



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



ELSEVIER

Contents lists available at ScienceDirect

Public Health

journal homepage: www.elsevier.com/locate/puhe

Themed Paper – Review

Online singing groups for people with dementia: scoping review

B. Dowson*, J. Schneider

Institute of Mental Health & School of Sociology and Social Policy, University of Nottingham, Nottingham, UK



ARTICLE INFO

Article history:

Received 29 September 2020

Received in revised form

25 January 2021

Accepted 3 March 2021

Available online 4 May 2021

Keywords:

Dementia

Music

Music therapy

Singing

Telemedicine

Telecare

Videoconferencing

Technology

Internet

Digital arts

ABSTRACT

Objectives: In the face of the SARS-CoV-2 pandemic, people with dementia and their carers are contending with serious challenges to their health and wellbeing, due to risk of severe illness, limiting of social contact and disruption to usual activities. Many forms of support for people with dementia and their carers, including singing groups, have moved online using videoconferencing. Previous research has demonstrated the benefits of group singing, which include cognitive stimulation, meaningful activity and peer support. However, although we know which aspects of the singing group experience participants find helpful, we do not know how this experience translates into an online videoconferencing format, and this is a very new field with little existing research. This article reviews the literature pertinent to online singing interventions and uses the findings to develop some suggestions for running an online singing group.

Study design: Scoping review.

Methods: Systematic literature searches were conducted in EMBASE, Medline, CINAHL, PsycINFO and Web of Science. Owing to the paucity of existing research, searches were also conducted in Google Scholar. The scope of the review covered five related areas: online music making and music therapy, telemedicine and telecare, everyday technology for people with dementia, digital arts and dementia, and use of technology for social interaction and leisure. Our analysis aimed to integrate the results to inform the implementation of online singing groups for people with dementia.

Results: Scoping of evidence from discrete fields of enquiry and different disciplinary traditions can inform the delivery of online singing in dementia. This literature also yields useful insights into the role of the carer and how best to support participants to use technology. Barriers and facilitators to online singing were found to relate both to the technology and to the individual participant.

Conclusion: Lockdown restrictions have led to much innovation, and this is likely to lead to changes in practice even after normal life resumes. The suggestions in this article will be helpful primarily for practitioners moving into online work and researchers investigating this novel area. They may also be useful to commissioners and policymakers because they reflect current knowledge about best practice.

© 2021 The Royal Society for Public Health. Published by Elsevier Ltd. All rights reserved.

Background

For people with dementia, the restrictions imposed by pandemic-related lockdowns and the cessation of usual activities mean that routines are disrupted, support networks are compromised, and meaningful activities outside the home are suspended.^{1,3} It is likely that loneliness and confusion resulting from the abrupt loss of many forms of support are compounded by lack of the cognitive stimulation which slows mental decline in dementia.⁴ In short, the pandemic could have a profoundly negative impact on the lives of people with dementia and on their family carers.

Fortunately, in many cases, family visits, activities and support groups for people with dementia and their carers have moved online. Practitioners have responded to the crisis in dementia care with creativity and innovation by harnessing digital technology. Videoconferencing platforms offer relatively cheap and accessible means for groups to meet face to face but virtually. Activity videos uploaded to YouTube or streamed via Facebook Live are perhaps even easier to access, with the advantage that they can be revisited at any time. Consequently, many people with dementia and their carers have turned to technology to maintain their activities and social connections. The experiences of people with dementia, their carers, and musicians over the past months have shown that singing groups can take place online in a way which, although far from ideal, nevertheless offers a meaningful and worthwhile

* Corresponding author.

E-mail address: becky.dowson@nottingham.ac.uk (B. Dowson).

experience to those who participate. Therefore, this article focuses on replicating the community singing experience online.

Interest in the possible benefits of musicking for people with dementia and their carers has increased in recent years, and research evidence is growing. The most recent Cochrane systematic review found moderate evidence that music therapy improved depressive and behavioural symptoms in people with dementia.⁵ However, all the studies included in the Cochrane review were conducted in residential care settings. There has been less focus on musical interventions for people with dementia living in the community, who represent a majority of those with the condition.⁶ Singing groups are an example of a popular community-based intervention which may have benefits for both people with dementia and their family carers. Previous research has indicated some of the potential benefits of singing for people with dementia and their carers: improvement of some cognitive functions and reduced depression;⁷ providing meaningful and enjoyable activity;⁸ improving memory, social inclusiveness and mood;⁹ and sustaining or strengthening relationship within caring dyads.^{10,11} This evidence is promising but inconclusive, given that studies in this area are still scarce, and those that are conducted tend to have small samples and effect sizes. Furthermore, online singing is a new, unexplored field, and we do not currently know how these possible benefits carry over to this format.

Looking to the future, remotely delivered singing sessions offer potential advantages, especially for those who are unable to attend in person because of transport, mobility or timing issues. Even after singing groups can resume in their usual format, there may still be an appetite for online groups. If we can suggest ways that the key features of group singing can be replicated in online sessions, this information will provide a basis for future development and evaluation of this approach. Although there is very little existing research about online singing for people with dementia, a large quantity of relevant research in other areas can offer insight and evidence about some pertinent issues.

Aims

The aim of this scoping review is to analyse existing literature to inform the development and implementation of online singing for people with dementia. To accomplish this, we examine both the literature which is directly relevant to the implementation of online singing in dementia and the wider literature that pertains to this topic. Because the purpose of this review is to inform the process of implementing telesinging, the analysis of literature focuses on issues relating to implementation, such as accessibility and feasibility, rather than on the outcomes and effects of the interventions. However, outcomes are mentioned where they are relevant.

Methods

A scoping review was conducted to map the relevant and related literature.¹² Systematic searches identified any existing literature about videoconferenced singing for people with dementia. Subsequent, broader searches were conducted to explore relevant bodies of literature that could be applied to online singing in dementia.

Systematic searches

Systematic literature searches were conducted in EMBASE, Medline, CINAHL, PsycINFO and Web of Science in August 2020. Combinations of the following search terms were used: music, music therapy, singing, telecare, telemedicine, dementia, video calling, videoconferencing, technology, internet, online. These terms were identified a priori by the authors, based on their

knowledge of music therapy, dementia and technology research. **Table 1** sets out the search strategy as it was implemented (the structure was adapted as appropriate for each database).

Owing to the expected paucity of published research on this topic, any article was included if it discussed remotely delivered music or singing for people with dementia using videoconferencing technology, regardless of whether it was an empirical study or not. Conference proceedings were also considered for inclusion. Given the newness of the technology used, articles published before 2010 were excluded.

Searches for related literature

To find literature which was most relevant, influential and recent, and pertinent to telesinging, additional searches were made using Google Scholar. The articles returned in the searches tended to fall into one of five areas at the intersections of research into digital music making, technology as a medium for psychosocial interventions in dementia, and the use by people with dementia of new technology for health, leisure or to maintain independence. The relevance of each area is outlined below:

- **Digital arts and dementia.** This topic helps us to understand how people with dementia engage with and respond to arts-based activities delivered through a digital medium.
- **Everyday technology and dementia.** Research in this area can demonstrate how technology and accompanying instructions can be adapted to be accessible and dementia-inclusive.
- **Remotely delivered music or music therapy, including music teaching.** This area gives insight into how digital music making can be optimised, overcoming technical challenges and troubleshooting.
- **Technology for social interaction and leisure.** Studies involving use of technology by people with dementia for social/leisure reasons (as opposed to household tasks) can show us what kinds of software and hardware are accessible and helpful.
- **Telemedicine/telecare and dementia.** Studies in this field can give insight into whether a healthcare service usually delivered in person can be successfully adapted into a remote format.

The articles retrieved in these searches were read and briefly summarised. Because the main purpose of this review was to inform the implementation of telesinging, the focus of this enquiry was not the effects of the interventions described in the studies, but rather issues surrounding the accessibility and feasibility of their implementation, as well as the motivations behind their initiation. However, the impacts of the intervention were noted where relevant.

Results

Findings from systematic search

Fig. 1 shows how articles indexed by the main databases were assessed for inclusion in the review. Most of the articles excluded after reviewing full texts related to the use of technology by people with dementia, often including musical components. However, none of these articles described musical interventions delivered remotely using videoconferencing technology. **Table 2** lists the articles which were excluded and the reasons for their exclusion; some of these articles are discussed later in this article under “Literature related to telesinging”. The single article included from the systematic search is a journal article in Japanese from 2014 which describes music therapy conducted via Skype with people with dementia.¹³ Although the article itself could not be obtained,

Table 1
Search strategy for databases.

Line number	Search terms
1	TOPIC: (DEMENTIA)
2	TITLE: (dement* OR alzheimer*)
3	TITLE: ("nursing home*" OR "care home*" OR "residential care")
4	#1 OR #2 OR #3
5	TOPIC: (TECHNOLOGY)
6	TOPIC: (INTERNET)
7	TITLE: (web* OR internet* OR email* OR tablet* OR android* OR smartphone* OR facebook* OR skype* OR zoom* OR whatsapp* OR instagram* OR twitter* OR wechat* OR software* OR app OR "social network*" OR "social media*" OR "video call*" OR "video conferenc" OR "everyday technolog*")
8	#5 OR #6 OR #7
9	TOPIC: (MUSIC)
10	TOPIC: (MUSIC THERAPY)
11	TITLE: (music* OR sing OR sings OR singing OR singer* OR song* OR choir* OR choral* OR playlist* OR listen* or concert*)
12	#9 OR #10 OR #11
13	#4 AND #8 AND #12

the final report from the same project was downloaded from the study’s website, and run through online translation software. The resulting translation was sufficiently clear to be able to surmise the study’s methods and findings.

In this study, three participants who were diagnosed with dementia received individual music therapy via a video-calling platform (Skype).¹³ The therapist used CDs of personalised music which were created for each participant in the study, but additional description of session format is not provided. The effects of the therapy were assessed using the BEHAVE-AD scale for measuring behavioural and psychological symptoms of dementia (BPSD) and a technology which monitored the number of times the participant smiled during the session. The study found that BPSD decreased in two participants and was unchanged in one, while the number of smiles increased in two cases, and decreased in one. Questionnaires

completed by participants and their family members indicated they had noticed positive effects, including improved mood.

Although the study is very small and no firm conclusions can be drawn from the results, it does provide some proof of principle that music-based interventions for people with dementia can be conducted using videoconferencing. However, it does not describe how the participants responded to using Skype, nor how they interacted with a remote music therapist. To explore how teleinsing interventions can be implemented and optimised, it is necessary to draw on other, more tangentially related literature.

Literature related to telesinging

The broader searches of related literature from all sources enabled us to investigate the contribution of a range of disciplines to the topic of telesinging in dementia. Here we outline the evidence drawn from each field of enquiry and show how it may be applied to our area of interest.

Digital arts and dementia

A frequent theme in the literature about digital arts was the design of activities and technology to facilitate participation of people with dementia. This work points to the importance of balancing accessibility with population-appropriate technology. Ford et al.¹⁴ implemented a programme in a residential care setting using publicly available software applications (apps), selected for their simplicity and to exclude any that might be experienced as infantilizing. Peeters et al.¹⁵ emphasised the importance of an 'easy interface that is low tech' in their development of a personalised music and picture player.

Digital arts interventions are rarely designed for people with dementia to use independently, but are typically a shared activity between care partners, or in a group. While frequent interaction with the app is an indicator of engagement, Luyten et al.¹⁶ found that their touchscreen art installation 'VENSTER' stimulated more interactions among the group than it did between individuals and the installation. Successful engagement with digital arts interventions may be associated with enthusiastic involvement of the carer; Golden et al.¹⁷ observed that carers needed a lot of prompting to use an arts app, and reflected that the project may have added to their sense of 'burden'. This implies that the perspectives of both the carer and person with dementia need to be considered in developing digital tools.

Everyday technology and dementia

The literature around the use of everyday technology by people with dementia examines barriers to engagement, while challenging some commonly held views. A qualitative study by Nygard et al.¹⁸ found that the most important factors driving technology use were the embodiment of the physical movements required to operate it and a perceived need for the particular technology. They reported that people with dementia could learn to use new, complex technology, provided they were highly motivated to do so.¹⁹ There was consensus among authors that tailoring technology to the specific needs of a person with dementia and training in its use—individualisation, was vital.^{19–21} Furthermore, Bartels et al.²² indicated that people with dementia were able accurately to assess their own capabilities with regard to technology use.

Remote music therapy and music teaching—individual versus group experience

Although music teaching and music therapy are dissimilar in their aims, they encounter similar challenges when transferring to an online format. Research in music education indicates there may be subtle shifts in session dynamics when interaction is online; one

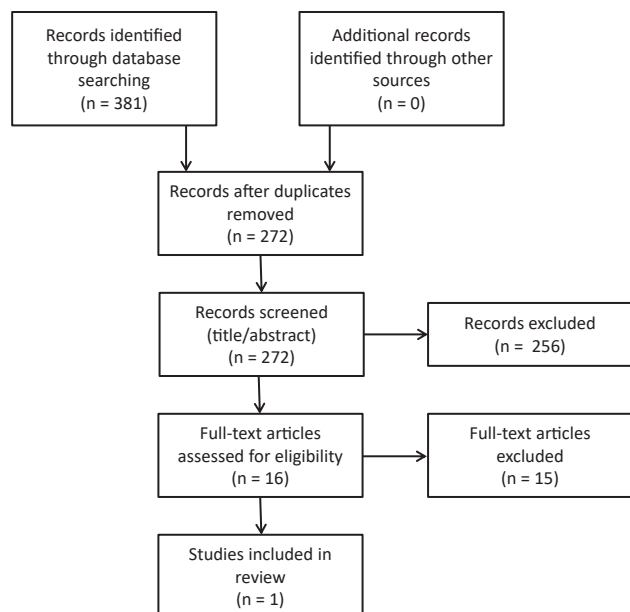


Fig. 1. PRISMA diagram for systematic literature search.

Table 2
Papers screened for inclusion at full text level and reasons for their exclusion.

Authors	Year	Title	Journal/Conference	Reason for excluding
Ford et al. ¹	2019	Evaluating the Impact of Music & Memory's Personalised Music and Tablet Engagement Program in Wisconsin Assisted Living Communities: Pilot Study	JMIR Aging	Study is about the use of personalised music and entertainment/leisure apps but does not include videoconferencing.
Gilson et al. ²	2019	Using Computer Tablets to Improve Moods for Older Adults With Dementia and Interactions With Their Caregivers: Pilot Intervention Study	JMIR Formative Research	Article discusses an individualised tablet engagement programme but is not about music or videoconferencing.
Golden et al. ³	2017	The Challenges of Developing a Participatory Arts Intervention for Caregivers of Persons With Dementia	Cureus	Article reports the results of an intervention based on pre-recorded videos of arts activities.
Han et al. ⁴	2020	Cognitive Intervention With Musical Stimuli Using Digital Devices on Mild Cognitive Impairment: A Pilot Study	Healthcare	Study is about a technology- and music-based approach to Cognitive Stimulation Therapy, but does not use videoconferencing.
Imtiaz et al. ⁵	2018	A Mobile Multimedia Reminiscence Therapy Application to Reduce Behavioral and Psychological Symptoms in Persons With Alzheimer's	Journal of Healthcare Engineering	Article describes the creation of a multisensory music/pictorial app to reduce behavioural symptoms, but does not involve videoconferencing.
Le Navenec & Parr Vijinski ⁶	2015	A Case Study of the Responses of a Person With Semantic Dementia to the Use of Music With Active Video	Neurodegenerative Diseases	Article describes using video clips played to the person with dementia during music sessions, not videoconferencing.
McCabe et al. ⁷	2019	Designing a Better Visit: Touch Screen Apps for People Living With Dementia and Their Visitors	Neurodegenerative Diseases	Study is about use of touchscreen tablets by dyads, but does not involve videoconferencing.
Nezerwa et al. ⁸	2014	Alive Inside: Developing Mobile Apps for the Cognitively Impaired	IEEE Long Island Systems, Applications and Technology Conference	Article describes the creation of a musical app, but videoconferencing is not involved.
Peeters et al. ⁹	2016	Designing a Personal Music Assistant That Enhances the Social, Cognitive, and Affective Experiences of People With Dementia	Computers in Human Behavior	Study deals with use of a personal music- based technology for people with dementia, but no videoconferencing.
Samuelsson & Ekstrom ¹⁰	2019	Digital Communication Support in Interaction Involving People With Dementia	Logopedics, Phoniatrics, Vocology	Study deals with the use of technology to stimulate and prolong conversation between caring dyads. Videoconferencing is not involved.
Tak et al. ¹¹	2015	Computer Activities for Persons With Dementia	The Gerontologist	Article discusses use of computers by people with dementia to carry out everyday leisure activities.
Tsolaki et al. ¹²	2015	New Technologies and Dementia	Neurobiology of Aging	Article is an overview of different technology-related projects but videoconferencing is not mentioned.
Tsolaki et al. ¹³	2015	Our Experience With Informative and Communication Technologies (ICT) in Dementia	Hellenic Journal of Nuclear Medicine	Article is an overview of various technology based interventions. Videoconferencing is not mentioned. (Similar work to the other Tsolaki et al. paper.)
Varshney et al. ¹⁴	2019	Dementia: A Cognitive Disability and Role of Non-Pharmacological Intervention Alzhatv in Cognitive Remediation	American Journal of Geriatric Psychiatry	Article is about watching pre-recorded family/entertainment/orientation videos.
Yamagata et al. ¹⁵	2013	Mobile App Development and Usability Research to Help Dementia and Alzheimer Patients	Ninth Annual Conference on Long Island Systems, Applications and Technology	Study deals with development of apps for people with dementia for social/leisure activities, but not videoconferencing. Same project as Nezerwa et al. (2014)

study found that online lessons were more dominated by verbal activity with less demonstration by teachers and students.²³

Three music therapy articles provide some insight into video-conference sessions. Baker and Krout²⁴ conducted a proof-of-concept study which compared face-to-face music therapy sessions with Skype© sessions for an adolescent with Asperger's syndrome. They found that the client liked using the technology and was more ready to engage and offer suggestions over Skype than in person. The therapist found that not being able to play guitar together and poor sound quality were limitations, but one-to-one, songwriting-based music therapy seems well-suited to videoconference delivery because it does not rely on synchronous playing.

Lightstone et al.²⁵ present a case study in which a veteran with complex PTSD attended music therapy via videoconferencing. Use of an established Canadian telehealth network meant that the internet connection was fast, secure and stable. Remote therapy in this case seemed as effective as in-person therapy. There is no mention in the article of any issues relating to latency or sound

quality, probably because latency will have a less pronounced effect on individual sessions than on work with several people in different locations. Using a custom-built virtual reality (VR) environment, Tamplin et al.²⁶ explored the possibility of group singing over the internet for people with quadriplegia. Low latency audio was achieved via a software platform called JackTrip. Participants reported that the latency between audio and video of about 1 s did not affect their singing experience, and that VR reduced their inhibitions about singing in front of other, but may have made it harder to read social cues. VR also facilitated the experience of "going somewhere" for singing sessions. Although the JackTrip technology enabled real time group singing, the level of technical involvement and set-up needed may present barriers for participants joining a singing group from their own home.

Technology for social interaction and cognitive stimulation

The group singing experience may be characterised as a social and leisure activity as much as a therapeutic intervention designed to support wellbeing and improve quality of life. The literature in

this area largely concerns the use of tablet devices, as these are considered portable, accessible and user-friendly.²⁷ It includes several instances of digital devices being used to support conversation and interaction between people with dementia and their carers.^{28–30} Samuelsson and Ekstrom (2019) found that using a tablet with photos, music and videos produced conversations between nurses and people with dementia that were less one-sided and covered a wider range of topics. Ferm et al.²⁹ showed that the device itself can become a stimulus to conversation, prompting discussion of developments in technology and experiences of using the device.

Several articles emphasise the importance of functional and reliable technology in facilitating further engagement. In a study of videoconferencing technology to connect with older people in remote parts of Finland, researchers found that robust technology and previous experience of use enabled successful participation, whereas lack of experience, technical problems and negative self-perception as a user of technology were seen as barriers.³¹ Ferm et al.²⁹ support this finding, stressing the importance of ensuring that initial experiences with technology are positive.

Telemedicine and telecare

There are many studies in telemedicine, so priority was given to more recent papers concerning at-home videoconferencing. Because telemedicine is driven by the potential to make economic savings in health care, there is a risk of bias in the literature which we could not control for in this review. That said, a number of studies have shown that dementia diagnostic testing conducted remotely via videoconferencing is not inferior to in-person testing, in terms of reliability.^{32–35} Participants were often very willing to use telemedicine because they lived in an underserved community.³⁶ People with dementia and their families readily accepted telemedicine, confounding researchers' expectations.³⁷ However, 30% of patients said that they felt more anxious in a video appointment than they would have done face to face. Moo et al.³⁸ compared people who accepted videoconferenced telemedicine to those who declined, and found that the main reason for declining was lack of a computer. Satisfaction with telemedicine was very high and the study showed it could be as successful as in-person visits. In some cases, participants chose telemedicine even when face-to-face care was available, implying good acceptability. The present pandemic is likely to generate even higher rates of telemedicine. Because lack of technology is the biggest barrier to taking part in telemedicine, the need for strategies to avoid excluding a proportion of people with dementia is once again emphasised.

Barriers and facilitators

Given the recency of online singing, it is not surprising that the interrogation of related literature proved more fruitful than the direct systematic searches. This also means that dementia-specific considerations in online singing have not emerged from our analysis. Still, the evidence gathered provides information about barriers and facilitators which can inform the development of online singing and which indicates how to optimise the musical experience of participants with dementia. Moreover, what works for this population will work for other groups. These barriers and facilitators are summarised, first, in relation to the individual participant and their psychological state, and second, in relation to the technology itself.

Psychological

Encountering obstacles when using technology can make participants less motivated to engage with it in the future, so care should be taken to minimise such problems and provide adequate

support. Getting online and using technology is itself a shared experience for the group and may become a topic of conversation, so it could help to reassure participants if facilitators are open about their own experiences and challenges. In addition to providing clear and simple instructions, previous studies indicate that support from another person to use unfamiliar technology may promote successful participation.

The experience of people with dementia in the online session may be more dependent on their interaction with their carer than it would be in a face-to-face session. The carer will also have more insight into how the person with dementia is responding to and engaging with the session. It follows that it may be helpful for the facilitator to provide some tips or instructions about how carers can maximise the person's enjoyment of the session, and in turn the facilitator can learn from the carer's feedback about how their person responds.

Because peer support and sharing knowledge between carers is an important part of the singing group experience for attendees,^{8–10} facilitators of online activities may wish to consider how they can support carers to build or maintain similar relationships in the online format (e.g. breakout rooms, text-based chat).

It is inevitable that not everyone will be able to access the required technology to join an online session, so facilitators should think carefully about what alternative formats they can offer to avoid excluding these participants.

Technological

Technology should be appropriate to the intended population and tailored to their needs and existing knowledge. The accessibility of the user interface is important; ease of use and functionality characterise successful applications of technology. It should not be assumed that people with dementia and their carers are novice technology users.

We know that group music-making is highly reliant on inter-participant synchronicity which makes its adaption to an online format a challenge. However, the existing music therapy literature suggests that online, videoconferenced sessions are a viable possibility. Playing and singing in unison is not possible with commonly available platforms due to audio latency. Available solutions are relatively complex and costly for groups. Group facilitators therefore need to work within latency restrictions and adapt the singing session to preserve a sense of togetherness and group feeling using the technology which is available. There remains a need for software applications to be developed to overcome the problem of audio latency, or for existing apps to be better distributed to this consumer group.

Conclusion

The public health crisis of SARS-CoV-2 has compelled practitioners to innovate to keep their singing groups musically together while remaining socially distant. Our scoping review highlights a number of logistical issues that can promote or inhibit the use of online singing by people with dementia and their carers. Overall, we found evidence of growing acceptability of digital interventions, largely from the telemedicine literature. There is evidence of their efficacy from remotely delivered music therapy, and evidence of the feasibility of digital apps to support social, leisure and practical needs. It is likely therefore that online singing could be taken up by millions of people with dementia worldwide as a relatively inexpensive aid to wellbeing and social inclusion, and in fact increased online provision could improve accessibility for those who live outside the large urban areas where most singing groups tend to take place. A key to scaling up this activity would be improved

software to overcome audio latency, while also tackling digital exclusion among older age groups. The pace of innovation in this field is rapid and literature lags behind. This scoping review provides a benchmark for further research and innovation. It should be useful to technology developers, researchers, service providers and practitioners.

Author statements

Ethical approval

Not required as this study involved reviewing existing literature.

Funding

This work was supported by the Alzheimer's Society (grant number 400).

Competing interests

None declared.

References

- Jordan RE, Adab P, Cheng KK. Covid-19: risk factors for severe disease and death [Internet] *BMJ* 2020;**368**(March):1–2. <https://doi.org/10.1136/bmj.m1198>. Available from:..
- Brooke J, Jackson D. Older people and COVID-19: isolation, risk and ageism. *J Clin Nurs* 2020;**29**(13–14):2044–6.
- Greenberg NE, Wallick A, Brown LM. Impact of COVID-19 pandemic restrictions on community-dwelling caregivers and persons with dementia. *Psychol Trauma Theory, Res Pract Policy*. 2020:19–21.
- Woods B, Aguirre E, Spector AE, Orrell M. Cognitive stimulation to improve cognitive functioning in people with dementia. *Cochrane Database Syst Rev* 2012;**2**.
- van Der Steen JT, Smaling HJA, Van Der Wouden JC, Bruinsma MS, Scholten RJPM, Vink AC. Music-based therapeutic interventions for people with dementia (Review). *Cochrane Database Syst Rev* 2018;**(7)**:1–86.
- Prince M, Knapp M, Guerchet M, McCrone P, Prina M, Comas-Herrera A, et al. Dementia UK: second edition overview. *Alzheimer's Soc* 2014;1–136.
- Sarkamo T, Laitinen S, Numminen A, Kurki M, Johnson JK, Rantanen P. Clinical and demographic factors associated with the cognitive and emotional efficacy of regular musical activities in dementia [Internet] *J Alzheimers Dis* 2016;**49**(3):767–81. Available from: <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=medl&NEWS=N&AN=26519435>.
- Camic PM, Williams CM, Meeten F. Does a "Singing Together Group" improve the quality of life of people with a dementia and their carers? A pilot evaluation study [Internet] *Dementia* 2011;**12**(2):157–76. Available from: <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=medl&NEWS=N&AN=24336767>.
- Osman SE, Tischler V, Schneider J. Singing for the Brain: a qualitative study exploring the health and well-being benefits of singing for people with dementia and their carers [Internet] *Dementia* 2014 Nov;**15**(6):1326–39. Available from: <http://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=119144932&site=ehost-live>.
- Unadkat S, Camic PM, Vella-Burrows T. Understanding the experience of group singing for couples where one partner has a diagnosis of dementia [Internet] *00(00) Gerontol* 2017 Jun:1–11. Available from: <http://gerontologist.oxfordjournals.org/lookup/doi/10.1093/geront/gnv698>. 57, 3, 469–478.
- Tamplin J, Clark IN, Lee YEC, Baker FA. Remini-sing: a feasibility study of therapeutic group singing to support relationship quality and wellbeing for community-dwelling people living with dementia and their family caregivers. *Front Med* 2018;**5**(AUG):1–10.
- Noble H, Smith J. Reviewing the literature: choosing a review design. *Evid Base Nurs* 2018;**21**(2):39–41.
- Hori M, Iizuka M, Nakamura M, Aiba I, Saito Y, Kubota M, et al. At-home music therapy intervention using video phone (Skype) for elderly people with dementia [Internet] *Gan To Kagaku Ryoho* 2014;**41**(Suppl 1):33–5. Available from: <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=medl&NEWS=N&AN=25595076>.
- Ford JH, Dodds D, Hyland J, Potteiger M. Evaluating the impact of music & memory's personalized music and tablet engagement program in Wisconsin assisted living communities: pilot study. *J Med Internet Res* 2019;**21**(3):1–13.
- Peeters MMM, Harbers M, Neerincx MA. Designing a personal music assistant that enhances the social, cognitive, and affective experiences of people with dementia. *Comput Hum Behav* 2016 Oct;**63**:727–37.
- Luyten T, Braun S, Jamin G, van Hooren S, de Witte L. How nursing home residents with dementia respond to the interactive art installation 'VENSTER': a pilot study [Internet] *Disabil Rehabil Assist Technol* 2018;**13**(1):87–94. <https://doi.org/10.1080/17483107.2017.1290701>. Available from:..
- Golden A, Gammonley D, Hanna Powell G, Wan TT. The challenges of developing a participatory arts intervention for caregivers of persons with dementia. *Cureus* 2017;**9**(4).
- Nygård L. The meaning of everyday technology as experienced by people with dementia who live alone. *Dementia* 2008;**7**(4):481–502.
- Astell AJ, Malone B, Williams G, Hwang F, Ellis MP. Leveraging everyday technology for people living with dementia: a case study. *J Assist Technol* 2014;**8**(4):164–76.
- Tak SH, Zhang H, Patel H, Hong SH. Computer activities for persons with dementia [Internet] *Gerontol* 2015;**55**(Suppl 1):S40–9. Available from: <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=medl&NEWS=N&AN=26055780>.
- Wallcock S, Nygård L, Kottorp A, Malinowsky C. The use of everyday information communication technologies in the lives of older adults living with and without dementia in Sweden [Internet] *0(0) Assist Technol* 2019:1–8. <https://doi.org/10.1080/10400435.2019.1644685>. Available from:..
- Bartels SL, Assander S, Patomella AH, Jamnadas-Khoda J, Malinowsky C. Do you observe what I perceive? The relationship between two perspectives on the ability of people with cognitive impairments to use everyday technology [Internet] *0(0) Aging Ment Health* 2019;**24**(8):1–11. <https://doi.org/10.1080/13607863.2019.1609902>. Available from:..
- Dye K. Student and instructor behaviors in online music lessons: an exploratory study. *Int J Music Educ* 2014;**34**(2):161–70.
- Baker F, Krout R. Songwriting via Skype: an online music therapy intervention to enhance social skills in an adolescent diagnosed with Asperger's syndrome. *Br J Music Ther* 2009;**23**(2):3–14. Available from: <http://bjm.sagepub.com/lookup/doi/10.1177/135945750902300202>.
- Lightstone AJ, Bailey SK, Voros P. Collaborative music therapy via remote video technology to reduce a veteran's symptoms of severe, chronic PTSD. *Arts Health* 2015;**7**(2):123–36.
- Tamplin J, Loveridge B, Clarke K, Li Y, Berlowitz D J. Development and feasibility testing of an online virtual reality platform for delivering therapeutic group singing interventions for people living with spinal cord injury [Internet] *J Telemed Telecare* 2019;**26**(6):365–75. <https://doi.org/10.1177/1357633X19828463>. Available from:..
- Yamagata C, Kowtko M, Coppola JF, Joyce S. Mobile app development and usability research to help dementia and alzheimer patients. In: *2013 ninth annual conference on long Island Systems, Applications and Technology (LISAT 2013)*; 2013.
- Gilson A, Dodds D, Kaur A, Potteiger M, Ford JH. Using computer tablets to improve moods for older adults with dementia and interactions with their caregivers: pilot intervention study. *J Med Internet Res* 2019;**21**(9):1–13.
- Ferm U, Ekström A, Larsson E, Samuelsson C. Tablet computer-supported conversation between people with dementia and their carers: technology as interactional focus [Internet] *Univers Access Inf Soc* 2020:0123456789. <https://doi.org/10.1007/s10209-020-00745-4>. Available from:..
- Samuelsson C, Ekström A. Digital communication support in interaction involving people with dementia [Internet] *Logop Phoniater Vocology* 2019;**44**(1):41–50. <https://doi.org/10.1080/14015439.2019.1554856>. Available from:..
- Airola E, Rasi P, Outila M. Older people as users and non-users of a video conferencing service for promoting social connectedness and well-being—a case study from Finnish Lapland [Internet] *Educ Gerontol* 2020;**46**(5):258–69. <https://doi.org/10.1080/03601277.2020.1743008>. Available from:..
- Grosch MC, Weiner MF, Hynan LS, Shore J, Cullum CM. Video teleconference-based neurocognitive screening in geropsychiatry [Internet] *Psychiatr Res* 2015;**225**(3):734–5. <https://doi.org/10.1016/j.psychres.2014.12.040>. Available from:..
- Lindauer A, Seelye A, Lyons B, Dodge HH, Mattek N, Mincks K, et al. Dementia care comes home: patient and caregiver assessment via telemedicine. *Gerontol* 2017;**57**(5):85–93.
- Vahia IV, Ng B, Camacho A, Cardenas V, Cherner M, Depp CA, et al. Telepsychiatry for neurocognitive testing in older rural latino adults [Internet] *Am J Geriatr Psychiatr* 2015;**23**(7):666–70. <https://doi.org/10.1016/j.jagp.2014.08.006>. Available from:..
- Martin-Khan M, Flicker L, Wootton R, Loh PK, Edwards H, Varghese P, et al. The diagnostic accuracy of telegeriatrics for the diagnosis of dementia via video conferencing [Internet] *J Am Med Dir Assoc* 2012;**13**(5):487.e19–24. <https://doi.org/10.1016/j.jamda.2012.03.004>. Available from:..
- Tso JV, Farinpour R, Chui HC, Liu CY. A multidisciplinary model of dementia care in an underserved retirement community, made possible by telemedicine. *Front Neurol* 2016;**7**(DEC):1–6.
- Azad N, Amos S, Milne K, Power B. Telemedicine in a rural memory disorder clinic-remote management of patients with dementia. *Can Geriatr J* 2012;**15**(4):96–100.
- Moo LR, Gately ME, Jafri Z, Shirk SD. Home-based video telemedicine for dementia management [Internet] *Clin Gerontol* 2020;**43**(2):193–203. <https://doi.org/10.1080/07317115.2019.1655510>. Available from:..