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Effectiveness of music-based interventions to address well-being in people with a vision impairment: a scoping review

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ABSTRACT

Objectives The objectives of this review were to identify the types of music-based interventions and associated accessibility challenges for people who have visual impairment (VI) and their reported effects on psychological, physiological and social well-being.

Design A scoping review was developed according to the Joanna Briggs Institute methodology and reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews checklist and guidelines. A narrative synthesis was conducted to map out the types of music-based interventions undertaken and to compare the therapeutic outcomes. The studies were evaluated according to the music reporting checklist.

Results In total 5082 records were identified, 69 full-text articles were screened and 13 studies were included. Eleven studies included younger children and teenagers, two focused on adults with acquired VI. Ten studies involved active music therapy strategies and three used passive music listening. Eleven of the studies focused on social outcomes and two reported mental health. Although the studies reported that music-based intervention strategies improved psychosocial well-being in people with a VI, conclusions could not be drawn as robust outcome measures were not generally used and only four of the studies included any statistical analysis.

Conclusions Although potential was evident, details of intervention protocols and training requirements were not sufficiently reported and further, high-quality evidence-based studies are required.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This study used best practice methods as set out by the Joanna Briggs Institute Scoping Review Methodology manual to conduct a scoping review.
⇒ Publications written in any language were considered for inclusion.
⇒ Clinical trials, comparative, evaluative and observational studies were considered eligible for inclusion.
⇒ A limitation of this study was that patient and public involvement was not undertaken to advise on identifying objectives, research questions and types of well-being domains.
⇒ The research team, with expertise in vision and music therapy, devised the eligibility criteria.

INTRODUCTION

A visual impairment (VI) impacts all aspects of a person's life and is associated with reduced functional ability. The effects may vary depending on the level of VI, but often include difficulties with reading, writing, comprehending non-verbal cues and following conversations in social situations.[1–3] Such difficulties may impact an individual's mental health, causing depression,[4–7] emotional distress,[6] anxiety,[8–12] feelings of loneliness,[12] social isolation[12] and loss of a sense of belonging.[13 14] Together with addressing the visual difficulties, improving the well-being of those with a VI should be prioritised[15–17] as psychological, physiological and social factors influence mental health and impact psychosocial well-being.[18]

Well-being does not have one single definition, but there is a general agreement that, it includes the presence of positive emotions and moods (eg, contentment, happiness), the absence of negative emotions (eg, depression, anxiety), satisfaction with life, positive functioning, feeling healthy and full of energy.[19] Researchers from different disciplines may refer to well-being, depending on their area of interest in that domain, which can include physical, social, developmental and activity-based, emotional, psychological, life satisfaction, domain-specific satisfaction, engaging activities and work. This review will include all the listed areas, psychological, physiological and social factors impacting on well-being.[19–21]

Some ways to address well-being could be through physical activity,[22] arts activities[23] and mindfulness.[24] Another approach with people who have a VI can be through music-based

interventions. Music can create feelings of physical and mental relaxation by disguising environmental noises and transferring an individual's attention to a more pleasant emotional state.[25–29] Music-based interventions can be regarded as multifunctional, that is, they may involve purposeful musical activities, music listening and making music through playing musical instruments or singing. In the literature, there is a distinction between music-based interventions run by a music therapist and those by other healthcare professionals. Interventions involving a music therapist are characterised by the presence of a therapeutic process and the use of personal musical experiences where the therapeutic relationship is central.[30–33] Interventions in a music therapy context may involve active or passive music listening, improvisation, composing and song writing.[34] In contrast, when the music-based intervention is offered by a medical or healthcare professional, this can be defined as a purposeful music activity such as passively listening to pre-recorded music, which has been referred to as music medicine.[35]

Several studies suggest that listening to music can induce pleasant and positive feelings by the activation of the limbic system.[36 37] Music has also been shown to have a broad range of therapeutic effects, such as giving individuals a sense of connection, which fosters a sense of community and promotes feelings of interpersonal attachment which can offset loneliness.[38–41] Engaging in musical activity leads to a decrease in cortisol[42] which may alleviate anxiety, promote relaxation, improve mood and decrease agitation.[43] Studies have been conducted in VI populations to promote social cohesion, interpersonal communication[12 13] and for relaxation. Listening to calming music has been used during medical treatment such as cataract surgery.[44] In addition, people with a VI rely on other means of communication such as sound and touch to compensate for their vision loss.[45] Research indicates that people with a VI prefer auditory mediums, such as listening to music or the radio.[45] Children with VI prefer musical toys[46] and enjoy engaging in music as a means of expression.[38] The most recent review of music-based interventions for people with a VI[46] informed on the use of music-based interventions for educational purposes, but excluded studies that used music for relaxation and did not focus on the therapeutic outcomes of those studies to promote psychosocial well-being. In addition, there may have been other music-based intervention studies conducted with people who have a VI since the review was published. To date, no study has attempted to identify the volume of literature on music-based interventions aimed at improving well-being in people who have a VI, thus indicating a need for an up-to-date review.

Therefore, the aims of this review were to investigate and map the literature on how music-based interventions have been used with people with a VI to promote their psychological, physiological and social well-being and any accessibility challenges that may have hindered people with VI taking part in the intervention at locations away from their home. This is important to highlight, as often people with VI are not able to access face-to-face interventions because of constraints related to transport, geographical location of clinics and/or finances.[47] Similarly, the review investigated if special arrangements and/or accessibility technologies were utilised in the intervention setting and during the treatment to address specific challenges regarding participants navigating unfamiliar settings (both online and in-person).[48]

Objectives

The scoping review questions were categorised into three aspects as described below:

1. Description (types of interventions):
   i. What types of music-based intervention studies have been conducted to date that have addressed psychological and/or physiological and/or social well-being among people with VI?
   ii. What is the geographical scope of the conducted studies?
   iii. In what ways was the intervention made accessible for people with a VI?
2. Population groups:
   i. What participant demographics were recorded? (eg, age, gender, ethnicity, and nationality).
   ii. Was the intervention targeted at specific ocular pathologies? (eg, congenital or acquired).
3. Therapeutic domains of the intervention:
   i. What therapeutic outcome domains were identified and outcome measures used to report treatment-related effects?
   ii. What is the effectiveness of music therapy for psychological, physiological and social well-being?

METHODS

Patient and public involvement (PPI)

We did not conduct any PPI for this review.

Study design

A scoping review was selected for this study because it is an inclusive and flexible approach where specific questions can be posed and addressed that have not already been established in the literature.[49] Due to the limited body of literature in this area, a systematic review was not appropriate. For example, the pooled sample size from the included studies would be too small to make any meaningful inferences within the confines of a systematic review.[49–51]

Protocol and registration

As presented in the published protocol,[52] this review follows the methodology manual published by the Joanna Briggs Institute (JBI) for scoping reviews[53] and the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist.[54] A search on Cochrane Reviews, JBI Evidence Synthesis and Prospero showed no current or ongoing review on this topic.

Eligibility criteria

The PCC format (P—participants/population, C—context, C—concept) was used to formulate the inclusion criteria.[49 53] The inclusion criteria were devised with input from experts in the fields of VI and music therapy. A music therapist helped to identify the most pertinent information, including interventionist (music therapist, teacher, carer), method, frequency and duration of delivery, group or individual and whether active or passive music therapy was used. The music reporting checklist added further rigour to the review.

Participants

People of any age with a VI were included, with or without additional health-related problems. VI was defined as people living with long-term, irreversible vision loss that is not rectifiable by surgical procedures.

Context

This scoping review identified music interventions used therapeutically in people with a VI to improve well-being. It reports on the contexts in which music-based interventions have been used, including music therapy, music listening and other music-based activities. Therapeutic outcome domains and treatment characteristics were examined. The therapeutic outcome domains included quality of life (any health-related quality of life measures), physiological outcomes/health-related outcomes (such as blood pressure/heart rate), mental health (eg, well-being, anxiety or depression) and communication and social outcomes (including social engagement).

Concept

Interventions delivered in all settings were included if they addressed the therapeutic outcome domains outlined above.

Adaptations to the original protocol

To better capture the most relevant aspects of the included studies, the original inclusion criteria: PCC in the protocol were modified.[52] For context, therapeutic well-being outcomes during ophthalmic treatments/procedures were excluded. This includes ophthalmic procedures such as (1) cataract surgery, (2) routine eye health check-up, (3) retinal eye laser treatments, (4) treatment for glaucoma and (5) eyelid surgeries. This decision was due to the outcome only measuring therapeutic effects while undergoing the procedure, rather than a well-being shift in the individual's overall life across the therapeutic outcome domains of interest. Subsequently, by refining the area of interest, interventions conducted in hospital/medical operation setting/environment were excluded.

Information sources

The review included all types of published research such as clinical trials, case studies, comparative, evaluative and observational studies. Publication types included peer-reviewed journal publications, postgraduate theses and conference papers. There was no publication date restriction. This wide approach to data gathering provided an extensive and comprehensive selection of sources to address the research question. In addition to the modifications to the original protocol, studies from the following topics were excluded: music for non-therapeutic purposes (ie, educational interventions), opinion papers, abstracts with no full-text paper written, preprints and undergraduate papers.

Search strategy and selection of sources of evidence

The databases searched were EMBASE (Ovid interface, 1974 onwards), MEDLINE (Ovid interface, 1948 onwards), CINAHL Plus (EBSCOhost), PsycINFO (EBSCOhost) and Web of Science (Clarivate Analytics). Further search strategies included free-text hand searches in Google Scholar for grey literature and screening reference lists of all relevant studies. The searches were conducted on 14 December 2021 and again on 11 April 2022. The purpose of using a variety of major databases was to ensure adequate and efficient coverage related to health, life sciences, nursing and psychology.[55] The detailed search terms can be found in online supplemental data 1. The retrieved studies were exported into Mendeley, and duplicates were automatically removed. One reviewer (NS) first screened the titles and abstracts for eligibility for full-text analysis. This was then cross-checked by a second reviewer (RL). The reviewers independently classified the eligible articles for inclusion for the scoping review into one of the following groups:

1. Therapeutic well-being outcomes: interventions during surgery or treatment that had therapeutic well-being outcome(s) to improve well-being in VI populations.
2. Therapeutic well-being outcomes: interventions for non-irreversible vision loss that is not rectifiable by surgical procedures

Where there was a disagreement between the two reviewers at any stage of the study selection process, a final agreement was sought by mutual consensus with input from a third reviewer (PMA). When the full text of an article was not available in English language (n=2), a professional translation service was used.

Data charting process and data items

Data extraction tables were developed using the JBI scoping review template[53] and the Checklist for Reporting Music-based Interventions[56] to capture the information necessary for data synthesis. To minimise bias during the review process, two independent reviewers were selected with different professional backgrounds[57] (ie, sports science and dispensing optics). For any disagreements regarding interpretation and critical reflection of studies, a third reviewer (from an optometry background) was consulted. This team was appointed to minimise the influence reflexivity or prior assumptions on study selection. To ensure quality assurance during the review process, the research team followed the JBI review checklists[53] and PRISMA-ScR.[54]

The agreed data extracted by the authors were: (1) author and year of publication and country); (2) participant demographics (mean age, sample size, ocular pathologies, gender, and nationality (ethnicity)); (3) description and findings of the review studies (study design, intervention description (strategies used, setting, length and duration of the intervention and who delivered the intervention), accessibility adaptations and main study findings); (4) therapeutic outcome domains of interest (eg, change in behaviour, social engagement, psychological well-being) and (5) corresponding therapeutic outcome measures (eg, physiological parameters, questionnaires, observations, interviews). The data items were grouped into sub tables to present the data.

Critical appraisal of individual sources of evidence

A critical appraisal of the sources of evidence was not conducted as part of this review. The primary goal was to enquire what has been investigated to date and to understand the scope for future research, rather than to assess the reliability of study findings. The music-based intervention reporting checklist sections were reported according to published guidelines.[56]

The purpose of the checklist is to improve the transparency and specificity of reporting. It consists of seven different sections, including intervention theory, content and delivery, schedule, interventionist, treatment fidelity, setting and unit of delivery. These sections are intended to support Consolidated Standards of Reporting Trials and Transparent Reporting of Evaluations with Non-randomised Designs statements for transparent reporting of interventions while taking into account their variety, complexity and uniqueness.

The checklist has been used in previous studies as a tool to report the quality of the music intervention research in terms of clinical relevance and rigour. For this review, the checklist was used to evaluate the individual sources of evidence.[58–60]

Synthesis of results

PRISMA-ScR guidelines were followed to report the results from the extracted data.[54] This allowed us to identify the characteristics of sources and map the existing literature. For data presentation, the results were categorised by its study designs (non-experimental and experimental) and extracted data were grouped and tabulated with a descriptive numerical analysis to identify comparative data. In addition, to synthesise the data, it is presented as tables to summarise the key findings addressing the research questions in the three broad categories. Existing gaps in the research were determined on the evaluation of the interventions to improve well-being in people with a VI.

RESULTS

Selection of sources of evidence

The database search yielded 5082 citations after removal of duplicates (see figure 1). Screening of titles and abstracts resulted in a first classification, after which 69 papers were included for full-text review. Thirteen studies met the final inclusion criteria.[50]

Characteristics of sources of evidence

Summary of the study characteristics

The geographical scope of the included studies was America (n=7), Australia (n=1), Canada (n=1), Brazil (n=2), Germany (n=1) and China (n=1). The first music intervention study in a VI population was undertaken in 1982 and the most recent in 2016. Two out of the 13 studies were conducted with adults, the remaining 10 studies' were with young children and teenagers under the age of 18 years. One study took place at the participant's home, the rest took place in an external location, such as a school or clinical environment.

Synthesis of results

A narrative synthesis of the results that supplements the tabulated results is separated by the following four sections:

1. Participant demographics.
2. Description of the studies.
3. Therapeutic outcomes.
4. Checklist for Reporting Music-based Interventions.

This was done by their respective study designs (non-experimental and experimental), identifying the gaps in the literature and scope for future music-based interventions.

Participant demographics

Non-experimental studies

A total of 28 participants were included in the non-experimental studies. The range of the sample size of each study varied from 1 to 10 participants with 6 studies having 1 participant, 1 study had 2 participants and 2 studies had 10 participants, respectively. All the case studies involved children. The age range was 2–18 years (mean: 8.5 years, SD: ±5.3), of which half, n=14 (50%) were female. The nationality was stated, but ethnicity was not consistently reported in the included studies. The VI of the participants was mainly congenital or acquired at a very young age (see table 1).

Experimental studies

A total of 134 participants were included in the four experimental design studies. The range of the sample size varied from 1, 6, 41 and 80, respectively. The age range was 5–55 years (mean: 32.2 years, SD: ±21.68). The age range of the two studies with children was 5–17 years. Slightly more participants, n=75 (56%), were female. The VIs in the studies ranged from congenital to acquired (see table 2).

Six out of the nine non-experimental studies were single subject case studies and three were case series. Four of the studies were led by a music therapist,[61–64] two were undertaken by researchers[65 66] and three by school-teachers.[63 67–69]

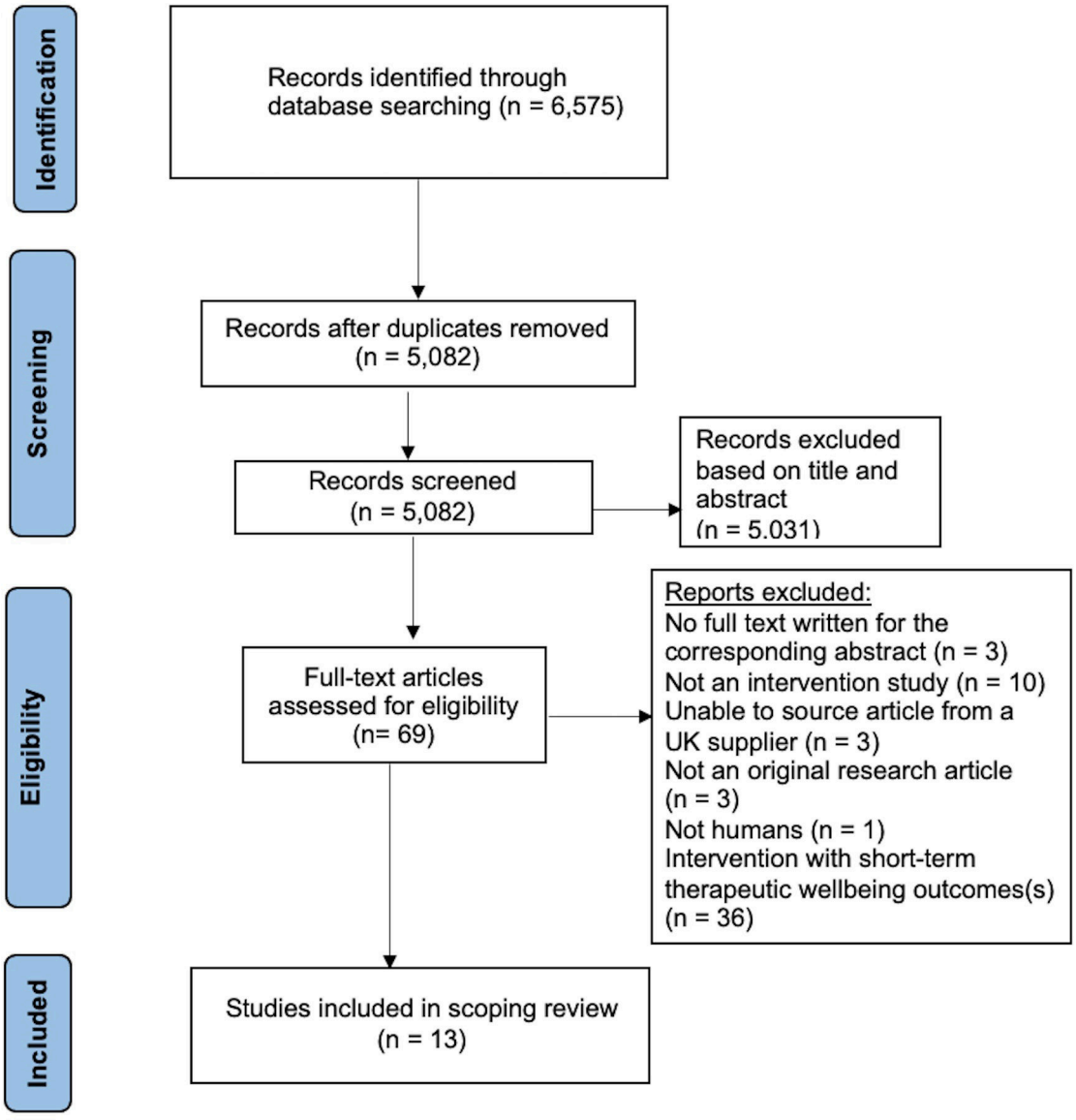

Figure 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram of study inclusion process.

Music improvisation was used in four studies,[61 62 64 69] which involved the music therapist and client/s cocreating and exploring music with different instruments and/or voice.[32] Three studies used music-based activities such as playing with musical toys, one study used passive music listening and one used nursery rhyme singing[63 66 68] (See table 3).

The average music listening time and duration was 30 min per day over a period of 2 months. Seven out of the nine studies were conducted in a school setting[62 63 65–69] and the other two were undertaken in a private clinical setting[61] and university research centre,[64] respectively. Four studies did not report any accessible adaptations made for people with a VI.[62 65 66 68] Two studies reported that the study sessions were lead and guided by the researchers or teachers as a means of making the intervention more accessible, by being present to offer support.[67 69] One study reported training was provided to the parents/carers of the participating children to make it more accessible by offering assistance.[64] Only two studies reported adaptations to the environment to make it more accessible. One study made adaptations to the layout of the playground[63] and the other made changes to the lighting of the therapy room[61] (see table 3). All five studies refer to accessibility and adaptations made; however they lack specific detail on how barriers were addressed, and support provided.

Experimental studies

Two out of the four experimental studies were randomised control trials,[70 71] the other two were quasi-randomised (repeated measures),[2] ABA reversal and stimulation treatment design,[72] respectively. Two of the studies were led by researchers,[70 71] one study conducted by a teacher[72] and one by a music therapist.[2] The music-based intervention strategies used in two out the four studies were music listening.[70 71] One study used improvisation using instruments to create music, accompanied with singing.[2]

Table 1 Participant demographics across review studies (non-experimental)

Author (year, country)	Sample size	Mean age	Gender	Nationality (ethnicity)	Vision impairments
Salas and Gonzalez (1988, USA)[61]	1	4 years	Female	American/Italian	Bilateral optic atrophy
Rogow (1982, Canada)[65]	10	4 years	6 Females 4 Males	Canadian (Chinese)	Anophthalmia, cortical blindness, partial sight impairment, several sight impaired and total blindness
Shoemark (1991, Australia)[62]	1	8 years	Male	Australian	Detached retina (blind)
Silliman *et al* (1994, USA)[66]	1	10 years	Male	American	Blind
Kern and Wolery (2001, USA)[63]	1	3 years	Male	American (African)	Bilateral congenital anophthalmia/microphthalmia
Villasenor and Vargas-Colon (2012, USA)[67]	2	14.5 years	1 Female 1 Male	American	Retinopathy of prematurity
Desrochers *et al* (2014, USA)[68]	1	13 years	Female	American	Bilateral congenital anophthalmia
Metell (2015, Norway)[64]	10	2.5 years	5 Females 5 Males	Brazilian	Optic nerve atrophy, septo-optic dysplasia, chorioretinitis, coloboma of optic papilla, chorioretinitis, microphthalmia, corectopia-clara, optic nerve atrophy, toxoplasmosis, agenesis ocular, optic nerve atrophy, anophthalmia
Villas Boas *et al* (2016, Brazil)[69]	1	5 years	Male	South American	Nystagmus and blind

Another study used a music-based activity that involved listening to prerecorded music.[72] The average music listening time was 30 min per day over a period of 15 days. The intervention setting varied from a university research centre[71 72] into a participants' home,[70] and a school.[2] Three out of the four studies reported on the intervention accessibility adaptation, including adaptations to the classroom,[72] provision of instructional training to those participating[2] and one study conducted home visits, together with weekly check in calls to participants.[70] The fourth study did not state any accessibility adaptations,[71] as seen in table 4.

Table 2 Participant demographics across review studies (experimental)

Mean age	Gender	Nationality (ethnicity)	Vision impairments
51 years	40 Females 40 Males	Chinese	Diabetic retinopathy
55.8 years	17 Females 14 Males	German	Open angle glaucoma
17 years	Female	American	Blind
5 years	1 Female 5 Males	American	Blindness ranging from: one prosthetic eye, bilateral retinoblastoma nystagmus, cortical visual impairment

Therapeutic outcomes domains

Non-experimental studies

All nine studies investigated social therapeutic domains only.[61–69] These included outcomes such as, social engagement, bonding and interaction, change in behaviour (eg, attentiveness), developing interpersonal/social skills (eg, communication) and participation skills. The corresponding outcome measures used to assess the therapeutic outcomes were qualitative methods, such as observation, note taking, videotaping and interviews with participants/caregivers. None of the studies conducted statistical analysis, so it was not possible to draw any definitive conclusions, as seen in table 5.

Experimental studies

The therapeutic outcome domains investigated in the included studies were psychological/mental well-being, quality of life and reduced psychological stress for two studies.[70 71] In addition, one of these[71] investigated the physiological domain. Two further studies investigated social domains, namely changes in behaviour (eg, increased attentiveness and compliance)[72] and participation skills[2] (See table 6).

Outcome measures

Mental health and stress were investigated using the Diabetes Quality of Life Specific Scale (DQOL), Visual Quality of Life (VQOL) and Symptom Check list (SCL-90).[70] One used the profile of mood states[71] and a

Table 3 Description and findings of the review studies (non-experimental)

Author (year, country)	Study design	Strategies used	Length and duration of the intervention	Who delivered/ facilitated the intervention	Intervention setting	Accessible (yes/ no) and what accessibility adaptations were made?	What are the main findings?
Rogow (1982, Canada)[65]	Case studies	Singing nursery rhymes researcher	30 min daily over a period of 2 months	Researcher	School	None stated	Nursery rhythms can help develop communicative behaviours
Salas *et al* (1988, USA)[61]	Case study	Music therapy: improvisation	Twice a month, 30 min sessions for 10 months	Music therapist	Clinical setting/ private clinic	Yes. Lights in the room were switched off to create a restful and semi dark environment	Long-term positive changes in physical and mental capabilities, expressive and creative aspects were identified in the participant's personality
Shoemark (1991, Australia)[62]	Case study	Music therapy: improvisation, singing, and learning to play the piano	30 min sessions, twice a week for 9 months	Music therapist	Residential educational facility (school)	None stated	Basic music skills developed, spontaneous interaction and increased participation in classroom activities was recognised.
Silliman *et al* (1994, USA)[66]	Case study	Music-based activity: involving playing music as a reinforcer to help improve motor skills	30-to-40-min sessions, three times a day for 10 days	Researcher	School	None stated	All four gross motor skills increased noticeably when music was introduced as a reinforcer. The authors also concluded such skills may be maintained with regular use of them
Kern *et al* (2001, USA)[63]	Case study	Music-based activity: different music instruments to play with, located in the play area	Daily for 35 days (period daily not specified)	Music therapist and schoolteacher	School	Yes. Adaptations were made specifically for the participant in the playground*	The playground adaptation resulted in no changes in the child's social interactions with peers or adults and no change in movement on the playground, as well as a decrease in stereotypical responses. The findings suggest that musical adaptations of physical environments may be helpful but not sufficient for promoting desired outcomes
Villasenor *et al* (2012, USA)[66 67]	Case studies	Passive music listening (nature sounds)	15 or 30 min daily, 5 days per week, for a period of 10 to 20 weeks	Teacher	School	Yes. Teacher/ assistant present to support the students	Both students' body awareness and movement, listening skills and tactile processing improved

Continued

Table 3 Continued

Author (year, country)	Study design	Strategies used	Length and duration of the intervention	Who delivered/ facilitated the intervention	Intervention setting	Accessible (yes/ no) and what accessibility adaptations were made?	What are the main findings?
Desrocher *et al* (2014, USA)[68]	Case study	Music-based activity: musical play with musical toy†	Two 8-min sessions separated by a 10-min break were held during 3 days within a period of a week	Schoolteachers	School	None stated	Background music was effective in reducing problem behaviours and increasing desirable behaviour of an adolescent who is blind with multiple intellectual disabilities during a reinforcer assessment
Metell(2015, Norway)[64]	Case studies	Music therapy: improvisation and singing Brazilian children's songs	Each session lasted around 25 min and number of sessions varied from 1 to 7 over a period of 10 weeks	Music therapist	University Research Centre (pedagogical institution)	Yes. The sessions were lead and guided by the researcher and training was provided to the parents/carers of the children	Positive bonding patterns enhance early interaction by providing experiences of togetherness, joint attention and happiness was identified
Villas Boas *et al* (2016, Brazil)[69]	Case study	Music therapy: improvisation and singing rhymes	Analysis was observed over 7 days (period was not stated)	Teachers	Educational services provider (school)	Yes. Teacher/ researcher present to offer support	Attention seeking behaviour towards teachers and children in the classroom occurred more in the body contact activities, music, and singing and rhythm

*Six multisensory musical stations with a connecting path (a 10 cm drainage pipe) were added to the playground. To assist navigation the participant was also provided with a pushcart which made a sound when pushed along the path.
†Musical toy was used to reinforce the participant raising their head from their chest, as this was considered socially desirable behaviour.

Table 4 Description and findings of the review studies (experimental)

Author (year, country)	Study design	Strategies used	Length and duration of the intervention	Who delivered/ facilitated the intervention	Intervention setting	Accessible (yes/no) and what accessibility adaptations were made?	What are the main findings?
Hill *et al* (1989, USA)[72]	ABA reversal and stimulation treatment design (case study)	Music-based activity that involved playing prerecorded music in the background and with the music stopping when the student gets up from their chair). The music selection included: rap, classical, rock and jazz	Approximately 28 sessions, varying from 5 to 20 min each (exact information not specified)	Teacher	Special needs university/ classroom	Yes. Adaptations were made in the classroom	There were higher rates of in-seat behaviour during the music phase. There was also a clear reversal of effects without a music reinforcement
Robb (2003, USA)[2]	Quasi- (repeated measures)	Music therapy: improvisation (including singing)	4×30 min sessions: 2 music-based sessions, 2 play-based sessions without music	Music therapist	Children's Centre for the Visually Impaired (nursery/play school)	Yes. Instructional training was conducted prior to the intervention	Attentive behaviour was significantly higher during music-based sessions t (5) = 5.81; p=0.002). Mean scores for the remaining group participation behaviours were higher in the music condition, but these differences were not statistically significant
Zhao *et al* (2005, China)[70]	Randomised control trial	Passive music listening (happy, cartoon music, sad song selection)	30 min, twice daily for 28 days	Researchers	At home	Yes. Home visits were done and weekly 'check in' calls	Significant differences were found between somatisation, interpersonal, anxiety, depression, phobia and positive score values (p<0.05). There is a positive correlation between the physical function of the diseased patients' quality of life-specific scale and the physical function, social function and mental function of the visual function impairment of the quality of life scale of patients with ophthalmopathy (p<0.05). There is a positive correlation between the social function and mental and psychological function of the patient's quality of life scale (p<0.05); the treatment dimension is positively correlated with the social function of the quality of life scale of patients with visual impairment (p<0.05). Mental dimension is negatively correlated with compulsion, depression, anxiety, hostility, horror, paranoia and spirit (p<0.05); Social dimension is negatively correlated with compulsion, interpersonal, depression and anxiety (p<0.05)

Continued

Table 4 Continued

Author (year, country)	Study design	Strategies used	Length and duration of the intervention	Who delivered/facilitated the intervention	Intervention setting	Accessible (yes/no) and what accessibility adaptations were made?	What are the main findings?
Bertelmann *et al* (2015, Germany)[71]	Randomised control trial	Passive music listening (treatment group listened to relaxation music)	30 min session daily for 10 days	Researchers	University clinical, research lab	None stated	The best-corrected visual acuity, daily intraocular pressure and short-term mental state (KAB) development were significantly better ($p<0.05$) in the treatment group in comparison to controls. Visual field testing, long-term mental well-being (profile of mood states) and adrenalin, cortisol, andendothelin-I blood levels did not differ significantly between both groups ($p<0.05$)

German questionnaire measuring stress, namely the Kurzfragebogen zur aktuellen Beanspruchung (KAB).[71] Physiological parameters included adrenalin concentration (pg/mL), cortisol concentration (µg/dL) and endothelin concentration (pg/mL), which were taken at four time points, and intraocular pressure (IOP, mm Hg). Vision outcomes included best-corrected visual acuity and 30° visual field (VF) testing.[71] Data were collected daily before the 30-min intervention for all 10 days during the core study phase.

Findings

Data from a randomised clinical trial, where the experimental group received relaxation music for 10 days and the control group did not, indicate significant improvements for the music group in daily IOP and short-term mental state (KAB).[71] VF scores, mental well-being profile of mood states and adrenalin, cortisol and endothelin-I blood levels did not differ significantly between the groups. The conclusive finding from this study suggests the addition of relaxing music on a daily basis, might positively impact some physiological and psychological parameters.

Another study[70] compared two groups of patients (n=40 per group) with diabetic retinopathy, one receiving music relaxation therapy while undergoing a fixed drug treatment simultaneously. The methods used to gather the quantitative data were validated well-being questionnaires: Quality of Life Specific Scale (QOL), VQOL and SCL-90. The main finding from this study indicated that the experimental group showed significant improvements when compared with the control group for psychological well-being measures, including somatisation anxiety and depression.

The other two experimental studies,[2 72] in this review, used qualitative methods such as, observation, note taking and video recordings. Robb[2] conducted a pilot study to compare attentive and participatory behaviours during music and non-music play-based group instructional sessions in preschoolers with VIs. The main finding was that attentive behaviour was significantly higher during music therapy sessions in comparison to non-music, play-based ones. The sessions were videotaped to collect behavioural data that were interpreted in a quantifiable way. The mean scores from the study indicated that attentive behaviours were higher in the music condition, but these differences were not statistically significant.[2] A single-subject case study for attentive behaviour in the classroom using music as a reinforcer in a young blind woman with ‘profound mental retardation’ found higher rates of in-seat behaviour during the music phase, with a reversal of effects without a music reinforcement.[72] However, this study did not conduct any statistical analysis (see table 6).

Music reporting checklist

Further data were extracted in accordance with the Checklist for Reporting Music-based Interventions,[56] including adherence and fidelity (Refer to table 7) to inform on the transparency and specificity of the included music-based interventions in this review.

Table 5 Therapeutic outcomes across the review studies (non-experimental)

Author (year, country)	Therapeutic domain of interest*	Therapeutic outcomes	Therapeutic outcome measures	Frequency of when the outcome measures were observed/ follow-up periods
Rogow (1982, Canada)[65]	Social	Social signals and engaging behaviour	Note taking and observation	Data were collected during the 30-min sessions daily over a period of 2 months
Salas *et al* (1988, USA)[61]	Social	Improve interpersonal skills and behaviour	Note taking and observation	Data were collected during all phases of the study: phase I—October 1988 to January 1989, phase II—February to May 1989 (bimonthly sessions) and phase III— July 1989
Shoemark (1991, Australia)[62]	Social	Communication and social skills, interactive behaviour/enhance self esteem	Note taking and observation	Data were collected during all periods of the study: initial period—twice weekly sessions, exploratory period—twice weekly sessions, control period—not specified
Silliman *et al* (1992, USA)[66]	Social	Increase compliant behaviour†	Note taking observation	Data were collected 24 hours before baseline 24 hours after the intervention phase 2 weeks and 3 months following treatment to determine if learning had been maintained
Kern *et al* (2001, USA)[63]	Social	Social interaction and engagement in play	Note taking, observation and video recording	Data were gathered daily during the 7 months period
Villasenor *et al* (2012, USA)[67]	Social	Improve functional skills: attention, speech and language, self-regulation, sensory integration	Observation, video recording and interviews	One interview during the intervention phase (up to 20 weeks) and one interview after the intervention phase
Desrocher *et al* (2014, USA)[68]	Social	Improve problem behaviour‡	Observation and video recording	Data were collected during all six sessions over 3 days
Metell (2015, Norway)[64]	Social	Bonding and interaction	Note taking, observation, video recordings and interviews with caregivers	Data were collected through 48 session notes, 29 field notes, 3 interviews with caregivers and 1 interview with two special teachers were conducted
Villas Boas *et al* (Brazil, 2016)[69]	Social	Improve attention and communicative behaviours	Observation and video recording	Data were collected from the 119:04 (minutes:seconds) recordings of interaction between the teacher and the child. The tapes were transcribed (82:02) and the recording time was encoded, which allowed the marking and location of behaviours to facilitate analysis of the data

*Social—includes social engagement, bonding and interaction, change in behaviour and social skills (eg, communication); mental health—includes well-being, anxiety, depression, psychological stress; physiological/health-related outcomes—includes blood pressure/heart rate; quality of life—includes any health-related quality of life measures.
†Behaviour measured as improving compliance to perform four gross motor skills: walking, stair climbing, standing and sitting.
‡Problem behaviours included standing up, hand hitting and mouth tapping.

Table 6 Therapeutic outcomes across the review studies (experimental)

Author (year, country)	Therapeutic domain of interest*	Therapeutic outcomes	Therapeutic outcome measures	Frequency of when the outcome measures were observed/follow-up periods
Hill *et al* (1989, USA)[72]	Social	Improve compliant behaviour†	Note taking, videotaping and observation	Data were collected from the 28 video recordings taken during the intervention period
Robb (2003, USA)[2]	Social	Attentive behaviour and participation skills	Note taking, observations and completing non-validated assessment forms	Data were gathered from four sessions that were videotaped to facilitate the collection of behavioural data (a time sampling data collection method, with 10 s observe/5 s record intervals). Observation forms were used to evaluate data from the videotapes
Zhao *et al* (2005, China)[70]	Mental health and quality of life	Improve psychological well-being and quality of life	Validated questionnaires (Quality of Life Specific Scale (DQOL), Visual Quality of Life (VQOL) and Symptom Check list (SCL-90)	Data were collected before the intervention and after the intervention period of 28 days
Bertelmann *et al* (2015, Germany)[71]	Mental health, physiological parameters	Reduce psychological stress and improve overall mental well-being	Profile of Mood States (POMS) Questionnaire and Kurzfragebogen zur aktuellen Beanspruchung (KAB) and physiological parameters (intraocular pressure, visual acuity, visual field, adrenalin concentration (pg/mL), cortisol concentration (µg/dL) and endothelin concentration (pg/mL))	Data were collected daily before the 30-min intervention for all 10 days during the core study phase. The physiological parameters: adrenalin concentration (pg/mL), cortisol concentration (µg/dL) and endothelin concentration (pg/mL) were measured at four time points

*Social—includes social engagement, bonding and interaction, change in behaviour and social skills (eg, communication); mental health—includes well-being, anxiety, depression, psychological stress; physiological/health-related outcomes—includes blood pressure/heart rate; quality of life—includes any health-related quality of life measures.
†Behaviour was defined as sitting when instructed to do so by the teacher.

Non-experimental studies

Non-experimental studies reported 100% on items B1—Intervention Content, B3—Music Delivery Method (Live or Recorded), B4—Intervention Materials, B5—Intervention Strategies, C—Intervention Delivery Schedule, G—Unit of Delivery and reported 50% or less on A—Rationale for Music Selection/Intervention Theory, B2—usic selection, E—Treatment Fidelity.

Experimental studies

Experimental studies reported 100% on items, B1—Intervention Content, B2—Music selection, B3—Music Delivery Method (Live or Recorded), B4—Intervention Materials, B5—Intervention Strategies, C—Intervention Delivery Schedule and G—Unit of Delivery. They reported less than 100% on items D—Interventionist and E—Treatment Fidelity. Hence, the experimental studies were more rigorously reported compared with the non-experimental studies (see table 7).

DISCUSSION

This scoping review reported on the available evidence related to the effectiveness of music-based interventions to promote well-being in people living with a VI. These are summarised below.

Only 2 of the 13 studies recruited adult participants.[70 71] There were no significant differences reported in studies aimed at adults and children, other than the latter were facilitated by teachers, with caregivers' consent. Therapeutic interventions can have different approaches dependent on the participants' age group. There is evidence that the effects of music on aspects of well-being may differ dependent on age.[73] Further research is required to understand how to optimise outcomes across age groups.

The ocular pathologies reported in this review were predominately congenital VI (11 out of 13 studies).[2 61–69 72] None of the included studies gave a classification on how they defined VI. The psychological and psychosocial impacts associated with having a VI can vary depending on whether onset is early, sudden, or progressive.[74–76]

For example, early onset may have a profound effect on a child's development, with adverse consequences for mental health in childhood and adult life. In contrast, the sudden loss of a sight, due to illness or accident, can devastate a person's life, if appropriate support is not given. A mild but progressive loss may have a serious growing effect on a person's self-esteem and independence.[75 76] In order to understand the rationale for study design and intervention type, future studies should specify details of

Table 7 Music reporting checklist*

	Yes Total non-experimental designs n=9 (%)	No Total non-experimental designs n=9 (%)
	Experimental designs n=4 (%)	**Experimental designs n=4 (%)**
A: Rationale for Music Selection/Intervention Theory What was the rationale for the music used and intervention?	Non-experimental designs: 1 (10)[67]	Non-experimental designs: 8 (90)[61–66 68 69]
	Experimental designs: 3 (90)[2 70 71]	Experimental designs: 1 (10)[70]
B1: Intervention Content Was it specified who selected the music (eg, preselected by investigator, participant selected)?	Non-experimental designs: 9 (100)[61–69]	n/a
	Experimental designs: 4 (100)[2 70–72]	n/a
B2: Music ► Was this is an original piece of music or a pre-existing musical composition? ► If a pre-existing musical composition was used then was the name of the composer and title of the musical composition stated? ► Was there a description of the music's overall structure (eg, form, elements, instruments or other)?	Non-experimental designs: 3 (20)[61 62 64]	Non-experimental designs: 6 (80)[63 65–69]
	Experimental designs: 1 (10)([2])	Non-experimental designs: 3 (90)[70–72]
B3. Music Delivery Method (Live or Recorded) ► If the music was played live was it specified who delivered the music and performance? ► Was the size of the performance group specified for the live music (eg, interventionist only, interventionist and participant)? ► If recorded music was used, was placement of playback equipment and/or the use of headphones vs speakers specified? ► If recorded music was used, was the decibel level of music delivered and/or use of volume controls to limit decibels specified?	Non-experimental designs: 9 (100)[61–69]	n/a
	Experimental designs: 4 (100)[2 70–72]	n/a
B4: Intervention Materials Which musical and other materials were specified?	Non-experimental designs: 9 (100)[61–69]†	n/a
	Experimental designs: 4 (100)[2 70–72]	n/a
B5: Intervention Strategies What music-based intervention strategies were used (eg, listening, recreating music by singing/playing an instrument, instrument/vocal play, improvisation, movement, song writing or other)?	Non-experimental designs: 9 (100)[61–69]	n/a
	Experimental designs: 4 (100)[2 70–72]	n/a
C: Intervention Delivery Schedule What was the duration, frequency and intensity of the treatment?	Non-experimental designs: 9 (100)[61–69]†	n/a
	Experimental designs: 3 (100)[2 70–72]†	n/a
D: Interventionist ► Were the qualifications and credentials of interventionist(s) reported? ► If more than one interventionist, from which discipline/what qualifications and training details were reported?	Non-experimental designs: 9 (100)[61–69]	n/a
	Experimental designs: 3 (90)[2 71 72]	Experimental designs: 1 (10)[70]
E: Treatment Fidelity Were there any strategies used to ensure that treatment and/or control conditions were delivered as intended (eg, interventionist training, manualised protocols and intervention monitoring)?	Non-experimental designs 1 (10)[64]	Non-experimental designs: 9 (90)[61 68 69]
	Experimental designs: 3 (90)[2 65 70]	Experimental designs: 1 (10)[71]

Continued

Table 7 Continued

	Yes Total non-experimental designs n=9 (%)	No Total non-experimental designs n=9 (%)
	Experimental designs n=4 (%)	Experimental designs n=4 (%)
F: Setting ► Where was the intervention delivered? ► What boundaries were reported (eg, time and location)? ► What ambient noise levels were reported in the environment? ► What boundaries were reported (eg, time and location)?	Non-experimental designs: 9 (100)[61–69]†	n/a
	Experimental designs: 4 (100)[2 70–72]†	n/a
G: Unit of Delivery Was the intervention delivered to individuals or groups of individuals?	Non-experimental designs: 9 (100)[61–69]	n/a
	Experimental designs: 4 (100)[2 70–72]	n/a

*Music-based Intervention Reporting Checklist was reproduced with permission from Robb *et al.*[56]
†Information was not fully described.

the VI, as its impact can differ significantly depending on the manifestation, type of ocular pathology and time of onset.[74–76]

In terms of geographical locations, 7 out the 13 studies were conducted in America,[2 61 63 66–68 70] 2 in Europe,[64 72] 1 in China,[71] Canada,[65] Australia[62] and Brazil,[69] respectively. Music-based interventions which reflect the cultural identity and preferences of participants may be more effective at creating meaning, compliance and promoting enjoyment through preferred music listening.[77 78]

Although five studies in this review refer to accessibility and adaptations made (refer to table 3), they lack specific detail on how barriers were addressed, and support provided. Researchers should provide transparent reporting on what accessibility and adaptations are made. This is particularly important as often people with VI are unable to access face-to-face interventions because of constraints related to the location, intervention setting[47] and/or participants navigating unfamiliar settings.[48]

Twelve out of the 13 interventions were conducted in a clinical or school setting.[61–70 72] It can be argued that research under such conditions may be convenient and allow researchers to obtain comparative results, which may not be possible to replicate in the participant's home as each home environment presents different variables.[79] However, one study found that participants reported being in a better emotional state and less stressed when doing a music listening intervention from home, in comparison to a clinical setting.[80]

In addition, five studies were facilitated by a music therapist.[2 62–65] State registered music therapists are highly trained allied health professionals, who have specialist skills in the use of music therapy strategies for assessment and treatment.[28–31] Music-based interventions include improvisation, guided imagery, song writing, voice work, music listening and functional exercises. It is recommended that wherever music improvisation is used and a therapeutic relationship is central, a music therapist would be optimal. It was not possible to draw conclusions on the benefits of music listening, as only 3 out the 13 included studies, reported on this.[67 70 71]

Evidence for psychological benefits is lacking, since only 2 of the 13 studies reported on this. Music listening research with other populations has shown improved psychological well-being, for example older adult populations with insomnia,[81] post-stroke rehabilitation,[82] poor mental health[83 84] and patients with long-term chronic conditions that require intensive care, such as cancer.[85] Older adults with VI can experience similar psychological and psychosocial symptoms to stroke survivors[82] and patients with cancer in recovery.[85] These symptoms include stress, social anxiety, insomnia, depression and poor quality of life.[86–92] In developed countries, acquired VI, such as age-related macular degeneration, is highly correlated with poor psychosocial well-being.[86–92] Based on the included literature it is not possible to recommend music-based interventions for long-term psychological well-being in adults with VI.

Two studies used validated outcome measures for well-being (psychological questionnaires),[70 71] the rest were all single-subject case studies that utilised qualitative methods such as observation or informal interviews.[2 61–69 72] Such studies can provide rich data (depending on the method of analysis of observational data) and inform on more bespoke intervention protocols. This is particularly the case where heterogenous symptoms are common within a patient population, such as stroke. Whether single case or randomised controlled trial, the use of validated outcome measures and/or standardised patient-reported outcome instruments, validated for the population of interest, will contribute more meaningfully to the internal validity and effectiveness of observational interventions.[93]

Music reporting checklist

As part of this scoping review, we used the music reporting checklist to ensure consistency and structure when reviewing and reporting the interventions. The checklist highlighted inadequate reporting across both non-experimental and experimental studies in areas such as music protocol, cultural influences for music choice, dosage and frequency. It is also not clear what specialist training requirements are needed for music listening protocol delivery in any setting, including the home environment. An indication of areas that should be reported but were missing from the studies included: fidelity of interventions and guidelines for delivery.

Limitations

The limitations of this study need to be considered during the interpretation of the findings. One limitation was that PPI was not undertaken to advise on identifying objectives, research questions and types of well-being domains. It may also be the case that interventions of interest are used in clinical practice, documented in book chapters, but not in research that was within the scope of this review. We did not report on the rigour of the included studies or whether they were appraised. We did not conduct any PPI to inform on search terms, inclusion and exclusion criteria and data synthesis. This may have led to identification of a different focus in terms of objectives, research questions and well-being domains. It may also be the case that interventions of interest are used in clinical practice, documented in book chapters, but not in research that were within the scope of this review. We did not report on the rigour of the included studies or whether they were appraised.

Overall, this review highlighted that there has been little research on music-based interventions for improving well-being for people with VI, particularly adults, indicating the need for a randomised controlled trial. Future studies may also consider the development of interventions which can be adapted to ensure that participants' preferences are included. Researchers should seek to garner opinions of the participants and 'audition' music with them, in order to fully establish the most personally meaningful music, rather than relying too heavily on checklist or questionnaire data.

Conclusion

Based on the data reported in the included articles, it appears that the effects of music interventions on well-being in VI have not been widely explored, particularly with adults. There is a lack of detail in the included studies regarding music and music therapy protocols. Further, robust research is required in order to understand treatment-related effects, dosage, training requirements and treatment fidelity.

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Search strategies

Records after duplicates removed (n = 5,082)

Medline (Ovid)
[searched on 14/12/21 AND 11/04/22*]

#	Search	Result
1	exp Vision Disorders/	73199 **254778***
2	exp Glaucoma, Angle-Closure/ or exp Glaucoma/ or exp Glaucoma, Open-Angle/	53879 **89698***
3	exp Conjunctivitis/	19313 **41202***
4	exp Uveitis/	31408 **58961***
5	exp Macular Edema/ or exp Macular Degeneration/ or exp Wet Macular Degeneration/ or exp Macular Pigment/	25216 **42082***
6	exp Edema/ or exp Diabetic Retinopathy/	68748 **358896***
7	exp Strabismus/	16097 **25243***
8	exp Astigmatism/	7215 **14923***
9	exp Myopia/	18402 **26669***
10	exp Hyperopia/	3235

		6925*
11	exp Trachoma/	3976 **3562***
12	exp Cataract/	29440 **62187***
13	exp Vision, Low/	3483 **3739***
14	(glaucoma or conjuncti* or uveitis or macula* or oedema or edema or strabismus or squint or astigmati* or myopi* or hypermetropia or trachoma or cataract or visual impairment or low vision or diabetic retinopath*)	585375 **940226***
15	exp Music Therapy/ or exp Music/	17468 **26125***
16	Singing/	961 **3802***
17	(Music or song or singing or Piano or guitar or saxophone or ukulele or violin or cello or trumpet or accordion or clarinet or flute or xylophone or mandolin or harmonica or drum or harp or oboe or trombone or bassoon or viola or French horn or tuba or theremin or banjo or bass or bagpipes or tambourine or lyre or lute or ocarina or harpsichord or cajon or didgeridoo or sitar or oud or marimba or melodica)	48357 **61236***
18	exp Blindness/	**45773***
19	exp Visually Impaired Persons/	**9088***
20	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 18 or 19	654042 **1101151***

21	15 or 16 or 17	48357 **61500***
22	20 and 21	618

EMBASE
[searched on 14/12/21 AND 11/04/22*]

#	Search	Result
1	exp visual impairment/	101268 **105086***
2	exp glaucoma/	86447 **89698***
3	exp conjunctivitis/	39710 **41202***
4	exp uveitis/	56876 **58961***
5	exp age related macular degeneration/ or exp macular degeneration/ or exp diabetic macular edema/	24596 **27037***
6	exp strabismus/	24407 **25243***
7	exp astigmatism/	14343 **14923***
8	exp myopia/	25485 **26669***
9	exp hypermetropia/	6683 **6925***
10	exp trachoma/	3505

		3562*
11	exp cataract/	60312 **62187***
12	exp visual disorder/ or exp low vision/	244916 **254778***
13	(glaucoma or conjuncti* or uveitis or macula* or oedema or edema or strabismus or squint or astigmati* or myopi* or hypermetropia or trachoma or cataract or visual impairment or low vision or diabetic retinopath*)	905903 **940226***
14	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13	1040312 **1078989***
15	exp music therapy/ or exp music/	25069 **26125***
16	exp singing/	3680 **3802***
17	Music or song or singing or Piano or guitar or saxophone or ukulele or violin or cello or trumpet or accordion or clarinet or flute or xylophone or mandolin or harmonica or drum or harp or oboe or trombone or bassoon or viola or French horn or tuba or theremin or banjo or bass or bagpipes or tambourine or lyre or lute or ocarina or harpsichord or cajon or didgeridoo or sitar or oud or marimba or melodica).	58099 **61236***
18	15 or 16 or 17	58345 **61500***
19	14 and 18	1196

CHNL PLUS (EBSCO)
[searched on 14/12/21 AND 11/04/22*]

#	Search	Result
1	MH "Eye Diseases+") OR (MH "Eye Diseases, Hereditary+") OR (MH "Diagnosis, Eye+") OR (MH "Eye Hemorrhage+") OR (MH "Eye Abnormalities+") OR (MH "Eye Infections, Viral+") OR (MH "Dry Eye Syndromes+	104,565 **110,827***
2	MH "Glaucoma+''	9,001 **9,451***
3	MH "Conjunctivitis+"	3,041 **3,150***
4	MH "Uveitis+"	5,332 **5,731***
5	(MH "Macular Degeneration+") OR (MM "Stargardt Disease")	7,412 **7,844***
6	MM "Diabetic Retinopathy"	4,239 **4,546***
8	MM "Strabismus"	997 **1,072***
9	MM "Trachoma"	297 **314***
10	MM "Cataract"	2,019 **2,250***
11	MH "Deaf-Blind Disorders+"	529 **558***
11	MH "Rehabilitation of Vision Impaired+	2,296 **2,325***
13	glaucoma or conjuncti* or uveitis or macula* or oedema or edema or strabismus or squint or astigmati* or myopi* or hypermetropia or trachoma or cataract or visual	104,391 **110,452***

	impairment or low vision or diabetic retinopath*	
13	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13	158,338 **167,220***
15	MM "Music Therapy (Iowa NIC)") OR (MM "Music") OR (MM "Singing"	8,371 **8,707***
15	Music or song or singing or Piano or guitar or saxophone or ukulele or violin or cello or trumpet or accordion or clarinet or flute or xylophone or mandolin or harmonica or drum or harp or oboe or trombone or bassoon or viola or French horn or tuba or theremin or banjo or bass or bagpipes or tambourine or lyre or lute or ocarina or harpsichord or cajon or didgeridoo or sitar or oud or marimba or melodica	54,415 **59,780***
16	S14 OR S15	54,415 **59,780***
17	S14 AND S17	1,072

PSYCHINFO (EBSCO)
[searched on 14/12/21 AND 11/04/22*]

#	Search	Result
1	DE "Vision Disorders" OR DE "Balint's Syndrome" OR DE "Blind" OR DE "Blindsight" OR DE "Eye Disorders" OR DE "Hemianopia" OR DE "Partially Sighted" OR DE "Eye Disorders" OR DE "Amblyopia" OR DE "Cataracts" OR DE "Color Blindness" OR DE "Glaucoma" OR DE "Nystagmus" OR DE "Refraction Errors" OR DE	18,073 **18,580***

	"Strabismus" OR DE "Tunnel Vision"	
2	MM "Glaucoma"	422 **440***
3	MM "Myopia" OR DE "Refraction Errors" OR DE "Myopia"	707 **731***
4	MM "Cataracts"	251 **263***
5	(glaucoma or conjuncti* or uveitis or macula* or oedema or edema or strabismus or squint or astigmati* or myopi* or hypermetropia or trachoma or cataract or visual impairment or low vision or diabetic retinopath*)	42,061 **43,235***
6	DE "Music" OR DE "Musical Instruments" OR DE "Rock Music" OR MM "Rock Music" OR MM "Music Therapy" OR MM "Music Perception" OR MM "Musical Pitch" OR MM "Music Education" OR DE "Musical Pitch" OR DE "Pitch Perception" OR MM "Musical Instruments" OR MM "Musical Ability"	29,499 **30,494***
7	Music or song or singing or Piano or guitar or saxophone or ukulele or violin or cello or trumpet or accordion or clarinet or flute or xylophone or mandolin or harmonica or drum or harp or oboe or trombone or bassoon or viola or French horn or tuba or theremin or banjo or bass or bagpipes or tambourine or lyre or lute or ocarina or harpsichord or cajon or didgeridoo or sitar or oud or marimba or melodica	67,007 **69,751***

8	S1 OR S2 OR S3 OR S4 OR S5	50,315 **51,708***
9	S6 OR S7	69,057 **71,835***
10	(S6 OR S7) AND (S8 AND S9)	674

WoS

14/12/21 AND 11/04/22*

#	Search	Results
1	glaucoma or conjuncti* or uveitis or macula* or oedema or edema or strabismus or squint or astigmati* or myopi* or hypermetropia or trachoma or cataract or visual impairment or low vision or diabetic retinopath*	663,084 **699,965***
2	Music or song or singing or Piano or guitar or saxophone or ukulele or violin or cello or trumpet or accordion or clarinet or flute or xylophone or mandolin or harmonica or drum or harp or oboe or trombone or bassoon or viola or French horn or tuba or theremin or banjo or bass or bagpipes or tambourine or lyre or lute or ocarina or harpsichord or cajon or didgeridoo or sitar or oud or marimba or melodica	309,383 **323,449***

3	1 AND 2	1,717

Google scholar
[searched on 14/12/21 AND 11/04/22*]
("music"|"music therapy"|"singing"|"musical") + (blindness|"low vision"|"reduced vision"|"subnormal vision"|"diminished vision"|"visual impaired"|"vision disorder"|"visual disorder"|"visual disabled"|"vision loss"|"loss of vision"|retina|retinal|cornea|corneal|vision|visual|visually|glaucoma|cataract)

Relevant google scholar searches found = 245