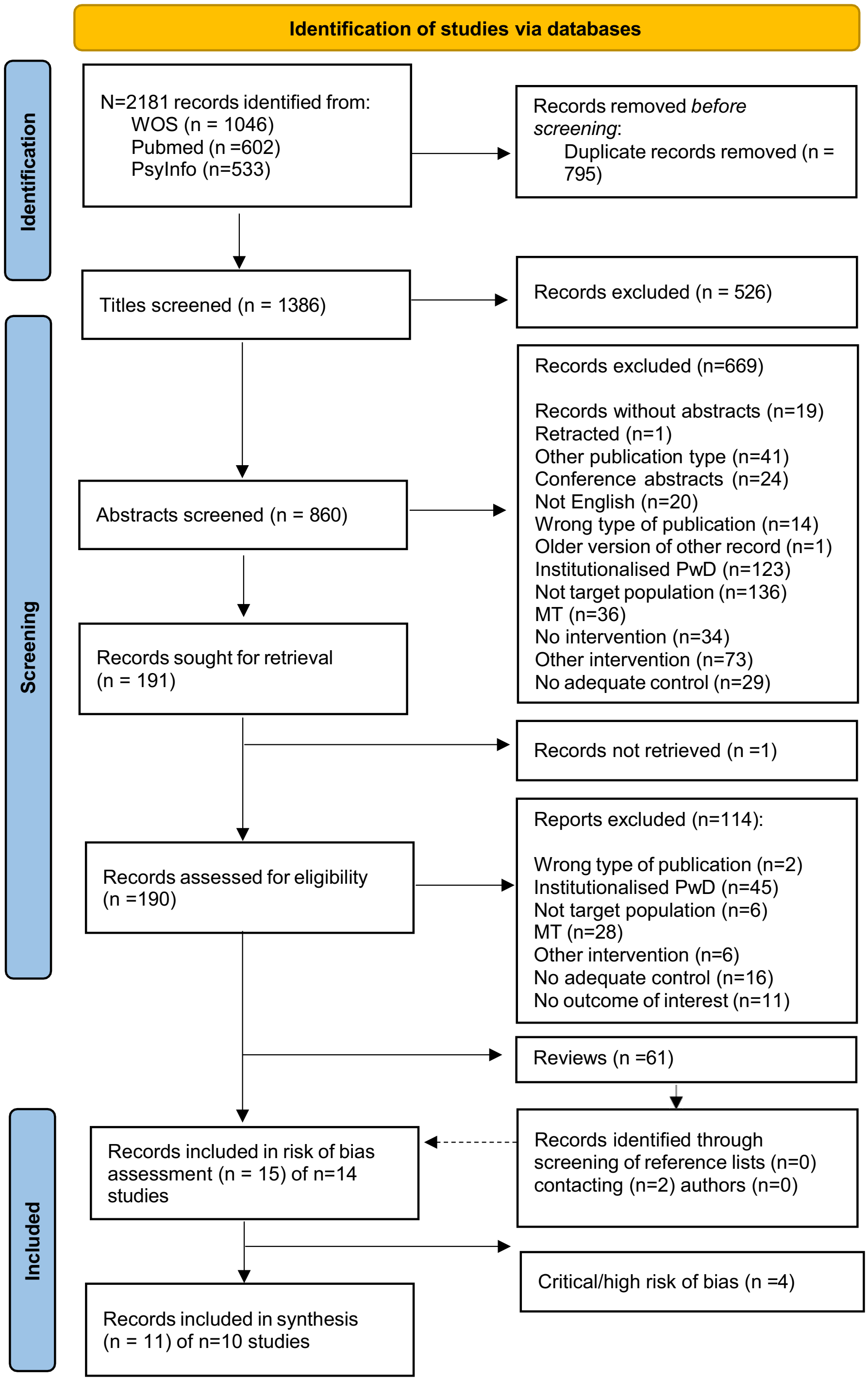
3.3 | Included outcomes

Included studies report on cognition, BPSDs, well-being, and QoL outcomes, i.e. all pre-specified primary and secondary outcomes. Additionally, pain and galvanic skin response were reported and are reviewed as 'other' outcomes. Results are synthesised in the following according to outcome domain and effect measurement time point (immediate, after 1–4 months of intervention, after 6+ months of intervention). For a graphical synthesis, see Figure 2.

3.4 | Primary outcome: Cognition

Nine out of 10 included studies that investigated cognitive outcomes (Table 2).

FIGURE 1 Visual representation of decisions made in the screening process. Adapted from Page et al. (2021).



3.4.1 | Immediate effects

Five studies, all using music listening in the experiment, assessed the immediate effect of music on cognition. Two studies by Baird et al. (2018, 2020) compared music-evoked with photograph-evoked autobiographic memories. All stimuli were well-known in previous decades of the participants' lives. In PwD with AD, music-evoked memories as frequently as photographs did (Baird et al., 2018, 2020). The authors also found that music from when the participants were between 10 and 30 years old evoked memories with much greater frequency ('reminiscence bump') than music from when participants were between 31 and 50 years old ($d = 1.6$) and older than 50 ($d = 2.8$). However, music-evoked memories were less likely to be of specific events than photograph-evoked memories (Baird et al., 2018). In participants with bv-FTD, music-evoked autobiographic memories less frequently than photographs did ($d = 0.6$), and these were also less likely to be of a specific event and more likely to be of a period of life than photograph-evoked memories. No 'reminiscence bump' was observed. Comparing the groups, the researchers found a comparable frequency of both music- and photograph-evoked memories and no difference in the evoked memories for stimuli from different life decades.

TABLE 1 Description of included studies in terms of population and intervention

Authors (year)	Study centre(s),[a] Country	Relevant sub-sample	Inclusion/exclusion	Recruitment via	Description of interventions	Design
Baird et al. (2018)	Macquarie University, Sydney, Australia	$N = 10$ Dementia type: AD (9), VD/AD (1) Diagnosis: Geriatrician and Clinical Neuropsychologist Severity: Not specified Age 77.7 ± 12.7, 60% female	Inclusion: (1) Native speaking English, (2) residing in Australia since aged 10 years Exclusion: (1) Comorbid neurological condition, (2) Severe psychiatric disorder, (3) Study-relevant visual, hearing, or language impairments	Aged care service ($n = 8$), Residential facility ($n = 2$)	EX: 16 (Australian) chart-topping songs from 1930 to 2010, delivered by the researcher using Laptop and Bluetooth Speakers CT: 16 photographs depicting world-famous events from 1930 to 2010	Experimental, within-participants
Baird et al. (2020)	Macquarie University, Sydney, Australia	$N = 16$ Dementia type: bv-FTD (6), AD (9), VD/AD (1) Diagnosis: Geriatrician and Clinical Neuropsychologist ($n = 11$), Neurologist ($n = 5$) Severity: Not specified Age 74.7 ± 12, 38% female	Inclusion: (1) Native speaking English, (2) residing in Australia since aged 10 years Exclusion: (1) Comorbid neurological condition, (2) Severe psychiatric disorder, (3) Study-relevant visual, hearing, or language impairments	Aged care service ($n = 9$), Research centre ($n = 5$), Residential facility ($n = 2$)	EX: 16 chart (Australia) topping songs from 1930 to 2010, delivered by researcher using Laptop and Bluetooth Speakers CT: 16 photographs depicting world-famous events from 1930 to 2010	Experimental, within-participants
Ihara et al. (2019)	George Mason University, Fairfax, Virginia, USA	$N = 51$ (EX: 31) Dementia type: Not specified Diagnosis: Not specified Severity: Not specified EX: Age 57–93 (M: 81.3), 61% female CT: Age 68–94 (M: 83.8), 75% female	Inclusion: (1) MMSE score ≤24	Day activity centre	EX: 20 min of listening to an individualised playlist (twice a week, over 6 weeks), using iPods and headphones in a quiet room with the researcher and/or other participants present CT: Care as usual	Quasi-experimental, between-participants
Irish et al. (2006)	St. James's Hospital, Dublin and Trinity College, Dublin, Ireland	$N = 10$ Dementia type: AD Diagnosis: NINCDS-ADRDA criteria Severity: Mild Age 76.3 ± 7.5, 40% female	Exclusion: (1) Significant depression, (2) scoring <17/30 on the MMSE	Memory clinic	EX: Background music Vivaldi's Four Seasons: Spring, delivered by the researcher using a cassette recorder set at approx. 40–50 dB CT: No music	Experimental, within-participants

TABLE 1 (Contiuned)

Authors (year)	Study centre(s),[a] Country	Relevant sub-sample	Inclusion/exclusion	Recruitment via	Description of interventions	Design
Li et al. (2015)	Municipal Ta-Tung Hospital, Kaohsiung, Taiwan	N = 41 (EX: 20) Dementia type: AD Diagnosis: DSM-IV criteria Severity: Mild EX: Age 76.7 ± 8.45, 75% female CT: Age 80.8 ± 5.94, 62% female	Inclusion: (1) AchEI treatment for at least 3 months, (2) Family or caregiver could assist the patient Exclusion: (1) Severe hearing loss, (2) Major psychiatric disorders; (3) Unstable illness status	Out-patient clinic	EX: 30 min. Music in the morning (Mozart's Sonata for Two Pianos in D major [KV 448], first movement) and evening (Pachelbel's Canon in D major for Violins), 6 m total, facilitated by the caregiver using the portable digital music player CT: Care as usual	Quasi-experimental, between-participants
Meilán García et al. (2012)	University of Salamanca, Salamanca and The National Reference Centre of Alzheimer Disease, Salamanca, Spain	N = 25 Dementia type: AD Diagnosis: NINCDS-ADRDA criteria Severity: Not specified Age 80.7 ± 5.8, no gender info	Inclusion: (1) Over the age of 60 Exclusion: (1) History of drug or alcohol abuse (2) Symptoms of depression (GDS >10), (3) Significant visual, hearing, or language impairments	Research Centre	EX: 5 min of music/sound listening (weekly, spaced over 5 weeks): (a) Vivaldi's Four Seasons: Summer ("happy"), (b) Alonso Lobo's Versa est in Luctum ("sad") (c) Eric C.W. Peel's Kang Time ("unemotional"), and (d) Cafeteria sounds, delivered by the researcher, using loudspeakers set at between 60 and 70 dB CT: (e) No music or sound	Experimental, within-participants
Thompson et al. (2005)	The Research Institute for the Care of the Elderly, Bath and University of Plymouth, Plymouth, the UK	N = 16 Dementia type: AD Diagnosis: NINCDS-ADRDA criteria Severity: Not specified 76.25 ± 4.67, 31% female	N/A	Memory Clinic	EX: Vivaldi's Four Seasons: Winter, delivered by the researcher at a comfortable volume chosen by the participant CT: No music	Experimental, within-participants
Pongan et al. (2017, 2020)	University Hospital of Saint Etienne, Saint Etienne and University Hospital of Lyon, Lyon, France	N = 59 (EX: 31) Dementia type: AD Diagnosis: NINCDS-ADRDA and DSM-V criteria Severity: Mild EX: 78.8 ± 7.4, 74% female CT: 80.2 ± 5.7, 57% female	Exclusion: (1) Neurocognitive disorder aetiology different from AD, with serious, progressive, or unstable pathologies	Memory Clinic	EX: 2 h choir singing (weekly, over 12 weeks) led by choir conductor (psychologist present), with piano accompaniment + participants sang at a concert after intervention CT: 2 h painting intervention (weekly, over 12 weeks) by painting teacher (psychologist present) + participants showed work at the exhibition after intervention	RCT, between-participants

(Continues)

TABLE 1 (Contiuned)

Authors (year)	Study centre(s),[a] Country	Relevant sub-sample	Inclusion/exclusion	Recruitment via	Description of interventions	Design
Särkämö et al. (2014)	University of Helsinki, Helsinki, University of Jyväskylä, Jyväskylä, Finland	*N* = 89 (EX: 30) Dementia type: AD (26), VD (13), MD (8), Other (9) Diagnosis: Geriatrician/Primary Care Physician Severity: Mild-to-moderate EX: Age 78.5 ± 10.4, 59% female CT1: Age 79.4 ± 10.1, 90% female CT2: Age 78.4 ± 11.6, 64% female	Inclusion: (1) Speak Finnish, (2) Physically and cognitively able to take part in the intervention and undergo the neuropsychological testing Exclusion: (1) Prior severe psychiatric illness or substance abuse, (2) Changes in psychotropic medication during the last 3 months	Day activity centre	EX: 1.5 h of singing (weekly over 10 weeks, Finnish KeyToSong method) focus on folk music from 1920 to 1960, each session themes (e.g. childhood music, music for relaxation) led by music teacher + 6× singing homework + voluntary continuation over follow-up facilitated by a caregiver CT1: 1.5 h of music listening (weekly over 10 weeks), focus on folk music from 1920 to 1960, each session themes (e.g. childhood music, music for relaxation) led by music therapist + 6× music listening homework + voluntary continuation over follow-up facilitated by a caregiver CT2: Care as usual	RCT, between-participants
Satoh et al. (2015)	Mie University, Tsu, Japan	*N* = 20 (EX: 10) Dementia type: AD Diagnosis: NINCDS-ADRDA criteria Severity: Mild-to-moderate EX: Age 78 ± 7, 60% female CT: Age 77 ± 6.1, 80% female	Inclusion: (1) Able to come to the hospital once/ week, (2) Caregiver familiar with daily life available, (3) Good general physical condition, (4) >3 months consistent dose of antidementia drugs Exclusion: (1) History of a cerebrovascular accident, (2) Chronic disease associated with exhaustion, (3) Study-relevant cardiac, respiratory, and orthopaedic disabilities, (4) Severe psychiatric symptoms, (5) Caregiver is not familiar with daily activities	Out-patient clinic	EX: 1 h of singing training (once/ week, over 6 months; YUBA Method) led by a professional singer and pianist + minimum of 3 × 20 min of singing homework facilitated by a caregiver CT: Care as usual	Quasi-experimental, between-participants

Abbreviations: AchEI, acetylcholinesterase inhibitor; AD, probable Alzheimer's disease; bv-FTD, behavioural variant frontotemporal dementia; CT, control (group or condition); dB, decibel; DSM-IV, Diagnostic and Statistical Manual of Mental Disorders, fourth edition; DSM-V, Diagnostic and Statistical Manual of Mental Disorders, fifth edition; EX, experimental (group or condition); GDS, Geriatric Depression Scale; MD, mixed dementia; MMSE, Mini-Mental State Examination; NINCDS–ADRDA, National Institute of Neurological Disorders and Stroke–Alzheimer Disease and Related Disorders; RCT, randomised-controlled trial; VD, vascular dementia.

[a]If not explicitly reported showing the affiliation(s) of the first author.

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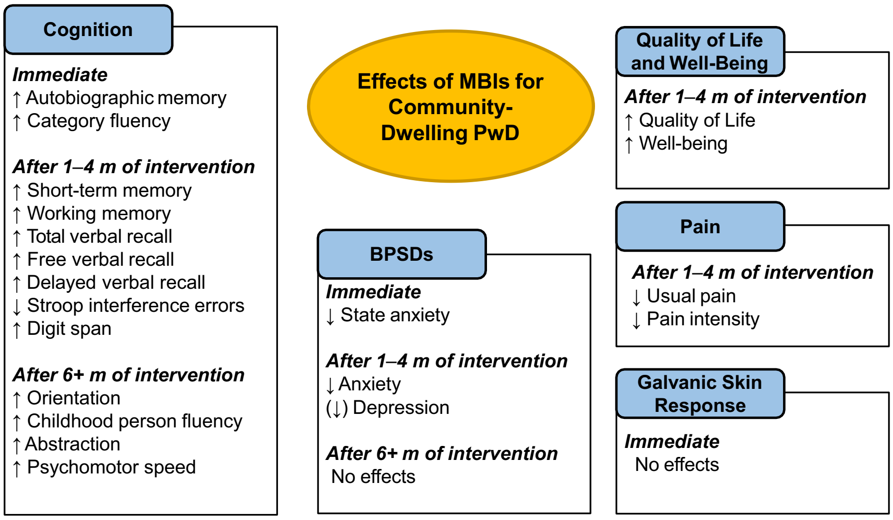

FIGURE 2 Graphical synthesis of included outcomes. Upward pointing arrows indicate an increase. Downward pointing arrows indicate a decrease. The brackets indicate a lack of certainty due to conflicting results.

Two other reports evaluated the impact of classical background music, i.e. music not specifically chosen because of its popularity in earlier decades of PwDs' lives, on autobiographical memory (Irish et al., 2006; Meilán García et al., 2012). Irish et al. (2006) found a total increase in autobiographic memories when listening to music versus when there was no music. This effect was very large (d = 1.66). Looking more specifically at semantic memories, they found an overall moderate increase in recall of semantic memories (d = 0.52) and a large increase in recent semantic memories (d = 1.12). There also was a largely increased recall of autobiographic incidence (d = 1.16). In contrast, Meilán García et al. (2012) found small-to-moderate effects. Total recall showed a small improvement when background sounds were present ('happy', 'sad' and 'unemotional' music as well as cafeteria sounds) compared to when there was silence (d = 0.2). Further, emotional music ('happy', 'sad') was associated with a small increase in total (d = 0.18) and remote recall (d = 0.27). 'Sad' music appeared particularly effective, being related to better remote recall than all other conditions (d = 0.26–0.43).

Work by Thompson et al. (2005) investigated immediate effects on a cognitive domain other than autobiographic memories, specifically category fluency. Compared to silence, there was a small increase in fluency when classical music was playing during the experiment (d = 0.31).

3.4.2 | Effects after 1–4 months of intervention

Two RCTs (Pongan et al., 2017, 2020; Särkämö et al., 2014) reported on the effect of singing interventions that lasted for around 3 months compared to alternative interventions. Särkämö et al. (2014) observed that weekly singing over 10 weeks with a music teacher (incl. Singing homework) was associated with improved short-term and working memory (as assessed approx. 2 weeks after the intervention), compared to therapist-led music listening intervention and compared to care as usual. Pongan et al. (2017, 2020) compared a singing intervention facilitated by a choir conductor consisting of 12 weekly sessions with a painting intervention facilitated by a painting teacher. They found that, compared to painting, singing increased total verbal recall significantly (d = 0.27). Moreover, both interventions were associated with improvements in free and delayed verbal recall, reduced interference errors in a Stroop test and increased digit span.

3.4.3 | Effects after 6+ months of intervention

After the first post-baseline measurement at 3 months, Särkämö et al. (2014) encouraged PwD and their informal caregivers to continue incorporating music into their home lives in the 6 months following the intervention period. Thereafter, outcomes were re-assessed. The researchers found that, compared to care, as usual, participants that continued the singing intervention or the (previously therapist-led) music listening showed better orientation and recalled more persons from the childhood era in a verbal fluency task. As a continuation, as home was unsupervised and many reported never continuing singing (28%) or music listening (8%) at home, it is not entirely clear, whether these benefits are benefits of the at-home continuation intervention or long-term benefits of the previous, supervised intervention period.

Two studies compared the effect of interventions lasting 6 months to care as usual (Li et al., 2015; Satoh et al., 2015). Li et al. (2015) investigated the effect of twice daily music listening at home. They found no effects on dementia severity (Clinical Dementia Rating) but observed a large improvement in abstraction (d = 1.0). Satoh et al. (2015) investigated the effects of weekly singing sessions, accompanied by a professional singer and a pianist, in conjunction with at least three voice training at home. They, too, found no effect on global cognition. However, they observed a very large improvement in the time it took to complete cognitive testing (d = 4.53), which they equated to an improvement in psychomotor speed. No such improvement was found in the control group receiving care as usual; yet, no direct comparison was made.

TABLE 2 Primary outcome: Cognition

Authors (year)	Measures	Measurement-time-points	Central findings
Immediate effects			
Baird et al. (2018)	MEAM/PEAM Task	-	• Music and CT (photographs) evoked memories at the same frequency • Music from when participants were aged 10–30 years triggered more frequent memories (58.50 ± 26.36) than music from later decades ('reminiscence bump') ○ 31–50: 20.00 ± 21.47, (95% CI [18.1%, 58.9%], within-P $t(9) = 4.27$, $p = 0.006$, $d = 1.60$) ○ >51: 4.40 ± 7.15 (95% CI [35.4%, 72.8%], within-P $t(9) = 6.55$, $p \leq 0.001$, $d = 2.8$) • Music evoked less memories of specific events (2.86 ± 6.02) vs. CT (33.50 ± 32.06, 95% CI [−53.3%, −8.0%], within-P $t(9) = −3.05$, $p = 0.041$, $d = 1.33$)
Baird et al. (2020)	MEAM/PEAM Task	-	AD participants: • For results see Baird et al. (2018) bv-FTD participants: • Less frequent music-evoked memories (17.71% ± 23.19) than CT (photograph)-evoked memories [28.12% ± 21.92, within-P $t(5) = −2.71$, $p = 0.042$, $d = 0.60$] • Music produced more memories of a period of life vs. CT [within-P $t(5) = 2.60$, $p = 0.048$] • Music produced less memories of specific events vs. CT [within-P $t(5) = −5.48$, $p = 0.003$] • Music from when participants were aged 10–30 years triggered memory did not evoke memories more frequently than music from later decades (no 'reminiscence bump') bv-FTD vs. AD participants: • No sig. difference in music-evoked and CT-evoked memory frequency between bv-FTD and AD • No sig. difference in the frequency of memories evoked by music or CT from different decades between bv-FTD and AD
Irish et al. (2006)	AMI, SART	-	• Total autobiographic memory recall (60.65 ± 10.14) improved during the music listening vs. CT (silence; 47.9 ± 9.66, within-P t-test sig., $d = 1.66$) • Total recall of semantic memories was improved during music (44.85 ± 17.48) vs. CT (37.78 ± 17.39, within-P $t(9) = −4.921$, $p < 0.001$, $d = 0.52$) • Recall of recent semantic memories improved (13.7 ± 5.34) vs. CT (9.35 ± 4.40, within-P t-test sig., $d = 1.12$) • Autobiographic incident recall was improved during music listening (15.8 ± 6.7) vs. CT (10.2 ± 5.25, within-P t-test sig, $d = 1.16$) • No effect on attention (SART)
Meilán García et al. (2012)	Autobiographic memory (total, remote, mid-remote, recent) from MMSE	-	• Total recall was better in the sound conditions (20.07 ± 6.57) vs. CT (silence; 18.98 ± 7.59, within-P ANOVA, $F[1,24] = 6.66$, $p = 0.016$, $d = 0.20$) • Total recall was better in the emotional music conditions (20.53 ± 6.22) vs. unemotional music and cafeteria sounds (19.6 ± 6.90, within-P $F[1,24] = 9.916$, $p = 0.004$, $d = 0.18$) • Remote recall was better in the emotional music conditions (9.92 ± 2.80) vs. unemotional music and cafeteria sounds (9.3 ± 3.01, within-P $F[1,24] = 8.088$, $p = 0.009$, $d = 0.27$) • "Sad" music was related to better remote recall (10.20 ± 2.84) than all other conditions (happy music: 9.64 ± 2.76, within-P t-test $p = 0.045$, $d = 0.26$; unemotional music: 9.28 ± 2.73, within-P t-test, $p = 0.010$; $d = 0.43$; cafeteria sounds: 9.32 ± 3.27, within-P t-test $p = 0.012$; $d = 0.37$; silence: 9.42 ± 3.23, within-P t-test, $p = 0.017$, $d = 0.33$)
Thompson et al. (2005)	Category Fluency Task	-	• Category fluency improved in the music condition (12.87 ± 3.36) vs. CT (silence; 12.00 ± 3.86, $d = 0.31$) (for AD as much as for older adults, sig main effect of C, n.s. C × G interaction)

TABLE 2 (Continued)

Authors (year)	Measures	Measurement-time-points	Central findings
Effects after 1–4 months of intervention			
Pongan et al. (2017, 2020)	FAB, FCRT, TMT, Digit Span, Digit Symbol, Stroop, Letter and Category Fluency	T0, T1 (12 weeks), T2 (T1 + 4 weeks)	T0 vs. T1: • Total verbal recall (FCRT) improved after singing intervention (31.15 ± 11.76) vs. CT (painting intervention; 27.77 ± 12.93, LMM T × G interaction $F = 5.06$, $p = 0.03$, $d = 0.27$) • Improvements were found after both singing intervention and CT in: ○ Free verbal recall (FCRT, LMM T main effect, $F = 4.71$, $p = 0.035$) ○ Delayed total verbal recall (FCRT, LMM T main effect, $F = 8.75$, $p = 0.005$) ○ Digit Span (LMM T main effect, $F = 12.61$, $p = 0.001$) ○ Stroop Interference Errors (LLM T main effect, $F = 4.93$, $p = 0.03$)
Särkämö et al. (2014)	MMSE; WMS-III; CERAD; WAIS-III; BNT; WAB; TMT; FAB; Verbal fluency for familiar persons	T0, T1 (12 weeks), T2 (T1 + 6 months)	T0 vs. T1: • The singing intervention improved short-term and working memory performance (subdomains of MMSE and WMS-III) vs. CT1 (music-listening) (Tukey HSD $p = 0.074$) and CT2 (care as usual; Tukey HSD $p = 0.006$)
Effects after 6+ months of intervention			
Li et al. (2015)	CDR, CASI	T0, T1 (6 months)	T1–T0: • Greater increase in abstraction (CASI) after music listening intervention (0.10 ± 0.29) vs. CT (care as usual; −0.90 ± 0.28; between-P ANCOVA $p = 0.024$, $d = 4.53$) • All other comparisons were n.s.
Särkämö et al. (2014)	MMSE; WMS-III; CERAD; WAIS-III; BNT; WAB; TMT; FAB; Verbal fluency for familiar persons	T0, T1 (12 weeks), T2 (T1 + 6 months)	T0 vs. T2: • Improvements were found after both singing and CT1 (music listening) vs. CT2 (care as usual) in: ○ Orientation (MMSE) (Tukey HSD sig.) ○ Fluency for familiar persons from childhood (Tukey HSD sig.)
Satoh et al. (2015)	MMSE, RCPM, RBMT	T0, T1 (6 months)	T0 vs T1: • No effect on global cognition • Sig decrease in time to complete RCPM (~psychomotor speed) after singing training (T0: 537 ± 196; T1: 396 ± 116, within-P *t*-test, $p = 0.0026$, $d = 1.0$) but not after CT (care as usual) (T0: 434 ± 136, T1: 463 ± 154, n.s.)

Abbreviations: AD, probable Alzheimer's disease; AMI, autobiographical memory interview; Between-P, between-participant; M BNT, Boston naming test; bv-FTD, behavioural variant frontotemporal dementia; CASI, cognitive abilities screening instrument; CDR, Clinical Dementia Rating Scale; CERAD, Consortium to Establish a Registry for Alzheimer's Disease battery; CT, control (group or condition); FAB, frontal assessment battery; FCRT, free and cued recall test; LMM, linear mixed effect model; MEAM/PEAM Task, Music-evoked and photograph-evoked autobiographic memory task; MMSE, Mini-Mental State Examination; n.s., non-significant; RCPM, Raven's coloured progressive matrices; SART, sustained attention to response Task; sig., significant (values not reported by authors); TMT, trail making test; WAB, western aphasia battery; within-P, within-participant; WAIS-III, Wechsler Adult Intelligence Scale III; WMS-III, Wechsler Memory Scale III.

3.5 | Primary outcome: BPSDs

Six papers investigated the effect of MBIs on BPSDs.

3.5.1 | Immediate effects

The experimental study by Irish et al. (2006) also assessed the effect of background music on state and trait anxiety. They observed a moderate reduction in state anxiety ($d = 0.51$). Moreover, they found that accounting for this reduction in anxiety in an analysis of covariance removed the positive effect of music on autobiographic memory recall. Thus, the reduction in anxiety may play a mechanistic role in the memory-enhancing effect of music (Table 3).

3.5.2 | Effects after 1–4 months of intervention

After a music listening intervention, Ihara et al. (2019) found no improvement in measures of anxiety or depression, neither directly

TABLE 3 Primary outcome: BPSDs

Authors (year)	Measures	Measurement-time-points	Central findings
Immediate effects			
Irish et al. (2006)	STAI	-	• Reduced state anxiety during music listening (25.3 ± 7.78, 95% CI [22.50, 28.10]) vs. CT (28.2 ± 4.52, 95% CI [23.38, 33.02], sig. Within-P *t*-test, $d = 0.51$) ○ Controlling for state anxiety removed the effects of music on cognition
Effects after 1–4 months of intervention			
Ihara et al. (2019)	CMAI, CSDD	T0, T1 (6 weeks), T2 (T1 + 6 weeks)	T1–T0 and T2–T0: • No effect of music listening or CT (care as usual)
Pongan et al. (2017, 2020)	GDS, STAI	T0, T1 (12 weeks), T2 (T1 + 4 weeks)	T0 vs. T1 vs. T2: • Improvement in depressive symptoms (GDS) only in CT (painting intervention) • Improvements were found after both singing intervention and CT: ○ Anxiety (STAI, LMM T main effect, $F = 10.74$, $p < 0.00001$)
Särkämö et al. (2014)	CBS	T0, T1 (12 weeks), T2 (T1 + 6 months)	T0 vs. T1: • Improvements were found after both singing and CT1 (music listening) vs. CT2 (care as usual) in: ○ Depressive symptoms (CBS) (Tukey HSD sig.)
Effects after 6+ months			
Li et al. (2015)	NPI	T0, T1 (6 months)	T1–T0: • No effect of music listening or CT (care as usual)
Särkämö et al. (2014)	CBS	T0, T1 (12 weeks), T2 (T1 + 6 months)	T0 vs. T2: • No effect of singing or CT1 (music listening) vs. CT2 (care as usual)

Abbreviations: CBS, Cornell-Brown Scale for Quality of Life (for depressive symptoms/mood); CMAI, Cohen-Mansfield Agitation Inventory; CSDD, Cornell Scale for Depression in Dementia; CT, control (group, condition); LMM, linear mixed effects model; NPI, Neuropsychiatric Inventory; STAI, State Trait Anxiety Inventory; T, time; within-P, within-participant.

post-intervention at 6 weeks nor an additional 6 weeks later. Pongan et al. (2017) reported, in the singing as well as the control (painting) intervention group, a significant decline of anxiety (measured at baseline, after 3 and 4 months) over time. However, unlike the control intervention, the singing intervention did not result in a reduction of depressive symptoms. Conversely, Särkämö et al. (2014) found that the 3-month singing observation reduced depressive mood compared to usual care. The improvement was equal to that of music listening therapy.

3.5.3 | Effects after 6+ months of intervention

In work by Li et al. (2015), twice daily music listening over 6 months did not result in a difference in neuropsychiatric symptom change between the intervention group and care as usual group. Similarly, after a 6-month voluntary at-home continuation of the singing intervention implemented by Särkämö et al. (2014), there were no effects of singing on depressive symptoms/mood compared to care as usual.

3.6 | Secondary outcomes: Well-being and QoL

3.6.1 | Effects after 1–4 months of intervention

Two studies investigated well-being and QoL outcomes (Table 4). Pongan et al. (2017, 2020) found improvements in QoL over time (baseline, 3 months, 4 months) (2017) and in well-being (2020) after the singing intervention. However, there were comparable improvements after the painting intervention. Conversely, Särkämö et al. (2014) found a significantly weaker improvement in QoL in the group that had continued the singing intervention at home compared to the group that continued the (formerly therapist-delivered) music listening intervention.

TABLE 4 Secondary outcomes: Well-being, quality of life, and other outcomes

Authors (year)	Measures	Measurement-time-points	Central findings
Immediate effects			
Irish et al. (2006)	Galvanic Skin Response	-	• No effect of music listening on skin response vs. CT (silence)
Effect after 1–4 months of intervention			
Pongan et al. (2017, 2020)	EQ-5D, RSES, EVIBE BPI, NRS, SVS	T0, T1 (12 weeks), T2 (T1 + 4 weeks)	T0 vs. T1 vs. T2: • Improvements were found after both singing intervention and CT (painting intervention) in: ○ Usual pain (SVS, LMM T main effect $F = 4.71$, $p = 0.01$) ○ Pain intensity and interference in daily life (BPI, LMM T main effect $F = 4.88$, $p = 0.009$) ○ Quality of live (EQ-5D, LMM T main effect $F = 6.79$, $p = 0.002$) ○ Well-being (EVIBE, LMM T main effect $F = 12.01$, $p < 0.001$)
Särkämö et al. (2014)	QOL-AD	T0, T1 (12 weeks), T2 (T1 + 6 months)	T0 vs. T1: • No sig. Improvement in quality of life (QOL-AD) after singing intervention
Effects after 6+ months of intervention			
Särkämö et al. (2014)	QOL-AD	T0, T1 (12 weeks), T2 (T1 + 6 months)	T0 vs. T2: • Sig. weaker improvement in quality of life (QOL-AD) than CT1 (music listening; Tukey HSD $p = 0.033$)

Abbreviations: BPI, Brief Pain Inventory; EQ-5D, EuroQol-5 Dimensions; EVIBE, Evaluation Instantane'e du Bien-Etre (for well-being); GDS, Geriatric Depression Scale; NRS, Numeric Rating Scale (for pain); RSES, Rosenberg Self-Esteem Scale; SVS, Simple Visual Scale (for pain); QOL-AD, Quality of Life in Alzheimer's Disease.

3.7 | Other outcome: Pain

3.7.1 | Effects after 1–4 months of intervention

Pongan et al. (2020) additionally found that singing, like the control intervention (painting), led to a reduction in reported pain. Specifically, they observed reductions in the amount of usual pain and pain intensity and interference in daily life. No reduction was found in pain as measured at a given moment.

3.8 | Other outcome: Galvanic skin response

3.8.1 | Immediate effects

Irish et al. (2006) measured the galvanic skin response of participants as an indicator of arousal whilst listening to music (Table 4). They saw no difference in galvanic skin response between the music and the silence condition.

4 | DISCUSSION

In this systematic review, we provided an overview of evidence from studies of MBIs delivered to community-dwelling people with dementia (PwD). As could be expected, given our broad inclusion criteria, the studies identified were heterogeneous in design and most records reported on (quasi-)experimental studies. The quality of the evidence was moderate to low overall. This is reflective of a field that is still developing in terms of standardised design and reporting (e.g. Beard, 2012; Sousa et al., 2021). In spite of this variability across studies, some inferences can be made based on the evidence.

First, evidence shows an immediate benefit of music listening on autobiographical memory. Findings implicate that popular music from earlier life decades might be particularly suited to evoke autobiographic memories (Baird et al., 2018, 2020). This is in line with previous findings showing a particularly large enhancing effect of music with personal relevance on autobiographic memory recall (El Haj et al., 2012). Still, classical music also results in an—albeit smaller—enhancement of autobiographic memory recall (Irish et al., 2006; Meilán García et al., 2012). As further evidence suggests, these effects could be mediated by a reduction in state anxiety (Irish et al., 2006). This would fit well with psychobiological explanations for music's beneficial effects centred around stress reduction (Sittler et al., 2021).

Another positive effect of music, on language abilities (Thompson et al., 2005), has been observed repeatedly (e.g. El Haj et al., 2013) and may be explained by the shared neurophysiological basis for both language and music processing (Koelsch et al., 2002; Schön et al., 2010). Results from our review further indicate that, compared with active control interventions, short-term (1–4 months) singing interventions were associated with more enhanced recall (Pongan et al., 2017), short-term memory, and working memory (Särkämö et al., 2014) and equal improvement in some additional cognitive domains (Pongan et al., 2017). Further, singing resulted in increased QoL, improved well-being, and reduced pain and anxiety.

There is no consensus as to whether active (e.g. singing) and receptive (music listening) therapy is superior to music listening and vice versa (e.g. Fusar-Poli et al., 2018; Tsoi et al., 2018; van der Steen et al., 2018). In line with this, we also observe no clear superiority of either singing or music listening MBIs. Whilst singing was more effective in terms of reducing depressive mood post-intervention, music listening at home over the follow-up was more effective in terms of improving QoL (Särkämö et al., 2014). Otherwise, results were comparable: Both singing and music listening over 6 months resulted in domain-specific but not general cognitive improvements (Li et al., 2015; Satoh et al., 2015), and post-intervention singing and music listening at home were equally associated with improvements in orientation and fluency for familiar persons from childhood (Särkämö et al., 2014). It may be the case that results depend less on the mode of intervention and more on how well suited the interventions is to a given PwD's skills and situation. Guidelines on how to determine which intervention is suited best will need to be developed.

We observed that longer interventions achieved fewer improvements than shorter interventions. All of the longer interventions included caregiver-facilitated home-based components (Särkämö et al., 2014; Satoh et al., 2015) or were entirely facilitated by informal caregivers at home (Li et al., 2015). Therefore, it is possible that the administration of the interventions was irregular or incomplete. Indeed, in the study conducted by Särkämö et al. (2014), 28% of caregivers of PwD encouraged to continue the singing intervention over the follow-up reported that they never did. In the comparison group, only 8% did not continue the music listening intervention. It is possible that singing, as an active intervention, was too demanding to integrate into caregivers' day-to-day. Further, motivation to maintain the intervention may have dropped in the absence of encouraging feedback. If interventions, such as MBIs, are to be delivered by informal caregivers at home, it might be beneficial to establish regular support. A direct assessment of barriers to home-based MBIs is needed so that these may be addressed.

Another intervention aspect that should be explored further is whether the type of music has any bearing on effects. Amongst the studies reviewed, only the experimental work by Meilán García et al. (2012) made such a comparison. They found that emotional music had a greater effect on autobiographic recall than unemotional music and that 'sad' music was particularly effective at enhancing recall. This is in line with studies of healthy adults showing benefits of 'sad' or 'moving' music, e.g. in the context of encoding new faces (Proverbio et al., 2015), verbal recall, and phonemic fluency assessments (Bottiroli et al., 2014). Whether this is due to a level of emotional arousal that is favourable for cognitive function (e.g. Bottiroli et al., 2014; Proverbio et al., 2018) or whether 'sad' music provides a context uniquely qualified for memories to be formed and retrieved (e.g. Irish et al., 2006; Proverbio et al., 2015) remains an open question. Further clarification of the mechanism behind music's positive effects is needed. Indeed, this has been called for repeatedly, as understanding the mechanism will be crucial to improving interventions in the future (Fancourt et al., 2014; Särkämö, 2018; Sittler et al., 2021).

Such research should also consider whether the adverse effects of a specific MBI offset any benefits observed. For instance, if 'sad' music indeed proves to be beneficial for cognition this may be offset by negative effects on mood and well-being. PwD with high levels of depression may be particularly at risk of this, as research has shown increased negative facial affect in this subgroup when listening to preferred music (Garrido et al., 2018). Detrimental emotional effects that music therapists can actively resolve in MT sessions may go undetected in non-therapist-led MBIs, meaning that specific care should be taken to prioritise well-being over any cognitive benefits. Indeed, (transient) cognitive benefits are only desirable in so far as they signify moments of enrichment and empowerment for PwD, and as such contribute to sustained well-being and thus the QoL (Beard, 2012).

Future studies face a number of challenges when it comes to designing more rigorous MBI investigations. One such challenge is to find a balance between flexibility and implementation fidelity. Losses in implementation fidelity have to be tolerated as flexibility is needed to allow for MBIs to integrate into the everyday lives of community-dwelling PwD. One way to address this is to integrate implementation evaluations into the trial processes. For instance, Olson et al. (2022) report integrating such checks in their pragmatic trial of a staff-led music-listening intervention in nursing homes. These checks included nursing home staff interviews, observational visits through research staff, and the evaluation of music player meta-data (showing play times and duration). Given such rich information, implementation fidelity could be considered in analyses. Other challenges include the difficulty in blinding researchers and participants and the challenge of choosing between preferred stimuli and such that have important characteristics from the researchers' point of view. Whilst the former can only be partially addressed by having objective outcome measures, a solution for the latter issue may be for researchers to offer a selection to participants (Koelsch & Jäncke, 2015).

There are some limitations to this review. One, as no unpublished work was identified in this review, the role of a publication bias in results cannot be discounted. Two, some of the works did not specify the severity of dementia so we cannot discern its role in the result. However, as community-dwelling individuals are typically in the early stages of dementia, it appears reasonable to assume that findings are applicable to individuals in these stages. Three, whilst most papers specified the types of dementia, results largely did not differentiate between them. Thus, we cannot comment on whether or not the benefits seen apply to specific dementia types. Yet, since the majority of PwD were diagnosed with AD, it can be deduced with relative certainty that results apply to this group. Four, conclusions made based on experimental music listening studies in controlled settings may not transfer directly to music listening in non-controlled settings. Nonetheless, experimental studies presented here give an indication of the effects music listening can achieve.

5 | CONCLUSION

Our review aims at presenting the state of the art of MBIs delivered to community-dwelling PwD. In contrast to MT, MBIs have the advantage of being more easily accessible to this group. Positive outcomes observed on cognitive, psychiatric, and pain outcomes indicate promising findings. Yet, the limited quality of evidence does not allow for specific conclusions. As it is, evidence suggests that home-dwelling PwD and their support network can be encouraged—e.g. by general practitioners—to incorporate music listening and/or singing into their daily routine. Given that no difference between modes of MBI delivery was observed, advice should be tailored to the individual PwD's skills and preferences. Individuals in the early stages of dementia who find joy in singing can be encouraged to do so whilst individuals who lack the skill and/or have more advanced dementia may benefit from music listening. Further, more rigorous investigations are warranted to be able to give more specific recommendations on an individual basis.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon request.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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