

## Chapter 29

### Using Singing and Songs to Learn and to Teach:

#### Section Introduction

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Learning and teaching are complex, interconnected and interdependent processes, and there are many factors that can influence and support successful teaching and learning (Ritter, Nerb, Lehtinen, & O’Shea, 2007). To increase the likelihood of meeting pedagogical aims in any discipline or subject area, instructional techniques should aim to efficiently introduce and reinforce material while simultaneously engaging students’ attention and increasing their motivation to learn. Further research into effective methods of teaching and learning is important because current instruction methods are often based on educational theories that may have limited evidence in support of their claims and recommendations. Using the findings of studies in psychology and neuroscience to inform educational practice is an exciting development, but it is important not to leap too quickly from empirical findings to pedagogical recommendations without taking the intermediate step of substantiating whether new, “evidence-based” instructional techniques are effective in the classroom. From a practical perspective, it is also important for any new pedagogical technique to work without requiring a great deal of extra training or preparation on the part of teachers, unless extra resources to support planning are available. Because each learner is unique and brings different cultural backgrounds, experiences, abilities, and motivations to the classroom, in educational contexts teachers must dynamically

take into account the effects of these individual learner differences and may need to modify their teaching methods or materials to enhance the learning process for their students (Ludke, 2010).

Part three comprises eight chapters that explore different questions related to how singing and listening to songs can support learning in other subject areas. To introduce this part, this chapter provides a summary of recent background literature about how song listening and singing has been used to support learning in different domains, offers an overview of findings related to the benefits of doing so, and delves into some of the complexities in attempting to conduct research in this area. It also outlines a framework for future research exploring how and why singing can support learning in a range of areas. It also makes links to specific chapters in this part to invite readers to see these chapters in light of the broader research area.

Serving as an example for readers to consider how educational practice can lead to research and theory development, this chapter begins with a vignette from my own personal experience related to teaching English to adult language learners through songs and singing.

### **Vignette**

*When I first started teaching English as a second language to adults in Harlem, New York City, many of my students wanted to improve their ability to speak in English, as well as their literacy skills, so that they could find a better job. I had always been interested in how to improve foreign language learning, and having a musical background, at various points I had used songs to help teach myself French, German and Spanish. Singing along and learning the lyrics seemed very effective for improving my pronunciation, vocabulary, and spoken fluency, as well as helping me to memorize particular idiomatic expressions and grammatical forms. Given my success using*

*music to learn new languages, I decided to try it with my students. Over the course of the year, we used a range of materials, including simple, a capella songs like “Row Your Boat,” classic rock hits from Frank Sinatra and Elvis, and newer, popular music that they might hear on the radio. I also encouraged my students to find singers and bands that they enjoyed in English and to listen to the music and sing along in order to learn the lyrics and improve their pronunciation and fluency outside of class. Over time, song-based activities and singing songs together seemed to help them learn English, and also created a positive atmosphere during lessons. These teaching experiences inspired me to begin researching whether (and how) listening to songs and singing might support foreign language learning.*

### **Singing, Learning and Memory**

Singing is believed to be one of the earliest forms of music and may have even preceded what we now call human language (Mithen, 2005), since it can effectively communicate emotional information to others about the here-and-now through pitch and rhythmic information. This proto-musical singing or chanting later became formalised into the varied melodies, harmonies and music systems that have been developed in many different cultures. Much of the information that remains about ancient societies comes from ballads that were used to transmit historical and cultural information through song from one generation to the next (Rubin & Wallace, 1989). In the last few decades there have been exciting advances in our scientific understanding of how listening to songs and singing can support learning in other areas, several of which are explored in the chapters in this third Part of this volume.

One important consideration when considering how singing might support education in other subject areas is the extent to which musical and verbal information (presented through language) might be interconnected in the neural processing of sung input and singing production. Similar to speech used for linguistic communication, singing involves many parts of the body and brain working together dynamically to produce vocal sound (Zatorre, 2005; see also Volume 1, Chapter 7, by Cohen & Levitin). Leo *et al.* (2018) found that sung melodies (compared to a spoken version of the narrative) enhanced verbal learning and recall 6 months into post-stroke recovery, particularly for individuals with mild aphasia (see also, Volume 3, Chapter 9 by Särkämö). There is also evidence that hearing background music during the learning process facilitates retrieval of verbal material, suggesting that background music provides a more associative way of organizing and processing the input, rather than relying on “traditional” memory encoding areas (Ferreri, Aucouturier, Muthalib, Bigand, & Bugajska, 2013). These new strands of research add to our understanding of the utility of sung presentation methods and singing as mnemonic aids (Lempert, this volume; Ludke & Good, this volume), which have the potential to support the learning of information across many different subject areas.

As discussed in the Introduction to this volume, singing can be viewed through complex skill learning theory (Ackerman, 1988) and social learning theory (Bandura, 1971), with different contexts affecting which perspective takes precedence; these two models can be seen as interacting with each other in most situations when songs and singing are part of the learning process. In many of the contexts presented in this part, the teacher’s aims for using songs and singing activities to teach another subject are more firmly placed on the learning outcome in a different domain, with relatively less focus on ensuring the learners’ singing development, pitch or rhythmic accuracy. Nevertheless, when new material is paired with music in songs and

singing activities in a classroom, this pedagogical approach is likely to develop the complex skill of singing, provide social learning via feedback from the teacher and other students, and also enhance learning in the specific domain or skill that is being taught. There is also evidence that long-term training in singing using the Kodaly method can lead to improvements in mathematics and literacy skills (Gardiner, this volume).

Thus, the notion of “transfer” is important in many of the chapters discussed in this Part. Defined as a change in learning that occurs in a particular setting or context due to learning learned previously in another situation, transfer effects can be both positive (enhancing the learning of the second skill) or negative (where the first skill learned interferes with later learning of the second skill). As applied to education, Bransford, Brown, & Cocking (2000) argue that learning is an inherently active and dynamic process that always involves the transfer of prior learning (which goes beyond rote memorization into a more in-depth understanding) to solving new problems or learning information or skills in future situations.

### **Singing and Song Listening to Support Learning in Other Areas**

A number of reasons have been put forward for the possible benefits of using songs to support learning and memory in the classroom. This Part summarizes our current understanding of some of the ways that listening to songs and singing can support learning and memory in other domains, while developing the learner’s skills in areas reaching far beyond the specific content or “test” material that the teacher may be focused on when using a song in a particular lesson.

### **Training the auditory processing areas of the brain**

As highlighted in Volume 1 and Chapters 1 and 2 of this volume, our early experiences with singing and songs have long-lasting effects on brain structures and processing. The last 20 years of research have led to the identification of cortical substrates that are specific for the sensory-motor control of singing pitch and are sensitive to the amount of vocal training (Zarate, 2013). Tone-deaf individuals have difficulty discriminating emotions conveyed by different pitch contours in speech when they were unable to rely on the linguistic information (Patel, Foxton, & Griffiths, 2005), whereas musicians perform better and more quickly than nonmusicians at perceiving small prosodic pitch incongruities (increased by 35%) in an unfamiliar foreign language (Marques, Moreno, Castro, & Besson, 2007). There is also evidence that musician non-tone language speakers have more accurate brainstem responses to pitch contours extracted from linguistic tones, compared to non-musicians (Wong, Skoe, Russo, Dees, & Kraus, 2007). Thus, even early in life, listening to songs and music can enhance and “fine-tune” auditory processing more generally.

### **Attention and memory**

There is evidence that during song or music listening, it is enjoyable to make successful predictions about when a new sound or phrase will occur, based on greater fMRI activation of the reward centers of the brain (Salimpoor, Zald, Zatorre, Dagher, & McIntosh, 2015). The beat, rhythmic features and melodic aspects of the musical structure can all enable the learner to predict *when* the next piece of input will appear, and after becoming more familiar with the piece, *what* sound to expect; this is also supported by the previously mentioned research showing enhanced brainstem responses to lexical tones in musicians (Wong et al., 2007). Correctly

making these predictions about what is coming next, in turn, may support the brain's ability to sustain and to effectively direct attention (Sridharan, Levitin, Chafe, Berger, & Menon, 2007). This improvement can be so strong that music has been used to train and expand learners' attention span (Lai, Lai, & Chiang, 2015).

There is also evidence that initial memory encoding and memory for verbal material may also be improved due to the rhythm and meter, rhymes and melodies found in songs (Tillman & Dowling, 2007). Their experiments suggest that the rhythm and rhyme structure of poetry (and similar features in music) are important at the initial encoding stage, perhaps through chunking that helps to bind different features of the stimuli into a coherent whole, so that memory does not decrease as precipitously over time. For verbal learning, it has been shown that with young children, combining more than one retrieval cue for memory, such as using illustrations, rhyme, and music, can be more effective than using one type of input in isolation (Ziegler, 2007).

A verbal memory benefit, particularly for speaking tests, was observed for a "listen-and-repeat" Singing condition after three presentations of foreign-language material (Ludke, Ferreira & Overy, 2014), both immediately after the learning period and after a short delay. This suggests that the benefits observed in the native language for musical features to better support and sustain verbal learning and memory over time (Gardiner, this volume; Tillmann & Dowling, 2007) can also occur for verbal material in a foreign language (see chapters by Kulset; Lempert; Ludke & Good, this volume).



### **Involuntary rehearsal**

It has been proposed that when rhythm and melody are used to help “chunk” verbal material, this is more likely to lead to involuntary rehearsal and the transfer of the song lyrics into memory.

Variously named as “earworms” (Kellaris, 2003) or the “song stuck in my head” phenomenon (Murphey, 1990)—a musical version of “din” (Krashen, 1983)—in which words, sounds and phrases that have been heard, read or written are rehearsed involuntarily, occurs significantly more often in a sung presentation than in a spoken version (Salcedo, 2010; Ludke & Good, this volume). Typical attributes of musical earworms are:

- The structure of the song is simple and predictable (Kellaris, 2003);
- The melody line is symmetrical, often consisting of a rise in pitch, followed by a fall, and the end of the chorus, song or phrase leads naturally back to the beginning, making it more likely to repeat in your head (Kellaris, 2003);
- The rhyme scheme of the lyrics can facilitate recall (Rubin & Wallace, 1989).

The musical characteristics listed above all seem likely to enhance learners’ memory-based predictions. In other words, if the learner can more easily predict what word will come next because they remember the melody of the song, that may in turn improve memory retrieval of verbal material which is paired with that melody.

This evidence for involuntary rehearsal leading to the more effective learning and memory of song lyrics fits with the dual integration hypothesis, which proposes that listening to songs may lead to the dual encoding of lyrics and melody, where the recall of one element can prompt retrieval of the other (Ginsborg & Sloboda, 2007; Thiessen & Saffran, 2009). Thus, it is possible that part of the reason listening to songs and singing may enhance learning in other areas because

the pitch and rhythmic structures, patterned with the syllables and words that are repeated in the lyrics, can provide better initial memory encoding and later retrieval through the paired melodic-linguistic cues (Ludke & Good; Lempert).

### **Motor and physical development through singing**

Singing involves the entire body and develops both fine and gross motor skills and coordination (Countryman & Gabriel, this volume). Similar to, but more extensive than what is required for speech, effective singing in a group requires not only finely tuned auditory discrimination, but also fine muscle skill memory and coordination, control of breathing, rhythmic and timing skills. In classroom settings, many singing activities and musical games are accompanied by spontaneous or expected clapping and/or rhythmic hand-clapping, movements, dancing, gestures, and so on, which all develop learners' sense of beat and rhythm as well as gross motor skills. Interestingly, Gilleece (2006) found that children's productive rhythm skills were correlated with language learning ability, even after controlling for the effects of IQ. Thus, singing and musical activities on the playground or in the classroom have the potential to transfer to other aspects of motor skills and physical development (Countryman & Gabriel, this volume), as well as pronunciation, language-learning, and reading skills (Cornaz, Caussade & Groff; Ludke & Good; Gardiner, this volume).

Furthermore, in a classroom setting, active learning is often more effective than passive learning (Barker, 1999; Iwata, 2005; Michael, 2006), although there are examples of complex skills, such as dance moves, that can be learned through concentrated observation (Grafton & Cross, 2008), and behavioral rehearsal or practice does not improve learning in every task (Colvin Clark & Mayer, 2008). There is also classroom-based research using musical mnemonics to support

children's spelling skills which suggests that it is important to repeat the material during learning, at least sub-vocally (Gfeller, 1983). In addition, one pre/post-test study conducted with young English as a Second Language learners (Schunk, 1999) showed that vocabulary learning was greatest for instruction through singing and signs in American Sign Language (ASL), followed by a condition that learned vocabulary through speaking with ASL signs; the singing-without-signs condition also showed significantly higher performance at post-test than the speaking-without-signs condition. Singing or chanting can also be effective in coordinating movements in sports teams, such as rowing, or when workers are engaged in physical labor.

### **Emotional and social benefits of singing and song listening**

Emotions have long been recognized as vitally important in education, with strong emotions at the time of learning or of an event, leading to a dramatic increase in the likelihood that detailed information will be stored in long-term memory, due to the greater brain activation and coordination between the amygdala and hippocampus that occurs with strong emotions (McGaugh, 2004; Richter-Levin & Akirav, 2000). Rather than purely arising due to a positive emotional response that can occur when someone listens to upbeat, happy music, there is in fact evidence that certain types of music can gain and keep participants' attention better than speech (Baldwin & Lewis, 2017; Cirelli, Trehub, & Trainor, 2018), resulting in a more effective overall learning state that enables learning to occur without attention being, for example, solely focused on what the learner needs to know for a test.

There is also growing awareness of the social, emotional and hormonal benefits of group singing in particular, which can reduce cortisol levels (associated with stress) and increase oxytocin

levels, which are associated with social bonding and love (Kulset, this Part). There is also evidence that 4-year-old children are more socially cooperative after taking part in a short musical game involving singing (Kirschner & Tomasello, 2010), which further supports the value of singing and musical games in education. It has also long been argued that incorporating songs into the curriculum (whether as background music or as part of the lesson) can set a positive classroom tone and may provide affective or motivational benefits for learning (see Cornaz, Caussade & Groff and Ludke & Good, this volume).

Thus, it is possible that song-based musical activities enhance learning due to positive emotions or enhanced motivation that lead to an improvement in attention, as well as decreasing students' performance anxiety. It is also possible that incorporating music or song listening and singing into the curriculum can lead to relaxed, creative problem-solving (Ritter & Ferguson, 2017). Having positive educational experiences and knowing how to apply effective learning strategies are also likely to transfer to subsequent learning. Being successful, having fun and enjoying learning without constantly thinking about "the test"—which can all be facilitated by singing and musical activities—may in turn lead to improvements in learners' self-esteem and self-confidence, both academically and more broadly due to the reciprocal relationship between them (Trautwein, Lüdtke, Köller, & Baumert, 2006).

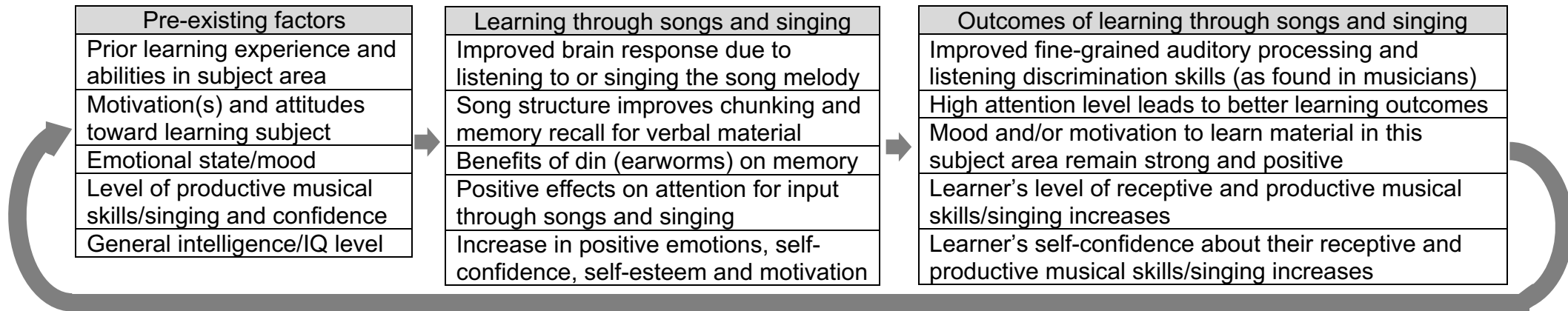
### **Framework for research into singing to support learning in other areas**

Figure 29.1 shows a framework (adapted from Ludke, 2010) for how listening to songs and singing can support learning in other areas, which it is hoped may help direct future research. Each learner brings his or her learning experience (in that subject area or topic, as well as more general experiences of education), their motivations (intrinsic and/or extrinsic) and their attitudes

toward learning that subject, their present emotional state or mood, their prior musical experience and abilities, and their general intelligence (Mayes, Calhoun, Bixler, & Zimmerman, 2009) to a specific learning situation in a particular context. This framework proposes that, through one or more underlying mechanisms (described in the middle section of Figure 29.1), incorporating songs and singing into the curriculum when teaching other subjects may:

- improve a learner's fine-grained auditory processing and listening discrimination skills (as found in musicians);
- support higher attention levels, leading to better learning outcomes for the material;
- maintain stronger and more positive mood and/or motivation to learn that subject;
- increase the learner's level of receptive and productive musical skills/singing; and
- increase the learner's self-confidence about their receptive and productive musical skills/singing.

Fig. 29.1 Framework for future research exploring how singing might support learning



Because many of these positive outcomes of incorporating songs and singing into the learning process form part of what each learner brings to the educational context and learning situation (in the first section of Figure 29.1), this can create a positive feedback loop or a “virtuous cycle” that leads to improved learning in these subjects and skill areas over time. While at this stage it is clear that many questions remain, it is hoped that this framework can provide useful directions for future investigations into the effects of singing, listening to songs and engaging in related musical activities, and even creating new songs, on learning in a diverse range of skill and subject areas.

### **Summary of this Part**

The chapters within this final part of the book focus on the applied effects of singing as a method of instruction and as a way to express the outcomes of learning in a range of different domains. Subjects such as mathematics, reading and literacy, phonetics, and other foreign language skills can be facilitated through singing-based learning methods, particularly when song materials and singing are used during childhood.

Martin Gardner opens this part with a longitudinal, empirical chapter showing long-lasting academic benefits of singing instruction (using the Kodaly method) particularly with primary school children who are facing disadvantage, in this case poverty, and theorizes about how and why this type of singing-based musical training can support cognitive development.

Many of the chapters that follow report on various projects involving singing as a method for improving language learning, social development, and (inter)cultural understanding. Nora Kulset looks at the social and emotional aspects of singing together as a way to create friendships

among preschoolers across different languages, drawing on evidence and theories that explain how a feeling of empathy arises through shared singing and music-making.

In our chapter, Arla Good and I describe two short-term, quasi-experimental studies that investigated singing in a new language as a way to support second-language vocabulary and grammar learning in primary and secondary school classrooms. Drawing on experimental evidence and theory, some potential mechanisms for why singing and song listening may benefit foreign-language skills are proposed.

Henrietta Lempert's experimental study examines the efficiency of L1-Chinese speakers' learning of grammar in a novel, artificial language through a song-based instruction method.

Sandra Cornaz, Diane Caussade and Vincent Groff review theories, research and methods for teaching L2 French phonetics, linguistic stress and prosody through singing and music. One interesting finding from their work suggests that it is unnecessary to have had intensive musical training to increase a learner's pronunciation abilities through the use of singing and music integrated together with language training.

June Countryman and Martha Gabriel's chapter explores young children's spontaneous singing and vocal play accompanied by movement on the playground. They discuss multimodal theories related to children's communicative intentions and motivations for these artistic vocal-and-movement play behaviors. The chapter also refers back to themes highlighted in Part 1 and in Kulset's chapter, drawing attention to the fact that alternating between speaking, singing and movement are natural and ubiquitous in children's play, and that singing can both make meaning but also initiate or extend social interaction.



Kathy Liperote then discusses how singing is used in instrumental music instruction as part of audiation practice, for example in sight-reading. Likening audiation in music to thinking in language, she argues that we can assimilate and comprehend music that was just heard or heard in the past, and that it is through audiation that we give meaning (comprehension) to music.

Finally, Gadanidis and Scucuglia write about how to enliven and celebrate successes in mathematics learning through the incorporation of composition and singing new songs. Rather than using music as a representational context to help students better understand mathematics concepts, such as ratio and proportion, or song as a mnemonic device for remembering mathematical processes like long division or the factoring of trinomials, this chapter describes song as a form of human communication that helps us share our emotions, experiences and intentions.

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