Chapter 11

# Creativity in singing: Universality and sensitive developmental periods?

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## 11.1 Introduction

The creation of song is a natural activity in early childhood. As every child learns to speak so does every child learn to sing. Whether singing or speaking comes first is a matter of definition, but it is safe to say that the child's speaking or singing relies on exposure to cultural models of speech and song respectively. This period of exposure to 'two distinct sound systems' (Patel, 2008: p. 9), enables internalization of the elements of the specific language or musical style, and this, in turn, eventually enables spontaneous production of linguistic and musical phrases.

From a linguistics perspective, the child's consequent production of song can be regarded as creative to the extent that its generative and novel, rather than merely imitative. The notion of generativity of language has been promoted since Chomsky's (1959) famous review of Skinner's (1957) book *Verbal Learning*. In his attack on Skinner's behaviourist and reductionist account of language acquisition as arising from the reinforcement and concatenation of verbal elements, Chomsky claimed that Skinner overlooked the speed with which language learning took place in the absence of appropriate verbal models or rewards for correct verbalizations. Chomsky instead emphasized the combinatorial productivity of language based on the notion of a universal grammar possessed by every child, particularized for a specific linguistic culture through a pre-adolescent critical period. A similar argument could be made for the infinite creativity of singing: children can understand songs they have never heard before; they rapidly learn to sing and to compose new songs. Perhaps there is equally a critical or sensitive period during which a universal grammar of music becomes particularized (cf. Cohen, 2000; Hauser & McDermott, 2003).

Accepting that language and singing are creative in a generative respect, singing is further aligned to creativity through its link to the arts. Creativity—in a non-linguistic sense—is intrinsic to aesthetics and the making of the art of music. The fundamentality of singing to music is underlined by the fact that unlike other aspects of musical behaviour, involving human-made musical instruments, in singing, the human body provides the instrument—there is no unnatural or artificial intermediary between performer and listener. In addition to its ties to music and the arts, singing is a behaviour that emerges early in life (de Vries, 2005; Dowling, 1984; Moog, 1976; Sloboda, 1985), and, it can continue throughout life to the most senior years, as a leisure, aesthetic, or professional activity (Cohen & Kleinerman, 2010). Within music, singing is a discipline unto itself and can offer a unique perspective on creativity in music. Thus, in a multidisciplinary exploration of musical imaginations, such as that of the present book, there are many reasons for focusing attention on singing.

In the present article, following a brief discussion of the definition of creativity in singing, the uniqueness of this human ability will be highlighted by contrasting it with the often assumed absence of creativity in birdsong. However, consistent with the notions of critical periods for the

acquisition of birdsong, the potential for creativity in singing at different stages in the lifespan will be discussed. Examples of creativity in singing in Western culture, as revealed in research, are reviewed, and examples found in music performance are discussed, specifically skat singing in jazz improvisation. A new initiative which is developing a test battery of singing skills is then described as a means to obtain answers to questions of universality and sensitive period in the emergence and maintenance of creative singing across the lifespan trajectory. The aims of the article are first to show that singing provides one of the most important contexts for future studies of musical creativity and second to encourage increased opportunities for young and old to develop their abilities for song making.

## 11.2 Creativity in singing: definitions

Singing is one of two natural forms of human vocal communication, the other being speech. Because singing is the act of producing musical tones, in Western culture it is strongly linked to the arts, specifically to music.[1] Within Western culture, singing is heard in many contexts in playgrounds, classrooms, formal choirs, professional choirs, solo 'in the shower', and performances of popular or classical music. Singing usually involves both lyrics and music; in this sense it differs from music performance on instruments which cannot simultaneously control both a musical and verbal stream. In Western culture, singing is often associated with special occasions (e.g. the 'Happy Birthday' song, New Years, the singing of national anthems) whereas in other non-Western cultures, singing may routinely accompany everyday events with a song for particular activities (e.g. in the Xhosa songs of Africa, for beer, work, hunting, etc., cf. Heunis, 1998). In Western culture, for the majority of adults, singing entails listening to the voices of a talented minority of professionals—song-writers and performers who are endowed with or who have developed through hard practise special creative and artistic talents which the remaining public majority are able to enjoy in live concerts and through recordings.

For the present chapter, the term *creativity* refers to behaviours that are novel and judged worthy by the creator (small 'c' creativity) or by a larger audience or conventional gatekeeper (big 'C' Creativity), using Csikszentmihalyi's (1996) small 'c'/big 'C' distinction. The small 'c' category is broad and admits new compositions or improvisations that would not meet public standards of novelty or worth but do represent those characteristics within say a child's own limited experience. Yet, we want to distinguish this from the creativity of language where the purpose of language is simply to denote meaning in a non-artistic sense. If, however, a linguistic utterance were to please the utterer or audience for its poetry, then that production could also be regarded as creative. The point here is that when song creation produces an aesthetic response in the singer or listener, this would qualify the singing as creative, in accordance with the defining characteristics of novelty and value, whereas simply repeating a known song would lack the characteristics of novelty. Of course every human rendition of a song will contain variation, and the balance between meeting a standard of performance and adding an aspect of originality reflects the mysterious and ineffable aspect of aesthetic experience. The present discussion does not focus on this more subtle aspect of creativity in singing but instead focuses on the ability to vocally create new compositions, though again this too may be a matter of degree, viz., utterances which might not be regarded as aesthetic but merely novel also provide data of interest for many inquiries.

While the ability to produce new vocal melodies is evidence of creativity and is worthy of admiration, still everyday small 'c' creativity must be contrasted with large 'C' Creative performance

[1] Whereas the art of drama uses speech, the everyday function of speech is pragmatic and not artistic. Singing is also found in drama from the time of Ancient Greece, through to songs in Shakespeare and early opera, to which music theatre has been added in contemporary times.

feats of professional interpreters of standard songs, jazz improvisers and skat singers, vocal cadenzas, and da capo arias which can imaginatively incorporate conventions of elaboration particularly on the return to the original exposition. The question arises as to what allows for the unique performance of both small and large 'c (C)' creativity (Creativity)? A two-point thesis will be advanced here. First, the potential for learning musical rules for generating new outcomes may be partially constrained by age-based neural plasticity influenced in part by early opportunities, formal or informal, for music learning, training, and practice. Second, the capacity for vocal creativity remains throughout life, and may even increase in older years of reduced inhibition, high motivation, and high attentional control. Evidence from research and observation supporting this proposal will be reviewed, and the ongoing AIRS (Advancing Interdisciplinary Research in Singing) project for acquiring more evidence will be described.

## 11.3 **Beyond birdsong**

Over the last two decades, much behavioural and neuroscientific research has been conducted on birdsong (Zeigler & Marler, 2004). Songbirds are one of only a few species to engage in vocal learning, the others being humans, whales and dolphins. Over 5000 different avian species learn song; this number is not much below around 6500 different spoken world languages. Hundreds of studies on the acquisition of birdsong have served to reveal four stages of acquisition. The first is referred to as the *sensory learning period*, an exposure phase, during which the young bird hears songs to be acquired that establishment a corresponding mental template. The second (which can overlap with the first and third) is the *subsong* stage, which is like a babbling stage of human infants, when the infant tests out and callibrates his vocal apparatus. The third stage is referred to as *plastic song*, during which the juvenile bird begins to approximate the template song. The final stage is the *adult stage* of *crystallized song* in which the adult song is more or less fixed. This 'crystallized' song of adulthood may vary but seldom does (Slater, 2001; Williams 2004); however, see Taylor (2010) for a contrasting view, as well as Beecher (2010), Berwick, Okanoya, Beckers & Bolhuis (2011), and Nottebohm (2005) with evidence of malleable adult song; ~~however, see Taylor (2010) for a contrasting view, as well as Berwick, Okanoya, Beckers & Bolhuis (2011).~~ The human analogy to birdsong is typically speech (Williams, 2004: p. 5) not song. When analogies to the musical realm are made it is to the acquisition of musical grammar and musical knowledge, not singing (cf. Slater, 2001; Whaling, 2001). Yet, the four stages of acquisition of birdsong serve as a preliminary model for the acquisition of human song development: 1) exposure to the culturally-specific songs; 2) a babbling stage during which experiments of vocal production are carried out; 3) a song production phase in which elements of the culturally-specific songs are accommodated by babbling which ultimately comes to reflect the singing style of the culture, and finally; 4) production of recognizable songs of the culture. However, this model captures imitative vocalization but not creative possibilities during adulthood. It is also the case that for songbirds, typically males acquire the ability to produce song, for the purpose of defining territoriality and for attracting mates. For humans, song acquisition occurs naturally for both genders and can be developed throughout adulthood by males and females. Who actually develops singing capabilities is the result of a combination of idiosyncratic and social situational factors. The comparison with a classic prototype of birdsong highlights the conclusion that creativity in human singing, which can be demonstrated in children younger than 3 years of age (de Vries, 2005), is quite an extraordinary, human phenomenon, well deserving of attention. It should be emphasized that the notion of reduced flexibility during the adult crystallized stage for birdsong is of current research interest, and the study of more species may be revealing (e.g., Beecher, 2010).

In contrast to the large numbers of studies of the acquisition of birdsong, there are embarrassingly few studies of the acquisition of human singing, and very few that focus on creativity

in singing. This paucity of studies can also be contrasted to the much larger number of studies that focus on music perception in general, or performance on musical instruments. The topic of singing in creativity is rightly mentioned in an earlier book on musical creativity (Deliège & Wiggins, 2006). It is timely for the present volume on creativity to focus on this topic of singing.

In what follows, articles and studies that discuss research in singing and creativity will be reviewed followed by a description of a new short battery of singing tests which includes tests of creativity in singing.

## 11.4 Research on creativity in singing

### 11.4.1 Peter de Vries' parental scaffolding of a 2-year-old

In a unique case study,[2] Peter de Vries reports the stages of vocal improvisation and song acquisition of his son Jack, between the ages of 24 and 36 months. Until the age of 24 months, Jack engaged in babbling songs without tonal centre or similarity to heard songs. The father who was knowledgeable in Vygotsky's (1987) learning theory, chose to encourage the development of Jack's improvisations through imitation, variation, setting small new challenges, directing attention by describing what he did and modelling, and providing rewards for successes small or large. He reports how this 'scaffolding' led to Jack's repetition of phrases at 26 months, mirroring models provided by Dad (e.g. in dynamics, and tempo) at 28 months, expanding his interval repertoire and mirroring his own improvisations at 31 months, incorporating fragments of known songs such as 'Baa Baa Black Sheep' into his improvisations at 33 months, and aligning new lyrics to familiar tunes by the age of 35 months. There is certainly a need for more parent–child case studies of this type extending for an even longer time period. Clearly by the age of 3 years, in this particular child, the tools for vocal creativity are in place for representing sets of pitches (i.e. diatonic scale), rhythms, dynamics, tempo, integration of words, and rules of repetition.

### 11.4.2 Johannella Tafuri's study of children's musical creativity

Noting that improvisation is usually associated with performance on musical instruments, Johannella Tafuri (2006, p. 139) remarked that research on spontaneous singing 'provides interesting information about creative processes and assimilation of musical structures'. She briefly reviewed research on musical creativity that examined improvisation in singing in children, noting the melodic and rhythmic analysis carried out by Moorhead and Pond (1941/1978). Moorhead and Pond distinguished two kinds of singing—chant, which was carried out by groups and was structured around a central note, and plainsong, carried out by individuals with much freer melodic form and little dependence on words. Sundin's (1960) somewhat later study of children's invented songs concluded that musical creativity was influenced by the 'atmosphere of the school, social class, and gender' (Tafuri, 2006: p. 139).

Responding to the absence of research on teaching strategies that encourage the development of musical creativity, Tafuri and her colleague Gabriella Baldi conducted a study based on the assumption that teacher's strategies can influence the 'activation and maturation of the creative process' (p. 141). Although the study did not focus on singing, it provides a background for such studies. Tafuri and Baldi first reviewed research that encouraged musical improvisation and from this distinguished three kinds of prompts for creativity: 1) semantic, or expression of meaning; 2) musical rules; and 3) materials (musical instrument constraints). Hypothesizing (p. 141) that: 1) chosen structures would reflect semantic prompts; 2) rule prompts would lead to the most structured organizations;

[2] See Cohen (2010) on the value of the case study approach in creativity research.

3) absence of semantic or rule prompts and provision of musical instruments would favour exploration; and 4) evidence of organization procedures would increase with age, even in the absence of formal music training, they tested 132 children between the ages of 7 and 10 years, distributed across grades 2–5 in primary school. The children were of medium–low socioeconomic status and had no prior experience with music composition or improvisation. They were asked individually by the experimenter to improvise two examples for each of three types of prompts: semantic, rule, and materials. The semantic prompts were 'old man and a child' and 'waking up'. The rule prompts were alternation and repetition. The materials prompt were a glockenspiel with a range $C^3$–$F^4$ and a tambourine, having three sounds. Following the improvisation, the experimenter asked the child to introspect about the process. The entire session was audio recorded.

Transcriptions of the compositions and the dialogue were carefully analysed by both researchers, and the few discrepancies were resolved. The three types of prompts led to differences in the productions. The semantic prompt of 'waking' was not sufficiently explicit in comparison to the prompt of 'old man and a child'. Similarly the repetition rule led to more systematic organization than did alteration, and the tambourine, with its small tone alphabet, led to greater structure than did the more complex glockenspiel. The evidence that structure of the compositions increased with age led to the inference that 'patterns can be learnt through exposure and use of musical products . . . when the cognitive mechanisms are ready . . . [and] . . . underlines the important role of mechanisms such as memory, comparison, judgment, logic thinking, and reversible mind, and the role of an environment that is more or less culturally or musically stimulating, etc.' (p. 151). The general conclusion was that musical creativity was shown by all of the children, and the analysis of the improvisations gave access to the underlying cognitive musical processes. The value of longitudinal studies was proposed, along with the guidelines for teachers in the encouragement of musical creativity in their students, with the idealistic view that the early development of musical creativity may provide a resource for creative approaches to other problem solving throughout life.

Tafuri's study provides overwhelming evidence of musical creativity in children. It also shows increasing creativity with age. It is important, however, to consider the Italian cultural context of this study. We may be reminded that classical music has been broadcast in public areas of large cities in Canada and the USA as a deterrent to loitering. It is unlikely that such music would have the same effect in Italy, where opera arias may be as familiar to children as nursery rhymes are in America. So there remains a question of the generality of Tafuri's results to children in other cultures. There is also the question of generality to singing and a comparable study using voice rather than percussion and glockenspiel would be welcome.

### 11.4.3 Margaret Barrett's case study of Charli's invented song

Indeed, a review of invented songs elicited in a study by Barrett (2006) has suggested growth of this ability to make up songs from ages 18 months to 7 years with a subsequent decline, just at the age at which Tafuri has suggested musical creativity, in Italian children, began to increase. Barrett further suggests that the 'gradual disappearance (or submergence?) of invented song from children's music making as they enter formal schooling' may arise from the reification of 'vocal models, styles of vocal presentation, and song materials' and an emphasis on attaining correct adult renditions of particular repertoire that dismisses the 'playful and generative qualities of invented song-making' (Barrett, 2006: pp. 202–3). She says that 'Given the near ubiquitous nature of invented song in young children's activity, the careful examination of this phenomenon holds potential as a site for the exploration of creative thought and activity in young children'.

Consistent with Tafuri's plea for longitudinal research on creativity, Barrett reports a longitudinal case study of one child's invented melodies over a period of 2 years, beginning in kindergarten. Barrett's study focused on singing improvisation in two different schools, one more rural and the

other more urban. The children in the first year had daily music training and in the second year had access just once a week to a music teacher in which formal instruction about music theory and elementary solfège took place. In the study, the experimenter (the author) was given a music corner of the class in the first year and a separate room nearby in the second year. The children were allowed to initiate a visit to the music corner. The activities at the music corner were videotaped for later analysis. The activities included the request by the experimenter to sing known songs, make up songs, and explore musical instruments. A detailed analysis of the responses of one child Charli were provided, focusing on three visits to the music corner during the first year.

The spontaneous song lyrics were presented as well as several transcriptions. Whenever the experimenter requests Charli to repeat her made-up song, she agrees but always changes it, wanting to sing something new each time. The content analysis of the lyrics reveals themes of significance to Charli, such as hidden motives of others and a visit from her father (as her parents are separated). The songs provide a means of communication with the experimenter.

In addition to this rich communication experience, there is communication with a group of children who learn and participate in her song. One child continues to sing one of Charli's songs, which is evidence of how children acquire songs from each other (Campbell, 1998). The musical notation reveals tonal centers, and phrases, but fails to reveal the strophic repetitions that adults might value, and as appear more with increasing age in the study of Tafuri (2006) previously described. Barrett makes the point that musical improvisation for children does not necessarily aim to create musical forms that imitate adult models but rather offers the opportunity to explore different ways of expressing the same thing. An interpretation of this free form that I would like to offer is that children blend the pragmatic rules of music and speech. In speech, every sentence communicates new information, and words are not repeated for their own sake. In music, repetition of note and phrase is common. Perhaps the child is caught between these speech and music rule systems when dealing with both lyrics and melody.

### 11.4.4 Ságí and Vitány's (1988) study of vocal invention in Hungary

Ságí and Vitányi (1988) examined vocal invention in over 200 persons representing students of junior and senior high school, younger and older industrial workers, and university age students some of whom were conservatory students. Participants were asked: 1) to compose melodies for four sets of lyrics representing 19th-century folk style, 20th-century serious poetry, and a lyric of a contemporary hit song; 2) to compose improvisations to seven different harmonic progressions that varied in complexity beginning with the simplest as I-IV-V-I; and 3) to improvise completions to three short melodies by Bartók and Mozart . The data consisted of over 3700 tunes that were tape-recorded and subsequently transcribed by 10 professional musicians and checked by two independent judges. The first conclusion was that although the participants were not experienced at improvisation they were able to carry out the improvisation task to some degree. Improvisations typically mirrored the strophic character of the lyrics and suggested ideal forms that differed across the 11 different samples in the study, suggesting that compositional tendencies are influenced by one's listening environment which is cohort and situation specific. Given the enormous corpus of material analysed over an 8-year period, it is particularly unfortunate that the results of the Hungarian study are not accessible to the English speaking world.

### 11.4.5 The AIRS test battery

To partially address the lacuna in research on creativity in singing, a major collaborative research initiative called AIRS (Advancing Interdisciplinary Research in Singing, generously funded by the Social Science and Humanities Research Council of Canada), directed by the present author, is

planning a large longitudinal study that focuses on measuring various singing skills across different ages and cultures.

The AIRS project in general responds to the relative lack of scholarly attention to the natural human communication ability of singing as compared to that directed to language acquisition. One technological development that accelerated progress in studies of child language was the establishment of a shared database of transcriptions of child discourse. The initiative known as CHILDES—the Child Language Data Exchange System—the inspiration of Brian MacWhinney and Catherine Snow (MacWhinney, 2000; MacWhinney & Snow, 1985) led to over 3000 publications in this field. A similar shared database of song, envisioned by Cohen (2000) and at the time referred to as CHIMES—Children's Music Exchange System—awaited further developments in computer technology which allowed for the storage of and fast access to acoustic data. The CHILDES system managed well with less resource-intensive symbolic transcription of utterances, however, part of the problem of understanding the acquisition of singing is to determine or develop consensus on what the vocal or musical elements are. In comparison, the international phonetic alphabet provides a basis for a fairly comprehensive coding system for speech discourse with additional elements developed by MacWhinney and his team to accommodate other sounds and their durations and inflections. Michael Forrester (personal communication) of Kent University who used CHILDES for research in developmental psycholinguistics confirmed the need for something additional for addressing the data of singing.[3]

A short AIRS test battery has been in development since 2008 to acquire data on a variety of aspects of singing ability including musical creativity (Cohen et al., 2009). The battery consists of 11 components, the first and last of which obtain data on language skills through conversation and through administration of short speech tasks such as repeating a sentence representing a large proportion of the phonemes of a language (a pangram) and making up a story. The remaining components acquire data on such aspects as vocal range, and the ability to sing back a familiar song.[4] The battery also includes learning an unfamiliar song, as well as singing back several scale patterns to the syllable 'la' (e.g. *doh re mi re doh, doh re mi fa mi re doh, doh mi sol*, and the entire diatonic scale, *doh re mi fa sol la ti doh*).

[3] A Digital Library acquired at the University of Prince Edward Island for a project (led by Annabel Cohen) focuses on the use of multimedia in education in a cultural context. The Digital Library Technology was exploited by the University Library Digital Library staff under the direction of University Librarian Mark Leggott as the server to support interactive web-sites through Drupal and an underlying architecture for a digital repository known as Fedora (or Flexible Extensible Digital Object Repository Architecture). The latter is an open-source product and project spear-headed over a decade ago by Cornell University through DARPA and NSF grants and currently used in major digital library projects such as the National Science Digital Library, having the tools and capacity to accommodate audio and video storage and indexing. The CHILDES system was an early example of a specialized digital library. The AIRS Digital Library will provide access to singing data, for example; in principle all of the data from the Hungarian study previously mentioned could be placed and indexed in such a digital library (although it would be a time-consuming process to do so).

[4] The song chosen, *Brother John* (*Frère Jacques*) has a simple repeating structure a a $a_1$ $a_1$ b b c c (Are you sleeping, Are you sleeping, Brother John, Brother John, Morning bells are ringing, Morning bells are ringing, Ding dang dong, Ding dang dong). The repetitions test whether the singer grasps the notion of higher order structure (i.e. the rule of repetition). If the singer produces the same incorrect pattern twice, for each of the four phrases, it is clear that the higher order rule has been grasped but the lower order ability to represent particular intervals has not. Translations of the lyrics in over 55 languages provide for cross-cultural investigation although familiarity with the song may not be equal for the various cultures.

Creativity in singing is directly tested with two tasks. In the first, the beginning portion of a simple song with lyrics was presented (*doh re re me re doh re me . . . I have a dog, and he goes bark . . .*) and the participant was asked to continue the song. This task has elements of both a rule task and a semantic task of Tafuri (2006). In our first studies using the test battery, the experimenter provided a sample ending. This appeared to restrict original completions, and future studies that used the battery have omitted the lyrics of the initial prompt and have provided no examples of continuations.

A second creativity task is more reminiscent of Tafuri's (2006) semantic task. Encouraged by Stefanie Stadler Elmer (2000) who has conducted research on children's singing for over 20 years, four picture prompts were provided, and the singer was asked to choose one and to make up a song about it. This task provided no musical ideas, although the prior musical content of the singing test may have had an influence as was shown in subsequent analysis.

The battery was initially administered by two students, Marsha Lannan and Jenna Coady, to participants representing an age range from 3 years to university students. There were two boys and two girls tested at each of the ages of 3, 5, and 7 years (i.e. 12 participants in total). There were two males and two females of university age tested who had musical training and a similar number of male and female university students who had no musical training (i.e. 8 participants in total). The aim was to test all participants monthly for 5 months; however, one university student and one of the children did not complete testing. The data are very rich and only several aspects have been submitted to detailed analysis. For the composition from the picture prompts, the lyrics and contour were transcribed and a preliminary analysis has been conducted by Lauren Mitchell.[5] Examples of lyrics for participants of different ages are provided in the Appendix. In particular she focused on the influence of prior exposure to the lyrics and melodic structure (particularly contour) of *Brother John* and *I have a Dog and he goes bark,* the prompt used in the song completion task.

Evidence of influence of prior exposure was seen and a negative correlation between the evidence of influence (e.g. use of the word bark) and age of the participant was significant. In other words the younger the child, the greater was the influence of prior words and melodic structure (i.e. contour) seen on the produced song. This greater influence for younger children suggests to me reverberating auditory imagery of recent information, poising the child for mimicry and rehearsal. Such a process, with emphasis on detailed acoustic information, would enable the acquisition of the phonology of the language as well as elements of the music. This is consistent with the ability of children to pick up a native accent as compared to those past adolescence.

The lyrics produced by the children also reflected their appreciation of the concept of composition and of song, and generally of a distinction between literal and poetic language. One half of the materials (those obtained by student Marsha Lannan) were passed on to a member of the Faculty of Education who specialized in the teaching of creative writing. He was asked if he could determine the age of the author from the lyrics. It was not easy for him to do so. This anecdotal finding does concur with the view expressed by Barrett (2006) that the ability to create songs does not improve after the age of 7 years, in that there was no marked distinction between the lyrics created by the six children and the four adults when their five sessions were considered.

The lyrics of the 3-year-old male are particularly striking with the repeated theme in sessions 2 to 5 (a period of 4 months) of the baby eating all the hearts, flowers, and sunshine—different visual images, eliciting lyrics about an interfering baby! This is reminiscent of the repeated theme of mischievous fairies of the 4-year-old Charli in the case study of Margaret Barrett. Song is serving a purpose for children as it does for adults of expressing what may be difficult to say in words.

[5] Lauren Mitchell was a visiting summer student in the AIRS/CMTC-E Research Laboratory at UPEI who worked on her senior thesis under a student Internship program from Kalamazoo College.

One can see from these lyrics a knowledge of phrasing and poetic language; in adulthood this entails a greater use of rhyme as part of the canonical song form.

A second administration of the battery was conducted by Emily Gallant with a senior population of four healthy elderly persons and six persons with suspected Alzheimer's disease (four of whom were institutionalized). The test was administered on two or three occasions at approximately monthly intervals, with the exception of one individual due to a family crisis. In contrast to the healthy elderly participants, persons with Alzheimer's disease (with one exception) were unable to create songs, although they were able to carry out other aspects of the test battery. This is of interest in that the resilience of song memory is often cited as an exception to the otherwise drastic deleterious cognitive impairment associated with the disease. Our preliminary results suggest a dissociation between the ability to recognize songs and the ability to use musical rules to create a new song.

The test battery, slightly revised, was administered a third time to eight native-born Canadian university students and eight native-born Chinese students enrolled at the same Canadian university. The melodic prompts were sung, and for the melodic completion task only the prompt was presented, not a sample completion. The data were collected by Lexy McIver and the melodic completion data were analysed by visiting undergraduate student Ruth Reveal.[6] This analysis entailed pitch extraction for each completion for two sessions, a contour analysis, and a rhythm analysis. Rules of the original melodic prompt were observed in the completions (e.g. in the first session, 50% of the completions preserved the rhythmic motive), both completions for an individual were often similar but differed across individuals, and completions were on average seven notes for both sessions. However, the main conclusion was that the richness of the data warranted additional investigation, for example, with respect to tonality, and that future studies should assure greater duration between sessions so as to reduce the role of memory of a prior session on the original composition in a subsequent session.

The relatively short completions of songs by the young adults contrasts with an extreme case of childhood singing of the vocal prodigy Bejun Mehta who reports that

> . . . as a small child I was always singing. When there was music in the house, which was all the time, I would imitate what I heard. If I heard a record, I would sing that. . . . I would go into my room and put on an opera recording . . . I would sing every part, every word, every thing—I would stay in my room and sing the entire opera. Nuvi [his older brother by 5 years] remembers listening to this . . . Even without an external stimulus, I would sing. . . . sing whatever came to mind. I would sing for hours upon hours, sing until I was hoarse . . . Singing was spontaneous with me. On car trips, I'd sit back and make up songs about whatever I felt like . . . When I was seven, my teacher sent home a report card which commented in part . . . 'he frequently sings or hums during independent work time . . . disturbing to those who are working near him. . . .' a tune bubbled in my throat twenty-four hours a day. Something just made it so.
>
> (In Kenneson, 1998: p. 337.)

While this is the introspective report of a someone who rose rapidly to acclaim as a professional vocalist (first boy soprano, later adult counter-tenor), it is well to think of the extent to which such proclivities for creative song are part of every child's make-up but are extinguished in the absence of appropriate scaffolding, such as exposure to song, singing and parental encouragement in the home (e.g. de Vries, 2005).

[6] Ruth Reveal, a senior undergraduate student at Agnes Scott College in Atlanta Georgia, was a visiting summer student in the AIRS/CMTC-E Research Laboratory at UPEI.

Through continued application of the AIRS test battery, in age- and cultural-cross-sectional and longitudinal designs, and sharing audiovisual recordings of the sessions via the AIRS digital library, we expect to answer many of the questions about the natural creative ability of children to sing, whether this ability is influenced by cultural factors, and whether it declines during a critical period or is robust at least for some people throughout the lifespan. Data has been collected in Estonia by Marju Raju under supervision of Professors Jaan Ross and Stefanie Stadler Elmer and plans are underway to extend the collection of data of singing, including creativity in singing, in Asia, Africa, China, and South America. The aim here is to acquire and share longitudinal and cross-sectional data gathered in a short period of time from many participants. The methodology at the outset is very different from the case study approach of Barrett, and yet audiovisual records of singing are so rich in information that we believe a complete picture of the creativity in singing can emerge. Case studies of course can continue to provide additional important information. The two approaches go hand in hand.

## 11.5 Role of training and song improvisation

The skill of musical improvisation has been valued at various times in music history and by various cultures. Reference to improvisation in westernized society today raises associations of jazz, and if one thinks further, of creation of the continuo in early chamber music, the convention of embellishment in the ABA da capo aria, and perhaps the creation of the concerto cadenza, although in most of the latter cases, performers may resort to either using examples that have been passed down, or mapping out the variation prior to public performance. In music having an oral as opposed to notated tradition, improvisation may play more of a role, due to the training and reliance on memory. Indeed, improvisation places an enormous demand on memory, as one must know the rules and be able to apply them quickly, whereas, the availability of a score frees cognitive capacity for other needs, for example, that required by the instrument.

In early jazz, improvisation was associated with an instrumentalist playing within the field of liberty defined harmonically by the chord progression of the piece and thematically by the melodic motifs. The blues had a simple standard progression, and similarly, standard progressions characterized the jazz standards; even those which sounded complex often had a very logical progress based on the cycle of fifths (e.g. from Gershwin's *I Got Rhythm* to Jerome Kern's *All the things you are*, to Thelonius Monk, *Round Midnight*): however, improvisation was the territory of the instrumentalist. The vocalist sang the lead, when there was a vocalist at all. Louis Armstrong, however, popularized the potential of the voice for improvisation. The story goes that in 1926 during a recording session for the tune 'The Heebie Jeebies Dance', as Armstrong himself tells it . . . 'when I dropped the paper [with the lyrics], I immediately turned back into the horn and started to Scatting . . . to my surprise they all came running out of the controlling booth and said—"Leave That In".' (As quoted in Edwards, 2002: p. 619; square brackets inserted for explanation).

There were other examples of scat singing prior to this, but this recording drew attention to the phenomenon. The scat technique was developed by great jazz vocalists such as Ella Fitzgerald. In the 21st century, the technique has been to some extent demystified. Educator Bob Stoloff (1996, 2003) has written scat singing exercises with accompanying CDs (see also Fredrickson, 2003; Weir, 2000). These are a testament to real-time vocal creativity that can be taught through a rigorous and systematic curriculum and demanding practice. The concept is similar to teaching improvisation for any instrument, as can be acquired at many specialized schools and increasing numbers of university music programmes, the first, however, being the Berklee School of Music in Boston (formerly Schillenger House, and since 1970, the Berklee College of Music).

## 11.6 Sensitive periods and over-riding constraints

It is well-known that native active accent can be readily acquired by non-natives prior to adolescence, but afterwards it is more challenging to do so (Oyama, 1976; Pinker, 1994; Uylings, 2006). Accent entails fine articulatory motor coordination and the ability both to shape the vocal apparatus suited to vowel resonances characteristic of the particular language, and to move the articulators in appropriate timing and order to block the air stream in the manner characteristic of the phonemes of that language. The learning of the grammatical rules of the language however are not subject to the same articulatory-motor constraints, and whether they are also subject to a critical period for acquisition is more controversial. Similar questions arise for the acquisition of music grammar (Cohen, 2000 ; Trainor, 2005), and there is evidence of modest increase in the corpus callosum of the brain of children of 5–7 years of age who have been learning an instrument for 15 months as compared to age-matched controls who are not learning or practising an instrument (cf. Schlaug, 2009: p. 202). However, the questions have seldom been raised in the context of singing. Singing, in involving articulation and the vocal apparatus, parallels speech. If there is a critical period for the acquisition of native accent, there could similarly be one for acquisition of fine motor coordination required for singing. Yet, surprisingly voice lessons are among the few in the realm of music performance training that are typically postponed until well into adolescence. This is true for both genders, although it is the male voice that undergoes dramatic physiological change at puberty (a situation strikingly described by Mehta (Kenneson, 1998) in terms of the trauma experience over the metaphorical death of his boy-soprano voice).

The known facts of creativity in singing pose enormous questions for research. On the one hand there is evidence to suggest a universal natural vocal creativity between the ages of 18 months to 7 years. And on the other hand there is the evidence that training as in scat singing can lead to impressive real-time vocal creativity during adult years. Between these two poles are the examples of the minority of persons, young and old, in Western culture who can make up songs easily. The question of the extent to which everyone is a composer of songs invites the participation and insight of vocal educators, early child educators, vocal performers and jazz musicians at both amateur and professional levels and from countries throughout the world to join the behavioural scientists and researchers in music psychology who are addressing this problem.

## 11.7 Concluding theoretical perspective

In concluding with a theoretical perspective on creativity in singing, first consider a previous proposal of Cohen (2000) to account for the acquisition of music grammar. The proposal was that there existed an early critical or sensitive period during which exposure to music of particular styles established the grammar or vernacular which would serve as the native musical grammar for the rest of life. This theory was consistent with evidence that the music of one's youth was preferred throughout life, and that music that violated that style was more difficult to recognize or appreciate than music from that style. However, evidence from training of jazz improvisation and scat singing suggests that the constraints of a critical period for music grammar acquisition can be overridden through motivation and practice, such that the ability for real-time spontaneous vocal melodic composition can be acquired through dedicated years of practice at any time of life. The research of Sági and Vitányi (1988) and Tafuri (2006) has suggested that the ability to create songs is dormant within most adults. It is consistent with the passive but deep appreciation that most people have for songs, improving the quality of their life through concerts and recordings. The proposed framework suggests that favourable conditions of musical exposure and encouragement to create songs in early life may do much to set the stage for future creativity in singing. Further, passive appreciation of singing as an adult listener could

instead become appreciation of one's own active creativity in singing given appropriate training, motivation, and practice in later years.

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# Appendix

The following are some examples of lyrics for participants of ages 3, 5, and 7 years and University-age students. The participants had received the AIRS test battery monthly for 5 months. The 8th component of the battery requests creation of a song based on one of four pictures: an apple, a sun, a flower, and heart. Prior to this component, the participants are asked to listen to the first phrase of a song and to produce an ending for it. The phrase begins 'I know a dog, and he goes bark'. Some elements of this appear occasionally in the lyrics that follow. The participants have also heard the song *Brother John* (Frère Jacques). The lyrics were transcribed by Marsha Lannan and verified or amended by Lauren Mitchell. Marsha had administered the tests.

**Female child age 3**

Session 3 (apple as choice of picture prompt):

*This apple has a worm in it*
*And someone was going to eat it*
*And saw a little hole*
*And they were going to eat the worm*

Session 5 (sun):

*I love the sun*
*He plays bark*
*Bark, bark, bark*
*What a little Sunday bark*
*Because he's a sun*
*And while he maked up a ending*
*He followed asleep*

Session 5 (heart):

*A heart is in the afternoon*
*In the afternoon*
*I love you in the evening*
*And underneath the moon*

**Male child age 3**

Session 1 (sun):

*Ah sun come up*
*And melt the snow away*
*Sun come snow*
*Snow (unintelligible)*
*Sun will come out oh melt the snow*
*Yes melt the snow all away*

Session 2 (heart) (Marsha gave an extra example before he sang—she sings something like 'I love red hearts, they are beautiful' and the influence is seen):

*I love red hearts I love red*
*They are beautiful*
*But a baby named Sarah*
*Walked up and ate them*

Session 3 (heart):

*A baby a a lady brang all hearts*
*But a baby ate them all*

Session 4 (flower):

*A baby a girl brang a um um a um all of em*
*Gave a baby all their flow*
*All her hearts*
*And the baby chewed em all up*

Session 5 (sun):

*I know a (unintelligible)*
*Gave all her hearts to a baby and ate them all up*
*And I know a baby gave*
*Who gave them all for baby (unintelligible)*
*And the sunshine*
*And the lady gave a bunch of sunshine*
*And she ate them all up*
*And she gave a bunch of flowers*
*And she ate them all up*

**Female child age 5**

Session 5 (apple):

*I know a apple it's bright and red*
*Bright, bright, bright red*
[note, this shows similarities to the prior prompt to complete the ending to 'I know a dog and he goes bark, bark bark bark . . .']

**Male child age 5**

Session 3 (apple):

*Once upon a time there was a apple*
*And in the apple there was a worm*
*As the worm was frustrated*
*Because it was too dark in there*
*So he went off to find a new one*

Session 5:

*Apples are great*
*They are red and shiny*
*And people eat them*
*Because they are healthy*
*And it also keeps the doctor away*

**Male child age 7**

Session 3 (apple):

*I like the apples*
*They are very sweet*
*But look out for the things*
*That worms eat*

Session 5 (apple) (This session was rushed because his mom was waiting for him to finish):

*I like the apples*
*They are yum*
*Um um um*
*Um um um um*

**Female age 7**

Session 1 (flower):

*I have a flower, it's re-*
*It's really nice*
*I have a flower*
*It's a -*
*It's really nice*
*My mom has a flower*
*It's really nice*
*My mom has a flower*
*It's really nice*
*When I gave my mom my flower*
*Now she has two*
*Really nice*
*Flow-ow-ers*

**Male adult, non-musical**

Session 1 (apple):

*My mother had an apple*
*She crushed it into a pie*
*We had a slice for dinner*
*And I liked it*

Session 4 (flower):

*As I start out small*
*And get some water in me*
*I grow up tall*
*With petals all around*
*Bright and shiny*
*Are all my colours*
*And I smell pretty good too*

Session 5 (heart):

*I got this thing in my chest*
*It kinda looks like a circle*
*With a dent in the side*
*It's called my heart*
*It's big and it's full of love*

**Female adult non-musical**

Session 5 (sun):

*In the month of August*
*Two thousand and eight*
*We've had so many days of rain*
*So now that the sun is here*
*For a few days*
*I'm gonna go to the beach*

**Female adult musically trained**

Session 1 (flower):

*What shows up in Spring time*
*Flowers, flowers*
*Bringing in the morning sun*
*What shows up in spring time*
*Flowers, flowers*
*To blow away the winter fun*

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