

Vowels—Sonic Gems of Emotion for Social Communication: Practical Singing Strategies for Non-musician Teachers with Developmentally Diverse Young Children

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Abstract Communicative and social capacities are known to be of primary developmental importance to all children and often present a particular difficulty for children with neurodevelopmental disorders. A recurring challenge for teachers is achieving effective communication with children who span developmental diversity (e.g. inclusive settings or those with a range of special needs) while using practical strategies that feel manageable to the teachers themselves. Music, a powerful affective medium, is appealing to all children and has the inherent flexibility to reach differing individuals. Thus, it is especially valuable for children with autism and other special needs. However, teachers without musical training may miss a great deal of music's potential benefits. The author describes an affective singing technique that, while grounded in vocal practice and music theory, uses an overt focus upon vowels—vowels being known conveyors of emotion in sounded communication. This natural port of entry offers non-musician teachers a simple and accessible way to incorporate live singing into daily activities that opens space for two-way affective communication, a crucial component of social development. Key concepts in this paper are elucidated by childhood instructional and play scenarios and graphics. The discussion is supported by published behavioral and imaging research.

Keywords Music · Singing · Vowels · Relational · Neurodevelopmental disorders · Preschool teachers

While social capacities of engagement and communication are known to be of primary developmental importance to all children, they often can be particularly difficult for children with neurodevelopmental disorders (American Psychiatric Association 2013). Singing, whether self-produced or heard from others, is known as a pleasurable and fruitful experience that garners attention and engagement from all young children. Important qualities of music in childhood development are its flexibility and appeal in a medium that also supports emotional growth, communication and social relating.

Within the medium of singing, vowels—functioning as sonic gems of emotion—may help non-musician teachers facilitate rich relational strategies that are particularly effective with mixed groups of developmentally diverse children. Whether a particular child responds, in turn, with singing or other explicit musical behavior is not the goal of the interaction. Rather, the aim of this strategy is to enable the *teacher's singing* or other vocalizations, enhanced through attention to vowels, to spark a child's attention, engagement, communication, and social reciprocity.

A View of Teachers' Singing in Classrooms

From the myriad musical activities preschool teachers choose, a review of surveys and observations points to singing as one of the most frequent and valued (Gillespie and Glider 2010; Tobin et al. 2011). Moreover, in suggested uses of music for early childhood teachers, drawn from professional literature spanning 15 years (1985–2010), singing has been most frequently suggested for musical expression of classroom management and non-musical learning (Lee 2012). For classroom teachers, singing assumes many forms and has a variety of goals, such as

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large group recreational singing, finger plays, individual emotional regulation, support of cognitive skills, literacy, social skills, and overall well-being. Singing during transitions soothes children during change (Mathews 2012). At larger schools music activities often fall upon classroom teachers who, unlike music specialists, are more likely to use it for “non-musical” goals (Nardo et al. 2006).

Worth singling out are activities related to early language development. Long paired with singing (Chen-Hafteck 1997), more inventive ways emerge as research clarifies music’s potential role for young learners. Teachers make use of words, sounds, rhymes, and rhythmic patterns with aural and oral integration of songs and literacy skills (Wiggins 2007; Green et al. 2006). Creating original story songs is a teaching tool that involves adapting stories and elaborating songs (Ringgenberg 2003). Jalongo and Ribblett (1997) highlight the whole genre of song picture books such as “Old MacDonald.” Their use fosters connections between singing, pictures, reading and writing—all simultaneously contributing to emerging literacies in music and in print.

A literature review confirms that various factors influence the nature of teachers’ singing interactions with their students. Examples include the prevalence of active singing in the culture from which teachers are drawn; curriculum preparedness; and socio-cultural norms. For instance, while American teachers choose singing over other possible musical activities and value its effect on children’s affect and learning, they often state their own need for more training and self-report low confidence in their singing abilities (Moore 2002). Musical preparedness of American teachers is comparatively weak, and the teachers come from a culture in which being involved with music personally is often a receptive (i.e., listening) rather than active music-making process. This is in stark contrast to, for example, the Venda culture (Blacking 1973) of present day, post-apartheid South Africa, which has managed to keep alive its vibrant music traditions as a society even as it merges and is challenged with its new “rainbow” identity. Venda children sing vociferously with their teachers as well as with each other and there is an over-arching musical fabric of life (Emberly 2013).

Japanese preschool teachers place top value on singing. Like American teachers, they lead children in singing frequently and with a variety of songs throughout the calendar year. Both piano and voice are a solid part of Japanese preschool teachers’ training. In contrast to North American emphasis on individuality, Japanese teachers consistently engage the class group as a whole during singing. They do not encourage modification of song lyrics by specific children since singing, as a reflection of Japanese culture, is considered to be an act of social unity (Adachi 2013; Tobin et al. 2009).

Descriptions from the literature highlight the affective, ritualistic, and pedagogical uses of teachers’ singing. Variables also explain certain of its strengths and weaknesses, giving the present approach a context.

Singing Techniques can Support Agendas

As many preschool teachers often use singing for musical activities in their classrooms, the singing practices recommended here may dovetail with agendas while naturally facilitating communicative and social issues. However, teachers without musical training or without a relational-musical perspective, may miss much of music’s unique potential benefits. They are not familiar with the nuanced expressions that arise from study and play with musical elements (e.g., rhythm, melody, volume, tempo, tone color, etc.) Nevertheless, as detailed here, there are simple techniques that classroom teachers (with or without music training) could accomplish and apply to their interactions with typically-developing children and with young children having special needs who may all be grouped together for instruction or play. The suggested purposeful use of sung vowels is particularly valuable in diverse constellations to support teachers’ emotional statements, co-regulate through signals, show attunement and, in turn, elicit responses from children because they have internalized communications with more ease.

Simple Objectives

The efficacy of these sound effects, which are embedded in the present approach, arise from the nature of acoustics, musical elements, and vocal production. Three practical, rudimentary objectives for communicating affect by early childhood teachers are suggested:

1. Use of affect through vocalized exclamations
2. Use of affect through simple songs
3. Use of affective singing for transitions.

The relational significance of these objectives is examined in the following sections. Specific illustrations related to classroom activities, practice tables and figures, based on the author’s experience and relevant published scientific research, are also included.

Appeal of Music, Especially Singing

Almost all young children love music (Dansereau 2011), and children with various special needs have been found to be responsive to it (Hallam and Price 1998; Levitin et al. 2003; Nordoff and Robbins 1983). One explanation for its

heightened appeal may be that sound patterns found in music are comparatively simpler than those in speech. Musical patterns require slower brain processing speeds than speech patterns (Zatorre et al. 2002). This simplicity is especially true in traditional children’s music with its repetitive musical patterns. Moreover, recent neuroscience research validates music’s powerful role in eliciting emotions, including the initial stage of garnering attention in autism spectrum disorder (ASD) (Heaton 2009; Molnar-Szakacs and Overy 2006).

Evidence about the power of singing converges from diverse scientific angles. For example, when researchers exposed listeners to vocal and instrumental renditions of the same tunes, enhanced memory for vocal over instrumental music was demonstrated (Weiss et al. 2012). In another investigation, levels of the hormone cortisol measured in infants under differing conditions revealed that live maternal singing is more supportive of arousal than speech (Trehub and Nakata 2002; Shenfield et al. 2003).

Live singing, in particular, is a healthy relationship-builder due to the adaptability of musical elements and their effect in the present moment (Weeks 2009). Colwyn Trevarthen and Niki Powers state “... the voice, driven by the movements of breathing, gives the richest and the most intimate and immediate information on our inner state of mind and body.” (Powers and Trevarthen 2009, p. 214).

Vowel Sounds Convey Emotions

When adults sing live to children—whether to playfully sing out directions, as in “If you’re Happy and You Know It,” that drives hand clapping and foot stomping; to lead them in a game (“We all fall down,” found at the end of the timeless early circle game, “Ring Around the Rosy”); to soothe as in the French lullaby “Fait dodo, Colas, mon p’tit frère” with its lilting dance rhythm; to march; or to signal lost and found in a peek-a-boo, there is a simple technique to effectively alert, engage, and attune to the children. This is accomplished by adjusting vowels to emphatically convey the intended message. It is a fact, as long known by trained singers and actors and, more recently by scientists, vowels are the sound in singing (and speaking) that convey emotions (Powers and Trevarthen 2009). This can be used to teachers’ advantage when eliciting changes in their own sounds as they sing-song or fully sing—conveying cheer, sadness, calm, joy, assertion, amusement, mystery, and more.

The only way to sustain a truly flexible vocal sound is upon a vowel, which is cast upon unimpeded breath. One may try holding out the sound of a consonant—‘b’, for example. The only result is short puffs of “buh, buh, buh.” Using sibilants, you can play with rhythm and volume, but

just try to sing a tune on “s”! Nasal consonants, such as ‘m’ and ‘n’ also sustain sound but do not serve a variety of effects, though they are important in selected languages. However, by speaking or singing the vowel sound of the letter ‘o’ one can sail away with that sound for as long as breath supports it!

No wonder so many songs begin with a “pick-up beat” on the sound of the exclamation “Oh”—e.g. “Oh, say can you see,” the opening of “The Star Spangled Banner.” In common language the term “up beat” (*anacrusis*) is an unaccented note(s) that foreshadows a strong “down beat.” It can occur anywhere in a composition, but we are most aware of it at the start of a song. The singer can set up a snappy tempo, or dawdle before settling into the anthem, for example. Immediately, a mood gets established—crisp or languid—with just the execution of that simple vowel sound.

A valuable characteristic of vowels is that since they can be sustained, they are open to all kinds of “color.” Color

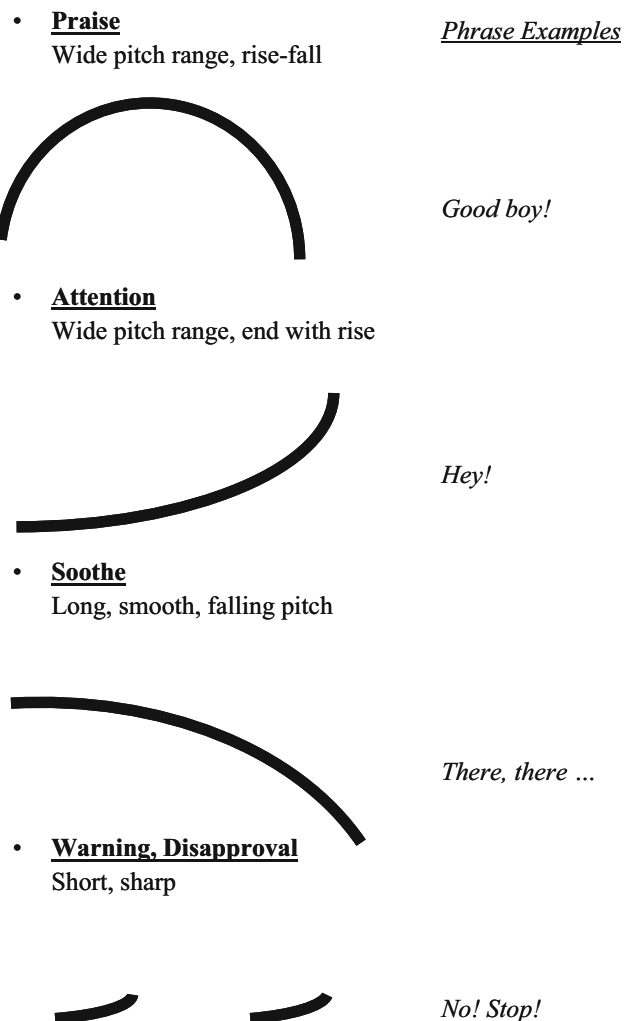


Fig. 1 The shape of a vocalized sound conveys a message. *Note* Based on the research of (Fernald 1992)

(*timbre*) is often thought of as the unique identity of different instruments, for example, how a flute sounds is distinctive from a trumpet. But the human voice is also a wizard of producing wide-ranging *timbre*. We have all experienced the power of *timbre*, either as a recipient of it, as a giver or both; it occurred when we were either babies or became parents. Not co-incidentally, many early sounds that express ideas and affects such as soothing, calming, surprise, or prohibition (See Fig. 1) occur on vowel sounds (Fernald 1992). While contour (e.g. rising vs. falling) of a sound and timing play important roles, the color of the vowel sound can greatly clarify one's intent.

Human companionship is first played out in such highly affective mother-infant vocalizations (Stern 1985). We are able to inform our approaches with older children and special needs children in particular by the clarity of form and effect of what has aptly been coined “communicative musicality.” This refers to highly expressive musical qualities and prosody as Malloch and Trevarthen (2009a, b) found to be in place before formal language developed.

Enhancing Color in Exclamations or Interjections

Timbre is one element of prosody embedded in speech, sound effects, or singing. Different colors of sound associate to non-verbally expressed meanings which can then be layered upon the words themselves. Choices of vocal qualities abound, such as brassy, squeaky, whispered, nasal, breathy. Remarkably, the affective sentiment and meaning expressed through *timbre* can be perceived in as little as a single musical sound (Koelsch 2013). Moreover, empirical research supports the notion that children with ASD are responsive to changes of musical *timbre* (Heaton 2009).

The following are two illustrations of simple, effective prosody in speech-like vocalizing. In the first scenario a 5 year-old girl has finished a difficult puzzle that took top-notch spatial figuring and persistence. The teacher produces a long “ah”—a non-verbal commentary—that starts on a high pitch, rises higher and descends slowly, and is bright and clear in tonal quality, reflecting joy to the child about what she has accomplished. The prosodic sound, together with an accompanying smile, has thus been paired with another non-verbal signal to produce a powerful effect.

In the second situation a boy has reacted to the teacher's second request to hang up his back-pack and hat by putting only his back-pack on the hook and then hurriedly aiming his hat so that it drops on the floor; he turns to run off. The teacher knows that even though he has genuine difficulty with motor planning and task organization, he is capable of doing this right. She responds with a burst of “uh” (the more closed than “ah” vowel sound), thus: two shorts and a long: “uh, uh, uh—.” “No way, buddy,” she is saying, but

Table 1 Example of a teacher's affective singing to initiate a transition

The action and responses	Teacher: Communicates with an Initial Sung Vowel Children: Alert, Attend, Engage, Anticipate, Enjoy, Gather Vitality
The situation	The children have been in free play time and are scattered all over the room. They are occupied with others and with toys. You want them now to put the toys away in order to go to a new classroom activity
The solution	Don't use the old way: Just start singing a familiar clean-up song, (“Clean up, clean up, time to put your toys away”) Use the new way: Precede the verse with “Oh” as a vowel-based pick-up beat to the song (as the start of The National Anthem, “Oh, Say Can you See,” detailed earlier) <i>Draw out</i> that one sound on “Oh” until you've got everyone's eyes looking to your eyes; you may even take a breath to keep holding it while you pick up the stragglers While you're holding the tone (you can bet you'll get attention!) you can help by pointing to a child's eyes (go near if necessary) and then point to your own eyes, indicating ‘watch me’, as you are singing that long “Oh.” When you're ready to go, launch into the song verse with a good breath and all the purposeful release that follows a long wait and anticipation. Use your arm for the downbeat, and the children may well be likely to sing along and be primed with vitality to clean up
Why it works	Vocal expressiveness receives human attention—it's our biology (Porges and Lewis 2010) Vowels carry sustained sound and reflect emotion and intent (Powers and Trevarthen 2009) Vocalizations communicate regulation in social encounters (Panksepp and Bernatzky 2002) Sustaining the opening sound in this manner is novel and attracts attention Anticipation is a great emotional/biological magnet for whatever follows, in this case, the Clean-Up Song (Huron 2006)

without words; her disapproval is expressed but couched in gentleness that invites (and expects) him to try again.

In these examples, whether the teacher subsequently adds words, she has already non-verbally communicated her emotional tone and stance very well to each child. Basic preverbal communications with children who have special challenges, such as the young boy, are more likely to be received by him (heard and listened to) than a string of words. Indeed, they may possibly be imitated and/or stored in both body and memory along with other aspects of the caregiver's communication, such as words, gestures, and facial affect. Psychologist Serena Wieder, co-founder with Stanley Greenspan, MD, of the developmental intervention approach known as DIR[®] (Developmental, Individual, Relational) notes, “The voice is probably the most

Table 2 Enriching songs with vowel play and multi-sensory modalities

Song verse*	Description	Vowel play	Add sensory modalities
<i>Los Pollitos Dicen</i> (verse 1)	A beloved Latin American song	“Pio, pio, pio” with its diphthong of “ee” and “oh” sounds are perfect to either stretch into lingering whines, or vary as clipped, pitiful baby cries	Facial expressions of sadness and appeal Hand(s) wiping away pretend tears
Los pollitos dicen Pio, pio, pio Cuando tienen hambre Cuando tienen frío	Little chicks cry (“pio, pio, pio”) to mama when they are hungry and cold		
<i>Yuki (Snow)</i> (Japanese in Romaji)	A popular Japanese children’s song	The first two lines mean “snow is falling; hail is falling”	Light, wafting finger, arm motions for snow falling; tapping fingers onto open palm for hail
Yuki ya konko, arare ya konko futte wa fute wa zunzun tsumoru yama mo nohara mo wataboshi kaburi kareki nokorazu hana ga saku	About snow and hail falling, covering the trees, creating snow hats and flowers	They can be distinguished by stage-whispering about snow versus louder, staccato sounds for hail	Tap beat lightly on the rest of the song for continuity and flow
<i>Bell horses</i> Bell horses, bell horses What’s the time of day? One o’clock, two o’clock. Time to run away	Mother Goose from Great Britain, originally paired with children’s racing starts and as dandling/bounces for babies	Like a trumpet heralding, sing or chant “one” and “two” (o’clock) with brave, bright, open vowels sounds: “ah” for “one” and “oo” for “two” That will build anticipation of the clippety-clop style sound of “time to run away”	Head and upper body bounces to beat Cup mouth to announce “one o’clock, two o’clock” Alternate hand taps on last line to imitate horse running

* These tunes can be heard by searching their titles on publicly accessible audio-visual sites, such as www.youtube.com or www.mamalisa.com

powerful tool you have to cue your child. Whether or not he understands the words, the message comes from the tone, and the rhythm, and the loudness, and the pacing of it.” (Greenspan 2004).

Using singing (versus speech) to communicate with colors is particularly rewarding because the pitch one is singing can be held steadily for a longer time before it changes to a different one. In contrast, pitch within speech shifts constantly and quickly, sometimes even within one syllable (Ladefoged 2005). Therefore, playing with and hearing the color of words can be accomplished more readily in singing than in speech.

Expressive Vowel Sounds in Simple Songs

Many classroom teachers sing hello to a group of children, but not all sing hello to each child. Such singing can be an individual affirmation and a chance to communicate exclusively, establishing a unique affective relationship even within a group. For example, a child named Dana appears a little sleepy one morning, yawning and rubbing her eyes. The teacher may want to pull her in while also acknowledging her sleepy state. She may accomplish this by letting her vowel sounds in the words be not only quieter but also longer. She can draw out the first vowel sounds (i.e. the sound ‘eh’ and ‘oh’ in “Hello”) and continue in the same way with the rest of the vowels (i.e. the

‘eh’ and ‘ah’ in “Dana” and so forth.) At the end of the song’s last phrase (“We’re glad to see you here”) even more of a lengthening of the final vowel “eh” in “here” is an effective cadence for the mood. What the teacher is essentially accomplishing musically is a slowing of tempo, which, affectively, offers an attuned soothing sound linked to Dana’s sleepy self-state.

In another related scenario, a teacher wants to reach a child who is not showing much emotion by gently invigorating her. She makes her sound a little mysterious by using a playfully darker tonal color, communicating “What’s up with you?” Darker color comes with making more closed sounds on the vowels, for example, the ‘o’ in “Hello” sung with rounded, somewhat protruding lips and leaning closer to “ooh” than a plain “oh.” The less frequently heard darker *timbre* is more likely to get a child’s attention due to its novelty.

Preschoolers are often led to sing about other daily events, such as the weather and days of the weeks. Many other themes can be put into simple songs (Nordoff and Robbins 1983) infused with affect, including: counting the number of children present; spelling children’s names; naming the children’s clothes; colors; feelings; seasons; and safety.

Affective Singing in Transitions

Whether lining up or cleaning up, it’s not uncommon for young children, especially those who are more rigid about

Fig. 2 Sonic gems—practice possible shapes of vowels

<p>Try this for Practice:</p> <ol style="list-style-type: none"> 1. With your finger touch or trace the “gems” one by one, taking note of each shape 2. Repeat, this time while also <u>singing the corresponding vowel</u> (boxed on the left) by vocally imitating each shape, one by one. 	
<p>▪ Sing it very short in duration</p>	
Ah!	
<p>▪ Sing it long, and longer, in duration</p>	
Ah ___ Ah _____	
<p>▪ Change pitch (high, medium, low)</p>	
Ee Ee Ee	
<p>▪ Sing smoothly up and down</p>	
Ah _____	
<p>▪ Sing disconnected and sharply up and down</p>	
Ah! Ah! Ah!	
<p>▪ Sing quietly</p>	
oooooh	
<p>▪ Sing loudly</p>	
OH _____	
<p>▪ Sing softly and burst into loudness</p>	
oooooh ___ OH ___	
<p>▪ Sing a spooky sound</p>	
OoOoOoOooh	
<p>▪ Sing a calming sound <i>Slow, down, ever-softer, smooth</i></p>	
Ah _____	

change, to have difficulty as they move from one activity to the next. Directives that are made in a busy or noisy environment can be difficult for children to process, particularly so for children with ASD (Russo et al. 2009).

To ease transitions teachers often make use of visual aids, such as charts showing daily schedules. Such familiar aids can be well supported by affective singing. Combining the visual representation with singing or chanting is likely to be much more effective than spoken commentary, which can get swallowed up by the texture of background sounds. Singing, by its musical nature, will be more alerting and engaging. Singing in that situation will also deliver an additional mode (i.e., hearing) for communication,

reinforcing support of individual differences in sensory processing (Baranek et al. 2006).

Details for using an everyday exclamation, “Oh,” to direct attention to a familiar song are shown in Table 1. There we consider an expressive vowel’s function before a customary transition song, namely, for clean up. The children may immediately recognize the song and, indeed, know its intended meaning, but without an attention-grabber, they may be likely to tune-out or ignore it. Table 1 gives details and also provides further understanding about some of the biological and behavioral stimuli in expressive singing that can move listeners from mindless habituation to a positive response in attitude.

Multi-modality Strengthens Relational Singing

The rich multi-sensory communication that begins with mother-infant dyads is characterized by single communications that are conveyed by parallel signals from different sensory channels (Gogate et al. 2000). It is a clear template that helps us see what pathways can be used, and that is valuable not only when relating with special needs children, but also when establishing uniquely-tailored back and forth communication with any child.

Children continue to actively use multi-modal forms of communication into early childhood years with certain modes being unique, for example, gestures being used for meaning that children know but cannot express in words (Flewitt 2005). Besides gestures, other strong multimodal supports teachers can use with singing are body stance; personal space (nearness and distance); gait; eye contact; facial expressions; and sounds beyond basic speech, such as laughter, whines, moans, whoops, and humming. See Table 2 for practice suggestions in expressive sounds that are linked with other modalities in songs or chants.

Sing, Listen, Adjust, and Sing Again

Many anatomical descriptions could be given, such as those that teachers of singing or theatre coaches give for how to produce these different sounds. But the effects of the “oral-auditory-motor” feedback loop—meaning, “you sing it-you hear it-your vocal tract adjusts per your mind’s intent”—works surprisingly well and quickly (Jones and Munhall 2005) Practicing these variations of sung sounds (See Fig. 2) automatically exercises not only one’s own hearing, but also one’s breathing and the muscular mechanisms involved in the vocal tract that are needed to produce them (Erdemir 2010).

In class teachers will also set into motion live interactions and thereby, with the children’s actual reactions and responses (which may possibly, but not necessarily, be vocal—look also for body changes, facial expressions, etc.), their own feedback loop will grow stronger from the power of real-time experiences.

Conclusion

Non-musician classroom teachers who consciously keep these goals in mind, practice on their own, and enjoy them in live class circumstances will have an opportunity to elevate simple and natural singing to a more skillful, affective level. Such singing works alongside almost any classroom activity and can be applied to whole songs, to sound effects, to repetitive vocalized accompaniments in

storytelling, and to short individually reinforcing phrases as commentary or paired with activities and transitions.

Relational strategies in this context are crucial because they help individual children feel known and experience learning in the most meaningful way—in social relationships, something that can be especially difficult when cognitive, emotional, physical, or neurodevelopmental challenges arise (Greenspan and Wieder 1998). Moreover, singing in this way allows for terraced teaching, whereby both the group and diverse individuals may be addressed in relatively effortless yet effective ways.

Based on the author’s experience as well as published surveys, observations and a wide range of relevant scientific research, the emphasis of this article has been on vowels because they offer a rich and accessible starting point for interjecting affective musicality into singing. Clearly, there are many other practical aspects of meaning, speech, and singing as well as individual language and cultural influences that are relevant to this topic and worthy of exploration, but a good starting point is with the musical gems that carry sound and emotion best—vowels.

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References

- Adachi, M. (2013). The nature of music nurturing in Japanese preschools. In P. S. Campbell & T. Wiggins (Eds.), *The Oxford handbook of children’s musical cultures: Giving voice to children* (pp. 449–465). Oxford: Oxford University Press.
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.
- Baranek, G. T., David, Fabian J., Poe, Michele D., Stone, Wendy L., & Watson, Linda R. (2006). Sensory experiences questionnaire: Discriminating sensory features in young children with autism, developmental delays, and typical development. *Journal of Child Psychology and Psychiatry*, 47(6), 591–601.
- Blacking, J. (1973). *How musical is man?* Seattle, WA: University of Washington Press.
- Chen-Hafteck, L. (1997). Music and language development in early childhood: Integrating past research in the two domains. *Early Child Development and Care*, 130(1), 85–97.
- Dansereau, D. (2011). The role of musical engagement in the musicality of three-year-old children. In S. L. Burton & C. C. Taggart (Eds.), *Learning from young children: Research in early childhood music* (pp. 39–59). Plymouth: Rowman and Littlefield Education.
- Emberly, A. (2013). Venda children’s musical culture in Limpopo, South Africa. In P. S. Campbell & T. Wiggins (Eds.), *Oxford handbook of children’s musical culture: Giving voice to children* (pp. 77–95). Oxford: Oxford University Press.

- Erdemir, A. (2010). *Motor representations and the effects of auditory feedback disruption on singing remembered tunes*. Master's Thesis, Vanderbilt University. http://etd.library.vanderbilt.edu/available/etd-06262010-135139/unrestricted/MastersThesis_AysuErdemir.pdf
- Fernald, A. (1992). Meaningful melodies in mothers' speech to infants. In H. Papoušek, U. Jürgens, & M. Papoušek (Eds.), *Nonverbal vocal communication: Comparative and developmental approaches* (pp. 262–282). Cambridge: Cambridge University Press.
- Flewitt, R. (2005). Is every child's voice heard? Researching the different ways 3-year-old children communicate and make meaning at home and in a pre-school play group. *Early Years: An International Research Journal*, 25(3), 207–222.
- Gillespie, C. W., & Glider, K. R. (2010). Preschool teachers' use of music to scaffold children's learning and behaviour. *Early Child Development and Care*, 180(6), 799–808.
- Gogate, L. J., Bahrick, L. E., & Watson, J. D. (2000). A study of multimodal motherese: The role of temporal synchrony between verbal labels and gestures. *Child Development*, 71(4), 878–894.
- Green, S. D., Peterson, R., & Lewis, J. R. (2006). Language and literacy promotion in early childhood settings: A survey of center-based practices. *Early Childhood Research and Practice*, 8(1).
- Greenspan, S. I. (2004). *Floortime™: What it really is, and what it isn't*. Web-based radio show audio transcript. Retrieved from <http://www.icdl.com/distance/>.
- Greenspan, S. I., & Wieder, S. (1998). *The child with special needs: Encouraging intellectual and emotional growth*. Boston: Addison-Wesley.
- Hallam, S., & Price, J. (1998). Can the use of background music improve the behaviour and academic performance of children with emotional and behavioural difficulties? *British Journal of Special Education*, 25(2), 88–91.
- Heaton, P. (2009). Assessing musical skills in autistic children who are not savants. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 364(1522), 1443–1447.
- Huron, D. (2006). *Sweet anticipation: Music and the psychology of expectation*. Cambridge: MIT Press.
- Jalongo, M. R., & Ribblett, D. M. (1997). Using song picture books to support emergent literacy. *Childhood Education*, 74(1), 15–22.
- Jones, J. A., & Munhall, K. G. (2005). Remapping auditory-motor representations in voice production. *Current Biology*, 15, 1768–1772.
- Koelsch, S. (2013). Neural correlates of music perception. In M. A. Arbib (Ed.), *Language, music, and the brain: A mysterious relationship* (pp. 141–172). Cambridge: MIT Press.
- Ladefoged, P. (2005). *Vowels and consonants: An introduction to the sounds of languages*. Malden: Blackwell.
- Lee, S. (2012). Tracing the transformation of early childhood music education in young children from 1985 to 2010. *Visions of Research in Music Education*, 22, 1–27.
- Levitin, D. J., Menon, V., Schmitt, J. E., Eliez, S., White, C. D., Glover, G. H., & Reiss, A. L. (2003). Neural correlates of auditory perception in Williams syndrome: An fMRI study. *Neuroimage*, 18(1), 74–82.
- Malloch, S., & Trevarthen, C. (2009a). *Communicative musicality: Exploring the basis of human companionship*. Oxford: Oxford University Press.
- Malloch, S., & Trevarthen, C. (2009b). Musicality: Communicating the vitality and interest of life. In S. Malloch & C. Trevarthen (Eds.), *Communicative musicality: Exploring the basis of human companionship* (pp. 2–11). Oxford: Oxford University Press.
- Mathews, S. E. (2012). Singing Smooths Classroom Transitions. *Dimensions of Early Childhood*, 40(1), 13–18.
- Molnar-Szakacs, I., & Heaton, P. (2012). Music: A unique window into the world of autism. *Annals of the New York Academy of Sciences*, 1252(1), 318–324.
- Molnar-Szakacs, I., & Overy, K. (2006). Music and mirror neurons: From motion to e'motion. *Social Cognitive and Affective Neuroscience*, 1(3), 235–241.
- Moore, T. (2002). If you teach children, you can sing! *Young Children*, 57(4), 84–85.
- Nardo, R. L., Custodero, L. A., Persellin, D. C., & Fox, D. B. (2006). Looking back, looking forward: A report on early childhood music education in accredited American preschools. *Journal of Research in Music Education*, 54(4), 278–292.
- Nordoff, P., & Robbins, C. (1983). *Music therapy in special education*. Gilsum: Barcelona Publishers.
- Panksepp, J., & Bernatzky, G. (2002). Emotional sounds and the brain: The neuro-affective foundations of musical appreciation. *Behavioural Processes*, 60, 133–155.
- Porges, S. W., & Lewis, G. F. (2010). The polyvagal hypothesis: Common mechanisms mediating autonomic regulation, vocalizations and listening. *Handbook of Behavioral Neuroscience*, 19, 255–264.
- Powers, N., & Trevarthen, C. (2009). Voices of shared emotions and meaning. In S. Malloch & C. Trevarthen (Eds.), *Communicative musicality: Exploring the basis of human companionship* (pp. 210–211). Oxford: Oxford University Press.
- Ringgenberg, S. (2003). Music as a teaching tool: Creating story songs. *Young Children*, 58(5), 76–79.
- Russo, N., Zecker, S., Trommer, B., Chen, J., & Kraus, N. (2009). Effects of background noise on cortical encoding of speech in autism spectrum disorders. *Journal of Autism and Developmental Disorders*, 39(8), 1185–1196.
- Shenfield, T., Trehub, S. E., & Nakata, T. (2003). Maternal singing modulates infant arousal. *Psychology of Music*, 31(14), 365–375.
- Simpson, K., & Keen, D. (2011). Music interventions for children with autism: Narrative review of the literature. *Journal of Autism Developmental Disorders*, 41, 1501–1514.
- Stern, D. N. (1985). *The Interpersonal world of the infant*. New York: Basic Books.
- Tobin, J., Hsueh, Y., & Karasawa, M. (2009). *Preschool in three cultures revisited: China, Japan, and the United States*. Chicago: University of Chicago Press.
- Tobin, J., Kim, H. K., & Kemple, K. M. (2011). Is music an active developmental tool or simply a supplement? Early childhood preservice teachers' beliefs about music. *Journal of Early Childhood Teacher Education*, 32(2), 135–147.
- Trehub, S. E., & Nakata, T. (2002). Emotion and music in infancy. *Musicae Scientiae*, 5(1), 37–61.
- Weeks, K. (2009). Musical gold: The partner's singing voice in DIR®/Floortime™. *Growing and maturing, Early Childhood Newsletter of the AMTA*, 15, 22–23.
- Weiss, M. W., Trehub, S. E., & Schellenberg, E. G. (2012). Something in the way she sings: Enhanced memory for vocal melodies. *Psychological Science*, 23(10), 1074–1078.
- Wiggins, D. G. (2007). Pre-K music and the emergent reader: Promoting literacy in a music-enhanced environment. *Early Childhood Education Journal*, 35(1), 55–64.
- Zatorre, R. J., Belin, P., & Penhune, V. B. (2002). Structure and function of auditory cortex: Music and speech. *Trends in Cognitive Science*, 6(1), 37–46.