***Title:***

***The development of musicality: A review of longitudinal studies.***

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Abstract:

As a contribution to the ongoing work on the development of musicality, this review brings together and examines existent longitudinal research studies of children. We focus on findings from studying the *same* child developmentally, reviewing work on musicality, singing, and music related behavior during childhood and adolescence. The currently available studies (n=41) are categorized in six broad sub-themes: music focused; language and music; education oriented; impairment; and, family and cultural context. A close examination of the studies, highlights a number of key observations, include (a) that no definitive stage-like picture of cognitive-musical development has emerged over the period of these studies, (b) understanding the relationships between the development of language and developing musicality benefits from cross-cultural comparison, (c) the primary focus for those with an educational focus on children’s musicality has been on singing, and (d) recording and documenting everyday spontaneous musical behavior is changing the nature and focus of contemporary longitudinal studies. Concluding comments provide suggestions for articulating a theory of the development of musicality.

***The development of musicality: A review of longitudinal studies.***

*1. Introduction*

One route towards understanding the development of musicality during infancy and childhood has been through the adoption of a longitudinal methodological perspective, that is, studying the same child (or children) over an extended period of time. The aim is to gain a developmental picture of the emergence and trajectory of a particular set of skills, competencies or abilities relevant to the topic in question. The longitudinal methodological approach forms the backbone for both theory formation and data collection in numerous areas of developmental psychology, and is most often found in research on the acquisition of language (Ambridge & Lieven, 2011; MacWhinney, 2000). This review is focused on bringing together the existent and emerging collection of studies that have included or adopted a longitudinal approach to the study of musicality, singing, and music related behavior during childhood and adolescence. There is of course an existing and significant body of work on childhood musicality (e.g., Moog, 1968; Moorhead & Pond, 1977; Campbell, 1998), representing important and significant findings regarding the development of musicality. For the most part however, the general approach in the area compares children of different ages cross-sectionally on one or other measure of competence or skill, and for this reason may gloss over or omit particular dimensions or indices of the development of musicality. In what follows we have adopted a particular definition of longitudinal, here meaning any research project that has involved the study of individual children over a period of time.[[1]](#endnote-1) Our over-arching criterion is that the research involves reporting on the results or findings from studying the *same* child developmentally. We have included studies which report on the results of long-term musical training but excluded studies that could best be described as ‘retrospective’ longitudinal studies (e.g., where musicians are interviewed about what they remember of their early childhood).

A search of the contemporary literature produced around 41 research reports and journal articles concerned with aspects of the development of musicality or singing employing a longitudinal approach. At some risk of over-simplification or potentially arbitrary classification, the studies can be grouped into six different sub-areas or themes representing the focus underpinning the research undertaken: music (8); language and music (5); effects on musicality (4); educational concerns (11); impairment (2); and family, culture and context (11). The music category represents work where the overarching concern is with largely musical aspects of the development of musicality; language and music where the focus is informed by views on the interdependence of musicality and language skills, and education, which encompasses studies concerned with learning, gender issues, and relationships between play and children’s spontaneous musical behavior. There is also a relatively small category of studies, where the focus has been on the musicality of impaired children, and a fifth group where attention is given to how family, cultural context and environmental factors interpenetrate the development of musicality.

In a summary review of this kind it is not possible to fully represent the detail of many of the studies reported below. It is also the case that no one discipline or sub-discipline with an interest in children’s musicality appears dominant - the work encompassing perspectives from developmental psychology, music education, ethnomusicology, music research and the sociology of childhood. The forms of analysis are equally diverse with both quantitative and qualitative approaches being adopted, and it becomes apparent that the background ideas informing the research reflect in part theoretical shifts within the relevant disciplines (e.g., developmental psychology and music education research). Our commentary should be read as an attempt to provide some overall guide to the main ideas that have informed this sub-theme within the broader study of the development of children’s musicality. Towards the end of each section outlined below we offer a number of thoughts and considerations in service of providing an overview of longitudinal studies in this field.

*2. Music and the development of musicality*

Keeping in mind our recognition that by far the majority of studies into the development of musicality have been concerned with the study of children’s singing competencies and abilities, in this category we locate reports where the primary concern is on specifically musical or music-related aspects of children’s behaviors – that is, core research on what they can do and how their skills develop.

While specific details on the number of children and the amount of data collected remains uncertain, the only cross-cultural longitudinal study of children’s early musicality was carried out by Bjørkvold (1992) in Russia, Norway and the USA. Spending at least one year in each country observing and recording pre-school children singing, playing and communicating, this engaging and thoughtful work reports on the differences and similarities between song and play. Arguing that spontaneous singing in children serves some universal features of both use and function, his research emphasizes the significance of the interdependence of playfulness and music. Through this work Bjørkvold (1992) seeks to show the subtle inter-relationships between children’s play, spontaneous singing, cultural identity and the significance of the ‘muse’ within humans. One of the more interesting suggestions is that children’s songs and their play are really two sides of the same coin – and Bjørkvold (1992) warrants caution regarding any simplistic notion of musical universals. He comments:

“My central conviction regarding this matter (children’s spontaneous songs) is that all cultural expressions are formed on the basis of a concrete human reality but are firmly anchored in the surrounding culture. No song form as such is universally given to us from above.” (p. 114).

The importance of local context is also emphasized in a detailed 3-year longitudinal study of 8 pre-school children aged 2-5 years carried out by Whiteman (2001; 2009). This work provides us with a considered and careful analysis of children’s spontaneous singing and its development. This thesis invites a detailed examination by researchers in the field as there is considered musical analysis (of the songs produced) alongside an account of the function of singing in context (e.g., communicative; imitative; playful). Whiteman (2001) provides a critique of the assumed relationships between cognition and musicality that often draw their point of departure from Piagetian developmental models. In contrast, his ‘child-by-child’ painstaking analysis of song development emphasizes a Vygotskian approach to the development of singing. For example, he details how individual children transmit and acquire musical signs within a zone of proximal development highlighting the role that peers and other more advanced singers play in enhancing the child’s musicality. The triarchic model of children’s musical development during this period Whitman (2001) provides a conceptually rich vein of work that has yet to be mined in detail.

We might contrast the emergence of Vygotkian ideas with the earlier concern that leaned towards Piaget. The significance of young children’s musical thinking was the focus of research by Davies (1992) who studied 32 children aged 5- 7 years, over a period of 18 months. Reporting in depth on the spontaneous song production of three of these children, Davies (1992) considered various structural elements of their songs and how these change over time. This work can be seen as an extension of the earlier ideas surrounding abstraction and representation in the development of musicality (Swanwith & Tillman; 1986) that sought to examine musical thinking from a Piagetian cognitive-developmental perspective. Essentially, Davies’s (1992) analysis of the various elements of children’s songs – narrative; closure; four-part-structure and superordinate abstraction -- draws attention to the somewhat constraining picture a Piagetian approach to musical development can have. This work was one of the first to call into question definitive notions of developmental stages in musical thinking and the particular age-levels young children might exhibit competencies in musical abstraction.

Interest in how musical abstraction and representation might be linked to memory skills is evident in an earlier study by McKernon (1979) who reports the musical development of four children longitudinally from 12 months to 2.5 years (observed once a week over this period). These children were part of a larger study looking at symbolic representation skills, language and musical development. McKernon (1979) makes the point that when learning what constitutes music and song in Western cultures the child has to sift out, from their surrounding environment, the specifically musical elements –such as recognizing tones, timber, dynamics and metric organization. This study is one of the first to consider particular kinds of musical abilities, reporting on the infants earliest competencies in producing glissando as pitch; recognizing an producing major 2nds and minor 3rds, and the spontaneous production of songs in line with certain phrase structure rules and conventions (ABC; ABA and so on). McKernon (1979) comments:

“It is precisely the rules of rhythmic and melodic organization that children must learn in order to participate in the process adults call singing a song. Among the most striking characteristics of the earliest spontaneous turns [at singing] are their lack of predictability and memorability” (p. 48).

McKernon (1979) also makes the point that often rhythmic and melodic organization break down during an initial phase when children are aged around 15 months. What is emphasized is that by 29 months children can produce little patterns or ‘bits’ of melodic structures, and then extend and re-produce these in evolving songs of their own. McKernon (1979) argues that this is a significant milestone on the road to melodic organization given that it indicates the beginning of memory for melodic sequences. Such fragments are the embryonic versions of, ‘what are later to become long sequences of pitches arranged in specific structures (standard tunes) (p. 53)’. The essential message that comes out of this study – which includes some very informative examples of the children’s songs in music notation, is that the capacity to re-produce singing rests on the emerging ability (at around 2 years) to both recognize and reproduce organized patterns of sound. Being able to somehow abstract and transfer these pattern units from one context to another is said here to be one of these most essential elements in the young child’s emerging musicality.

An alternative account of how musical representation emerges developmentally can be found in the work of Dowling (1984, 1994) who provides a considered analysis of spontaneous songs recorded over a 3-4 year period of his two daughters (between the ages of 1 and 3.5). Approaching his analysis using a framework akin to syntactic approaches in language acquisition research, Dowling (1984) details the structural organization of the children’s singing from a developmental perspective. He suggests that their singing represents the acquisition of a gradually more complex schematic control over the melodic and rhythmic contours of the phrases used in songs.

Defining schemata here as systematic patterns in the abstract knowledge listeners have about musical structure, he outlines a model of the stages of the development of musical schemata framed with respect to an adult model of the structural elements in song. Dowling’s (1984) analysis of over 579 songs collected from over 68 hours of audio recordings leads to the suggestion of a number of phases or stages children go through. Following an initial period in the second year when songs become clearly differentiated from speech, the first stage is schematic musical development and entails the recognition and production of melodic contours. This is then followed by a second stage where stable tonal centres are established, leading finally to a period when sensitivity to intervals are more clearly established. The measurement of syntactic analysis Dowling (1984) outlines rests on elements such as repetition, linear sequencing and variation in phrase contours, which make realizable a type/token index that forms the baseline for the comparisons made.

Dowling’s (1984) work is certainly thorough with detailed accounts of the kinds of analysis carried out, as well as the memory tasks used to test the children’s singing competencies. Amongst additional findings reported in this work we find an absence of evidence for the universality of the interval of the descending minor third, alongside the suggestion that the perfect fifth may be a more universally occurring interval. The main conclusions Dowling (1984) highlights are (a) when children imitate an adult song model, the result is a version filtered through the child’s own song syntax, and (b) it is in the child’s syntax that one can see the origins of more articulated and elaborate versions. As he comments, “The same patterns of novelty and repetition are found in both. The simple codes of the children’s songs grow into the complex codes of the adult’s composition” (p. 162).

While recognizing that the question of complex codes in composition presupposes particular associations of musicality with Western tonal organization, such an orientation underpins another related study. Looking in detail at the development tonal dimensions of children’s early songs, Davidson (1985) reports on a longitudinal study of nine children between the ages of 1 and 7 years. Frequent visits were carried out at the children’s homes and alongside other data collected as part of a study into early symbolization, recordings of both learned and spontaneous songs were made. These formed the basis of a detailed analysis of the children’s grasp of tonal materials – here defined as a set of stable and increasingly prominent tonal structures, contour schemes. Conceptualizing a contour scheme as the interval that serves as the top and bottom boundaries of the tonal space of a musical phrase, the detailed analysis of what children would reproduce or spontaneously sing is considered with regard to dimensions of this tonal mapping.

The main findings were that children exhibited individually syncretic way of producing intervals (in this space), and during the age period studied, the space of the contour schemes expands from the interval of a third to nearly an octave. To paraphrase the approach that Davidson summaries with regard to the development of singing, the essential task the child faces is that of learning to measure what is initially an undefined ambiguous (sound) space. Davidson (1985) suggests that initially the only tool is a qualitative and topologically organized sense for the rising or falling of successive pitches. Davidson’s (1985) study is interesting not least as it can be seen as a detailed attempt to map out the child’s developing musicality solely with reference to Western tonal harmony and organization. This close examination of song recognition and production as one way of looking at musicality leads to the suggestion that children gradually derive the articulate units of tonal organization, (here defined as the set of fixed pitches), from an early sensitivity to figural (sound) shape. Davidson (1985) argues that children’s mappings of the tonal space proceed along three lines; initially with the gradual acquisition of ‘tonal frames’ (from age 1 to 5 years); then the use of tonal frame ‘templates’ for producing standard songs as well as spontaneous inventions, and then finally (from 7 years on) the pitches that children can sing “become clear and fixed in their interrelations, until the implicit notion of scalar organization” (p. 372).

One final study in this music-focused sub-theme is interesting in that when we turn to an analysis of how musicians themselves conceptualize the development of musicality, there is less concern with musical cognition and musical thinking, and more with the role of the family and early social-emotional relations. In a study of the social context of musical success, Burland & Davidson (2002) conducted a longitudinal follow-up of 18 children involved in an earlier large cross-sectional study conducted by Moore, Burland & Davidson (2003). In the follow-up, carried out 8 years after the original work, detailed interviews were conducted with the musicians, and using a qualitative interpretative approach (IPA)[[2]](#endnote-2), distinct life-span developmental themes identified. The three most significant themes relevant to success with professional musical development were music itself (as a determinant of the self-concept); positive experiences with others and within institutions; and finding successful methods of coping with the demands of professional musical life. The findings, the authors suggest, contradict the belief that only practice makes perfect, or that the influence of others is the most significant factor in development. This is appears to be borne out in the related study by Moore, et al (2003) who highlighted the significance of a supportive early maternal environment. They call for more exploration of the role that early mother-child interaction seems to play in developing or encouraging an emotional relationship to music, as well as “the role that the teacher’s personality plays in encouraging learning and in providing sensitive scaffolding”. (p.547). We will see that this appears to correspond to the contemporary interest in communicative musicality (Malloch & Trevarthen, 2010).

To some extent we might say that the six or seven studies found in this category represent in microcosm certain themes we find within the study of children’s musicality. One prevailing interest is with the concept of musical thinking or musical cognition and how it emerges. The prevalent metaphors represent the dominant themes in developmental psychology and education over the last 30 years or so – schema theory and Piaget-like stages; templates, frames and musical abstraction, followed by a gradual change towards social-context, play and Vygotskian inspired metaphors of learning-through-scaffolding and communicative musicality. At this point we might note that no definitively agreed on stage-like picture of cognitive-musical development has emerged over the period of these studies. This is possibly no particular surprise as ultimately, while stages of cognitive ability can be mapped out through associated tasks indicative underlying reasoning or thinking, it is much more challenging, if not contentious, to associate performance or production of music as indicative of a specific ‘stage’ of musical thinking.

*3. Music and language*

It may be quite difficult to recognize that in research in the psychology of music, and particularly in the developmental psychology of music certain assumptions seem to be made between the development of musicality and language development. In part this may derive from the fact that, considered from a young infant’s point of view, the primary task he or she faces during the first few years is learning how to make sounds that those around him or her call ‘language’ or alternatively, call ‘music’ or ‘singing’. For the study of the acquisition of language, and in the development of musicality the likelihood that we are looking at parallel phenomena is an attractive proposition. We can turn now to studies that consider some of the close associations between musicality and language development.

One of the earliest and most influential longitudinal studies of musicality during infancy is the work of Papoušek & Papoušek (1981; 1991). They studied one of their children from birth to around 16 months, making frequent audio recordings. From these recordings a wide range of data were reported including musical transcriptions, phonetic analysis, spectrographic analysis, analyses of temporal structure, fundamental frequency, and amplitude measures of the sounds the infant produced.

The detailed descriptions the Papoušeks give us are very informative of the child’s early vocalizations, that is, leaving aside the presupposed interdependence between musicality per se, and Western harmonic organization. For example, during the first three months the child’s vowel-like sounds began as somewhat harsh or grating and then gradually becoming ‘euphonic musical sounds approximating pure harmoniously voiced tones’. (p. 184). Their recognition of the significance of context comes out when describing cooing sounds (when the child is playing with some toy birds), and when they emphasize the different moods the child might be in when producing these sounds. The reader is then provided with detailed descriptions of the development of musicality, with reference to musical intervals, glides, and the predominance of certain sounds. Papoušek & Papoušek (1981) are also careful to locate the results they describe with regard to the physiological development of the vocal tract and to the parameters of breathing. What was particularly significant about this early work of the Papoušeks was the significance that was placed on the child’s orientation to early harmonic relations. Understandably, and from the psycholinguistic/phonetic perspective that underpins their approach, importance was also placed as much on biology as on culture, evident in comments such as:

“The fundamental elements of musical compositions seem to have the same biologically determined roots as those of intuitively composed nursery songs, naturally selected calls, babytalks, and also spontaneously preferred melodies in the preverbal vocal plays. Consequently it was not surprising occasionally to detect in Tanya’s musical improvisations a short piece of music corresponding to the formal principles of harmony, although no relation to prior musical stimulations could be found” (p. 213).

There is little doubt that this early work had a considerable influence on the emergence of the field, as well as making a major contribution to developmental psycholinguistics (e.g., Papoušek, Papoušek & Symmes, 1991).

Representing the increasing interesting within psycholinguistics on cross-cultural studies of language acquisition since the mid-1990’s, and examining children’s speech and song in a pre-school play setting, Mang (2001) reports on a longitudinal study of eight children between the ages of 12 and 38 months. Four of the children spoke either Mandarin or Cantonese as their first language, and four spoke English. Recording both their spontaneous song and everyday talk at regular 6-monthly visits, Mang (2001a) examined the children’s recordings using acoustic pitch analysis alongside an independent rater coding scheme. This work documents the kinds of stages children appear to go through during these first 3-4 years (children participating in the study began at different age points and then recorded for up to 42 months). It would seem from the main findings reported that initially, children go through a stage of fine-tuning where they begin to differentiate their productions into ‘word’ and ‘song’ vocalizations. This is then followed by a period when children begin to use song and speech in ways that closely resemble the adult models around them, and finally entering a stage when they have mastered the skills of singing and speaking effectively, but nevertheless often express themselves through novel forms of vocalizations. Two particular things are worth noting about this work. During the early period when children are producing acoustic intermediate vocalizations they engage in what Mang (2001a) calls ‘prosody of poem’ song-word productions. Some of the intervals produced by one child are described as being,

“microtonal, speech like, unstable, and not pertaining to the Western diatonic system. The pitch changes ……were much wider, and the syllables uttered with much longer duration that when spoken in normal speech….(resulting) in a form of heightened speech that displayed certain characteristics of singing.” (p. 118).

Secondly, Mang’s (2001a) work emphasizes that the boundaries between speech and singing during the pre-school period are somewhat ‘fuzzy’, reminding us that there are certain challenges with assuming that language acquisition and the development of musicality are related expressions of similarly developing cognitive competencies.

In a related study involving some of the same children, Mang (2001b) reports on comparisons between English and Chinese speaking children with regard to vocal fundamental frequency. What is particularly striking about this study is the finding that differences (in fundamental frequencies with respect to pitch) between speaking and singing increased with age (from 2-5 years) for the English-speaking children but remained constant across the same period for Chinese speaking children. It is interesting to consider the explanation Mang (2001b) proposes for these differences, as it brings out something of the relationships said to exist between music and language research in this area. She argues that Chinese and English melodies (songs) are very different with regard to what determines movement and change across time – English being oriented to underlying rules of harmonic progression, while in contrast Chinese melodies are expressed with reference to linguistic pitch. For this reason when Chinese children are learning Chinese songs there is much more of a conflation between speech and song (given that both are based on fine distinctions of pitch movement) than what is observed with English children. For the latter, they are already beginning to separate song and speech/talk on the basis that while song relates to a harmonic progression and change, speech is more concerned with pitch – and thus much less conflation between the two.

In another study on the musical development of the same children Mang, (2005) analyzed spontaneous songs produced during the years 2-4. Here the findings indicate that it is the learning of words that present the most difficult challenge for children learning to sing. Mang (2005) notes that the basis for the production of most self-generated songs appeared to emerge from fragments of learned songs, and ‘reference to the diatonic system and metrical rhythm would often be lost when a spontaneous early song began’ (p. 12). For Mang (2005), this study indicates that words are the most difficult element in song learning during this period. Further, through using learned songs as a referent, a child would typically vary the musical features of a familiar song to create and improvise. Theoretically, Mang (2005) relates the difficulties and challenges for the children learning adult-modeled songs to the processing capacities associated with attention and memory.

One other study in this sub-area was carried out by the first author of this review (Forrester, 2010) with his daughter Ella, examining instances of musicality with respect to their form and/or function. Employing a single-case study approach, this work documents the emergence of one child’s musicality between the ages of 1 year, and 3 years 10 months. From a data corpus of video-recordings taken during mealtimes, 33 examples of musicality, representing 20 time periods, were examined and categorized, and employing conversation analysis, a sample of extracts examined in detail. In answer to the question when does a young child begin to exhibit spontaneous behavior that is treated by those around him/her as ‘musical’, it is not until around 1 year 6 months that unambiguous examples were found. This was not to say that vocalisations and utterances made in prior months could not be analyzed for their musical properties, only that as a socially embedded practice the child’s family did not specifically respond to her as being intentionally musical until around the middle of the second year.

Forrester (2010) also reports that the form musicality took across the 2-3 year period changed considerably. During the early phases it is closely related to affective and emotional/social aspects of interaction and in some sense was highly dependent on the synchronicity of the interaction with an adult partner. From this point, the child then (during the next six months) become increasing independent musically, and indications of a close relationship between musicality and word-formation and word play were evident. By age 3, over and above an increase in the occurrence of spontaneous musicality, there were indications of an inter-relationship between musicality and story-playing – using musicality creatively in the production or realization of characterization and narrative structure. Forrester’s (2010) research highlights the fact that music making as a social practice, is something the child only displayed a distinct orientation towards during the third and fourth year – that is explicitly referring to singing, songs and what you might be doing with them (e.g., to get attention, to challenge another’s interpretation of a song and so on). The child’s musicality itself can be best described as initially finding form and expression in dyadic interaction, closely synchronized with a partner, and then gradually becoming more of a self-focused and ‘individuated’ set of practices. To some degree these observations accord with Malloch & Trevarthen’s (2010) emphasis on the significance of communicative musicality during the young child’s early years.

When we consider this sub-theme of language and music one of the most significant contributions the Papoušeks made to the study of early musicality was to highlight the relationships between the child’s orientation to pitch and early harmonic relations. They also made a considerable contribution methodologically – showing the numerous ways the scientific study of very early musicality might proceed. The associations between language and music their work highlighted serve to remind us that language learning children hear words as ‘sounds’, not necessarily as initially distinct lexical items. The manner in which ‘word’ sounds gradually become distinct and to be differentiated from ‘music-sounds’ has yet to be fully understood, particularly given that the very earliest speech a child hears contains many of those same elements that constitute musicality (rhythm, rhyme and sound repetition, intonational change and transformation). Mang’s work is recognizable as an extension of the ‘early language/early musicality’ orientation, and the observation that there is a fuzzy boundary between song and words/language is important. Finally, examining the function that early spontaneous singing may have in context, using a methodology such as conversation analysis raises the question, what might it mean to have a acquired the ability to sing? In other words, in the same way that researchers in child language ask what does it mean (pragmatically) to have acquired language, that is to be able to participate in talk/language practices, what exactly what does it mean to have acquired the ability or competence to display musicality? Not least, we might note that although it might be acceptable to suggest not having competence or expertise in the latter, it is quite a different thing to say the same about using language.

*4. Effects of musicality on other developmental domains*

The question of the value of being specifically musical that is with reference to the beneficial effects on other areas of the child’s development has been of interest to developmental psychologists, music researchers and music educators for a long time. Understandably, given the consistent constraints on the funding music education in many countries, there appears to be considerable interest in finding out whether engaging in music, and enhancing the development of musicality, will have additional benefits beyond the immediate artistic or aesthetic value of musicality itself. When we consider the few longitudinal studies that have studied the effects of music, for the most part, the focus is on musical cognition - and elements such as abstract reasoning or spatial cognition.

Looking at of effects of musical training on other elements of a child’s development, Bilhartz, Bruhn & Olson, (1999) followed a group of 71 4-6 year olds for a 30-week period, collecting various measures of cognitive development. Approximately half of the children participated in structured music lessons and were compared with those who did not. The design of the study also allowed for an examination of the role of social-economic status and compliance (the degree to which children were able to participate fully). The results supported the suggestion that there is a link between early music instruction and cognitive skills in specific non-music abilities. Bilhartz, Bruhn & Olson, (1999) comment that even minimally musically treated children in the study scored significantly higher than the control children on a measure of abstract reasoning ability. However, they emphasize the significance of parental engagement, noting that the strong correlations between levels of parental involvement in the music program and post-treatment scores on the reasoning measurements, “underscore the importance of parental activities as an influence in the cognitive development of young children” (p. 633-634).

A similar longitudinal study on the effects of musical practice on cognitive development was carried out by Costa-Giomi (1999). Following 117 children aged 9 over a three-year period, they found a link between spatial cognitive development and musical instruction after 2 years, although this affect dissipated after 3 years. Additionally, no differences were found in other related skills and abilities (e.g., academic achievement or self-esteem). Costa-Giomi (1999) suggests that because the extent of the improvements were small, and there were no noticeable effects after 3 years of treatment, music educators should be cautious about setting unrealistic expectations regarding the cognitive benefits of music instruction.

Adopting a neuropsychological perspective, Rauscher (1997; 2003) reports on studies of around 30 children who received at least two years of instruction on piano, singing, or rhythm instruments. In one of the studies (Rauscher, 2003), 33 pre-school children were pre-and post-tested on a range of cognitive, spatial imagery and IQ tests. In a second study reported in the same paper, 34 at-risk pre-school children were also provided with varied musical instruction for a two-year period. The results indicated that all music groups scored higher than controls in spatio-temporal tasks, with the rhythm group scoring higher than the piano and singing groups. Furthermore these effects continued two years after the initial post-testing, with the rhythm group scoring higher than controls on temporal and mathematics tests. Rauscher (2003) suggests that the findings provide partial support for the hypothesis that different types of music instruction affect different aspects of spatial-temporal cognition.

Such suggestions, as well as similar related work on the same data set reported in Rauscher, et al, (1997), have engendered considerable controversy in the broader music research literature (e.g., Overy, 1998; see also responses, Rauscher, 1998; Lamont, 1998). Lamont (1998) for example, suggesting caution in this area comments:

“The only conclusion that can currently be drawn from existing research into the positive effects of music is that children’s cognitive development in areas other than music may be stimulated or enhanced by a combination or interaction of some or all of the following variables: peer group values, teacher perception, individual instruction, increased concentration through regular instruction and practice, practical mastery of a musical instrument (and so on)…..To date we do not have scientific evidence of a sufficiently robust nature to be able to state conclusively that music does improve the mind.” (p. 203.)

Finally, in an innovative longitudinal study of the process, rather than the effect, of learning a musical instrument, McPherson & Renwick (2001) provide a detailed analysis of 7 children over a 3-year period (aged between 7 and 9 at the beginning of the study). The children were video-taped during their practice violin lessons and using a form of behavioral coding, the analysis highlighted common trends and individual differences in self-regulation. The findings revealed very diverse patterns of learning styles – with very minimal indications that children were monitoring their own learning strategies, which help explain why some learners develop their performance skills relatively quickly while other do not. In accounting for the very large differences in the children’s abilities to self-regulate, McPherson & Renwick (2001) note that the background tradition for these children place considerable emphasis on being able to read scores from the beginning of their lessons. However, for many of the children there don’t seem to be sufficient opportunities for learning to associate their “aural schemata with the notation” (p.179), and this places considerable demand of working memory (given they are trying to learn to read a score and at the same time manipulate their instrument, and adjust what they are doing constantly given what they are hearing).

Again, this last study highlights the significance of cognitive factors placing constraints on what a child may or may not be able to accomplish when seeking to enhance their musical skills. We can see, however, that the idea that music or musicality somehow necessarily improves the mind, that is, in the sense of having some direct influence on one or other cognitive skill has not gained particular credence within the research field. It would seem the debate regarding the effects of training on cognitive development remains unresolved (Hannon & Trainor (2007) provide a very useful review of the relevant literature). To some extent, this may reflect the difficulties of establishing clear-cut unambiguous antecedent-outcome relations in the study of developmental phenomena, i.e., definitively demonstrating that behavior at point Y is due solely to an intervention made at moment X.

*5. Education and the development of musicality*

Another identifiable sub-theme within longitudinal studies of the development of musicality revolves around educational issues matters broadly defined. Again, at some risk of overlap across papers, there are at least three sub-themes within this education stream; studies focused on understanding the relationship between children’s pre-school play activities and music play; reports on the development of singing, and work on similarities and differences between girls and boys in the development of signing skills.

*5.1. Children’s play and musicality.*

One study, typical of the approach found here, focused on the significance of musical play behavior in pre-school settings (Berger & Cooper, 2003) and followed 18 children over a 10-week period. The children were observed, video-recorded and detailed field notes of their spontaneous musical play taken throughout the length of the study. The purpose of the study was to observe the musical behaviours in both free and structured musical play environments. Berger & Cooper (2003) sought to discover how children engage in musical play alone and with others given that ‘learning the nature of children's free musical play may inform adults who interact with young children, including music educators and music education researchers.’ (p. 152).

The analyses, based on the multiple data sources collected during the study, revealed three main themes in the children’s musical play: unfinished play (numerous occasions where musical play would simply be suspended); extinguished musical play (where adults would move the children towards more structured activities) and enhanced play (contexts where the adult’s response would facilitate the musical behaviour). In light of their findings Berger & Cooper (2003) make three suggestions for adults involved in music education work with pre-school children, “first, to continually align and adjust teaching actions to the on-going dynamic process of interaction; second, to keep an eye on constantly assessing current curriculum, classroom environment, and student needs, and third, to providing ample and appropriate opportunities for free musical play”. (p. 152)

In a series of longitudinal case-studies looking at the role of free-play and learning, Adachi (1994; 2012) considers in detail pre-school children’s spontaneous musical behavior (primarily singing) highlighting the particular significance of ‘learning through song’. In the earlier case study of one 4-year old girl, Adachi (1994), adopting a Vygotskian perspective on musical socialization, draws out the importance of adults as role partners in the child’s acquisition and use of musical signs. This is seen for example, through the specifics of the circumstances where the child’s father provides appropriate opportunities for the sedimenting of earlier musical experiences (with another adult). Seeking to understand in more detail how a child’s ‘intrapsychological’ musical functioning develops from ‘interpsychological’ experiences, Adachi (2012) reports on two subsequent case studies with four Japanese 2-4 year-old and seven 5 year-old children. Here, observational and diary methods were used to examine how material learned in formal lessons were later expressed through spontaneous musical behavior at home. One of the most important observations was the emergence of flexible role-switching by the children when singing spontaneously.

In order to look in closer detail at the everyday musical play of pre-school children, Koops (2012) conducting a longitudinal study involving six families over a nine-week period. Children were participating in a 45-minute music class each week. The data collected on the children aged between 2 and 4.5 years (n=10), included observations of video-footage of children at home and school, transcriptions of interviews with parents and parent-written posts on a social networking site. Employing a qualitative methodological approach, Koops (2012) reports that the findings indicated that what was central to musical play-enhancing behaviors was the child’s expression of self-agency. To paraphrase Koops (2012) in situations in which children exert agency, their musical play is enhanced or extended. At the same time however, adults must be very careful not to get too involved and thus begin to subtly manipulate the context. They may have the very best of intentions, but ultimately this will be unhelpful.

The role of adults in supporting musical play was behind the aim of a music program studied by Suthers (2001). Adopting a case-study design and focusing on a narrative diary record, Suthers (2001) documented one child’s experiences in a daycare music program for 10 months. Aged 12 months at the beginning of the study, Suthers (2001) highlighted the fact that musical experiences can provide opportunities for toddlers to develop, use and practice skills in a variety of domains. One noticeable findings of this study was that the child’s participation in music play changed from initially simply exploratory to much more purposeful use of musical material. Furthermore, during this time he began to use his singing voice, first of all in wordless vocalizations and then singing repeated words. Suthers (2001) makes the point that planned music experiences are not only an intrinsically valuable part of the pre-school curriculum, but in addition, ‘physical, language and social skills may all be enhanced through appropriate, self-selected toddler music experiences’ (p. 31).

Looking at the potential relationships between children’s play and musical play, Valerio, et al (2006) document a 6-month longitudinal case study of two children participating in a program of pre-school music-play sessions. Adopting a Vygostkian approach to the relationship between thinking, communication and interaction, Valerio, et al (2006) consider the suggestion that, similar to language acquisition, children might be supported to engage in and then acquire a distinctly musical syntax. Over a six-month period (from when the children were around 18months old), the two children were video-taped continuously as they moved around, got involved in general play and participated in specific interactions where music educators would interact with them in musically related playful activities (not formal music lessons). The adults carefully organized their activities so as to introduce tonal improvisation, rhythm improvisation and periods of silence.

The video-analysis involved coding and categorizing the children’s behaviors along dimensions of general play, musical play and non-music play. The results showed that each toddler performed many more non-music vocal behaviors than music vocal behaviors, regardless of the play session type. It was also clear that in such contexts, adults appear to elicit more toddler vocalizations when they provide tonal pattern and rhythm pattern improvisation, and silence, during music play than when they do not. Valerio, et al (2006) point out that the two children in this study performed music vocal behaviors that were distinctly different from non-music vocal behaviors, particularly when the adults provided music without words. Each of the children also exhibited very different music vocal behavior patterns across the six-month period.

The main points that emerge from these studies on play, are the significance of adults being able to constantly re-align and adjust their actions so as to enhance musicality (Berger & Cooper, 2003), the importance of self-agency for the child themselves, when engaging in spontaneous musicality (Koops, 2012), and the role of the adult in scaffolding the child’s emerging musical thinking (Valerio, et al, 2006). Suthers (2001) also highlights the fact that music play appears to have marked effects on other aspects of the child’s pre-school experiences.

*5.2 Singing and music education*

Keeping in mind the observation that often it is singing (more than any other behavior) which is taken as THE main expression of a child’s developing musicality, we turn to longitudinal studies of singing in music education research. Not surprisingly, music teachers have often carried out research looking into educational aspects of singing and singing development. For example, Rutkowski & Miller’s (2003) and Rutkowski, et al, (2001) report on a longitudinal study focused on investigating how to encourage the use of the singing voice within the (traditional) music class setting. Over a six-year period 28 children were tested (before, during and after reaching the age 8 years; and then again at 10 years) using a series of singing measures - which essentially involved listening to, and then reproducing various singing patterns followed by repetitions of the task. Based on independent ratings of the children’s responses, Rutkowski & Miller’s (2003) concluded that all children can be taught to use a singing range, that is, when given instruction in a general music setting in small-group and individual sessions. Interestingly, Rutkowski, et al, (2001) following the same group of children report that what they call a ‘6th grade singing slump’ (11-12 years) that is, when comparisons were made with the children’s singing performances across the 5th and 6th grades.

Exploring the nature of children’s singing development, Leighton & Lamont (2006) carried out a longitudinal study of 28 children aged 4-6 (at the beginning of the study) for a period of two years. In order to track different aspects of singing development over time, Leighton & Lamont (2006) building on the earlier work of Welch et al, (1996), devised a series of singing tasks, including singing your own song, test songs and singing either individually or in a large group. Drawing from certain aspects of sociocultural theory, there was some expectation that the social support of group context might enhance singing skills. The procedure and context of this study serve as exemplary examples of producing test conditions allowing for careful post-test comparisons. Various detailed forms of analysis were carried out (including pitch accuracy and voice analysis) on both the test battery and song-singing. The results indicated that within the test battery, certain items were more challenging than other (notable single pitches for boys), and the analysis indicated that children perform at different levels of accuracy depending on the specific tasks. Furthermore, while there was no overall difference between individual and group singing, there were indications that group singing for boys was if anything detrimental (compared to singing alone). For girls, the pattern was in the opposite direction. Leighton & Lamont (2006) conclude that children’s singing development is a complex combination of skills each of which needs careful and sensitive assessment, and that research needs to explicitly address the multifaceted nature of young children’s singing in order to help them achieve their potential along the continuum of singing development.

Spanning a period of over 25 years, Stadler Elmer (1988; 2012) has looked in depth at the development of singing in children. Some of these longitudinal case studies lasted more than 2 years (and were video-recorded), and most lasted approximately 4 - 6 months (n = 50). However, the extensive data collected has as yet only been partly analyzed (e.g. for pitch matching, vocal range, song acquisition processes and so on). A representative early example looked in detail at the song acquisition process for 42 children aged between 2-8 years, for a period of six months (Stadler Elmer, 1997). Emphasizing the idiosyncratic learning styles of individual children over this period, this report outlines a microanalytic methodology that underpins and informs Stadler Elmer’s approach (see Stadler Elmer & Elmer, 2000; Stadler Elmer, 2012a; 2012b; 2012c; 2012d)[[3]](#endnote-3). A good deal of this extensive body of work has yet to be published, however many of the findings form the basis of an outline model of the development of singing (Stadler Elmer, 2012d). This model while cautioning against specifying specific age-ranges, argues that children’s singing acquisition exhibits a developmental sequence involving seven periods, including imitation and ritual; auditory-vocal co-ordination (as a sensori-motor strategy); generalizing examples and appropriating conventional rules for singing. Stadler Elmer (2012d) makes that point that such an outline serves as a useful heuristic for further research in the area.

An eloquent and detailed model of early childhood singing development emerges from the work of Welch and colleagues (Welch, et al, 1997; Welch, et al, 1996; White, et al, 1996) who carried out longitudinal research with 184 5-7 year olds during their first three years at school. The children were tested on their singing abilities and on their skills at performing musical material from songs that did not involve words. Subsequent analysis was carried out on the recordings by a panel of experienced judges that revealed an, ‘explicit hierarchy in children’s developing singing competencies’ (Welch, 1998; p. 34). Amongst the detailed findings of this work was the observation that a systemic improvement of pitch matching skills year-on-year, but not in the case of pitch-matching in song-singing (consistently poorer in comparison). Furthermore, Welch and colleagues found that at each age, children were much more accurate in pitch matching when asked to match simple glides; single pitches (from age 6) and melodic fragments, that is, in comparison to complex glides and songs.

Summarizing the results of this unique large-scale longitudinal study Welch (1998) points out that children enter school with an ability to learn the words of songs, a linguistic competence that seems to be more advanced than the ability to learn the melodic contour and musical intervals of the same songs. He notes,

“The evidence from this study is that children arrive at school ‘programmed’ to be responsive to words and perhaps ‘biased’ towards words when these are attached to specific melodic contours (as in songs). ….if such children’s overall musical development were to be judged solely on the accuracy with which they could reproduce song melodies, a false picture which would belied their developing (and more competent) singing skills when presented with non-song tasks.” (p. 37).

Welch’s (1998) model of musical development emphasizes the rich and diverse pattern of musical competencies any child might possess. To paraphrase Welch (1998), the complex interaction between the basic structure of the human intellect and the opportunities of the socio-cultural environment is what influences the nature of musical development in early childhood. The differences observed in the research, ‘reflect individual developmental “routes” along the socially constructed musical “pathway”’. (p. 37).

*5.3. Singing and gender in mid-childhood*

Within the study of the development of singing, one often quoted observation is the relatively significance singing has for boys and girls, the former often not extending their involvement into early adolescence. We noted above that certain patterns concerning differences between boys and girls have been reported in the literature (Leighton & Lamont, 2006). There is a general concern in the area with the kinds of similarities and differences said to emerge when comparing the developmental trajectory of girls and boys singing skills. In a three-year longitudinal study of three older children from the ages of 12 to 15, Howard & Welch (2002) looked in detail at the girls (female choristers) singing experiences and development. Using electrolarynographic data they document very individualistic patterns of development. Specifically, Howard & Welch (2002) note their identification of particular relationships between the development of higher formants (energy peaks) that previous research did not consider important, commenting that:

“The data gathered for (the two) popular genre songs indicates that this group of choristers are able to perform in an imitative style with exhibits a spectral quality that is very different from that used in their core choral singing.” (p. 68).

Howard & Welch (2002) argue that such individual development might be overlooked in a choral setting and has implications for those educators concerned with the professional performance skills of choristers.

Similarly, Hall (2005) reports on a study of Australian boys singing during their first year at school. Considering the question of why it would seem that many boys begin to move away from singing during the early childhood years, Hall (2005) introduces the concept of hegemonic masculinity – in this context meaning that dominant forms of masculinity (e.g., being tough) subjugate other forms. Hall (2005), comments that earlier work has established that many boys make a decision not to sing between elementary and secondary school as a result of the perception that singing is not an appropriate activity for males beyond a certain age. As a teacher-researcher, Hall (2005), focusing on 38 five-year old boys, first established their attitudes and beliefs regarding singing. This was then followed up by involving older children in a peer-modeling participative research design, i.e., ensuring that the children sang with older-aged boys. Using a largely qualitative interpretative approach, which included observation, video-recoding and diary records, Hall’s (2005) established that the predominant hegemonic masculine perceptions regarding singing were already in place by age five years, with the inappropriateness of singing for males the strongest emerging theme. However, the introduction of peer-modeling resulted in much more participation across the school year – as well as an increase in positive attitudes towards singing. Hall (2005) concludes:

“This research contributes towards a greater understanding of how gendered identities intersect with learning to sing and raises awareness about the challenge of finding ways to improve participation in a wider range of musical behaviors early in childhood”. (p. 18).

Taken together it would seem that the primary focus for those with an educational focus on children’s musicality has been on singing. Needless to say in part this reflects the ubiquitous and universal accessibility of this form of musicality.

*6. Impairment and musicality*

Before moving to the final theme of this review, we should note two existing longitudinal studies on the development of musicality where the focus is on children categorized as disable or impaired in some way. Building on earlier work by McPherson & Renwick (2001) on the significance of parental influence on musical development, Hendricks and McPherson (2010) document a single-case longitudinal study of a child between the ages of 3.5 and 4.5 with a sensory integration disorder. Adopting a mixed methodology (including observations; interviews; email communications; mixed-media and parental journals) this study of a child who displayed early signs of a precocious inclination in music, examines the specific practices the parents introduced so as to enhance his musical development. The results, they suggest, indicate that the period of early ‘communicative musicality’ (Malloch & Trevarthen, 2010) can be elongated through the provision of a positive family environment. As Hendricks and McPherson (2010) put it:

“His parents provided him with a sense of autonomy by allowing him to direct his own musical activities, which they supported and encouraged but did not force upon him, and tailoring their interactions with him depending on how they believed he was progressing. Their nurturing, supportive parenting style fostered a strong sense of relatedness between parents and child. Finally, his activities were purposeful in that he engaged in deliberate play to improve and enhance his musical knowledge, and as a means of self-expression and identify formation. ” (p. 99).

The other longitudinal study considered in detail (across a 12 year period) the singing skills of a child with ASD who sings but does produce recognizable speech (Mogharbel, et al, 2006). In this case-study over 260 singing examples were collected through audio and video- recordings from a girl between the age of 3 and 15 years. This child was diagnosed as having both autism and a severe learning disability. In describing the focus of the study, Mogharbel, et al, (2006) comment that in the course of language development, children adapt their phonetic output to the sound patterns of the target language, and adopt the phonological system of their language to differentiate meaning. In a case where there is no phonological system or linguistic meaning to guide phonetic development, the question is:

“whether phonetic output in singing adapts to the input: are the sounds produced by the autistic girl similar to the sounds of the original sound lyrics? Is there any evidence of development in this respect?” (p. 237).

The main findings that emerge from this case study are (a) the precocious musical competence that this child exhibited at 3 years did not alter after that time; (b) musical expressiveness and creativity grow until about age 9 and then decline, and (c) through singing some residual language-like capacity can be enhanced.

This work is also interesting in that it articulates some of the prevalent assumptions found in the study of musical development. The authors suggest that singing turned out to be the ‘autistic child’s window to the world outside’ (p.239). Mogharbel, et al, (2006) describe how one of the child’s carers gradually began to establish a communicative relationship with her through a kind of song-fragment dialogue which was then incorporated into feedback procedures to enhance her care. However, they comment that this form of communication (as communication) remained restricted to ‘singing intentions’, did not translate into other domains and for this reason, ‘her singing cannot be classed as a symbolic form of communication’ (p. 240). Such a comment reminds us of the difficulty recognizing, or even agreeing on, what might constitute ‘symbolic communication’ within a dialogic singing context.

It is difficult to draw any meaningful conclusions from these longitudinal studies children with an impairment, the first drawing out in a positive fashion what can be gained from enhancing the development of whatever we call ‘musicality’ in context, the other highlighting rather curious assumptions regarding ability, cognition and communication for somebody diagnosed as ASD. What these studies do highlight is the often unrecognized presuppositions and associations made between musicality, language and communication.

*7. Family, culture and context-informed studies of musicality*

Within the final sub-theme of this review, there are a number of longitudinal studies influenced by approaches from the sociology of childhood and ethnomusicology. De Vries (2011), for example, as a parent-researcher reports an in-depth case study of an 8-year-old boy’s musical preferences studied intensively over a four-week period. Using a constant comparative method (involving observations, video-recordings, drawing activities and associated everyday ‘musicking’ practices) this research highlights what can be gained from looking in-depth at one child’s idiosyncratic music-making. The detailed analysis of the boy’s responses to his favorite songs brings out the multiple functions music served in his everyday life. De Vries (2011) argues that music educators, in the attempts to understand the specific role of music education within schools, should start by focusing on the function of music in young children’s lives. Furthermore, adopting a constant comparative case-study method allows for the examination of how apparently unrelated activities (such as drawing) can help inform our understanding of the value young children place on music in their everyday lives.

One early study of infant musical productivity (Kelley & Sutton, 1987) recorded observations of three children between birth and two years from musically distinct family contexts (professional musicians; music oriented and non-musical). Document the different ways in which music was expressed in these families, this work draws attention to the potential significance of early exposure to musical experiences (singing and playing instruments with parents) for the emergence of various expressions of musicality. The developmental sequence that is described for each child highlights the significance of context, Kelly & Sutton-Smith (1987) suggesting:

“What is perhaps (more) important is the discovery that the character of developmental stages varies for the (musical) children, versus the (nonmusical) child. Just as there are different ways in which children learn language, so there appear to be different ways in which children learn to be musical. The musical children proceeded to music from a musical base; the relatively nonmusical child proceeded from words and the incorporated rhythm. The stage of musical development between 1 and 2 years, when language usually develops, might be critical in determining which of these kinds of progress is adopted. Perhaps the acquisition of musical skill prior to the acquisition of language makes the owner an inherently musical thinker, whereas the acquisition of musical skill after the acquisition of language may interpose that latter competence between the learner and his or her music” (p. 51).

As part of a longitudinal research carried out in Italy, looking specifically at the ability to sing, Tafuri (2003) and Tafuri & Villa (2002) report research following 68 mothers-to-be with the aim of tracking their children’s singing abilities over a six year period. Tafuri & Villa (2002) note that following participation in a weekly music course (for the mothers) the amount and quality of their young children’s singing at aged 2 years was significantly higher that results found in other previous studies. Furthermore, they note that analysis of the infant’s babbling revealed the presence of musical patterns found in (the Western) musical system. Subsequent research looked in detail at the songs 21 of the same children produced at around 2-3 years. Using a categorical scheme focused on musical phrases, monologues and songs, and analyzing the spontaneous productions recorded by the children’s mothers, their results suggest that if the family environment is strongly supportive of singing right from the beginning of life, then the ‘physiological, perceptual and cognitive mechanisms can be ready for the use of certain melodic structures in invented songs (p. 638). In other words, they are drawing attention to their observation that, and contrary to other work (Moog, 1968), songs were much more prevalent in the children’s productions than phrases or fragments or monologues. They also suggest that in the imitation of songs (rather then their own songs) there is much more control over pitch. Tafuri & Villa (2002) conclude by suggesting that the presence of songs (over phrases) could be explained by the fact that the children have already developed the form of a song because:

“mothers tended to concentrate more on the overall song than its phrases, as we also do at our weekly meetings. Moreover at home, if the children stop after a phrase mothers frequently say ‘and then?’, stimulating them to go on.” (p.638).

A recent longitudinal study of 18 children (aged approximately 18-48 months) conducted in Australia by Barrett (2003; 2006; 2009; 2012), looked in detail at musical engagement in either pre-school or day-care setting over a three-year period. Musical engagement included listening to music, song-making and interactive music experiences. This stream of research is located at the boundaries between music education and the sociology of childhood and has led to number of in-depth reports on various aspects of the development of musicality. In contrast to solely cognitive or musicological approaches, Barrett considers a number of themes primarily through a detailed consideration of individual children. Themes considered so far from this data set include, the relationship between narrative and musical development, the emergence of musical creativity and identity formation through music making.

Theoretically, Barrett’s work is as much informed by contemporary post-modern critical thought as it is by traditional musical analysis. The work on musical narratives, for example, employed a combination of the analysis of one child’s songs, researcher observations and parent-interviews (Barrett, 2010). The results suggest that invented song and music-making rest in part on the young child’s emerging ‘communicative musicality’ which provides narrative structures ‘in which young children perform and enact multiple ways of being through musical storying and story-telling’ (p. 1). For Barrett (2010) as a music educator, the findings raise the question of the extent to which the environment of the pre-school setting offer children the opportunity to explore different versions of their musical selves and/or selves in music. She argues that what is crucial in understanding the role and function of music in young children’s development is whether we foster their independent music-making.

Similar research is reported in Barrett (2009) through the analysis of two children’s everyday musical engagement – with the focus in this study on the music-making in the wider context of family life. Here, data sources included parent-maintained audio, video and paper diaries of music engagement, interviews with parents and observations of the children involved. Again emphasizing the significance of Malloch & Trevarthen’s (2010) concept of communicative musicality, the findings highlight the importance of the function of joint music-making in the regulation of children’s behavior and emotional states; the role of individual music-making in children’s self-making, and the function of joint music-making to foster family unity. The question of creativity is addressed through Barrett’s (2012) study of two other children from the original data corpus, where a considered account of what might constitute creativity in children’s early song-making is discussed. Based on examples from the children’s spontaneous songs Barrett (2012) develops the argument that creative thought and behavior is enhanced through music-making. She suggests:

“we see here (children’s songs) not only the beginnings of the capacity to improvise, but also some persistence, independence and self-reliance, coupled with a capacity to pay attention, be curious and exhibit drive. The ‘general creativity’ skills that underpin creativity are emergent in these children’s adaptations of the musical materials of others, and their capacity to extend these in ways that are original for them.” (p. 67).

Support for this line of thinking is provided in an earlier related study of another child’s song making (Barrett, 2006). In this case, Barrett (2006) provides a detailed analysis of the specifically musical elements in one child’s songs that emerged out of the communicative intimacy of prior musical engagement. Her songs reached a point where they, “exhibit an increased capacity to make musical meaning drawing on the forms and structures of known songs, including the use of regular phrasing, repetitive motives (both rhythmic and melodic), and melisma.” (p. 214).

The most succinct statement of Barrett’s theoretical position regarding the development of musicality can be found in another longitudinal analysis of one child’s song-making with reference to the more dominant forms of musical culture found in her environment (Barrett, 2003). Weaving a considered analysis of popular media culture, post-modern thought and social constructionist accounts of childhood, this work considers in depth the forms of musical content prevalent in contemporary children’s TV and then highlights how they impact and inform one child’s song production. Barrett (2003) argues that the study of children’s music making has somewhat over-focused on those musical events with are replicable. She points out that such an emphasis overlooks the affective and aesthetic characteristics of children’s musical narratives, and,

“the ways in which children construct meaning through subtle deviations and changes of emphasis in their tell and re-telling of a musical narrative…..As a meme engineer, Chelsea creates divergent, idiosyncratic musical statements that draw on her ‘reading’ and analysis of a range of musical worlds.” (p. 206)

We can see then that the most recent longitudinal studies have focused on the child’s music making in the family and broader cultural context. In part this reflects the availability of accessible and easy-to-use video and audio-recording facilities not around during the early 1970’s and 1980’s. Recording and documenting everyday spontaneous musical behavior in systematic and considered ways is gradually changing the nature and focus of longitudinal studies. Certainly the function of music in children’s lives has now become a major theme (De Vries, 2011), as has the significance of parental encouragement and input (Tafuri, 2003). It is also evident from the considered and extensive work of Barrett (2003; 2012) that disciplines outside of those who traditionally had the main interest in the development of children’s musicality are bringing to bear ideas and themes that look beyond the possibly somewhat narrower focus of earlier work. Such work enriches and extends what has now become a multi-disciplinary research field.

*8. Concluding comments*

We began this review of longitudinal studies with the intention of providing a picture of the development of musicality. In bringing together the available work the aim was to understand whether adopting a longitudinal approach uncovers particular *developmental* aspects of children’s musicality that other methodological designs may not be able to highlight. Our overview indicates that providing a consistent, and specifically developmental, picture remains a challenging aim, given the diverse nature of the specific research aims underpinning the studies, and the different approaches regarding the analyses used. In other words, while a number of studies have mapped out consistent elements regarding say, children’s early singing skills – as evidenced in being able to reproduced Western tonal organization – and how these develop (e.g., Welch, 1998), researchers are careful not consider the development of such skills as being necessarily linked to specific theories in say, developmental psychology. We might note however that there are certainly indications that there has been a shift in the explanatory frameworks favored over the last 50 or so years, moving from largely Piagetian orientations to now largely Vygotskian or socio-cultural perspectives. The recent interest on communicative musicality in children’s early lives has many close parallels with the latter. Possibly the clearest picture regarding specifically stage-related developmental change emerges from the earlier work on children’s singing from McKernon (1979), Dowling (1984) and Davidson (1985) where discussion of song abstraction and representation were related to the cognitive-developmental abilities of the child and thus acquire skills for manipulating the ‘tonal frame space’. Of course, suggestions made regarding the generality of such findings are tempered by the recognition that thus far, detailed longitudinal studies on singing have focused primarily on Western tonal organization.

Finally, and with regards to the forms of analyses employed within these longitudinal studies, there are indications of a shift from primarily quantitative approaches to the analysis of data (e.g., Dowling, 1984) to qualitative approaches (Berger & Cooper, 2003; Barrett, 2012), the latter encompassing methodologies as diverse as IPA; grounded theory and conversation analysis. In part this reflects the particular disciplinary orientations of the researchers involved, but it may also reflect the increasing interest in highlighting the rich and subtle ways children express their musicality – ultimately very difficult to capture or represent in strictly quantitative terms. On the basis of our reading of the above studies, and in order to further stimulate discussion regarding the formulation of theoretical framework to guide the study of the development of musicality, we suggest that articulating a model will involve integrating four key elements:

(a) The recognition of the significance of interactional synchrony and early communicative musicality (during infancy and the pre-school period)

(b) An understanding of the musically-relevant processes of learning and instruction taking place within the zone-of-proximal-development during childhood (i.e., informed by Vygotskian theory)

(c) The mapping out of the specific representational/cognitive skills underpinning the child’s emerging ability to recognize and reproduce sound patterns (i.e., with reference to forms of music prevailing within a particular cultural context),[[4]](#endnote-4) and

(d) A socio-cultural orientation articulating the specific embedding of musicality as meaning-making social practice – incorporating affective, aesthetic, and community-focused domains.

Further work will undoubtedly demonstrate the significance of musicality in the lives of children as they grow and develop. Mapping out this development remains a key challenge for the various disciplines involved.

*References*

Adachi, M. (1994). The role of the adult in the child's early musical socialization. *The Quarterly Journal of Music Teaching and Learning, 5*(3), 26-35.

Adachi, M. (2012). Incorporating formal lesson materials into spontaneous musical play. In C. H. Lum & P. Whiteman (Eds.), *Musical childhoods of Asia and the Pacific*. New York: Information Age Publishing.

Ambridge, B., & Lieven, E. (2011). *Child Language Acquisition*. Cambridge: Cambridge University Press.

Barrett, M. S. (2003). Meme engineers: Children as producers of musical culture. *International Journal of Early Years Education, 11*(3), 195-212.

Barrett, M. S. (2006). Inventing songs, inventing worlds: the ‘genesis’ of creative thought and activity in young children’s lives. *International Journal of Early Years Education, 14*(3), 201-220.

Barrett, M. S. (2009). Sounding lives in and through music: A narrative inquiry of the `everyday' musical engagement of a young child. *Journal of Early Childhood Research, 7*(2), 115-134.

Barrett, M. S. (2011). Musical narratives: A study of young children's identity work in and through music-making. *Psychology of Music, 39*(4), 403-423.

Barrett, M. S. (2012). Preparing the mind for creativity: a case study of early music learning and engagement In O. Odena & G. F. Welch (Eds.), *Musical Creativity*. Aldershot, Surrey:: Ashgate Publishing.

Berger, A. A., & Cooper, S. (2003). Musical Play: A Case Study of Preschool Children and Parents. *Journal of Research in Music Education, 51*(2), 151-165.

Berkowska, M., & Dalla Bella, S. (2009). Acquired and congenital disorders of sung performance. *Advances in Cognitive Psychology, 5*, 69-83.

Bickford, T. (2011). *Children’s Music, MP3 Players, and Expressive Practices at a Vermont Elementary School: Media Consumption as Social Organization among Schoolchildren.* Columbia University, New York.

Bilhartz, T. D., Bruhn, R. A., & Olson, J. E. (1999). The effect of early music training on child cognitive development. *Journal of Applied Developmental Psychology, 20*(4), 615-636.

Bjørkvold, J. (1992). *The muse within*. New York: Harper-Collins.

Burland, K., & Davidson, J. W. (2002). Training the Talented. *Music Education Research, 4*(1), 121-240.

Campbell, P. S. (1998). The Musical Cultures of Children. *Research Studies in Music Education December 11*(1), 42-51

Costa-Giomi, E. (1999). The effects of three years of piano instruction on children's cognitive development. *Journal of Research in Music Education, 47*(3), 198-212.

Davidson, L. (1985). Tonal Structures in Children's Early Songs. *Music Perception, 2*(3), 361-374.

Davies, C. (1992). Listen to my song: A study of songs invented by children aged 5 to 7 years. *British Journal of Music Education, 9*, 19-48.

de Vries, P. (2011). An 8-year old's engagement with preferred music: A case study. *Research Studies in Music Education, 33*(2), 161-177.

Dowling, W. J. (1984). Development of musical schemata in children's spontaneous singing. In W. R. Crozier & A. J. Chapman (Eds.), *Cognitive processes in the perception of art* (pp. 145-163). Amsterdam: Elsevier Science Publishers B.V.

Dowling, W. J. (1999). The development of music perception and cognition. In D. Deutsch (Ed.), *The Psychology of Music, Second Edition* (pp. 603-624). New York: Academic Press.

Forrester, M. A. (2010). Emerging musicality during the pre-school years: A case study of one child. *Psychology of Music, 38* (2), 131-158. .

Hall, C. (2005). Gender and boys' singing in early childhood. *British Journal of Music Education, 22*, 5-20.

Hannon, E. E., & Trainor, L. J. (2007). Music acquisition: effects of enculturation and formal training on development. *Trends in Cognitive Sciences, 11*(11), 466-472.

Hendricks, K. S., & McPherson, G. E. (2010). Early stages of musical development: Relationships between sensory integration dysfunction, parental influence, and musical disposition of a three-year-old ‘maestro’. *International Journal of Music Education, 28*(1), 88-103.

Howard, D. M., & Welch, G. F. (2003). Female chorister voice development: A longitudinal study at Wells, UK. *Bulletin of the Council for Research in Music Education*(153), 63-70.

Howe, M. J. A., Davidson, J. W., Moore, D. G., & Sloboda, J. (1995). Are there early childhood signs of musical ability? *Psychology of Music, 23*(2), 162-176.

Howe, M. J. A., & Sloboda, J. (1991). Young musicians' accounts of significant influences in their early lives: I. The family and musical background. *British Journal of Music Education, 8*, 39-52.

Kelley, L., & Sutton-Smith, B. (1987). A study of infant musical productivity. In J. Peerey, T. Peerey & T. W. Draper (Eds.), *Music and child development* (pp. 37-50). New York: Springer.

Koops, L. H. (2012). 'Now can I watch my video?': Exploring musical play through video sharing and social networking in an early childhood music class. *Research Studies in Music Education, 34*(1), 15-28.

Lamont, A. (1998). Music: Does it improve the mind? Respondent 3. *Psychology of Music, 26*(26), 201-203.

Leighton, G., & Lamont, A. (2006). Exploring children's singing development: do experiences in early schooling help or hinder? . *Music Education Research, 8*(3), 311-330.

MacWhinney, B. (2000). *The CHILDES project: Tools for analysing talk - The Database* (Vol. 2). New Jersey: Lawrence Earlbaum Associates.

Malloch, S., & Trevarthen, C. (Eds.). (2010). *Communicative Musicality*. Oxford: Oxford University Press.

Mang, E. (2001a). Intermediate vocalizations: An investigation of the boundary between speech and songs in young children's vocalizatons. *Bulletin of the Council for Research in Music Education, 147*, 116-122.

Mang, E. (2001b). A cross-language comparison of preschool children's vocal fundamental frequency in speech and song production. *Research Studies in Music Education, 16*, 4-14.

Mang, E. (2005). The referent of children's early songs. *Music Education Research, 7*(1), 3-21.

McKernon, P. E. (1979). The development of first songs in young children. In H. Gardner & D. Wolf (Eds.), *Early symbolization* (Vol. New Directions for child development). San Francisco: Jossey-Bass.

McPherson, G. E., & Renwick, J. M. (2001). A Longitudinal Study of Self-regulation in Children’s Musical Practice. *Music Education Research, 3*(2), 169-186.

Minks, A. (2008). Performing gender in song games among Nicaraguan Miskitu children. *Language & Communication, 28*, 36-56.

Mogharbel, C. E., Sommer, G., Deutsch, W., Wenglorz, M., & Laufs, I. (2006). The vocal development of a girl who sings but does not speak. *Musicae Scientiae, 10*(1), 235-238.

Moog, H. (1968). *The musical experience in children of the pre-school child* (C. Clarke, Trans.). Mainz: Schott.

Moore, D. G., Burland, K., & Davidson, J. W. (2003). The social context of musical success: A developmental account. *British Journal of Psychology, 94*, 529-549.

Moorhead, G. E., & Pond, D. (1977). *Music of young children*. Santa Barbara: Pillsbury Foundation for Advancement of Music Education.

Overy, K. (1998). Can music really 'improve the mind'? *Psychology of Music, 26*(26), 97-99.

Papousek, M., & Papousek, H. (1981). Musical elements in infant's vocalisations: Their significance for communication, cognition and creativity. *Advances in Infancy Research, 1*, 163-224.

Papousek, M., Papousek, H., & Symmes, D. (1991). The meanings of melodies in motherese in tone and stress languages. *Infant Behaviour and Development, 14*(415-440).

Rauscher, F. H. (1998). Music: Does it improve the mind? A response to Overy. *Psychology of Music, 26*(26), 204-205.

Rauscher, F. H. (2003). *Effects of piano, singing and rhythm instruction on the spatial reasoning of at-risk children.* Paper presented at the The 5th Triennial ESCOM Conference, Hanover University of Music and Drama, Germany.

Rauscher, F. H., Shaw, G. L., Levine, L., Wright, E. L., Dennis, W. R., & Newcomb, R. L. (1997). Music traning causes long-term enhancement of preschool children's spatial-temporal reasoning. *Neurological Research, 19*, 2-8.

Rutkowski, J., & Miller, M. S. (2003). A Longitudinal Study of Elementary Children's Acquisition of Their Singing Voices. *Applications of Research in Music Education, 22*(1), 5-14.

Rutkowski, J., Miller, M. S., & Campbell, D. L. (2001). *The "6th Grade Singing Slump": Continuation of a Longitudinal Investigation*.Unpublished manuscript, Tusconm, AZ.

Stadler Elmer, S. (1988). *Eine entwicklungspsychologische Untersuchung zum Erwerb des Tonsystems bei Kindern zwischen 4 und 9 Jahren.* Universität Bern.

Stadler Elmer, S. (1997). Approaching the song acquisition process. *Bulletin of the Council for Research in Music Education, 133*, 129-135.

Stadler Elmer, S. (2012a). Structural aspects of early song singing. . In A. Baldassare (Ed.), *Music - space - chord - image. Festschrift for Dorothea Baumann's 65th birthday (pp. 765-782). Bern: Lang.* (pp. 765-782). Bern: Lang.

Stadler Elmer, S. (2012b). *Infant Vocal Productions Challenge Music Education. A case study on the transition between speaking and singing at age 14 months. .* Paper presented at the Proceedings of the Twenty-fourth International Seminar on Research in Music Education, Thessaloniki.

Stadler Elmer, S. (2012c). Characteristics of early productive musicality. *Problems in Music Pedagogy, 10*, 9-23.

Stadler Elmer, S. (2012d). Human singing: Towards a developmental theory. *Psychomusicology: music, mind & brain, 21*(1&2), 13-30.

Stadler Elmer, S., & Elmer, F.-J. (2000). A new method for analysing and representing singing. *Psychology of Music, 28*(1), 23-42.

Suthers, L. (2001). Toddler diary: A study of development and learning through music in the second year of life. *Early Child Devopment and Care, 17*, 21-32.

Swanwick, K., & Tillman, J. (1986). The sequence of musical development. . *British Journal of Music Education, 3*(3), 305-339.

Tafuri, J. (2003). *Musical structures in spontaneous songs of children aged two to three years.* Paper presented at the The 5th Triennial ESCOM Conference, Hanover University of Music and Drama, Germany.

Tafuri, J., & Villa, D. (2002). Musical elements in the vocalisations of infants aged 2–8 months. *British Journal of Music Education, 19*(01), 73-88.

Tsang, C. D., Friendly, R. H., & Trehub, S. E. (2012). Singing development as a sensorimotor interaction problem. *Psychomusicology: music, mind & brain, 21*(1&2), 31-44.

Valerio, W. H., Seaman, M. A., Yap, C. C., Santucci, P. M., & Tu, M. (2006). Vocal evidence of toddler music syntax acquisition: A case study. *Bulletin of the Council for Research in Music Education, 170*(Fall), 33-45.

Welch, G. F. (1985). A schema theory of how children learn to sing in tune. *Psychology of Music, 13*(1), 3-18.

Welch, G. F. (1986). A developmental view of children's singing. *British Journal of Music Education, 3*(3), 295-303.

Welch, G. F. (1991). A developmental continuum of singing ability: Evidence from a study of five-year-old developing singers. *Early Child Development and Care, 69*(1), 107-119

Welch, G. F., Sergeant, D. C., & White, P. (1996). The singing competences of five-year-old developing singers. *Bulletin of the Council for Research in Music Education, 127*, 155-162.

Welch, G. F., Sergeant, D. C., & White, P. (1997). Age, sex and vocal task as factores in singing 'in tune' during the first years of schooling *Bulletin of the Council for Research in Music Education, 133*, 153-160.

White, P., Sergeant, D. C., & Welch, G. F. (1996). Some observations on the singing development of five-year-olds. *Early Child Development and Care, 118*, 27-34.

Whiteman. (2001). *How the bananas got their pyjamas: A study of the metamorphosis of preschoolers’ spontaneous singing as viewed through Vygotsky’s Zone of Proximal Development.*, University of New South Wales, Syndney.

Whiteman, P. (2009). Type, function and musical features of preschool children's spontaneous. In L. K. Thompson & M. R. Campbell (Eds.), *Research Perspectives: Thought and Practice in Music Education* (Vol. 2, pp. 37-62). Charlotte, NC: Information Age Publishing.

Yoffie, L. R. C. (1947). Three generations of Children's Singing Games in St. Louis *Journal of American Folklore, 60 (235)*, 1-51.

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1. Susan Young (personal communication) makes the point that if one stretched further the parameters of longitudinal, then this would bring in a range of studies in anthropology and ethnomusicology concerned with the study of children’s song and music making (Yoffie, 1947; Minks, 2002; Bickford, 2011). For the moment, and while recognizing the potential methodological ethnocentrism of this review, attention is restricted to those studies which employed a longitudinal approach as a deliberate research strategy. The two authors of this paper would like to acknowledge the work of Silvia Sbaraini who collated many of the relevant studies which form this review. [↑](#endnote-ref-1)
2. This qualitative methodology is known as interpretative phenomenological analysis (IPA). [↑](#endnote-ref-2)
3. A significant proportion of this work has been published in German, with further work either in press, or forthcoming (see <http://www.psychologie.uzh.ch/institut/angehoerige/dozierende/stadler.html>) [↑](#endnote-ref-3)
4. In this regard, Tsang, et al (2011) provide a comprehensive account of those aspects of singing development germane to the vocal sensorimotor loop model developed by Berkowska & Dalla Bella (2009). In this cognitively focused model, singing production is said to be mediated by a comparison between an ‘internalized voice’ and sensory information monitoring actual performance. [↑](#endnote-ref-4)