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Interactive Music to Facilitate Communication and Engagement in Advanced Dementia: An Exploratory Single-Case Study

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Abstract

This exploratory case study focuses on a 90-year-old female dementia patient, a veteran of the Second World War, who participated in multiple face-to-face singing and activating sessions. These sessions utilised interactive singing designed to stimulate cognitive, emotional, and motor engagement. The primary objective was to explore the sensory-stimulating techniques used by the music therapist and to document the patient's emotional, social, and motor responses. A case study was employed, combining qualitative and quantitative analyses of two video-recorded sessions. Findings reveal that familiar songs evoked autobiographical memories, enhancing emotional engagement and facilitating verbal and non-verbal psycho-social interaction. Rhythmic cues stimulated motor activation, while communal singing improved affective (emotional) responses. The study emphasises the importance of cultural and historical relevance in selecting musical material to optimise emotional and cognitive engagement in dementia care. Findings suggest that personalised interactive music interventions may improve motor, cognitive, emotional, and social engagement in dementia patients, supporting communication and reducing social isolation. Further research is recommended to validate these findings and explore the underlying mechanisms of music-induced cognitive and emotional activation in dementia patients.

Keywords: music therapy; rhythm; entrainment; rehabilitation; dementia; motor performing

Introduction

You are visiting your mother, who is 91 years old. Before moving into a nursing home, your mother was living by herself in a little flat. When still living alone she forgot to eat the food which the home care nurses had brought for her. She woke up in the middle of the night and often phoned you. When she moved to the nursing home, you were happy to know she was safe. When you visit the nursing home, you can see many residents in the common room sitting on sofas, armchairs and around the dining tables. There are two elderly persons who are walking slowly alone, each in their own direction along the corridor. There is no chatting, no smiling, no laughing. Everybody is in their own world, withdrawn, perhaps mumbling something in a low voice. The nurses are working in other private rooms or bathrooms. Eventually you notice your old mother sitting in the dining room, her head on the table, her hands on her lap. You greet her and try to reach her. She raises her head and seems to get angry. She does not recognise you and pushes your hands away.

– A poignant illustration of the profound social isolation and emotional withdrawal experienced by individuals with dementia in nursing homes.

This study examined a singing intervention with a 90-year-old female dementia patient who is also a veteran of the Second World War (WWII). It explored how she engaged in rehabilitation through rhythmical multisensory activating singing sessions led by an experienced physiotherapist. Since completing her studies in music therapy, the physiotherapist has incorporated multisensory rhythmic activation techniques into the rehabilitation of neurological patients. These techniques utilize visual, motor, tactile, and auditory cues to facilitate natural and fluent movement, while also supporting the patients' biopsychosocial well-being. Through shared singing, the therapist encouraged rhythmic bodily entrainment in her patients. The method aimed to engage both the cognitive and affective systems of the client, therein eliciting emotional responses. Numerous studies support the efficacy of using singing in reducing dementia symptoms, including reductions in specific symptoms such as agitation, anxiety, or cognitive decline (Black et al., 2017; Satoh et al., 2015; Tsoi et al., 2018). The primary objective of this study was to explore the use of rhythmic multisensory activating techniques on a person with dementia, and how they may respond to a singing-based intervention across a range pre-defined emotional, social, and motor domains.

Persons with Dementia

The prevalence of memory disorders is rapidly increasing worldwide (World Health Organization [WHO], 2023), driving a surge of interest into neurological research to develop efficacious interventions for patients with dementia. According to the WHO (2023), 55 million people have neurodegenerative dementia worldwide, with approximately 10 million new incidents reported every year. In Finland, approximately 190,000 people currently have a memory disorder, and there are approximately 14,500 new cases of dementia each year (Terveiden ja hyvinvoinnin laitos [THL], 2022). Nevertheless, there is scant evidence for the deployment of ecologically valid clinical therapy processes used with elderly patients with dementia (Thomas et al., 2020). Furthermore, there is a need to formally instruct trainee nursing personnel to develop their practice in order to effectively use music with elderly patients with dementia.

Patients with dementia have deficits in focus and sustained attention, memory recall, and controlled motor movement (Peavy et al., 1992). Consequently, these deficits pose recurring challenges in communication. In addition, dementia causes behavioural and psychological symptoms such as anxiety, aggression, apathy, agitation, delusion, hallucination, and depression (Ridder, 2019). In nursing homes, these behavioural symptoms are a significant burden for health-care personnel. This is due to the previously

mentioned symptoms associated with dementia leading to behavioural symptoms that demand intensive monitoring and specialised communication strategies from healthcare personnel, thereby increasing the overall caregiver burden (Song & Oh, 2015). The patient is also at risk of social isolation, characterised by significant withdrawal of interaction with other people (Honda et al., 2013).

Social interaction is considered a distinct component of patient well-being in dementia care. According to the Finnish law of Elderly Services (Finlex 2012, § 14, 8.7.2022/604), the person who needs long-term care must have access to maintain their social interaction and take part in activities that are meaningful, while also promoting and maintaining their welfare and health. In addition, the legislation defines that the needs, wishes, and viewpoints of an elderly person must be considered when planning their service entity (Siponkoski, 2020). This crucial component of legislation extends to the cultural background of the patients with dementia, as well as their requirements in relation to arts and culture (Siponkoski, 2020).

Music and Singing as Medicine for Dementia

Music is widely accepted as a universal biopsychosocial phenomenon (Wallin et al., 2001), known to produce a multisensory experience that impacts psychological (Clarke et al., 2010), neurological (Salimpoor et al., 2001), physiological (Koelsch et al., 2014), and behavioural functioning (Berns & Moore, 2012). It is also an effective means of emotional self-regulation (Saarikallio, 2017; Thoma et al., 2012). Given its comprehensive influence on human functioning, music-based interventions emerged as a therapeutic tool in various healthcare settings, particularly in dementia care, where they facilitate emotional expression, social interaction, and cognitive stimulation (Danso, 2023). More specifically, music-based interventions have an influence on the autonomic nervous system and neuroendocrine systems of people by enhancing mood, thereby reducing stress (Ruud, 2013). With the utilisation of music-based interventions, researchers have reported improvements in immune function in specific clinical settings (Chanda & Levitin, 2014). Due to music's capacity to simultaneously distract and engage listeners in a variety of ways (e.g., cognitive, affective), music is uniquely suited to regulating emotions and stress, thereby giving it a unique non-pharmacological advantage (MacDonald, 2013). In a study by Lee and colleagues (2020), group singing had a positive effect on the moods of both the elderly participants as well as their caretakers, who both described feelings of satisfaction, happiness, and relaxation. There were acute changes in the group's affective responses (i.e., emotional responses) post-session, with a positive lasting impact for the remaining 24 hours of the day (Lee et al., 2020). Findings from Särkämö et al. (2018) further supported the benefits of music-based interventions. Their research demonstrated that both singing and music listening improved mood, with singing specifically enhancing short-term and working memory, while music listening positively impacted quality of life (QOL). Notably, musical memories and the associated emotional responses often persist across the dementia continuum, even in advanced stages of the disease. Regular engagement in musical activities sustains cognitive, emotional, and social benefits in individuals with mild to moderate dementia, highlighting the potential of music-based interventions as a viable approach in dementia care and rehabilitation (Särkämö et al., 2018).

Rehabilitation in dementia care aims to improve both the psychosocial and physical well-being of patients with dementia. Music and singing are increasingly recognised as effective interventions for alleviating psychosocial symptoms associated with dementia. Neuroimaging studies indicated that musical stimuli activate multiple brain regions, including those involved in emotion and motor processing (Alluri et al., 2012; Grahn & Brett, 2007). Evidence suggests that music-based interventions modulate autonomic

nervous system activity in patients with dementia. Sihvonen et al. (2017) reported that both music listening and singing can stimulate the parasympathetic nervous system while inhibiting sympathetic activity, contributing to a calming effect.

The Musical Background of Finnish Older Adults and Its Relevance to Music Therapy in Dementia Care

Musical memories formed in early life remain accessible into late adulthood due to the persistence of neurological memory traces (Cohen et al., 2002). This phenomenon is particularly relevant for older adults, who tend to prefer music that is familiar from their youth or childhood (Ridder, 2019). In Finland, many individuals over the age of 90 years are veterans of World War II, a population that historically received state-supported rehabilitation services. While physiotherapy has been a primary intervention, music therapy has increasingly been incorporated into official rehabilitation programs (Sotaveteraanit, 2023). Given the high prevalence of dementia, frailty, and social isolation in this setting—especially among those residing in senior living facilities—there is a heightened risk of anxiety, agitation, and alienation from social interaction. Music-based interventions, including singing and familiar music listening, offer a potential means to alleviate these symptoms.

Understanding the musical background of older adults is crucial for tailoring effective music-based interventions (Danso, 2023). For instance, music used in therapeutic practice should be selected based on the participant's cultural and personal significance, as familiarity with musical material enhances emotional and cognitive engagement with the music (Brusniak, 2016). In Finland, older adults, ages 80 and older, grew up in an era when music was deeply intertwined with daily life, particularly in rural areas where radios and record players were uncommon until the 1950s. Music was primarily learned aurally and integrated into social and functional activities such as work, dance, and religious ceremonies. With industrialization, folk traditions gradually gave way to popular music genres such as *schlagers* (e.g., *iskelmä* in Finnish, characterised by melodic pop songs with sentimental lyrics; Niemelä, 2016). Traditional music education (from age 7 corresponding to the start of primary school) also played a significant role in shaping musical experiences, as singing was a compulsory subject before the 1960s. Many songs were reinforced through repeated use in schools, social clubs, and family gatherings, ensuring retention into older adulthood (Tammela, 2022). For many older Finns, music from their early years consists predominantly of school songs, hymns, and folk tunes, which remain deeply ingrained in memory and social identity.

Although dementia is prevalent among older adults, many elderly individuals continue to have diverse cognitive experiences and abilities. Hays and Minichiello (2005) examined the role of music in the lives of older adults and found that it serves as a powerful medium for emotional expression and communication, particularly when verbal expression is limited. Beyond its effects on mood regulation, music enhances social interaction in older adults, fostering connections in both dementia and non-dementia populations (Lesta & Petocz, 2006; Skingley & Bungay, 2010). Given the strong links between music, memory, and emotional well-being, integrating familiar and personally meaningful music into dementia care may provide substantial cognitive, emotional, and social benefits, complementing other therapeutic approaches in rehabilitation.

Multidisciplinary Rehabilitation and Care for People with Dementia

Music therapy is an evidence-based clinical practice that uses musical engagement to achieve non-musical goals, such as emotional expression, cognitive stimulation, and social interaction (De Witte et al., 2014). In dementia care, music therapy regulates arousal levels

(e.g., use of calming background music), enhances communication, and fosters emotional connection in people with dementia (Ridder, 2019). Music therapists achieve this by structuring musical elements such as harmony, rhythm, and timbre to facilitate combined music-therapist interaction and engagement. Attunement—a dynamic, dialogical process where therapists and patients with dementia exchange communicative cues—plays a crucial role in building therapeutic relationships and enhancing social responsiveness (Krøier et al., 2021). Singing, particularly in group settings, serves as a powerful tool for promoting social interaction and physiological well-being. The act of singing increases oxygen intake, thereby improving energy levels and overall mood (Särkämö et al., 2018). Historically, singing has also functioned as a motivator for physical labour, a principle that remains relevant in rehabilitation settings where movement and engagement are targeted therapeutic outcomes.

Physiotherapy is another key component of dementia rehabilitation, as mobility and motor function decline alongside cognitive deterioration (Kluger et al., 1997). Gross motor function is often severely impaired in Alzheimer's Disease (AD) patients, necessitating interventions that engage both cognitive and motor processes. Musical memory, particularly of familiar songs, facilitates mental timing for movements, aiding in motor coordination and mobility (Sihvonen et al., 2017). Physiotherapists can enhance interaction with patients with dementia through body movements and rhythm-based communication, using music adjunctly to encourage participation (Finnish Association of Physiotherapists, 2016).

Despite the well-documented benefits of music in dementia care, its integration into nursing education and daily care routines remains limited. Särkämö et al. (2018) found that musical and singing-based interventions are sparsely incorporated into nursing training, highlighting the need for arts-based education for caregivers.

Educating nurses and caregivers to use singing, music listening, and simple musical activities as part of their care routines, provides a cost-effective and accessible means of improving the quality of life for both patients with dementia and their caregivers. One significant challenge is the generational gap between caregivers and older adults in care facilities. Younger generations of caregivers may lack familiarity with the music that holds personal and cultural significance for older individuals, limiting their ability to use musical practices effectively in dementia care (as familiarity of the music plays a crucial role in using music for dementia care; Särkämö et al., 2018). In addition, challenges are present for caregivers to use singing as part of musical practice for dementia care. Cultural shifts have led to a decline in singing as a social activity; fewer Finnish youth engage in singing as a hobby (Hanifi, 2018), and many newly graduated teachers feel unprepared to teach singing in schools (Suomi et al., 2022). Additionally, while music consumption has expanded globally with digital access to diverse genres, older adults often remain connected to the music of their youth. Ensuring that patients with dementia have access to familiar songs is essential, as these musical memories can serve as anchors for cognitive, emotional, and social engagement in dementia care (Särkämö et al., 2018).

This study aimed to fill the gap in the literature created by the comparative rarity of research using multi-professional methods from music therapy and physiotherapy to simultaneously address patient needs in multiple domains. The review of Van der Steen and colleagues (2025) found that only seven of 30 studies delivered an individual intervention; the other studies delivered the intervention to groups.

Research Aims and Questions

The aim of this exploratory case study was to describe how singing-based music therapy was used with an older person living with advanced dementia, and how she responded in terms of emotional, social, and motor engagement. By documenting fine-grained

interaction patterns between therapist and client, the study sought to generate preliminary insights that may inform the development of dementia care practices and future training for care staff. The central research questions which guided this case study are:

RQ1. How did the therapist's live musical cues (vocal, rhythmic, gestural) relate to observable changes in Linda's engagement during sessions?

RQ2. How did song familiarity and session timing (early versus later in the session) influence Linda's emotional and motor responses in this case?

Methodology

Researcher Background and Reflexivity

The first author, who served as the therapist in this study, holds a degree in physiotherapy (1976) and a Master of Arts in Music Therapy (2013) from the University of Jyväskylä. Since 2013, she regularly integrates physiotherapy and music therapy in clinical practice to address the psychological, social, and physical needs of patients within a holistic rehabilitation framework. Her professional experience includes systematically documenting multidisciplinary rehabilitation approaches for her neurological patients.

The second author, who contributed to data analysis and manuscript preparation, earned a PhD in Music Education (2022) from the University of Jyväskylä. Her doctoral and master's research examined Finnish school songs, folk tunes, popular songs, and broader musical culture from the 1940s and 1950s.

The third author, contributed to the writing and conceptual positioning of the manuscript. He holds a PhD in Music Therapy from the University of Jyväskylä where he examined the effects of technology in post-stroke rehabilitation. He is currently a postdoctoral researcher at the Centre of Excellence in Music, Mind, Body and Brain, University of Jyväskylä, working at the intersection of music, physical activity and health. He is committed to interdisciplinary, human-centred approaches that link music interventions to improve mental health in sustainable ways.

These professional backgrounds provided expertise in neurological rehabilitation and Finnish musical culture, which informed both the design of the intervention and the interpretation of the findings.

Case Study Data Collection

As the participant could not provide written consent herself, written consent to begin the study procedure was obtained from Linda's son on 19th February, 2022. Data were collected by the first author (hereafter referred to as the therapist) during individual singing-based music therapy sessions with a woman over 90 years of age living with dementia, referred to as Linda (pseudonym). The therapist kept contemporaneous session notes documenting the clinical process, song selections, Linda's observable responses, and her own reflective observations. These notes supported a systematic examination of both the therapist's approach and Linda's engagement during the intervention.

Two sessions were video recorded for research purposes, with written consent provided by Linda's son. In the footage, Linda's facial expressions, vocal participation, and bodily movements are visible, while the therapist's face remains off-screen. The videos capture live singing, verbal exchanges, guitar accompaniment, and rhythmic elements such as clapping and simple gestures. The repertoire consisted of traditional Finnish communal songs, including folk songs, children's and school songs, circle dance tunes, and popular repertoire from the mid 1950s.

For the present analysis, we focused on a 37-minute video recording from a session conducted in February 2022. Three songs from this session (one occurring near the beginning, one mid-session, and one toward the end) were selected for close examination to capture variation across the session trajectory. As a comparative case, we also analysed the same song (“Honkain keskellä mökkini seiso”) from a second session recorded in May 2022.

Both authors (first and second authors) conducted the analytic work. The study used a mixed-methods case study design in which qualitative descriptions of interactional processes were integrated with quantitative behavioural coding to document psychosocial and motor engagement during the sessions.

- Qualitative component: The qualitative analysis drew on the session notes and video material to describe Linda’s behavioural responses, the therapist’s interactional strategies, and the potential relevance of song familiarity and personal history. This descriptive case-based interpretation focused on how musical cues appeared to support social engagement and emotional expression in this specific context.
- Quantitative component: The first author transcribed all verbal exchanges and salient nonverbal behaviours from the videos, after which the second author reviewed and refined the transcripts. The researchers then coded therapist–client interactions using a predefined set of behavioural categories (see Table 1). For each selected song, the duration and frequency of behaviours were quantified and expressed as percentages of the song’s total duration.

Case Description: Linda

Linda worked as a nurse’s assistant in Finland during WWII, which entitled her to state-funded rehabilitation services. She retired in her 50s and maintained an active musical life in later adulthood, including regular participation in a local choir.

Her cognitive decline became apparent following the death of her husband, eventually leading to relocation to a nursing home due to progressive memory impairment. At the time of the study, Linda required assistance with all activities of daily living (ADLs). She used a rollator walker and could occasionally stand up independently. She was able to feed herself, although at a slow pace.

Linda tended to engage minimally with her surroundings, often sitting in the same chair in the common area with her eyes closed. When approached, she sometimes reacted with irritation, which nursing staff attributed in part to hearing difficulties. Her verbal output was typically brief (one to two words), and she occasionally struggled to initiate speech. Previous physiotherapy had been discontinued because she did not engage with the exercises offered. On the recommendation of nursing staff, she was referred for individualised music therapy with the first author. Due to COVID-19 restrictions, sessions were conducted privately in Linda’s room, with the therapist required to wear a plexiglass face shield and maintain a distance of 1–2 metres.

According to staff, the wider nursing home environment included residents who exhibited behaviours commonly associated with advanced dementia, such as low social interaction, restlessness, or wandering. Music activities in the facility were infrequent, consisting of monthly hymn-singing led by a parish worker and occasional visits from external musicians. Staff also sometimes played background music via radio or CD player, although this was not consistently effective, in part because many residents had notable hearing impairments.

Music Therapy Goals and Session Structure

The therapeutic goals of the study are based on the theoretical approach outlined by Brusniak (2016), as well as discussions with nursing staff, initial observations, and the first therapy session with Linda. Accordingly, our primary music therapeutic goals included: (1) to encourage psychosocial interaction and engagement; (2) to promote bodily activation and movement; and (3) to evoke positive emotional responses through familiar music.

Researchers suggest that singing familiar songs can improve mood and support emotional regulation in patients with dementia by promoting a shift toward parasympathetic nervous system activity, reducing cortisol levels, as well as alleviating stress (Sihvonen et al., 2017). Music can also facilitate social interaction and increase responsiveness to caregivers (Särkämö & Sihvonen, 2018). Sessions were structured flexibly, allowing adaptation to Linda's mood and energy levels. Common elements included: (1) singing or listening to therapist's singing with or without guitar accompaniment; (2) rhythmic engagement (e.g., clapping hands, tapping thighs, stomping feet in a marching rhythm), mirroring therapist's activities; and (3) opportunities for Linda to play a tambourine or participate in other simple rhythmic activities. Due to her advanced dementia, Linda exhibited reduced voluntary movement initiation. The therapist used rhythmic cues, familiar melodies, and physical gestures to encourage spontaneous motor responses. For instance, transition movements (e.g., such as guiding Linda from the common area to her room) were facilitated through live singing of familiar, rhythmically clear songs. The session duration was approximately 50 minutes, though activities were adjusted based on Linda's engagement and external factors within the nursing home environment.

Data Analysis

We adopted a qualitative descriptive single-case design that combined directed qualitative content analysis with simple quantitative summaries of observable behaviour. The analytic strategy was informed by previous observational work on music therapy interactions and dementia care (Raglio, 2006; Spiro & Himberg, 2016) and tailored to the specific clinical context of this case.

The first author transcribed all verbal dialogue and noted salient nonverbal behaviours from the video recordings. The second author reviewed and refined these transcripts. Drawing on the literature on music-based interventions in dementia and our clinical experience, we then developed a behavioural coding scheme comprised of four main categories (e.g., emotional responses, vocal engagement, social interaction, and physical engagement/motor movement), each further specified into concrete observable indicators (Table 1). This constituted a directed qualitative content analysis, in which prior theory and empirical findings guided the construction of categories while allowing case-specific patterns to emerge.

For the quantitative component, we segmented each selected song into consecutive eight-beat units (eight quarter-note counts), following and adapting the temporal resolution used by Spiro and Himberg (2016). This segmentation provided a fine-grained time base for examining changes in Linda's behaviour while maintaining analytically manageable units (Table 2). For each eight-beat unit, we coded the presence or absence of each behavioural indicator for Linda (e.g., smiling, humming, head movement, upper-body movement, eye contact) and, where relevant, for the therapist (e.g., clapping, exaggerated facial expression, changes in vocal delivery).

Table 1. Behavioural Observations of Client-Therapist Interaction During Singing Sessions.

Behavioural Category	Specific Observations	References
Emotional Responses	Joyful Laughter Smiling Joyful Vocalisations (e.g., la-la-la)	Tsoi et al. (2018); Murakami (2021); Cho et al. (2018)
Vocal Engagement	Singing with clear words Humming Wordless Melodic Singing	Särkämö et al. (2018); Black et al. (2017)
Social Interaction	Eye Contact Looking at Therapist or Own Hands	
Physical Engagement or Observed Motor Movement	Head Movement Upper Limb Movement Mid-torso Bodily Movement Rhythmic Entrainment	Satoh et al. (2015)

Note. Table 1 presents observed behaviours during client-therapist interactions in singing sessions, categorised into emotional, vocal, social, and physical responses. A reference column is included to operationalise the behavioural categories, linking each to relevant literature on music therapy and dementia.

For each song, we then calculated the proportion of eight-beat units in which a given behaviour occurred, expressing this as a percentage of that song's total number of units. Thus, all percentages reported in the Findings refer to the relative duration of behaviours within a given song rather than the entire session. To aid interpretation in the figures, we combined upper-limb and upper-body movement into a single index of bodily activation.

Coding was conducted collaboratively by the first and second authors, who jointly reviewed the video material and reached consensus on the application of the coding scheme. Formal inter-rater reliability statistics were not calculated; we acknowledge this as a methodological limitation typical of exploratory single-case work. The integration of descriptive qualitative interpretation and time-based behavioural summaries (Table 2) allowed us to address the research questions by linking specific musical cues and song contexts to observable changes in Linda's emotional, social, and motor engagement in this case.

Findings

This case study examined how the therapist's sensory-stimulating techniques were used with Linda and how her motor and emotional responses varied with session phase, song selection, and therapist-client interaction. To address the research questions, we integrated qualitative descriptions of the interaction with quantitative summaries of observable behaviours during selected songs.

Activation of Linda by Multisensory Cues

Across the rehabilitation sessions, Linda appeared to be engaged psychosocially and motorically through a range of sensory cues introduced by the therapist. These included bodily movements, shared singing, and singing with partial instrumental accompaniment (guitar and/or tambourine). The therapist noted that Linda's bodily engagement often increased when the therapist sang without playing the guitar, which allowed for more direct mirroring of movements.

Table 2. Example of Behavioural Coding During “Honkain Keskellä” (02:23–05:12).

Session 2. The activities during the song: 02:23–05:12		
Actions of the client	Occurrence (8-count pattern)	Verbal descriptions
Client sings	(not singing)	
Client is humming (mumbling)	(not humming/mumbling)	
Eyes	Counts 5–8	Eyes open
Upper limbs	(no activity)	Arms crossed on the chest
Upper body	(relaxed)	Client has settled peacefully on an armchair for listening, no movement
Head	(no movement)	Head is moving on the chair, no movement
Visual contact	Throughout all 8 counts	Gaze directed at the therapist
Smile	(no smiles)	
Laugh	(no laughing)	
Confusion	(none observed)	

Note. Table 2 provides a detailed description of the client's actions during a singing session to the song “Honkain Keskellä,” specifically from the video segment 02:23–05:12. It tracks the client's behaviours across eight-count patterns, aligning these observations with the corresponding song lyrics and verbal reactions.

Auditory stimulation was provided through the therapist's live singing and guitar playing, as well as the internal auditory feedback from Linda's own vocalisations. Visually, Linda observed the therapist's facial expressions, gestures, and rhythmic body movements, including clapping while singing without the guitar; the therapist modelled clear rhythmic motion to support entrainment. Motor engagement was evident in Linda's repeated bodily movements, such as swaying, nodding, and moving her limbs in coordination with the singing. Tactile input arose when she clapped her hands or tapped her thighs in time with the music.

The therapist also sought to engage vestibular and proprioceptive systems. Linda was encouraged to mirror gentle leaning movements at varying speeds and directions, thereby engaging her sense of balance. Activation of her lower body was observed when she lifted her upper body forward and attempted rhythmic leg movements in response to these cues. During slower, calming songs, Linda often closed her eyes and appeared more relaxed; when she seemed to disengage, a gentle touch on her knee was used to reorient her attention to the interaction.

Cumulatively, these observations suggest that, in this case, multimodal musical cues provided multiple entry points for Linda's participation, with different sensory channels becoming more or less salient over the course of a session.

Emotional and Motor Responses to Singing

Linda's emotional state fluctuated within and between sessions, and the therapist adjusted interventions in response. Songs were selected based on Linda's personal history and cultural background, informed by discussions with her son and care personnel. Sessions were structured to include verbal engagement, singing, rhythmic movement, and moments of shared humour and enjoyment.

At the beginning of each session, the therapist assessed Linda's mental state through brief conversation. When Linda appeared withdrawn, the therapist introduced songs or discussion topics related to familiar themes such as nature, seasons, or animals to capture her interest. The therapist observed that Linda often required time to "wake up" at the start of sessions and seemed to respond particularly well to childhood songs. These songs, typically accompanied by simple gestures, appeared to evoke positive associations. Initially, Linda would listen with her eyes closed, occasionally smiling, and then gradually join in by humming or singing.

As the session progressed, the therapist introduced more movement-based songs, many of which Linda recognised from childhood and school settings. Linda demonstrated familiarity with the associated gestures, which appeared to support deeper engagement and emotional expression. Seasonal songs, such as those about winter or spring, also seemed meaningful to her; when prompted with the first few words of a lyric, she often recalled and sang along. Linda responded positively to dance-like songs from her young adulthood, including waltzes and tangos with lyrics referencing nature, love, and the moon. These songs were frequently accompanied by swaying and small dance-like movements, suggesting that she retained embodied familiarity with their rhythmic and melodic patterns.

The therapist reported that expressive vocal delivery and exaggerated facial expressions encouraged Linda's participation. Linda appeared to particularly enjoy high-energy "bar songs" and communal songs, which were associated with stronger vocalisation and more pronounced physical movements. In contrast, traditional folk songs were characterised by calmer breathing and a more relaxed yet attentive state. Themes of love and nostalgia in these songs did not seem to elicit sadness; instead, Linda often appeared contemplative and quietly content.

To attend to Linda's spiritual needs as perceived by staff and family, each session included at least one hymn. The steady rhythm and melodic simplicity of hymns appeared to provide comfort and predictability, and were sometimes accompanied by deep sighs and expressions of gratitude. Even when verbalisation was limited, Linda's body language (e.g., nodding, soft smiling, upright posture) often suggested satisfaction. The final 10 minutes of each session were typically used for winding down, discussing the session, and parting rituals. The therapist concluded with a consistent farewell song, set to a well-known melody with customised lyrics expressing appreciation for their time together. Linda frequently responded positively, either verbalising thanks or humming the melody after the therapist left.

Verbal Communication

Over time, the therapist observed that some of Linda's frustration and seemingly unfriendly responses were likely linked to hearing difficulties. To facilitate communication, the therapist began writing short messages in large letters, which Linda could read more easily. This strategy appeared to reduce agitation and support smoother interactions. The therapist introduced this approach to the nursing staff, who subsequently adopted it as a communication tool in daily care.

Within the sessions, musical rehabilitation that incorporated Linda's preferred songs, particularly those with guitar accompaniment, seemed to foster psychosocial and bodily engagement. The songs drew Linda's attention, appeared to create a sense of safety, and often preceded attempts at verbal expression. After songs, she frequently used words such as "beautiful" and "lovely" while nodding her head. On some occasions, she produced complete sentences or asked the therapist questions. Across sessions, Linda's spontaneous greetings and expressions of appreciation became more frequent, suggesting that the

combination of musical and adapted written communication supported her willingness to interact.

Linda’s Engagement Across Sessions

Figures 1–4 present Linda’s bodily and mental engagement during different songs, expressed as the percentage of eight-beat units in which specific behaviours were observed. The analyses compare Linda’s responses to the same song in two different sessions and positions within the session, and then examine how her engagement varied across other songs within a single session.

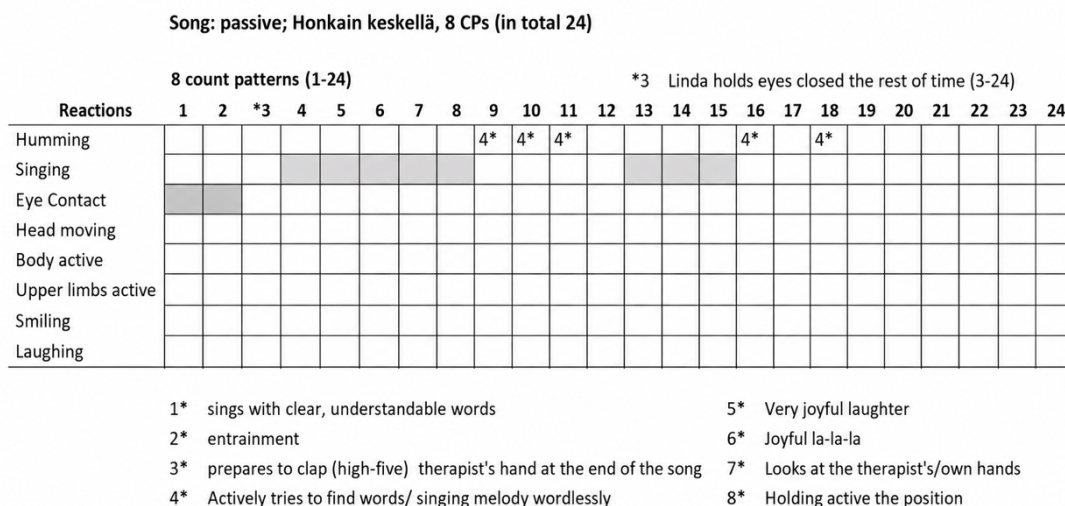
The first and second analyses focus on the song “Honkain keskellä mökkini seisoo” in two separate therapy sessions (February and May 2022), performed at different points in the session (opening vs. mid-session). The third and fourth analyses draw on the February 2022 session to examine two additional songs, allowing us to track how Linda’s activity changed as the session progressed.

First Analysis Phase: Linda’s lack of engagement with “Honkain keskellä mökkini seisoo”

Linda’s response to this national-romantic song differed across sessions. In the February 2022 session, “Honkain keskellä mökkini seisoo” was sung near the beginning of the session. Figure 1 illustrates Linda’s relatively passive participation in this context.

Despite her familiarity with the song, Linda remained largely inactive. She sang the lyrics during 37.5% of the song and hummed during 16.6%. Her eyes were closed for 91.6% of the time, and no significant bodily movement was observed. Following the song, she responded only with brief gestures rather than verbal comments.

Figure 1. Behavioural responses during passive singing session to the song “Honkain keskellä”.



Note. Despite familiarity, Linda remained passive, singing 37.5% of the lyrics and humming 16.6%. Her eyes were closed 91.6% of the time, and she exhibited no significant movement. After the song, she responded only with gestures.

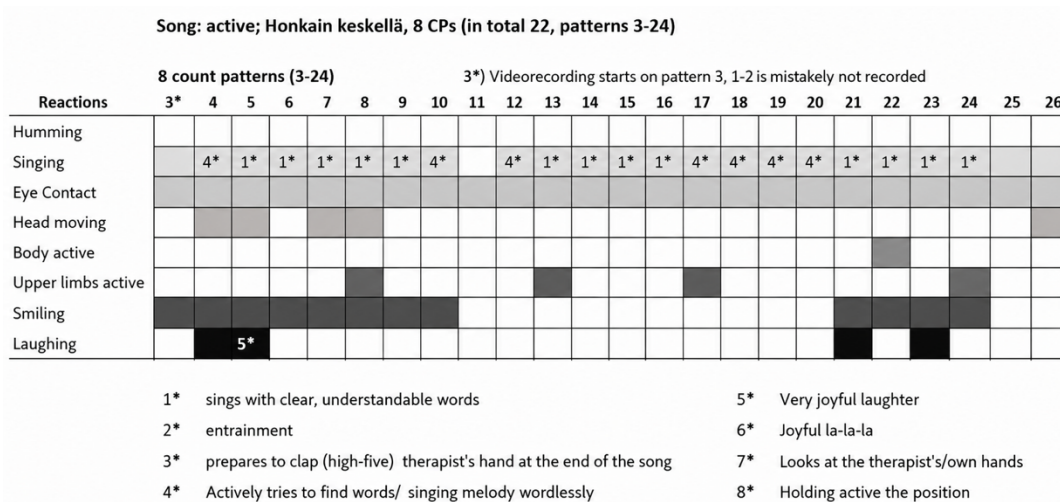
Second Analysis Phase: Improved Engagement During the Midpoint of the Session

The second analysis phase examines Linda’s responses to “Honkain keskellä mökkini seisoo” when it was positioned mid-session in May 2022. Before this recording, the therapist had accompanied Linda from the dining room to her room, and Linda appeared to be in a

positive mood. The session included songs from her adolescence and adulthood, themed around spring and summer, to align with the current season. Due to a recording error, the video for this song begins at pattern 3; patterns 1 and 2 were not captured. Figure 2 illustrates Linda’s active participation when the song was performed mid-session.

During this performance, Linda maintained visual contact with the therapist throughout the song. She sang the lyrics for 59% of the song and hummed for the remaining units. Smiling was observed during 63.6% of the song, and laughter occurred during 18.1%. She showed rhythmic head movement for 50% of the duration and maintained an upright posture for 31.8%. Upper-body movement was observed during 27.2% of the song. Linda demonstrated consistent singing and head movement, with particularly heightened upper-limb and upper-body activity during patterns 21 through 24. In this case, the comparison between Figures 1 and 2 suggests that session timing, emotional readiness, and prior activation may have influenced her level of engagement with the same song.

Figure 2. Behavioural responses during active singing session to "Honkain keskellä".



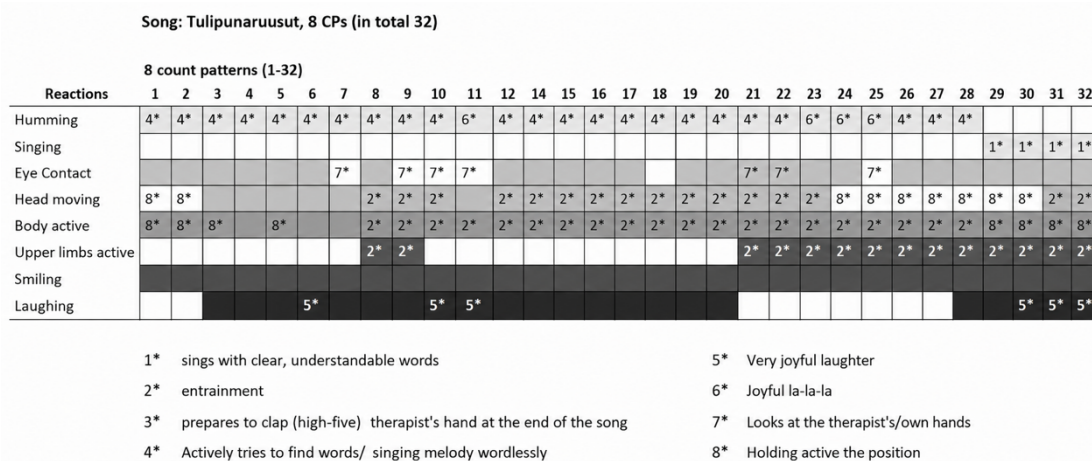
Third Analysis Phase: Progressive Activation and Motor Engagement During Tulipunaruusut

The third analysis considers Linda’s responses to “Tulipunaruusut,” a well-known communal song in Finland that is popular across generations and typically associated with rhythmic bodily movement and an energetic refrain. This song was performed mid-session in February 2022, within the same session in which the early-session performance of “Honkain keskellä mökkini seisoo” was recorded (Figure 1).

Figure 3 shows that, although Linda’s initial engagement was limited, she displayed several indicators of increasing activation as the song progressed. She sang the lyrics for 12.5% of the song and hummed continuously for the remaining 87.5%. Her eyes remained open throughout, and 78.1% of her gaze was directed toward the therapist. She mirrored the therapist’s hand movements during 21.8% of the song.

Linda’s bodily engagement increased notably compared with the earlier song in this session. She maintained an upright posture and mirrored the therapist’s tapping and clapping movements during 43.8% of the song, while moving her head rhythmically during 43.8% of the time. Emotional responses were also prominent: she smiled during 28.1% of the song and laughed during 71.8%. After the performance, Linda commented enthusiastically: “Oh! That was a good one, that song. It was really good.” In this context, the combination of familiar, high-energy repertoire and coordinated movement appeared to be associated with heightened emotional and motor engagement.

Figure 3. Behavioural Responses During Singing Session to "Tulipunaruusut".



Fourth Analysis Phase: Late-Session Response to "Heili Karjalasta"

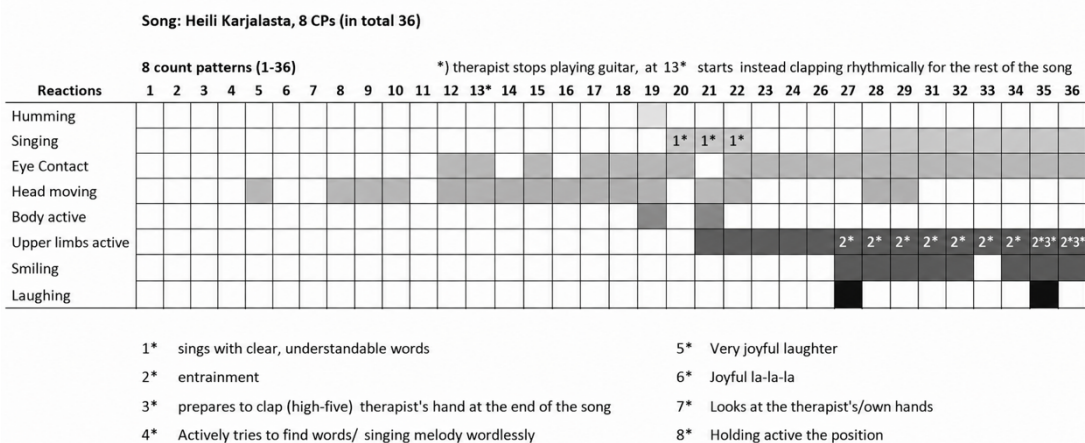
The fourth analysis focuses on a song performed later in the same February 2022 session. The therapist selected "Heili Karjalasta," a song with strong cultural and emotional associations for Linda's generation, many of whom experienced losses during World War II but also valued the cheerful, communal spirit associated with Karelia.

At the start of the song, Linda sat with her eyes closed for nearly two minutes, resembling a passive concert listener. When the therapist set aside the guitar and began clapping, Linda opened her eyes and initiated slight head movements. By the final minute of the song, she became actively engaged and began to sing.

Overall, Linda sang the lyrics for 16.6% of the song and hummed softly for 30.5%. Her upper body was active during 88.7% of the song, and she maintained an upright head position for 37.5%, mainly in the final third. She engaged in rhythmic interaction with the therapist for 52.7% of the song and focused on the therapist's hand movements for 2.7%. Indicators of enjoyment included smiling during 30.5% and laughing during 5.5% of the song's duration.

During the final two eight-beat patterns, Linda actively clapped her hands in coordination with the therapist. After the song concluded, she attempted to elaborate her gratitude beyond a simple "thank you," saying: "Thank you for that. I heard... [mumbling]." Although the utterance remained incomplete, her facial expression and tone suggested a strong positive emotional response. Figure 4 summarises these behavioural indicators, illustrating how late-session singing of a culturally salient song in this case was associated with sustained upper-body activation and visible enjoyment.

Figure 4. Behavioural Responses During Singing Session to "Heili Karjalasta".



Discussion

This exploratory single-case study examined how a singing-based music therapy intervention was used with Linda (i.e., an older woman living with advanced dementia). This study investigated her emotional, social, and motor responses to the presented intervention. By combining qualitative descriptions of the clinical process with micro-analytic behavioural coding, we sought to illuminate how live musical cues, song familiarity, and session timing were associated with fluctuations in Linda's participation during real-world rehabilitation sessions.

Interactive Musical Cues and Engagement in Advanced Dementia

Within this case study, Linda's participation appeared to be influenced by the therapist's use of multimodal, interactive musical cues rather than by music alone. Live singing, changes in vocal delivery, rhythmic gestures, and bodily modelling seemed to provide a flexible framework within which Linda could engage at different levels (e.g., listening with eyes closed, humming, singing words, making eye contact, or joining rhythmic movements). The observational analyses suggested that, when the therapist set aside the guitar and used her body more actively (e.g., clapping, leaning, exaggerating facial expressions), Linda's motor responses often became more pronounced.

These findings resonate with previous work emphasising attunement and non-verbal interaction in music therapy with people living with dementia, where the therapist's embodied responsiveness and moment-to-moment adjustments are central to maintaining contact and supporting participation (e.g., Krøier et al., 2021; Ridder, 2019). Rather than treating music as a background stimulus, the therapist in this case used singing and rhythm as a dialogical medium, continually adapting tempo, dynamics, and gesture to Linda's responses. The present case therefore underlines that, for some individuals with advanced dementia, interactive musical engagement may be particularly important for eliciting and sustaining psychosocial and motor activation, even when spontaneous verbal communication is limited.

At the same time, Linda's responses were not uniformly positive or "activated." The early-session performance of "Honkain keskellä mökkini seisoo" showed that familiarity alone was not sufficient to guarantee engagement. Despite knowing the song, Linda largely remained with eyes closed and showed minimal movement. The contrast between this performance and later, more active responses to the same and other songs indicates that the timing and manner in which musical cues are introduced can be just as important as the repertoire itself.

Song Familiarity, Session Timing, and Embodied Memory

The comparative analyses of four songs across two sessions provide tentative insights into how song familiarity and session timing may have interacted with Linda's emotional and motor readiness. When "Honkain keskellä mökkini seisoo" was sung near the beginning of a session, Linda sang and hummed only modestly, kept her eyes closed for most of the song, and showed little bodily movement. In a later session where the same song appeared mid-session, after other familiar material and a positive transition from the dining room, Linda sang more of the lyrics, smiled and laughed more frequently, and displayed more rhythmic head and upper-body movement. Although this pattern cannot be generalised beyond this case, it suggests that starting with highly activating material may not always be effective for individuals who need additional time to shift from a withdrawn state into interaction.

Similarly, the mid- and late-session performances of "Tulipunaruusut" and "Heili Karjalasta" were associated with increased bodily activation, elevated sustained eye

contact, and clear behavioural markers of enjoyment. Both songs carry strong cultural meanings for Linda's generation, and the observation that she began to clap, move, and eventually sing after initially sitting with eyes closed points to the possible role of embodied musical memory. This aligns with prior research suggesting that musical memories and associated motor patterns can be relatively preserved even in advanced stages of dementia, and that familiar songs may provide access points to procedural and autobiographical material (e.g., Niemelä, 2016; Särkämö & Sihvonen, 2018).

However, the current data do not permit strong conclusions about mechanisms such as "implicit memory retrieval" or specific neurophysiological processes. What can be said is that, in this case, certain songs with clear rhythmic structure and strong personal or generational relevance appeared, when introduced at appropriate points in the session, to coincide with marked increases in vocal, emotional, and motor engagement. Future studies using similar micro-analytic methods in larger samples could clarify how robust such patterns are and whether they differ by dementia subtype, disease severity, or musical background.

Communication, Hearing, and Adaptive Strategies

Another notable aspect of this case was the interplay between hearing difficulties, frustration, and communication strategies. Initially, Linda often reacted with irritation when approached, and her verbal output was typically brief. The therapist's introduction of written messages in large print offered a simple but effective adaptation, which seemed to reduce agitation and support clearer exchanges during and outside the sessions. When combined with singing-based interaction, this strategy appeared to lower barriers to participation. Linda began to comment on songs, initiate brief questions, and greet the therapist more spontaneously.

This observation dovetails with broader evidence that communication challenges in dementia are often multi-determined, involving sensory, cognitive, and environmental factors (WHO, 2017). In the present case, attending to hearing and visual access, in addition to musical preferences, seemed crucial for creating conditions in which interactive music could function as a meaningful bridge rather than an additional source of confusion or overstimulation. For practice, the case illustrates that simple adaptations (e.g., written key words, clear visual cues, and reduction of background noise) can be integral components of music-based approaches in nursing home contexts.

Implications for Dementia Care and Nursing Education

Although this is a single case and therefore cannot support generalised prescriptions, several practice-relevant themes emerge. First, the findings suggested that singing-based interventions in advanced dementia may benefit from being structured as interactive rather than solely receptive activities. For Linda, shared singing, eye contact, and mirrored movement appeared more engaging than passive listening to recorded music. This supports calls in the literature to move beyond "music as background" toward relational, co-created musical encounters in dementia care (e.g., Krøier et al., 2021; Ridder, 2019).

Second, the case highlighted the importance of culturally and historically meaningful repertoire. Songs from Linda's childhood, youth, and wartime generation seemed particularly effective in eliciting emotional and motor responses, especially when introduced after she had time to "warm up" within the session. This highlights the need for caregivers to have at least a basic understanding of the musical histories of the people they support, including knowledge of school songs, hymns, folk tunes, and popular genres relevant to the cohort in question (Brusniak, 2016; Tammela, 2022).

Third, the therapist's physiotherapy background allowed her to purposefully integrate rhythmic entrainment, balance challenges, and functional movements into the singing sessions. While not all caregivers or nurses will have this level of training, the case illustrates that relatively simple actions (such as clapping in time, inviting small seated movements, or using familiar songs during transitions between spaces) may offer feasible ways to support psychosocial and motor engagement in everyday care, provided that they are implemented sensitively and with attention to each person's limits and preferences.

From an educational perspective, this case supported arguments that nurse and care staff training could beneficially include basic principles of using familiar songs, simple rhythmic vocalisations, and embodied musical interaction in dementia care. However, such training should also address potential risks, including overstimulation, triggering of distressing memories, and the possibility that staff may feel insecure about their own musical abilities. The present case suggested that technical musical skill may be less critical than an "activating attitude," respectful curiosity about the person's musical background, and willingness to experiment with simple, flexible musical interactions.

Methodological Reflections

Methodologically, this study demonstrated the potential of combining qualitative case description with micro-analytic behavioural coding in dementia care research. Segmenting songs into eight-beat units allowed us to visualise how specific behaviours fluctuated over time and to relate these patterns to session context and musical structure. This level of detail provided a more nuanced picture than global ratings alone, particularly in an individual who showed subtle but meaningful shifts in gaze, posture, and small movements. At the same time, several constraints must be acknowledged. The observations are derived from two video-recorded sessions with a single participant and one therapist; the behavioural coding was conducted collaboratively, without formal inter-rater reliability estimation; and the inferences about processes such as comfort, enjoyment, or "activation" are necessarily interpretive, even when anchored in observed behaviour.

Furthermore, the dual role of the first author as both therapist and primary data collector introduced additional bias risks. Her investment in singing-based work may have influenced what was documented, how field notes were written, and which excerpts were selected for micro-analysis. Involving a second author in transcription review, coding, and writing provided some analytic distance, but no external audit or member-checking procedures were used. Future work could strengthen reflexivity by involving additional analysts or explicitly documenting how divergent interpretations are negotiated.

In terms of ecological validity, the study offered concrete examples of how interactive singing, culturally meaningful repertoire, and simple adaptations (e.g., written keywords) can be woven into everyday dementia care. Ethically, the study raised familiar tensions around representing a person with advanced dementia who cannot speak for herself in research. Consent was obtained from Linda's son, details have been anonymised, and we have aimed to foreground Linda's agency and competencies rather than deficits. Even so, interpretive power remains with the researchers and readers. Future research might address this more directly by involving families, staff, and, where possible, participants themselves in decisions about what kinds of material are documented, analysed, and disseminated.

Conclusion

This single-case study illustrated how singing-based music therapy was used to engage an older woman living with advanced dementia in a real-world nursing home context, and how her emotional, social, and motor responses varied with different songs, session phases,

and interactional cues. By combining qualitative description with micro-analytic behavioural coding, we showed that, in this case, culturally and personally meaningful repertoire, interactive live singing, and multimodal cueing were associated with shifts from withdrawn, minimally responsive states toward more active participation, shared affect, and brief episodes of spontaneous communication. Although the design does not allow for generalisation or efficacy claims, the detailed observations provide practice-relevant insights into how therapists and care staff might sensitively integrate familiar songs, rhythmic entrainment, and simple communicative adaptations into everyday dementia care. Future research using similar idiographic methods across multiple cases, and in combination with controlled designs, could help clarify for whom, under what conditions, and through which processes interactive music-based approaches may support communication and engagement in advanced dementia.

About the Authors

Jaana Routsalinen, a licensed physiotherapist (since 1976) and holder of an M.A. in Music Therapy (2013), is currently pursuing her doctoral studies in Music Therapy at the University of Jyväskylä. Her research focuses on integrating music, rhythm, and, as a novel element, the patient's own voice as tools to enhance long-term rehabilitation for neurological patients. Through her work, she aims to strengthen patients' subjectivity and self-esteem by incorporating activating and motivating elements such as rhythm, music, and singing into therapy. She approaches her patients holistically, considering their psychosocial, cognitive, and motor abilities. Jaana's publications document her extensive experience in neurological rehabilitation and contribute to the broader understanding of how music can influence motor, cognitive, and emotional functioning. The outcomes of her research are expected to support and advance the work of rehabilitation professionals working with neurological patients.

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References

- Alluri, V., Toiviainen, P., Jääskeläinen, I. P., Glerean, E., Sams, M., & Brattico, E. (2012). Large-scale brain networks emerge from dynamic processing of musical timbre, key and rhythm. *Neuroimage*, 59(4), 3677–3689.
<https://doi.org/10.1016/j.neuroimage.2011.11.019>
- Berns, G. S., & Moore, S. E. (2012). A neural predictor of cultural popularity. *Journal of Consumer Psychology*, 22(1), 154–160. <https://doi.org/10.1016/j.jcps.2011.05.001>
- Black, S., Rodin, G., & Zimmermann, C. (2017). Comfort, connection and music: Experiences of music therapy and inter-active listening on a palliative care unit. *Music and Medicine*, 9(4), 227–233. <https://doi.org/10.47513/mmd.v9i4.508>
- Brusniak, F., 2016. Aspekte der Liedforschung [Aspects of song research]. *Musiktherapeutische Umschau*, 37(4), 344–356.
<https://doi.org/10.13109/muum.2016.37.4.344>
- Chanda, M. L., & Levitin, D. J. (2013). The neurochemistry of music. *Trends in Cognitive Sciences*, 17(4), 179–193. <https://doi.org/10.1016/j.tics.2013.02.007>
- Cho, H. K. (2018). The effects of music therapy-singing group on quality of life and affect of persons with dementia: A randomized controlled trial. *Frontiers in Medicine*, 5, 279.
<https://doi.org/10.3389/fmed.2018.00279>
- Clarke, E., Dibben, N., & Pitts, S. (2010). *Music and mind in everyday life*. Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780198525578.001.0001>
- Cohen, C. A., Colantonio, A., & Vernich, L. (2002). Positive aspects of caregiving: Rounding out the caregiver experience. *International Journal of Geriatric Psychiatry*, 17(2), 184–188. <https://doi.org/10.1002/gps.561>
- Colliander, M. (2017). Kulttuuri ja taide hoivalaitoksessa: Laitosarjen ja kulttuuritoiminnan ideaalien kohtaamisia [Culture and art in institutional care: Encounters between the ideals of institutional everyday life and cultural activities]. *Sosiologia*, 54(3), 305–321.
<https://journal.fi/sosiologia/article/view/124299>
- Danso, A. (2023). *The use of technology in music-based interventions for health and education* [Doctoral dissertation]. University of Jyväskylä. *JYU Dissertations*.
- De Witte, M., Pinho, A. D. S., Stams, G. J., Moonen, X., Bos, A. E., & Van Hooren, S. (2022). Music therapy for stress reduction: A systematic review and meta-analysis. *Health Psychology Review*, 16(1), 134–159.
<https://doi.org/10.1080/17437199.2020.1846580>
- Finnish Association of Physiotherapists. (2016). *The core competences of a physiotherapist*. <https://www.suomenfysioterapeutit.fi/physiotherapy/sub-page-1/the-core-competences-of-a-physiotherapist/>
- Grahn, J. A., & Brett, M. (2007). Rhythm and beat perception in motor areas of the brain. *Journal of Cognitive Neuroscience*, 19(5), 893–906.
<https://doi.org/10.1162/jocn.2007.19.5.893>
- Hanifi, R. (2018, November 21). 3. Soittamista Harrastetaan Yhtä Aktiivisesti Kuin 20 Vuotta Sitten [3. Playing musical instruments is practiced as actively as 20 years ago]. Siirry etusivulle - Tilastokeskus. http://www.stat.fi/til/vpa/2017/01/vpa_2017_01_2018-11-21_kat_003_fi.html

- Hays, T. & Minichiello, V. (2005). The meaning of music in the lives of older people: A qualitative study. *Psychology of Music*, 33, 437–451.
<https://doi.org/10.1177/0305735605056160>
- Holmes, C., Knights, A., Dean, C., Hodkinson, S., & Hopkins, V. (2006). Keep music live: Music and the alleviation of apathy in dementia subjects. *International Psychogeriatrics*, 18(4), 623–630. <https://doi.org/10.1017/S1041610206003887>
- Honda, Y., Meguro, K., Meguro, M., & Akanuma, K. (2013). Social withdrawal of persons with vascular dementia associated with disturbance of basic daily activities, apathy, and impaired social judgment. *Care Management Journals*, 14(2), 108–113.
<https://doi.org/10.1891/1521-0987.14.2.108>
- Jukkola, R. (1999). *Yhteislaulut toimintamuotona dementoituneiden musiikkiterapiassa [Group singing as a form of activity in music therapy for people with dementia]*. [Master's thesis]. University of Jyväskylä.
- Kluger, A., Gianutsos, J., Golomb, J., Ferris, S., George, A., Franssen, E., & Reisberg, B. (1997). Patterns of motor impairment in normal aging, mild cognitive decline, and early Alzheimer's disease. *Journal of Gerontology Series B*, 52B(1), 28–39.
<https://doi.org/10.1093/geronb/52B.1.P28>
- Koelsch, S., Fritz, T., Cramon, D. Y. V., Müller, K., & Friederici, A. D. (2006). Investigating emotion with music: An fMRI study. *Human Brain Mapping*, 27(3), 239–250. <https://doi.org/10.1002/hbm.20180>
- Krøier, J. K., Stige, B., & Ridder, H. M. (2021). Non-verbal interactions between music therapists and persons with dementia: A qualitative phenomenological and arts-based inquiry. *Music Therapy Perspectives*, 39(2), 162–171.
<https://doi.org/10.1093/mtp/miab008>
- Kwak, J., Anderson, K., & O'Connell Valuch, K. (2018). Findings from a prospective randomized controlled trial of an individualized music listening program for persons with dementia. *Journal of Applied Gerontology*, 39(6), 567–575.
<https://doi.org/10.1177/0733464818778991>
- Lee, S., O'Neill, D., & Moss, H. (2022). Promoting well-being among people with early-stage dementia and their family carers through community-based group singing: A phenomenological study. *Arts & Health*, 14(1), 85–101.
<https://doi.org/10.1080/17533015.2020.1839776>
- Lesta, B., & Petocz, P. (2006). Familiar group singing: Addressing mood and social behaviour of residents with dementia displaying sundowning. *Australian Journal of Music Therapy*, 17, 2–17.
<https://search.informit.org/doi/10.3316/informit.570237173408984>
- MacDonald, R. A. (2013). Music, health, and well-being: A review. *International Journal of Qualitative Studies on Health and Well-being*, 8(1), 20635.
<https://doi.org/10.3402/qhw.v8i0.20635>
- Ministry of Social Affairs and Health. (2012). Act on supporting the functional capacity of the older population and on social and health services for older persons (No. 980/2012). Finland. <https://finlex.fi/fi/laki/ajantasa/2012/20120980>
- Murakami, B. (2021). The music therapy and harm model (MTHM). *ECOS - Revista Científica de Musicoterapia y Disciplinas Afines*, 6(1), 003.
<https://doi.org/10.24215/27186199e003>

- Niemelä, M. (2016). "Lauletaan vaan yhdessä, pojat!": Musiikki ja identiteetti sotiemme veteraanien ryhmämusiikkiterapiassa—Etnografis-narratiivinen tutkimus ["Let's just sing together, boys!": Music and identity in group music therapy for war veterans—An ethnographic-narrative study]. [Doctoral dissertation]. *JYU Dissertations*.
- Peavy, G. M., Herzog, A. G., Rubin, N. P., & Mesulam, M. M. (1992). Neuropsychological aspects of dementia of motor neuron disease: A report of two cases. *Neurology*, 42(5), 1004–1004. <https://doi.org/10.1212/WNL.42.5.1004>
- Ridder, H. M. (2019). Healthy and active ageing: Music as prevention. In S. Lindahl Jacobsen, I. Nygaard Pedersen, & L. O. Bonde (Eds), *A comprehensive guide to music therapy: Theory, clinical practice, research and training* (2nd edition, pp. 282–290). Jessica Kingsley Publishers.
- Ruud, E. (2013). Can music serve as a "cultural immunogen"? An explorative study. *International Journal of Qualitative Studies on Health and Well-being*, 8(1), 20597. <https://doi.org/10.3402/qhw.v8i0.20597>
- Saarikallio, S., (2017). Musical identity in fostering emotional health. In R. MacDonald, D. J. Hargreaves, & D. Miell (Eds), *Handbook of musical identities* (pp. 602–623). Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780199679485.003.0033>
- Salimpoor, V. N., Benovoy, M., Larcher, K., Dagher, A., & Zatorre, R. J. (2011). Anatomically distinct dopamine release during anticipation and experience of peak emotion to music. *Nature Neuroscience*, 14(2), 257–262. <https://doi.org/10.1038/nn.2726>
- Satoh, M., Yuba, T., Tabei, K. I., Okubo, Y., Kida, H., Sakuma, H., & Tomimoto, H. (2015). Music therapy using singing training improves psychomotor speed in patients with Alzheimer's disease: A neuropsychological and fMRI study. *Dementia and Geriatric Cognitive Disorders Extra*, 5(3), 296–308. <https://doi.org/10.1159/000436960>
- Sihvonen, A. J., Särkämö, T., Leo, V., Tervaniemi, M., Altenmüller, E., & Soinila, S. (2017). Music-based interventions in neurological rehabilitation. *The Lancet Neurology*, 16(8), 648–660. [https://doi.org/10.1016/S1474-4422\(17\)30168-0](https://doi.org/10.1016/S1474-4422(17)30168-0)
- Siponkoski, S. (2020). *Kulttuurisen vanhustyön tietopohjaa rakentamassa: RAI-järjestelmän hyödyntäminen [Building the knowledge base for cultural elderly care: Utilising the RAI system]*. Kulttuurin ja vapaa-ajan toimiala, Helsingin kaupunki.
- Skingley, A. & Bungay, H. (2010). The Silver Song Club Project: Singing to promote the health of older people. *British Journal of Community Nursing*, 15(3), 135–140. <https://doi.org/10.12968/bjcn.2010.15.3.46902>
- Song, J.-A., & Oh, Y. (2015). The association between the burden on formal caregivers and Behavioral and Psychological Symptoms of Dementia (BPSD) in Korean elderly in nursing homes. *Archives of Psychiatric Nursing*, 29(5), 346–354. <https://doi.org/10.1016/j.apnu.2015.06.004>
- Spiro, N., & Himberg, T. (2016). Analysing change in music therapy interactions of children with communication difficulties. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 371(1693), 20150374. <https://doi.org/10.1098/rstb.2015.0374>
- Stegemöller, E. (2014). Exploring a neuroplasticity model of music therapy. *Journal of Music Therapy*, 51(3), 211–227. <https://doi.org/10.1093/jmt/thu023>
- Suomi, H., Hietanen, L. & Ruismäki, H. (2022). Student teachers' views of their own musical skills to teach the national core curriculum in Finland. *Music Education Research*, 24(3), 327–339. <https://doi.org/10.1080/14613808.2022.2053511>

- Särkämö, T. & Sihvonen, A. J. (2018). Golden oldies and silver brains: Deficits, preservation, learning, and rehabilitation effects of music in ageing-related neurological disorders. *Cortex*, *109*, 104–123.
<https://doi.org/10.1016/j.cortex.2018.08.034>
- Tammela, A. (2022). *Kansakoululaisen lauluarteisto: Jälleenrakennusajalta tutut laulut ikäihmisten laulukokemuksissa ja muistoissa [The song heritage of elementary school pupils: Songs familiar from the post-war reconstruction era in older adults' singing experiences and memories]*. [Doctoral dissertation]. JYU Dissertations.
- THL. (2022). *Finnish institute for health and welfare*.
<https://thl.fi/fi/web/kansantaudit/muistisairaudet/muistisairauksien-yleisyys>
- Thoma, M. V., Ryf, S., Mohiyeddini, C., Ehler, U., & Nater, U. M. (2012). Emotion regulation through listening to music in everyday situations. *Cognition and Emotion*, *26*(3), 550–560. <https://doi.org/10.1080/02699931.2011.595390>
- Thomas, N. W. D., Beattie, Z., Marcoe, J., Wright, K., Sharma, N., Mattek, N., Dodge, H., Wild, K., & Kaye, J. (2020). An ecologically valid, longitudinal, and unbiased assessment of treatment efficacy in Alzheimer disease (the EVALUATE-AD Trial): Proof-of-concept study. *JMIR Research Protocols*, *9*(5), e17603.
<https://doi.org/10.2196/17603>
- Tsoi, K. K., Chan, J. Y., Ng, Y. M., Lee, M. M., Kwok, T. C., & Wong, S. Y. (2018). Receptive music therapy is more effective than interactive music therapy to relieve behavioral and psychological symptoms of dementia: A systematic review and meta-analysis. *Journal of the American Medical Directors Association*, *19*(7), 568–576.
<https://doi.org/10.1016/j.jamda.2017.12.009>
- Tähti, T. (2022). *Pienet teot, suuri hurma: Toimijuus kulttuurisessa vanhustyössä [Small acts, great charm: Agency in cultural elderly care]*. Taideyliopiston Sibelius-Akatemia.
- Usein Kysytyt Kysymykset [Frequently asked questions]*. Sotaveteraanit.fi. (2023, November 29). <https://sotaveteraanit.fi/usein-kysytyt-kysymykset/>
- Van Der Steen, J. T., Van Der Wouden, J. C., Methley, A. M., Smaling, H. J. A., Vink, A. C., & Bruinsma, M. S. (2025). Music-based therapeutic interventions for people with dementia. *Cochrane Database of Systematic Reviews*, *2025*(3).
<https://doi.org/10.1002/14651858.CD003477.pub5>
- Wallin, N. L., Merker, B., & Brown, S. (2001). *The origins of music*. MIT Press.
- World Health Organization. (2017). *Global action plan on the public health response to dementia 2017–2025: World Health Organization*.
<https://iris.who.int/bitstream/handle/10665/259615/9789241513487>