KAPITTEL 12

Co-singing in Families Living with Dementia[1]

Helene Waage
University of Agder, Norway

Abstract: The incidence of dementia is increasing rapidly, and a growing number of persons with dementia live in their private homes, even in stages of severe dementia. Therefore, persons with dementia and their relatives could benefit from supportive strategies to maintain communication and meaningful activities as their daily lives change due to the condition. Many people have had considerable singing experiences throughout their lives. Thus, low-threshold, flexible daily life singing activities for persons with dementia and their relatives could be based on their own singing competences and background. However, most existing research on singing and music for this target group, outside institutionalised healthcare settings, involves music therapists instructing relatives on how to apply individualised music programmes.

This article suggests a supplemental approach, and the term "co-singing" is proposed to describe such a practice. Singing in the context of families affected by dementia is seen in relation to different, though overlapping theoretical perspectives: health musicking, communicative musicality, dementia and memory, and the polyvagal theory. Within this context, the concept of co-singing highlights the relational aspects of singing, also outside a professional therapeutic or institutionalised context of music and dementia. Thus, "co-singing" provides a supplement and fills a gap between "singing" in general and "caregiver singing" or "care-singing". Co-singing in families – even when facing severe dementia – can enhance communication and interaction through an entangled process of neuropsychological co-regulation and implicit memories and skills.

Keywords: co-singing, dementia, relatives, polyvagal theory, communicative musicality

1 This article includes content and issues that will eventually be integrated, further explored, and developed in a PhD monograph as part of my research fellowship at the PhD-programme *Arts in context* at the University of Agder, Norway 2019–2023.

Sitering: Waage, H. (2022). Co-singing in Families Living with Dementia. In R. V. Strøm, Ø. J. Eiksund & A. H. Balsnes (Eds.), *Samsang gjennom livsløpet* (MusPed:Research No. 5, Chap. 12, pp. 327–353). Cappelen Damm Akademisk. https://doi.org/10.23865/noasp.162.ch12
Lisens: CC-BY 4.0

Each moment is an infinite multiplicity
—Karen Barad (2014, p. 169)

Prelude[2]

As the three of us started singing together, something happened in the room: A curious blend of excitement, joy, and relief. The somewhat challenging conversation a couple of minutes earlier – Anna and myself trying to include Alf who struggled with his words – had eventually turned into singing one of Alf's favourite songs. Now, his voice was growing in confidence and abundance, and his eyes were glowing. His wife was misty-eyed, and so was I.

I briefly knew the couple, and we had agreed that I would visit them to try out some singing and music. When I started to map Alf's musical preferences, it was soon apparent that he had a history of and a still enduring interest in singing, which – despite severe dementia – was still highly accessible. Therefore, we agreed on some songs that he liked to sing, which I assembled in a ring-binder.

At a later visit they told me that now they were singing the songs every late afternoon: This period of the day, Anna explained, was often challenging for both of them because of Alf`s restlessness. "But with the songs, we get such a nice ending of the day." For me, this was a pivotal moment. The life-long loving couple was struggling to cope with dementia as a new, unwelcome third partner in their spousal relationship and daily life. Their songs, however, obviously had the potential to make a major difference.

Introduction

The backdrop of such a daily-life-singing potential, is a rapidly increasing incidence of dementia (World Health Organization, 2017), and a growing number of people affected by dementia living at home. Despite decades of extensive research, there is still no cure in sight. Therefore, people living with dementia and their relatives need apt strategies to cope and

2 The personal narrative presented in the sections *Prelude*, *Interlude*, and *Postlude* is anonymised, with fictive names. "Anna" has approved the application and version of the text. My encounters with the couple were part of a project: In 2015–2016, I was exploring practical and educational activities in different local institutions and settings as part of a larger project developing methodological implementation of integrated music in dementia care, led by Dr. Audun Myskja.

maintain good communication, meaningful activities, and well-being. Substantial research has shown that singing and music, especially when used in an individualised manner (Leggieri et al., 2019), can be beneficial for persons affected by dementia and their relatives (Särkämö et al., 2014). Therapeutic musical approaches to dementia care can enhance well-being and ease communication and interaction between persons with dementia and their caregivers (Hammar et al., 2011).

Music therapy, music therapeutic caregiving, care(giver) singing, and music-based environmental therapy, offer different, though partially overlapping, frameworks for utilising (therapeutic) personalised music as a part of dementia care. Most research within these fields has been carried out in the context of institutional dementia care. However, a growing body of research addresses singing and music for persons with dementia and their relatives in a home care setting (Baker et al., 2019; Baker et al., 2012; Clair, 2002; Kulibert et al., 2019).

Experiences from existing individualised, therapeutic musical strategies in dementia care, with regular use of music based on personal musical preferences, can also be relevant for home-dwelling persons with dementia and their families. Hence, this article advocates a simple, flexible approach, encouraging singing as a low-threshold daily life resource woven into daily activities and communication. However, outside the therapeutic or institutional contexts and settings, such an approach might call for adapted terminology.

The main question framing this article is: How can low-threshold singing activities for persons with dementia and their close ones be communicated by more apt terminology than currently used within this field? Further, within such a context, how can the terminology be grounded theoretically, and what might be implications for the singing practice in families living with dementia?

The article outlines how singing together in the context of dementia in close relations can be connected to different but partially overlapping and interwoven theoretical perspectives: The concept of *health musicking*, the model of *communicative musicality*, *the polyvagal theory*, and research on dementia and memory. Further, I propose the concept of *co-singing* and discuss how this term can be argued and anchored.

Put shortly; this article explores and discusses co-singing as term and practice in the context of dementia and relations, read through different, entangled theoretical perspectives. The introductory case story serves as an illustration.

Background

Dementia is a broad category of degenerative brain diseases. Symptoms include memory loss, reduced orientation, problems with language and daily activities, and mood and behavioural changes. According to WHO, in 2015, dementia affected 47 million people worldwide, roughly 5 percent of the world's elderly population. This figure is predicted to increase to 75 million in 2030 and 132 million by 2050. Nearly 9.9 million people are estimated to develop dementia each year globally. Services to meet needed support and care are far from sufficient and are often fragmented or even lacking entirely (World Health Organization, 2017, pp. 1–2). Hence, the majority of persons affected by dementia live at home (Daley et al., 2017, p. 57; Kulibert et al., 2019, pp. 2971–2972), often also in stages of severe disease. This situation calls for constructive and supportive strategies for persons with dementia and their relatives.

A growing body of scientific research confirms the beneficial outcomes of personalised singing and music as part of dementia care strategies (Buller et al., 2019; Ridder et al., 2013; Särkämö et al., 2014). The research literature concerning singing and music as a systematic resource for persons with dementia and their families outside the institutionalised healthcare setting has been scarce but promising (Baker et al., 2012; Clair, 2002, 2016; Kulibert et al., 2019). This research field is increasing, also with major ongoing studies (Baker et al., 2019).[3] Mostly, such research implies *indirect music therapy*: Music therapists instruct relatives to carry out music programs regularly, with a premeditated, often individually adjusted, but still predetermined program.

3 The three-year EU-initiated HOMESIDE study started in autumn 2019 and is a three-armed randomised, controlled clinical quantitative study with close to 1,000 participants. An intervention of indirect music therapy, e.g., individualised music programs instructed by music therapists to be carried out by the spouses of persons living with dementia, is compared to reading activity and a control group.

However, most families affected by dementia do not have access to a music therapist. Hence, more flexible, low-threshold singing activities – akin to *care-singing,* which I will get back to – could be a useful and accessible daily life resource. *Care-singing* or *caregiver singing* implies that the caregiver sings with the person with dementia as an integrated part of daily activities and caring routines.

Research on singing and well-being shows beneficial outcomes in a variety of aspects. However, most existing research in this field concerns organised group singing activities (Balsnes, 2010; Daykin et al., 2018). Hence, Balsnes suggests that future research should include more informal singing, both community singing and private singing at home (Balsnes, 2010, pp. 7, 28). A review of research on individual singing with persons with dementia (Chatterton et al., 2010) unveiled that mainly music therapists and nurses and nurse aids were singing with persons with dementia.[4] There is also a small but growing body of research showing positive outcomes of community group singing for people with dementia and family carers (Clark et al., 2018; Thompson et al., 2021; Unadkat et al., 2017). Although research within the field of singing and dementia is growing, the tendency is still the same: Few studies concern relatives singing with persons with dementia. Admittedly, there might be an untapped potential and a need for more research, both in the field of singing at home more generally, and in relatives-involved music activities, including singing, with persons living with dementia.

Not all people with dementia or their relatives have had positive singing experiences during their lives, and some might prefer other activities. Still, based on the mentioned research, and provided individual adaptation, it is reasonable to believe that many families affected by dementia could benefit from singing more actively as part of their daily life (Parmar & Puwar, 2019). Therefore, I suggest a "bottom-up" perspective on singing as a resource in families living with dementia, building on their competencies and experiences but still supporting a broad, regular use. Such an approach to daily-life singing can be connected to an entanglement of

4 One of the reported studies concerned in-direct music therapy, where the music therapist instructed the relative to sing (or play recorded music) for the person with dementia.

theories shedding light on relational and co-regulative aspects of singing and dementia. These aspects and theories may underpin and anchor the suggested concept of *co-singing*, which will subsequently be discussed.

Health musicking

The relational and co-operative aspects of singing interactions have connections to *musicking*, introduced by Christopher Small (1998). Small's new term highlighted music as a relational activity, instead of music as an object. "The act of musicking establishes in the place where it is happening a set of relationships, and it is in those relationships that the meaning of the act lies" (Small, 1998, p. 13). The concept, process, and practice of musicking are central within the music therapy field. Music therapy researcher, Brynjulf Stige, remarks that

> Small's concept of musicking points not only to music as a verb but even more to music-in-context. […] While music arguably could be viewed both as product and process, music therapists have tended to stress the process aspects and underlined that to be involved in music is to be involved in musical, personal, and interpersonal processes. […] [M]usic therapists typically have advocated the view that music is activity and relationships. (Stige, 2012, p. 164)

In acknowledging that the therapeutic effects of music and musicking also can take place outside the client–therapist relation, Stige introduces the notion of *health musicking*, which in modern societies "may include any variant of nonexpert everyday uses of music-making or listening with positive health outcomes, whether these outcomes are intended or not" (Stige, 2012, p. 211). Further along these lines, Ansdell points out:

> People often personify music […] as a kind of "lay-therapist" within their everyday lives – or, alternatively they themselves are the lay music therapist using music as a tool for their own self-care in areas of energy and motivation, emotion and emotional regulation, identity, relationship, socialization, restorative "asylum", and self-reflective work in relation to everyday problems and challenges. (Ansdell, 2013, p. 7)

Such aspects of musical empowerment are relevant for families living with dementia and could also be connected to Antonovsky's salutogenic model discussed by Balsnes in this anthology's chapter 11. Overall, singing together in families affected by dementia shares the features of *health musicking*, as described by Stige and Ansdell, as well as fitting into the broader concept of *musicking* proposed by Small.

Interlude

A few weeks later I met Anna again. She looked excited and told me that an old friend of Alf's had come visiting the other day. At first, it had been hard to engage and include Alf in the conversation, but then she told his pal about how they had started singing together lately. He was curious, so she showed him the song-binder and she and Alf began singing. Soon, the friend joined in, and the three of them had an enjoyable time singing together. It was lovely, she told, to see the two old friends finally being able to connect, through singing.

Communicative musicality

Communicative aspects of singing can be connected to the theory of *communicative musicality* (Malloch & Trevarthen, 2014, 2018; Trevarthen & Malloch, 2000), developed after extensive research on mother–infant communication and interaction. Acoustic analysis and videos of non-verbal communication between mothers and infants revealed fine-tuned, musical, and gestural interactions, which the authors argue to be the precursor of both languages, rituals, and artistic expression. The authors define this innate communicative musicality by three main elements: *pulse* – which implies rhythmic patterns and turn-taking, *quality* – which describes the fine-tuned modulation of voice as well as mimics and gestures, and lastly; pulse and quality coming together in *narrative* – which indicates that though being non-verbal, the vocalisations and gestures imply meaningful communication.

Malloch and Trevarthen – referring to Dissanayake – argue that this form of communication is based in evolution to make the immature,

highly dependent infants able to communicate and bond with their caregivers. Dissanayake argues that evolutionary adaptive behaviours essential for survival and reproduction gave rise to what she calls *artification* – making the ordinary extraordinary. In this light, the function of art – art as doing – is not mainly diversionary but essential for regulating social relations (Dissanayake, 2015). "I claim that ritualized mother–infant interaction – and the features that it shares with play – gave rise to the arts" (Dissanayake, 2017, p. 161).

There is a link between the model of communicative musicality and Bjørkvold's (1992) notion of *the Muse within*, referring to ancient Greek mythology:

> The Muses – the divine muse-ical [sic] beings – were created precisely to give the world the voice that had been lacking. They were a manifestation of life, just as the primal cry of the newborn infant is a manifestation of life. Seen in this light, all playing and singing children are the legitimate heirs of the Muses. The Muses, then, according to the ancient myth, gave the universe an audible voice – a voice that could create new universes of pictures and concepts of the mind. […] New worlds can be created through something as direct and simple as song. (Bjørkvold, 1992, p. 55)

Bjørkvold's studies and descriptions of children's spontaneous musicality and how it unfolds in play, learning, and living are referred to in the writings on communicative musicality. Bjørkvold, on his part, cites Trevarthen's mother–infant research.

Music therapists recurrently refer to communicative musicality to shed light on the therapeutic effect of music and the music therapist–client relation. However, they also emphasise that the musical interplay in music therapy implies a very different relationship than in mother–infant communication. Rolvsjord (2002) remarks that since both the client and the music therapist mostly draw upon enormous musical experiences and memories, the musical meaning will also be connected to narrative and symbolic means. However, she considers this an additional resource, adding to the more direct or immediate meaning of musical communication (Rolvsjord, 2002, pp. 29, 30).

In communication and interaction with persons with dementia, the communicative musicality model may be of particular interest because of some of the central aspects of dementia itself.

Implicit versus explicit memory in dementia

Memory loss, or more precisely, the loss of *explicit memory*,[5] may often be the initial sign of dementia. At least, this is true regarding the most common forms of dementia, like Alzheimer's disease and vascular dementia. However, it is not always the case in less common dementia diseases, such as frontotemporal dementia, where behavioural symptoms are more striking. There are two forms of explicit memory: *semantic memory* refers to general knowledge, whereas *episodic memory* is connected to specific personal experiences. *Autobiographical memory* is based on a combination of semantic and episodic memory.

The categorisation of dementia into mild, moderate, and severe stages are also connected to the degree of explicit memory loss (Harrison et al., 2007, p. 287). Explicit memory is conscious, often intentional effort to recollect prior experiences and facts, while implicit memory[6] involves influences of prior episodes on current behaviour – without intentional retrieval – and sometimes without conscious remembering of those prior episodes (Schott et al., 2005, p. 1257; Son et al., 2002, p. 264). *Procedural memory* is a type of implicit memory which enables us to perform many types of tasks without conscious awareness of these previous experiences. *Priming* is another, smaller subset of implicit memory. It involves using stimuli or cues to induce recognition of information or experience.

This implies that the possibilities of different ways of retrieving information is essential for persons with memory loss. To *recall* information involves explicit memory and is often much harder for persons with dementia than *recognising* information, which draws on implicit memory (Sabat, 2008, pp. 72–73).

5 Explicit memory is also often referred to as declarative memory.

6 Implicit memory is sometimes referred to as unconscious memory or automatic memory.

> Thus, although the ability of a person with AD [Alzheimer's disease] to recall information may be compromised, the ability to recognize the same information may be less compromised, and the ability to learn new information can be intact, even if the person does not recall having learned that information. (Sabat, 2008, p. 73)

Explicit and implicit memory are claimed to be separate neurologic systems, processing and storing memories in different brain regions and depending on different neural pathways (Harrison et al., 2007, p. 287; Schott et al., 2005). While explicit memory gradually deteriorates due to the progression of dementia, implicit memory persists and may, therefore, play a more important role than before, also as part of dementia-care strategies (Harrison et al., 2007; Son et al., 2002).

Son and colleagues (2002) point out that infants are born with the ability to acquire habits and skills, while explicit memory matures slowly. Thus, patients with dementia or amnesia can maintain previously developed habits and skills for two reasons:

> First, a neuroanatomical dissociation of two neural systems is present from infancy in humans […]. Second, these habit and skill systems have already been established prior to limbo-diencephalic injury or disease onset and are typically spared by disease […]. Once the neural representation of stimulus and experiences has been achieved, the stored stimulus representation can be retrieved by stimulus cues through a process of associative recall and stimulus-response mechanisms. (Son et al., 2002, pp. 264–265)

Put simply, the two different memory "systems" are present from infancy, and since explicit memory matures slowly, substantial early experiencing and learning of habits and skills depend on implicit memory. Moreover, such habits and skills are established before the onset of dementia, and these neural networks are less affected by the disease. Hippocampus is essential for explicit memory and is one of the first areas affected by Alzheimer's disease. In contrast, neural networks supporting implicit memory are affected at a much later stage of the disease. Through "triggering" experiences or cues – priming – the implicit memories and skills can be recognised and activated.

Consequently, by applying principles from communicative musicality – either by utilising singing or paying extra attention to prosody (voice modulation), timing, and gestures in spoken communication – one may draw on (innate) non-verbal communication skills. Rooted in the infant's implicit, preverbal memory, singing and communicative musicality enable communication and "narrative", even when the loss of explicit memory and language makes verbal communication challenging. Thus, the communicative potential of singing together is actualised by memory mechanisms during the progradation of dementia.

An example of how this may unfold is apparent through the following citation from an interview in a music intervention study by Quinn et al. (2021):

> We noticed definitely in the dementia care home people who struggled to communicate hugely have retained an ability to sing most of the songs. Yes and sometimes with increasing stimulation with music will then be able to have some sort of conversation and might even communicate using a line of the song. (Quinn et al., 2021, p. 82)

Also, singing and music provide cues with the potential of connecting the person with previous life events and autobiographical memories (Baird & Samson, 2015, pp. 224–225; El Haj et al., 2015). Thus, singing might create a "bridge over the troubled water" of disorientation and confusion following cognitive decline, and guide the person into a "safe harbour" of familiarity and sense of identity.

On the other hand, there may also be a small risk that music can invoke less pleasant memories, even trauma. In the vulnerable state of dementia, a variety of different stimuli may trigger unpleasant as well as pleasant memories or associations. Singing and music is no exception. Still, the research literature on music and dementia generally promotes music interventions as safe, with "little capacity to do harm" (Nair et al., 2013, p. 50). Furthermore, several studies and reviews point out that, regardless of the music intervention approach, individualised music regimens provide the best outcomes for the patients (Leggieri et al., 2019; Nair et al., 2013, p. 50). Making individual adjustments and carefully choosing the

songs or pieces will, presumably, also minimise the risk of harmful or unpleasant experiences.

Moreover, the family member's capability for what Daniel Stern calls affect attunement (Stern, 2018, pp. 138–161) might also play a role in creating a safe setting for singing together. Unlike mere imitation or matching, affect attunement is often cross-modal or intra-modal and is a response to the affect underlying the other person's expressed behaviour.

The previous sections have outlined how insights from communicative musicality, and music and implicit memory, can contribute to understanding why and how singing communicates with persons living with dementia – and the relative. I will argue that Stephen Porges' polyvagal theory (PVT) may give additional – and partly overlapping – neuropsychological foundation to elaborate on subtle communicative and affective aspects of singing. At the heart of PVT lies a focus on safety as basis for social engagement and non-defensive behaviour. Thus, the following section will offer an introduction to PVT to ground and elaborate on certain aspects of how persons mutually affect each other – also while singing – especially in families living with dementia.

The autonomic nervous system and the polyvagal theory

Interpreting and understanding sensory stimuli can be challenging for persons with dementia. Therefore, their defensive systems will more readily be activated, either in the mobilising mode ("fight" or "flight") or an immobilising mode ("freeze" or "feign death") (Ridder, 2011, p. 131). Because of cognitive impairment, the person with dementia is also less capable of reorienting and self-regulating. Therefore, understanding the features of the autonomic nervous system's activations and regulations is of particular interest when it comes to dementia, also to understand the function and potential of singing.

Stephen Porges' polyvagal theory (PVT) traces the phylogenetic, neurophysiological substrates of the autonomic nervous system, and the implications for human social behaviour, communication, and interaction (Porges, 2011). "Fight, flight and freeze" are well-known terms from

his theory, describing the different innate defensive strategies of experienced threat. Less known is the notion of "the social engagement system", describing the phylogenetic more advanced, social survival system, which can down-regulate defence, provided sufficient picking up on subtle signals of safety, through an unconscious process which Porges describes as "neuroception" (Porges, 2011, pp. 11–19).

PVT also explains how tiny nuances in facial expression and tone of voice (prosody) are monitored via neuroception. Such micro-expressions are crucial to induce a sufficient sense of safety to enable social interaction instead of defensive activation or shut-down (Eide-Midtsand & Nordanger, 2017; Porges, 2015). Neuroception is influencing the autonomic bodily state, which in turn influences the conception of what is going on, as the mind tries to make sense of what the bodily state is telling. The neuroceptive feedback-loop of subtle cues of safety or danger is constantly and unconsciously monitored, resulting in accordingly adjusted behaviours based on social or defensive strategies (Dana, 2018, pp. 35–39; Porges, 2011, pp. 11–19).

Through the lens of PVT, we may explore some aspects of the underlying mechanisms to shed light on how and why singing may enhance communication and cooperation, especially under vulnerable conditions, like facing dementia in the family. The music therapist researcher Hanne Mette Ridder has pointed out PVT's relevance to better understand the music therapy process, especially regarding dementia (Ridder, 2007, pp. 434–437; 2011). However, a basic understanding of PVT guiding the use of relational singing may, as well, have implications outside a professional therapeutic context.

Although there are some controversies regarding PVT's phylogenetic aspects (Grossman & Taylor, 2007; Taylor et al., 2014), PVT's practical and clinical implications have shown considerable utility value (Porges & Dana, 2018), especially within trauma care (Porges, 2018). Likewise, PVT may also add useful perspectives to the context of relational singing in families affected by dementia.

Deb Dana (2018) outlines three main organisational principles for PVT in clinical practice: In addition to the concept of *neuroception* described above, are the hierarchy of autonomic states and the innate "wiring" to

connect (Dana, 2018, p. 4). Dana describes the hierarchy of autonomic states as a ladder (Dana, 2018, pp. 9–14): On the top is the "ventral vagal state", meaning that the ventral, myelinated branch of the vagus nerve is able to down-regulate defence, thereby allowing a regulated state where the social engagement system is active and connective. If a situation cannot be handled or solved by the social engagement system, we move down the ladder to the "sympathetic state" of fight or flight, where the sympathetic nervous system is mobilising to meet or avoid threats or danger. If even this system comes up short, we move further down the ladder to the "dorsal vagal state", where the dorsal branch of the vagus nerve induces a shutdown resulting in collapse: feign death, dissociation, or withdrawal. The described hierarchy corresponds with the order in which the different states are recruited.

The autonomic nervous system's (ANS) central issues are to keep us away from danger and – when safe – to connect socially. Humans are wired to connect since being included in a flock is part of our evolutionary survival. ANS will always be searching for signs of safety, both in social relations and in the environment (Porges, 2015). However, the ANS's defensive mechanisms cannot always differentiate effectively between real and conceived or imagined danger but might over-react (Dana, 2018, p. 38; Porges, 2011, pp. 12–13, 17–18). How individuals react when distressed or in critical situations will differ significantly due to earlier experiences – and present health conditions – which will affect both how and how easy the defence mechanisms get triggered and what defence strategy will be recruited (Dana, 2018, p. 33).

Moreover, when we are in a triggered state, our perception changes; both our hearing and the way we interpret facial cues. In the safe and social state, the middle ear muscles will regulate our hearing towards the ability to focus on the human voice. However, when in a triggered, sympathetic state of fight or flight, according to Porges, the middle ear regulation shifts away from listening for human voice towards listening for low-frequency sounds of predators or high-frequency sounds of distress. "The system is now tuned to the sounds of danger and not to the sounds of connection" (Dana, 2018, p. 25). Also, the ability to read facial cues is compromised, and we misread cues: Neutral faces appear

angry and are experienced as dangerous (Dana, 2018, p. 25; Porges, 2011, p. 15).

Thus, due to a variety of internal and external challenges to our ANS regulation, we are in a constant need for self-regulation and co-regulation: Our autonomic nervous system needs to co-regulate with others' autonomic nervous systems (Dana, 2018, pp. 44–47). To help a person out of a collapsed or mobilised defensive autonomic state, the other person – be it a therapist, relative, colleague, or friend – must be regulated, or self-regulate, to be anchored in the safe and sociable state. Otherwise, through neuroception, they will feed each other's autonomic nervous systems with new cues of threat or danger, keeping them both in a vicious circle of defensive, dysregulated states (Porges, 2011, p. 15).

On the other hand, neuroceptive cues can also impel a more positive spiral, enhancing memories or impressions of safety, comfort, or joy. Deb Dana calls such positive triggers for "glimmers" (Dana, 2018, pp. 66–71). A friendly smile, a caring gesture, or a pleasant memory are examples of glimmers. Singing and music, thus, have great potential for incorporating glimmers. In addition, the nature of singing and music may imply other beneficial neuro-physiological influences.

Porges argues that music listening, singing, and music therapy offer ways to engage and exercise the social engagement system (Porges, 2011, pp. 246–254). Melodic music contains acoustic properties similar to vocal prosody and may thereby recruit the social engagement system by challenging and modulating the neural regulation of the middle ear muscles (Porges, 2011, pp. 209, 210; Porges & Lewis, 2010, p. 260).

Porges and Dana also focus on the regulating potentials of breathing and singing. The phrasing of songs results in short inhalations and long exhalations, thus decreasing heart rate and inducing a calmer state (Porges, 2011, pp. 246–254). "Slow exhalation, the respiratory process associated with expressive social vocalizations, enhances the impact of the myelinated vagus on the heart, promoting calm states" (Porges & Lewis, 2010, p. 262). In other words: Long out-breaths, which singing in itself implies, can induce downregulation of defence and make the social engagement system more accessible. Besides, via breath, articulation, and intonation, singing activates several muscles connected to the social

engagement system, both facial muscles and muscles in the middle ear (Dana, 2018, pp. 149, 150; Porges, 2011, pp. 253, 254). Moreover, when people sing in unison, the song's structure can influence and synchronise the respiratory influence on the singers' hearts and induce an "inner entrainment" which may affect perception and behaviour (Vickhoff et al., 2013).

Entanglements of theories

The early infant-parent communication and regulation described in communicative musicality is a way to "exercise" the "social engagement system" and autonomic nervous system regulation. When communicative musicality unfolds in an intuitive, undisturbed way, the early interplay between infants and their caregivers offers the infant an "education" in modulating aspects of the social engagement system, including the neuroceptive underpinnings. Also, the less attuned sequences of companionship, which may lead to disruption, are essential in this education.

> Video microanalysis reveals that typical mother–baby pairs are in sync for affective states only one third of the time […]. It is the *repair* of the disruption – its timing, its sensitivity, its fits, its lack of intrusiveness – that will determine how well the dyad functions over time […]. (Sanders, 2018, p. 361)

The highly melodic and rhythmic features of the preverbal "language" described in communicative musicality activate the neural and muscular pathways of the social engagement system outlined in PVT. Thus, the basic components of communicative musicality – pulse, quality, and narrative – performed through turn-taking, gestures, mimics, and prosodic voicing, are also key components of downregulating defence by activating the social engagement system. Singing together draws on the same basic elements, in addition to more refined creative, melodic, and verbal content. When individualised adapted singing is part of communication and interaction, neural and muscular pathways supporting social engagement can be activated. In a sense, singing may offer a short-cut to social connection and downregulation of defence where language alone comes up short.

Language and other skills deteriorate as part of the progradation of dementia. Hence, both persons with dementia and their relatives may benefit from supplemental ways of communicating and interacting. The gestures, voice modulations, and narratives of communicative musicality, and the contexts of singing together may offer well-known, still accessible features of prosody, rhythm, music, and meaning. Also, the role and skills as a *singer* may still be mainly intact, due to implicit and procedural memories connected to the act of singing as well as the actual songs.

Individualised approaches to music and dementia have been advocated by Linda Gerdner (2005) and applied within music therapeutic caregiving (Götell et al., 2002, 2009; Hammar et al., 2011) and music-based environmental therapy (Batt-Rawden & Storlien, 2019; Batt-Rawden et al., 2021; Myskja, 2011), as well as within professional music therapy sessions (Leggieri et al., 2019). It is possible to reach and enhance implicit memories by adjusting music and song-selection to individual musical preferences and experiences. Well-known, loved songs may invoke autobiographical memories (El Haj et al., 2015, p. 1720) but can also induce associative stories, images, and feelings through implicit memory and offer a sense of familiarity and safety (Tomaino, 2013).

Discussion of terminology

Care(giver) singing is a research-based approach utilised by nurses and nurse aids, without particular musical experience, in nursing homes and other dementia care settings. Staff members are singing familiar songs during daily care procedures to enhance communication and interaction and prevent adverse behaviour, for instance while washing and dressing as part of the morning routine (Hammar et al., 2010, 2011).

The terms *caregiver singing* within the concept of *music therapeutic caregiving (MTC)* (Brown et al., 2001; Götell et al., 2009) and *care-singing* within the frames of integrated music in nursing homes (Myskja, 2011) have been applied to describe such practices. Although being a relevant point of departure, these terms do not necessarily embrace the variety of settings where singing may be a resource in the daily lives of families affected by dementia. Such terms originated within the context of

professional dementia care, all signalling music's and singing's potential as an agent or support for *care*.

The connotations and narrative of *care* add new dimensions to the term *singing*. *Care* adds associations of comfort, "holding", safety, concern, even love. Such implications of singing practice might also unfold in the singing encounters involving persons with dementia and their relatives or spouses. However, the connotations of *care* may also imply an uneven power balance if a person is *taking care of* the other in a way that leaves the cared for in an inferior or dependent situation. This may often be the case, both within institutional care and in families affected by dementia since persons with dementia often need help and support due to their condition.

Tom Kitwood's model of *person-centred care* (Kitwood & Brooker, 2019) is widely appreciated within dementia care for its focus on inclusion, individuality, and dignity. Person-centred care implies provision of an overlapping cluster of five primary psychosocial needs: *comfort, attachment, inclusion, occupation, and identity*, coming together in the all-encompassing need for *love* (Kitwood & Brooker, 2019, p. 92).

Still, even within this concept of care, the singing events may imply a more equivalent relation between the person with dementia and the carer. For instance, the person with dementia – despite other challenges due to the disease – might be a more confident singer than the carer, or even actively contribute to the carer's well-being through the singing incident. Moreover, singing together in families affected by dementia may also imply a sense of "self-care" and health-musicking for the person with dementia and the relative alike. Thus, I suggest the term *care-singing* is preferable over *caregiver singing*. The "care-singers" may care for themselves and each other on equal terms.

Thus, the term *care-singing* may indicate both equality and relationality. However, the institutional context of care(giver) singing practice may in some settings imply both an uneven power balance and an overly instrumental approach to singing. In an extensive review, Dowson et al. (2019) point out that outcome measures in most research on music and dementia focus predominantly on reduction of negative symptoms, also often in assessments of well-being. While still acknowledging the

challenges of dementia, the authors argue that researchers, thus, risk ignoring part of the spectrum of music's potential benefits.

Further along such resource-oriented lines, there is also a growing body of research on artful interactions with persons with dementia – and other populations – anchored in posthuman theory. Quinn et al. (2021) introduce the concept of *post-verbal* people – including people with dementia – as an alternative to the term *non-verbal* to signify that the "lost" language does not simply imply a lack of communication skills but a potential for alternative ways of communicating, where *post*-verbal indicates *going beyond* words. Their study offers an approach to arts, music, and dementia focusing on positive experiences, "magical moments", ways of non-verbal communication, and social inclusion.

Nevertheless, most studies on singing and music and dementia are still anchored within institutional or otherwise professionally organised settings. Furthermore, the musical interventions are primarily directed towards the person with dementia, although relatives are sometimes included. Such contexts may yet be part of the broader picture of resource-oriented relational singing and dementia.

Still, the main approach of this article is singing as togetherness, not as an "intervention" or even "happening", but as an interwoven part of daily life. As such, the singing is rooted in the competencies, experiences, and emotions of the persons with dementia *and* their close ones alike. My own ongoing PhD-research indicates that the accessibility of daily-life singing may manifest in a wide spectre of relational activities, incidents, and events, like singing together in the car or during practical chores, singing while walking or moving, or singing as (part of) conversation, reminiscence, and comfort.

Hence, it might be tempting just to use the term *singing*, which is simple, open, and inclusive. Yet, it might be too inclusive: embracing any form of existing multitudes of singing practices and contexts, from pop and rock superstars performing for thousands, via opera divas excelling in elaborate coloratura, to the local children gospel choir or the contemplative chant of Tibetan monks. Singing in families affected by dementia can gracefully add to this multitude of settings that honour the accessibility and versatility of singing. Still, in the context where singing is used

as a resource by families living with dementia, a more defining but still flexible term is called for.

How can the components and implications of such a term, in this context, be argued and grounded? Based on the previously referred theories, I will argue that the terminology should reflect and highlight the togetherness of singing and indicate the relational and communicative aspects and the co-regulative potential. In the co-operation of social interaction, singing is not mere singing, but *co*-singing. Not strictly understood – two or more persons necessarily singing *together* – but implying that the relational aspect is in the foreground of the situation and that the singing takes form as an encounter.

Therefore, I suggest the term *co-singing* to narrow down the – in this context – too general term *singing* and offer a supplement to the terms *caregiver singing* and *care-singing*, which has mostly been applied within the context of professional caregiving. The term *co-singing* is open enough to embrace a sufficient variety of contexts where singing has a clear relational and communicative aspect – also outside a therapeutic or institutional setting – without including every possible context of singing. Thus, *co-singing* may offer a supplemental approach and term, indicating singing as togetherness in a wide range of daily life circumstances, including in the context of families living with dementia.

The agency of co-singing

The actual song and the act of singing play in concert with the co-singers' mutual effects on each other. The way the music and songs are delivered – not mainly the quality of singing but also factors like facial and bodily gestures, tone of voice, and eye contact – may contribute to co-regulation of autonomic states and communicative aspects, turning singing into co-singing. Hence, a myriad of components and nuances may interact in countless ways. In such a process, the performed song is one of multiple influencing factors entangled with our neurology and relational and autobiographical aspects of time, being, and becoming.

Following Bjørkvold's (1992) terminology, going back to the mythical derivation of the Greek Muses, it is tempting to suggest co-singing seen as

an agent to mobilize the *Muse within*, individually and reciprocally. From that perspective, the *Muse within* is rooted in the early, preverbal proto-communication described by the communicative musicality model. She "inhabits" the social engagement system described by the polyvagal theory and can boost co-regulative communication and interaction. Further, the *Muse within* evolves through experiences of life and arts: including song, music, and musicking, which at the same time are carriers of autobiography, identity, and emotion. Even in severe dementia, these pre- and post-verbal "Muse-ic" expressive, communicative qualities are – at least to some degree – accessible through implicit memory.

Conclusion

This article argues that singing in the context of dementia in close relations calls for a term distinguishing this kind of singing practice from the general term *singing*, and at the same time, offering a more flexible and inclusive term than *caregiver singing* or *care-singing*. *Co-singing* is proposed to fill this gap, and the term is connected to the following theoretical perspectives: the polyvagal theory, communicative musicality, and health-musicking, whose principles and implications are entangled. Assessing these theories and concepts in relation to the potential of implicit and procedural memories and skills can shed light on the communicative and behavioural consequences of dementia – and the potential of daily-life co-singing.

When families affected by dementia apply co-singing as part of communication and interaction, then neuropsychological foundations, implicit memories and skills, life stories of singing, and autobiographical events connected to song and music are "bleeding" through the moment of the current act of co-singing. Thus, the multi-dimensional moment of tone and attunement may – at least temporarily – harmonise and "override" the fragmentation and confusion of dementia. The "thick" moment of co-singing carries meaning and memories of multiple lifetime stories and may provide a bridge over broken timelines and impaired memory and language. Moreover, co-singing has the potential to enhance autonomic neurologic regulation into a safe and social, co-regulated state.

In short, the concept of co-singing is grounded in relational aspects based on the entanglements of factors founding and tailoring co-regulation and musical togetherness.

Postlude

Shortly after our meetings, Alf moved to a dementia care department. He brought the song-binder with him and continued singing with his wife, and even with other relatives and staff members. Not long after, he passed away. Later, I met his widow again. In the funeral, she told me, Alf's pal had explained to her that the experience of his visit and their singing together had made such a profound impact on him: "I will never forget that moment."

References

Ansdell, G. (2013). Foreword: To music's health. In L. O. Bonde, E. Ruud, M. S. Skånland, & G. Trondalen (Eds.), *Musical life stories: Narratives on health musicking* (Vol. 2013:5, pp. 3–12). Norwegian Academy of Music. http://hdl.handle.net/11250/196825

Baird, A., & Samson, S. (2015). Music and dementia. In E. Altenmüller, Stanley Finger, & F. Boller (Eds.), *Music, neurology, and neuroscience: Evolution, the musical brain, medical conditions, and therapies* (Vol. 217, pp. 207–235). Elsevier. https://doi.org/10.1016/bs.pbr.2014.11.028

Baker, F. A., Bloska, J., Braat, S., Bukowska, A., Clark, I., Hsu, M. H., Kvamme, T., Lautenschlager, N., Lee, Y.-E. C., Smrokowska-Reichmann, A., Sousa, T. V., Stensaeth, K. A., Tamplin, J., Wosch, T., & Odell-Miller, H. (2019). HOMESIDE: Home-based family caregiver-delivered music and reading interventions for people living with dementia: Protocol of a randomised controlled trial. *BMJ OPEN, 9*(11). https://doi.org/10.1136/bmjopen-2019-031332

Baker, F. A., Grocke, D., & Pachana, N. A. (2012). Connecting through music: A study of a spousal caregiver-directed music intervention designed to prolong fulfilling relationships in couples where one person has dementia.(Report). *Australian Journal of Music Therapy, 23*, 4–21.

Balsnes, A. H. (2010). *Sang og velvære: En kartlegging av eksisterende forskning om sangens effekter* [Singing and well-being: A survey of existing research on the effects of singing]. Norsk visearkiv. https://fido.nrk.no/231ee3afdc6f65e564f566c62df1fc366191ddcf8b25c577700091312af11816/sang-og-velvare.pdf

Barad, K. (2014). Diffracting diffraction: Cutting together-apart. *Parallax, 20*(3), 168–187. https://doi.org/10.1080/13534645.2014.927623

Batt-Rawden, K. B., & Storlien, M. H. S. (2019). Systematic use of music as an environmental intervention and quality of care in nursing homes: A qualitative case study in Norway. *Medicines, 6*(12), 1–21. https://doi.org/10.3390/medicines6010012

Batt-Rawden, K. B., Vegard Berg, G., & Andersson, A.-P. (2021). Music-based environmental therapy and training programme: A qualitative evaluation study, Norway. *Health Promotion International*, daab173. https://doi.org/10.1093/heapro/daab173

Bjørkvold, J.-R. (1992). *The muse within: Creativity and communication, song and play from childhood through maturity* (W. H. Halverson, Trans.). HarperCollins Publishers.

Brown, S., Götell, E., & Ekman, S.-L. (2001). "Music-therapeutic caregiving": The necessity of active music-making in clinical care. *The Arts in Psychotherapy, 28*(2), 125–135. https://doi.org/10.1016/S0197-4556(00)00085-X

Buller, E., Martin, P. K., Stabler, A., Tucker, B., Smith, J., Norton, L., & Schroeder, R. W. (2019). The Roth Project – Music and Memory: A community agency initiated individualized music intervention for people with dementia. *Kansas Journal of Medicine, 12*(4), 136–140. https://www.ncbi.nlm.nih.gov/pubmed/31803356

Chatterton, W., Baker, F., & Morgan, K. (2010). The singer or the singing: Who sings individually to persons with dementia and what are the effects? *American Journal of Alzheimer's Disease and Other Dementias, 25*(8), 641–649. https://doi.org/10.1177/1533317510385807

Clair, A. A. (2002). The effects of music therapy on engagement in family caregiver and care receiver couples with dementia. *American Journal of Alzheimer's Disease and Other Dementias, 17*(5), 286–290. https://doi.org/10.1177/153331750201700505

Clair, A. A. (2016). Music therapy for people who have Alzheimer's disease. In J. Edwards (Ed.), *The Oxford handbook of music therapy*. Oxford University Press. https://doi.org/10.1093/oxfordhb/9780199639755.013.39

Clark, I. N., Tamplin, J. D., & Baker, F. A. (2018). Community-dwelling people living with dementia and their family caregivers experience enhanced relationships and feelings of well-being following therapeutic group singing: A qualitative thematic analysis. *Frontiers in Psychology, 9*. https://doi.org/10.3389/fpsyg.2018.01332

Daley, R. T., O'Connor, M. K., Shirk, S. D., & Beard, R. L. (2017). "In this together" or "Going it alone": Spousal dyad approaches to Alzheimer's. *Journal of Aging Studies, 40*, 57–63. https://doi.org/10.1016/j.jaging.2017.01.003

Dana, D. (2018). *The polyvagal theory in therapy: Engaging the rhythm of regulation*. W.W. Norton & Company.

Daykin, N., Mansfield, L., Meads, C., Julier, G., Tomlinson, A., Payne, A., Grigsby Duffy, L., Lane, J., D'Innocenzo, G., Burnett, A., Kay, T., Dolan, P., Testoni, S., & Victor, C. (2018). What works for wellbeing? A systematic review of wellbeing outcomes for music and singing in adults. *Perspectives in Public Health, 138*(1), 39–46. https://doi.org/10.1177/1757913917740391

Dissanayake, E. (2015). "Aesthetic primitives": Fundamental biological elements of a naturalistic aesthetics. *Aisthesis, 8*(1), 5–24. https://doi.org/10.13128/Aisthesis-16203

Dissanayake, E. (2017). Ethology, interpersonal neurobiology, and play: Insights into the evolutionary origin of the arts. *American Journal of Play, 9*(2), 143–168. https://search.proquest.com/docview/1906351398/fulltextPDF/75F52720A5CC4AA0PQ/1?accountid=45259

Dowson, B., McDermott, O., & Schneider, J. (2019). What indicators have been used to evaluate the impact of music on the health and wellbeing of people with dementia? A review using meta-narrative methods. *Maturitas, 127*, 26–34. https://doi.org/10.1016/j.maturitas.2019.06.001

Eide-Midtsand, N., & Nordanger, D. Ø. (2017). Betydningen av å være trygg: 1. Utviklingstraumatiserte barns affektreguleringsvansker forstått i lys av Stephen Porges polyvagale teori [Affect regulation problems among developmentally traumatized children in the perspective of Stephen Porges' polyvagal theory]. *Tidsskrift for Norsk psykologforening, 54*(10), 919–926.

El Haj, M., Antoine, P., Nandrino, J., Gély-Nargeot, M.-C., & Raffard, S. (2015). Self-defining memories during exposure to music in Alzheimer's disease. *International Psychogeriatrics, 27*(10), 1719–1730. https://doi.org/10.1017/S1041610215000812

Gerdner, L. A. (2005). Use of individualized music by trained staff and family: Translating research into practice. *Journal of Gerontological Nursing, 31*(6), 22–30. https://doi.org/10.3928/0098-9134-20050601-08

Grossman, P., & Taylor, E. W. (2007). Toward understanding respiratory sinus arrhythmia: Relations to cardiac vagal tone, evolution and biobehavioral functions. *Biological Psychology, 74*(2), 263–285. https://doi.org/10.1016/j.biopsycho.2005.11.014

Götell, E., Brown, S., & Ekman, S.-L. (2002). Caregiver singing and background music in dementia care. *Western Journal of Nursing Research, 24*(2), 195–216. https://doi.org/10.1177/01939450222045833

Götell, E., Brown, S., & Ekman, S.-L. (2009). The influence of caregiver singing and background music on vocally expressed emotions and moods in dementia care. *International Journal of Nursing Studies, 46*(4), 422–430. https://doi.org/10.1016/j.ijnurstu.2007.11.001

Hammar, L. M., Emami, A., Engström, G., & Götell, E. (2010). Reactions of persons with dementia to caregivers singing in morning care situations. *The Open Nursing Journal, 4*, 35–41. https://doi.org/10.2174/1874434601004010035

Hammar, L. M., Emami, A., Engström, G., & Götell, E. (2011). Communicating through caregiver singing during morning care situations in dementia care. *Scandinavian Journal of Caring Sciences, 25*(1), 160–168. https://doi.org/10.1111/j.1471-6712.2010.00806.x

Harrison, B. E., Son, G.-R., Kim, J., & Whall, A. L. (2007). Preserved implicit memory in dementia: A potential model for care. *American Journal of Alzheimer's Disease and Other Dementias, 22*(4), 286–293. https://doi.org/10.1177/1533317507303761

Kitwood, T., & Brooker, D. (2019). *Dementia reconsidered, revisited: The person still comes first* (2nd ed.). Open University Press.

Kulibert, D., Ebert, A., Preman, S., & McFadden, S. H. (2019). In-home use of personalized music for persons with dementia. *Dementia, 18*(7–8), 2971–2984. https://doi.org/10.1177/1471301218763185

Leggieri, M., Thaut, M., Fornazzari, L., Schweizer, T., Barfett, J., Munoz, D., & Fischer, C. (2019). Music intervention approaches for Alzheimer's disease: A review of the literature. *Frontiers in Neuroscience, 13*. https://doi.org/10.3389/fnins.2019.00132

Malloch, S., & Trevarthen, C. (2014). Communicative musicality. In W. F. Thompson, A. Lamont, R. Parncutt, & F. A. Russo (Eds.), *Music in the social and behavioral sciences: An encyclopedia* (Vol. 1, pp. 211–215). Sage Publications.

Malloch, S., & Trevarthen, C. (2018). The human nature of music. *Frontiers in Psychology, 9*, 1–21. https://doi.org/10.3389/fpsyg.2018.01680

Myskja, A. (2011). *Integrated music in nursing homes: An approach to dementia care* [Ph.D.-thesis]. University of Bergen.

Nair, B. R., Browne, W., Marley, J., & Heim, C. (2013). Music and dementia. *Degenerative Neurological and Neuromuscular Disease, 2013*(3), 47–51. https://doi.org/10.2147/DNND.S35762

Parmar, P., & Puwar, N. (2019). Striking a chord: Dementia and song. *Performance Research, 24*(1), 25–34. https://doi.org/10.1080/13528165.2019.1593732

Porges, S. W. (2011). *The polyvagal theory: Neurophysiological foundations of emotions, attachment, communication, and self-regulation*. W. W. Norton & Company.

Porges, S. W. (2015). Making the world safe for our children: Down-regulating defence and up-regulating social engagement to "optimise" the human experience. *Children Australia, 40*(2), 114–123. https://doi.org/10.1017/cha.2015.12

Porges, S. W. (2018). Why polyvagal theory was welcomed by therapists. In S. W. Porges & D. Dana (Eds.), *Clinical applications of the polyvagal theory: The emergence of polyvagal-informed therapies* (pp. xix–xxv). W. W. Norton & Company.

Porges, S. W., & Dana, D. (Eds.). (2018). *Clinical applications of the polyvagal theory: The emergence of polyvagal-informed therapies*. W.W. Norton & Company.

Porges, S. W., & Lewis, G. F. (2010). The polyvagal hypothesis: Common mechanisms mediating autonomic regulation, vocalizations and listening.

In S. M. Brudzynski (Ed.), *Handbook of mammalian vocalization: An integrative neuroscience approach* (pp. 255–264). Academic Press.

Quinn, J., Blandon, C., & Batson, A. (2021). Living beyond words: Post-human reflections on making music with post-verbal people. *Arts & Health, 13*(1), 73–86. https://doi.org/10.1080/17533015.2019.1652194

Ridder, H. M. (2007). En integrativ terapeutisk anvendelse af sang med udgangspunkt i neuropsykologiske, psykofysiologiske og psykologiske teorier [An integrative therapeutic application of singing based on neuropsychological, psychological, and psychodynamic theories]. *Psyke & Logos, 28*, 427–446.

Ridder, H. M. (2011). How can singing in music therapy influence social engagement for people with dementia? Insights from the polyvagal theory. In F. Baker & S. Uhlig (Eds.), *Voicework in music therapy: Research and practice* (pp. 130–146). Jessica Kingsley Publishers.

Ridder, H. M., Stige, B., Qvale, L. G., & Gold, C. (2013). Individual music therapy for agitation in dementia: An exploratory randomized controlled trial. *Aging & Mental Health, 17*(6), 667–678. https://doi.org/10.1080/13607863.2013.790926

Rolvsjord, R. (2002). *Når musikken blir språk: Musikalsk kommunikasjon i musikkterapi – et dialektisk perspektiv* [When music becomes language: Musical communication in music therapy – a dialectical perspective]. Unipub.

Sabat, S. R. (2008). A bio-psycho-social approach to dementia. In M. Downs & B. J. Bowers (Eds.), *Excellence in dementia care: Research into practice*. Open University Press.

Sanders, M. (2018). Strengthening the safety circuit: Applying polyvagal theory in the Newborn intensive care unit. In S. W. Porges & D. Dana (Eds.), *Clinical applications of the polyvagal theory: The emergence of polyvagal-informed therapies* (pp. 359–396). W.W. Norton & Company.

Schott, B. H., Henson, R. N., Richardson-Klavehn, A., Becker, C., Thoma, V., Heinze, H.-J., & Düzel, E. (2005). Redefining implicit and explicit memory: The functional neuroanatomy of priming, remembering, and control of retrieval. *Proceedings of the National Academy of Sciences, 102*(4), 1257–1262. https://doi.org/10.1073/pnas.0409070102

Small, C. (1998). *Musicking: The meanings of performing and listening*. Wesleyan University Press. https://muse.jhu.edu/book/1837

Son, G.-R., Therrien, B., & Whall, A. (2002). Implicit memory and familitarity among elders with dementia. *Journal of Nursing Scholarship, 34*(3), 263–267. https://doi.org/10.1111/j.1547-5069.2002.00263.x

Stern, D. N. (2018). *The interpersonal world of the infant: A view from psychoanalysis and developmental psychology*. Routledge.

Stige, B. (2012). *Elaborations toward a notion of community music therapy*. Barcelona Publishers.

Särkämö, T., Tervaniemi, M., Laitinen, S., Numminen, A., Kurki, M., Johnson, J. K., & Rantanen, P. (2014). Cognitive, emotional, and social benefits of regular musical activities in early dementia: Randomized controlled study. *The Gerontologist, 54*(4), 634–650. https://doi.org/10.1093/geront/gnt100

Taylor, E. W., Leite, C. A., Sartori, M. R., Wang, T., Abe, A. S., & Crossley, D. A. (2014). The phylogeny and ontogeny of autonomic control of the heart and cardiorespiratory interactions in vertebrates. *Journal of Experimental Biology, 217*(5), 690–703.

Thompson, Z., Baker, F. A., Tamplin, J., & Clark, I. N. (2021). How singing can help people with dementia and their family care-partners: A mixed studies systematic review with narrative synthesis, thematic synthesis, and meta-integration. *Frontiers in Psychology, 12*. https://doi.org/10.3389/fpsyg.2021.764372

Tomaino, C. M. (2013). Meeting the complex needs of individuals with dementia through music therapy. *Music and medicine, 5*(4), 234–241. https://doi.org/10.1177/1943862113505775

Trevarthen, C., & Malloch, S. N. (2000). The dance of wellbeing: Defining the musical therapeutic effect. *Nordisk Tidsskrift for Musikkterapi, 9*(2), 3–17. https://doi.org/10.1080/08098130009477996

Unadkat, S., Camic, P. M., & Vella-Burrows, T. (2017). Understanding the experience of group singing for couples where one partner has a diagnosis of dementia. *Gerontologist, 57*(3), 469–478. https://doi.org/10.1093/geront/gnv698

Vickhoff, B., Malmgren, H., Astrom, R., Nyberg, G., Ekstrom, S.-R., Engwall, M., Snygg, J., Nilsson, M., & Jornsten, R. (2013). Music structure determines heart rate variability of singers. *Frontiers of Psychology, 4*(334), 1–16. https://doi.org/10.3389/fpsyg.2013.00334

World Health Organization. (2017). *Global action plan on the public health response to dementia 2017–2025*. https://apps.who.int/iris/bitstream/handle/10665/259615/9789241513487-eng.pdf?sequence=1